Financed under specific grant agreement no.2015/368-253 from the EU IPA II Multi-Beneficiary Programme for Albania, Bosnia and Herzegovina, North Macedonia, Kosovo*, Montenegro and Serbia

* This designation is without prejudice to positions on status, and is in line with UNSCR 1244/199 and the ICJ opinion on the Kosovo declaration of independence.

# Western Balkans Investment Facility Infrastructure Project Facility Technical Assistance 5 (IPF 5)

TA2015030 R0 IPA

## Feasibility Study for the Adriatic-Ionian Road Corridor (Route 1 and Route 2) Montenegro and Albania

## WB14-REG-TRA-01

## PESIA – Albania

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June 2020

• IPF 5

A project implemented by the WYG : IPF 5 Consortium

*The Infrastructure Project Facility (IPF) is a technical assistance instrument of the Western Balkans Investment Framework (WBIF) which is a joint initiative of the European Union, International Financial institutions, bilateral donors and the governments of the Western Balkans which supports socio-economic development and EU accession across the Western Balkans through the provision of finance and technical assistance for strategic infrastructure investments. This technical assistance operation is financed with EU funds.*

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# Synopsis

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|---|---|
| Project Title: | Western Balkans Investment Framework Infrastructure Projects Facility – Technical Assistance 5 |
| Project Number: | TA2015030 RO IPA |
| Contractor: | IPF5 Consortium |
| Beneficiary: | Ministry of Transport and Maritime Affairs of Montenegro – State Roads Directorate<br>Ministry of Transport and Infrastructure of Albania |
| Location: | Montenegro and Albania |
| Consultant: | WYG-COWI-Atkins-Arup Joint Venture |
| Sub-Project Title: | Feasibility Study for the Adriatic-Ionian Road Corridor (Route 1 and Route 2) Montenegro and Albania |
| Sub-Project Number: | WB14-REG-TRA-01 |
| Project Start Date: | 15 November 2017 |
| Original Project Duration: | 18 months |
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# Abbreviations

| Abbreviation | Meaning |
|---|---|
| AIC | Adriatic-Ionian Corridor |
| ALB | Albania |
| ALL | Albanian Lek |
| ALUIZNI | Agency for Legalization, Urbanization and Integration of Informal and Building Areas |
| ARDM | Albanian Road Design Manual |
| ARA | Albanian Roads Authority |
| ASIG | State Authority for Geospatial Information |
| ASL | Above Sea Level |
| CBA | Cost-Benefit Analysis |
| CM | Cultural Monuments |
| CNC | Core Network Corridor |
| CSOs | Civil Society Organizations |
| DCM | Decision of the Council of Ministers |
| DTM | Digital Terrain Model |
| EBRD | European Bank for Reconstruction and Development |
| EC | European Commission |
| EIA | Environmental Impact Assessment |
| EIB | European Investment Bank |
| ESAP | Environmental and Social Action Plan |
| ESIA | Environmental and Social Impact Assessment |
| ESMP | Environmental and Social Management Plan |
| ESSS | Environmental and Social Scoping Study |
| EU | European Union |
| FS | Feasibility Study |
| GoA | Government of Albania |
| GDP | Gross Domestic Products |
| GIS | Geographical Information System |
| GHGs | Greenhouse Gases |
| GIP | Good International Practice |
| GCM | Global Climate Model |
| ICM | Institute of Cultural Monuments |
| IHC | Intangible Cultural Heritage |
| IFI | International Financing Institution |
| INDC | Intended Nationally Determined Contribution |
| IPA | Instrument for Pre-accession Assistance |
| IPCC | Intergovernmental Panel on Climate Change |
| IPF5 | Infrastructure Project Facility -Technical Assistance 5 |
| ILO | International Labour Organization |
| ISR | Institute of Soil Research |
| JT | Journey Time Surveys |
| LARF | Land Acquisition and Resettlements Framework |
| LRAP | Livelihood Restoration Action Plan |
| LEDs | Light Emitting Diodes |
| MCA | Multi Criteria Analysis |
| MNE | Montenegro |
| MC | Ministry of Culture |
| MIE | Ministry of Infrastructure and Energy |
| MTE | Ministry of Tourism and Environment |

| Abbreviation | Meaning |
|---|---|
| NEA | National Environmental Agency |
| NTS | Non-Technical Summary |
| OHS | Occupational health and safety |
| PA | Protected Area |
| PESIA | Preliminary Environmental Impact Assessment |
| PIT | Project Implementation Teams |
| PPP | Public-Private Partnership |
| PR | Performance Requirements |
| RAP | Resettlement Action Plan |
| RCTRA | Regulatory Council of the Territory of Republic of Albania |
| RCP | Representative Concentration Pathways |
| QA | Quality Assurance |
| REBIS | Regional Balkans Infrastructure Study |
| REA | Regional Environmental Agency |
| SAA | Stability and Association Agreement |
| SEE | Southeast Europe |
| SEETIS | South East Europe Information System |
| SEETO | South East Europe Transport Observatory |
| SEP | Stakeholders Engagement Plan |
| TA | Technical Assistance |
| TEM | Trans-European North South Motorway |
| TEN-T | Trans -European Transport Networks |
| ToR | Terms of Reference |
| UNECE | United Nations Economic Commission for Europe |
| UNEP | United Nations Environment Programme |
| UNFCCC | United Nations Framework Convention on Climate Change |
| WSSC | Water Supply and Sewerage Companies |
| WB | Western Balkans |
| WBIF | Western Balkans Investment framework |
| WMO | World Meteorological Organization |

# 1. Introduction

## 1.1 Project developer

The Project Beneficiaries in Albania are the Ministry of Infrastructure and Energy (MIE) and Albanian Roads Authority (ARA). The Ministry of Infrastructure and Energy (MIE) is responsible for the transport, infrastructure and technical standards. The MIE functions are managed through four General Directorates (divided into 3-4 directorates with its respective sectors), while the ARA functions are managed through five Directorates. Regional directorates implement and control the activity of ARA in their administrative area.

## 1.2 Project rationale

In order to review and analyse regional transport in the Western Balkans, the European Union (EU) commissioned and financed the Regional Infrastructure Balkans Study (REBIS) which was completed in 2003. The Trans-European Transport Network (TEN-T) audit and its integration with the basic REBIS network resulted in the South East Europe Transport Observatory (SEETO) transport network. The SEETO is a regional transport organization established by the Memorandum of Understanding for the Development of a Basic Regional Transport Network, signed by the Government of Albania, Bosnia and Herzegovina, Croatia, North Macedonia, Montenegro, Serbia, Kosovo as well as by the European Commission. The Adriatic-Ionian route is recognized in the Basic REBIS Network (Route 2b).


**Figure 1-1 The basic REBIS Network**

The Adriatic-Ionian Road Corridor (AIC) is part of the extension of the TEN-T Core Network into the Western Balkans, encompassing the Croatian Border – Bar - the Albanian border through Montenegro (Route 1) and the Albanian North-South Road Corridor linking the Montenegro border with the Greek border through

Albania (Route 2).The AIC will be part of the Mediterranean Road Core Network Corridor (CNC).

Extending the CNC to the Western Balkans should provide closer integration with the EU as well as the basis for leveraging investment in infrastructure, such as EU support through the Western Balkans Investment Framework and the Connecting Europe Facility. The CNC, once completed, will provide quality transport services for citizens and businesses, with seamless integration within the region as well as with the EU.

The existing Adriatic-Ionian Corridor in the Western Balkans region consists of different existing sections of the core road network, as shown in the following Figure.


**Figure 1-2 The Adriatic-Ionian Road Corridor**

On 1 April 2009, the Government of Albania and the EU Member States signed a Stability and Association Agreement (SAA). In June 2014, the EU granted a candidate status to Albania. The EU progress report in 2014 highlights that "Albania should focus on developing the routes defined in the indicative extension of the TEN-T to the Western Balkans region", and "improving transport operations by increasing the quality of the transport services and enhancing the overall performance of the transport system".

Albania has shown its commitment to improve the regional cooperation, to increase the economic stability, and to fulfil the EU accession criteria since the Berlin Process[1] was launched.

The importance of the AIC Corridor is recognized in the following national strategic documents:

National Strategy for Development and Integration 2014- 2020 (NSDI-II)

Between others this strategy underlines that the establishment of an efficient, flexible and safe transportation infrastructure is mandatory for economic growth because it facilitates productivity and ensures easy and reliable movement of people and goods. A modern transportation system is a prerequisite for creating a high quality business and living environment. *One of the main Goals of this Strategy is: "Modernization of major national motorways, railroad infrastructure, ports and airports to ensure compatibility and further integration with neighbouring countries and with the Pan-European transportation network".*

[1] The **Berlin Process** is a diplomatic initiative linked to the future enlargement of the European Union. It started with the 2014 Conference of Western Balkan States, Berlin, followed by the 2015 Vienna Summit, 2016 Paris Summit and the 2017 Trieste Summit. The last conference was held in July 2018 in London

National Plan for European Integration 2014-2020;

The National Plan for European Integration 2014-2020 serves as a basis for planning Albania's EU Integration process. The plan is fully consistent with the Annual Legislative Plan of the Government, and when updated will also be fully consistent with the National Strategy for Development and Integration, as well as with other national/sectorial strategies. The National Plan for European Integration replaces the National Plan, for the Implementation of the Stabilization and Association Agreements and acquis. Between others a range of transport legislation is adapted in this Plan frames.

National Single Strategic Project Pipeline 2016-2017

Supports the implementation of the National Strategy for Development & Integration (NSDI) 2015- 2020 • Based on developed set of criteria reflecting EU and NSDI 2015-2020 and policy goals of sectorial strategies & master plans.

Sectorial Strategy of Transport and Action Plan 2016-2020

The main goal of this strategy is to have an efficient transport system, integrated in the region and in the EU network, which promotes economic development and upgrades the citizens' quality of life. *One of the main challenges in the road sector for the 2016-2020 planning period is the completion of. Adriatic Ionian Highway North-South, while one of the short-term objectives is to ensure the implementation of the cross-border agreement with Montenegro as part of the Adriatic-Ionian highway project, while the medium term is linked to the increased efficiency of other cross-border agreements.*

Albanian National Transport Plan  2016-2020;

The main goals of this plan are; a) Further develop Albania's national transportation system; b) Significantly improve its interconnectivity, interoperability and integration with European transport system. It is in.full alignment with the strategic vision of the Albanian Government, (aligned with National Strategy for Development and Integration 2015-2020, and other crosscutting strategies).and the main concepts of the European Transport Policy

Five Year Multi Annual Plan SEETO, 2013;

The mission of this Plan is to improve the level of Road Safety and establish the positive trends in continuous decline of number of fatalities and injuries as is the case in EU

REBIS (Regional Balkans Infrastructure Study),  Updated September 2015

REBIS, is an effort to further develop the South East Europe transport observatory (SEETO) comprehensive network, integrate it in the European Union's (EU) Trans-European transport (TENT) network and strengthen the underlying transport planning systems, by the Western Balkans infrastructure framework (WBIF) for the update of the regional Balkans infrastructure study (REBIS). Its action plan identifies priority physical investments as well as non-physical improvements including regulatory, institutional, and managerial changes required to reduce impediments to the efficient performance of the network.

The existing Adriatic road runs along the eastern coast of the Adriatic Sea and passes through three countries, i.e. Croatia, Bosnia and Herzegovina and Montenegro, with a large part of it located in Croatia. The completion of the Adriatic-Ionian Road Corridor is proposed to replace the Adriatic road with a high-performance road route along the Adriatic coast. The Adriatic-Ionian Road Corridor is a strategic project for the Southeast Europe (SEE) and the Balkans region. Its completion will provide a corridor of high capacity and quality which will connect Central Europe and Northern Italy with the Ionian peninsula via Slovenia, Croatia, Bosnia and Herzegovina, Montenegro, Albania and Greece. The overall AIC from Italy to Greece will be approximately 1,500 km, while in Albania the corridor passes approximately 306 km or 20% of total length.

The Project is expected to provide significant improvements in the following fields:

Integrating the Albanian roads to the Core Transport Network and in the SEETO;

Fostering economic development of Western Balkans through improved connections;

Improving regional cooperation and economic stability of Albanian country;

Increasing the quality of the transport services and enhancing the overall performance of the transport system;

Reducing the road infrastructure maintenance costs;

Accommodating the increasing traffic growth and minimizing congestion;

Improving local environmental and social conditions;

Improving traffic safety and achieving cost efficiency regarding environmental protection, accidents and congestions at border crossings and urban area near the existing road in comparison to competitive roads,

Improving mobility of citizens and reduction of travel times;

Currently, the existing road network along the AIC route varies from single carriageway primary roads to sections of full motorway standards. The corridor itself has never before been examined as a whole, so there are currently no previous studies providing information for the entire corridor in Albania. However, smaller sections of the corridor have already been examined and are in different stages of maturity.

The AIC will be of great strategic importance for the Albania's economic growth and tourism, while it will provide access to businesses, densely populated areas and to major touristic attractions and coastal areas. Therefore, the further development and modernization of the transport infrastructure remains to be one of the top governmental priorities.

In terms of traffic, the AIC will contribute to the de-congestion of the existing traffic and increase of the speed. Currently, the road sections along the AIC which are closer to Tirana are congested (compared to the rest of the road sections) as they have more than 45,000 vehicles per day in 2018 (station near Vore). In addition, the average speed on the AIC existing road sections varies from approximately 50 km/h to 80 km/h. It is noted that in general, significant variations in speed are observed on all route sections.

One of the main projects in synergy with the AIC which will have an international character will be the Ionian Adriatic Pipeline (IAP). IAP will be approximately 511 km long, with approximately 168km in the Albanian section. The route starts at compressor station on the TAP system near Fier and runs north towards Shkodra. Near Torovica, a BVS (Block Valve Station) and (CTMS) Custody Transfer Metering Station Bushat will be placed. From Torovica the route runs toward the border between Albania and Montenegro at Shkodra. At the border the pipeline route crosses Buna river.


**Figure 1-3 Ionian – Adriatic Pipeline**

## 1.3 Project history

The main output outlined in the ToR is the Preparation of the Feasibility Study for the Adriatic-Ionian Road Corridor/expressway Road Corridor/expressway (further in the text Adriatic-Ionian Road Corridor-AIC) on the territories of Albania and Montenegro, together with the preparation of the General Project and the Environmental Impact Assessment and Social Issues Study.

The AIC in Albania will start at the new border crossing point in Fraskanjel, 6 km south of Sukobin, and will continue via Lezha (Lezha Bypass), Milot – Thumane – Vore (Limuth) – Beshiri Bridge – Konjat – Fier – Fier Bypass – Levan – Memaliaj –Subashi Bridge – Gjirokaster – Gjirokaster Bypass further south to Kakavija (Border with Greece). The Albanian part of the AIC is estimated to be approximately 318 km long and will form a combination of both motorways and expressways.

More specifically, the Albanian part of the AIC is divided into the following road sections:

Section 1: Murriqan (Border with Montenegro) – beginning of Lezhe Bypass, 40.946 km long

Section 2: Beginning of Lezhe Bypass – Milot, 16.190 km long

Section 3: Milot–Thumane, 13.455 km long

Section 4: Thumane–Kashar, 21.05 km long

Section 5: Kashar - Rrogozhine divided into two segments:

- 5B Kashar-Lekaj, 33.573 km long
- 5C Lekaj-Konjat, 14.168 km long

Section 6+7: Rrogozhine – beginning of Fier Bypass, 28.037 km long

Section 8: Fier Bypass currently under construction, 22.185 km long

Section 9 divided into two segments:

- 9A2: End of Fier Bypass –Pocem, 26.901 km long
- 9B2, Pocem-Memaliaj, 37.694 km long

Section 10: Memaliaj - Subashi bridge, 20.143 km long

Section 11: Subashi bridge – beginning of Gjirokaster Bypass,10.26 km long

Section 12: Gjirokaster Bypass, 9.7 km long

Section 13A: End of Gjirokaster Bypass – Border with Greece (Kakavije), 23.790 km long

The entire AIC in Albania is divided into 13 road sections according to their development status.

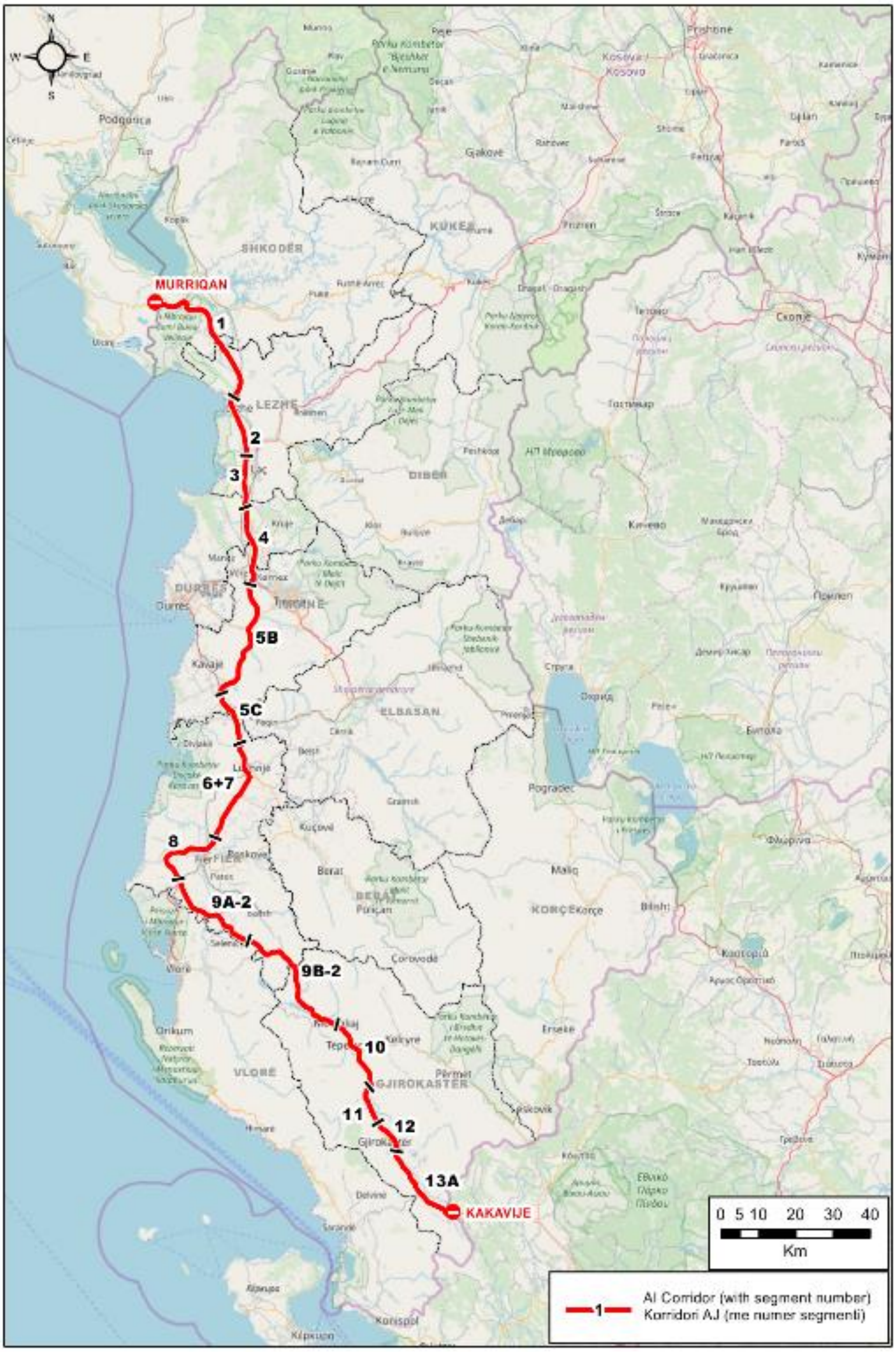



**Figure 1-4 The Adriatic Ionian Road Corridor through Albania**

The corridor itself has never been examined as a whole before, so there are currently no previous studies providing information on the entire corridor. However, smaller sections of the corridor in Albania have already been examined and are in different stages of maturity.

Previous studies that the present Conceptual Design analysis has been based on are presented in the following table.

**Table 1-1 Previous Studies for Albania**

| No | Study / document | Date / Consultant |
|---|---|---|
| 1 | National Strategy for Development and Integration (GoA programme 2016-2020) | Decree no. 348, dated 11 May 2016 |
| 2 | Ratification of the agreement for the opening of border crossings in Murriqan, between Albania and Montenegro, GoA | Official Gazette: Law no.9702, dated 2.4.2007 |
| 3 | Inventory and Analysis of Road Ancillary Infrastructure along TEN-T Core extension in South-East Europe, RCC/SEETO: Support to the Transport Dimension of the SEE 2020 Strategy | Final Report, Dec. 2016 I.E.C.C Marios Miltiadou & Associates Ltd. |
| 4 | Gasification Infrastructure Master Plan, EC/EIB | WBIF-IPF4, Final Report November 2016 |
| 5 | Albanian Road Code, GoA | Law no. 8378, dated 22 July 1998, amended |
| 6 | WB7-ALB-TRA-12: Feasibility Study, Preliminary Design and PESIA for new Tirana Bypass, EC | WBIF-IPF2, Final Report April 2014 |
| 7 | Project Proposal to GoA: Concession of Thumane-Rrogozhine Toll Motorway, GoA | Final Report, Dec. 2007 Konstruktor-Inzenjering DD. Split, Croatia |
| 8 | Project Proposal to GoA: Concession of Thumane-Rrogozhine Toll Motorway (update study), GoA | Final Report, Jan. 2016 ITP Consulting Ltd. Tirana, Albania |
| 9 | WB17-ALB-TRA-02: Feasibility Study and PESIA for new Lezhe bypass, EC | WBIF-IPF4, Draft ToR November 2017 |
| 10 | Construction Price Handbook, MIE | Latest update, 2015 |
| 11 | Detailed design (plan) for the existing Lezhe-Shkoder highway, MIE | Lotti (Italy), 2002 |
| 12 | Detailed design (plan) for the existing Levan-Tepelene highway, EU-PHARE programme in Albania | Scetauroute (France), 2004 |

The different parts of the AIC are in different stage in terms of preparation and implementation. The existing documentation regarding ESIA under EBRD guidelines and EIA under national guidelines is given in the following table.

**Table 1-2 Sections for which EIAs/ESIAs have been prepared**

| | Section | ESIA EBRD | EIA National |
|---|---|---|---|
| 1. | Border Crossing Buna bridge | | |
| 2. | Buna Bridge – Lezha | | |
| 3. | Lezhe bypass | | |
| 4. | Lezhe Milot | | |
| 5. | Milot – Thumane | | |
| 6. | Thumane – Vore | | |
| 7. | Vore – Beshiri bridge | | |
| 8. | Beshiri bridge – Konjat | | |
| 9. | Konjat -Fier | | |
| 10. | Fier bypass- Levan | | |
| 11. | Levan – Memaliaj | | |

| | | | |
|---|---|---|---|
| 12. | Memaliaj – Subashi bridge | | |
| 13. | Subashi bridge – Gjirokaster bypass | | |
| 14. | Gjirokaster bypass | | |
| 15. | Gjirokaster - Kakavije | | |

## 1.4 The Project's Preliminary Environmental and Social Impact Assessment (PESIA) Process

The Consultant's overall approach to PESIA follows Albanian regulations and in line with the requirements of the European Environment Impact Assessment (EIA) Directive, applicable international standards and the European Bank for Reconstruction and Development (EBRD) Performance Requirements (PR1-10).

The specific objectives of the PESIA areas are listed as follows:

- Present the main characteristics of the baseline regarding environmental and social parameters
- Ensure that key potential significant positive and adverse environmental and social impacts are identified;
- Capitalize on positive aspects and benefits;
- Mitigate negative impacts and avoid serious and irreversible damage to the environment and people;
- Prepare environmental and social management and monitoring plan to help ensure the stated above;
- Ensure that environmental and social factors are considered in the decision- making process of construction of the road alignment;
- Inform the public about the proposed Project and ensure stakeholder participation and involvement.

A description of the PESIA process steps is provided in the following table.

**Table 1-3 PESIA process steps**

| Step | Description |
|---|---|
| Alternatives Assessment - carried out during Phase 1 | Assessment of alternatives with the aim to identify the positive and negative environmental and social issues of each one per Section |
| Scoping | Scoping identifies the key issues to be addressed in the PESIA. Scoping, as presented in this report, will ensure that the process focuses on the potentially significant environmental and social impacts which may arise from the Project. It will consider the results of consultations undertaken to date on the Project. Ultimately scoping defines the scope of work of the PESIA, including stakeholder engagement. |
| Baseline studies | For the key issues identified in scoping, available information on the existing environmental and social conditions (also referred to as baseline conditions) will be gathered. This will be supplemented by field visits and engagement with affected communities where necessary. The future development of the baseline conditions in the absence of the Project will also be considered. |
| Impact assessment and mitigation measures | This stage focuses on predicting environmental and social changes from the baseline as a result of the Project's activities (considering the entire lifecycle of the Project). Each impact will then be evaluated to determine its significance for the environment and society. Where necessary measures will be proposed to mitigate significant impacts. |

| Step | Description |
|---|---|
| Preliminary Environmental and Social Management Plan (PESMP) | The various mitigation measures will be presented in a PESMP, describing how measures will be implemented throughout the different Project phases. The PESMP will give indicative details (reflecting the project stage - Conceptual Design) for the responsibilities for the implementation, the timing, monitoring and audit plans to ensure all the mitigation commitments are met. It will also identify any requirements for training and other capacity building. |
| Stakeholder Engagement and Consultation | During the PESIA phase, the team will seek the views of interested parties so that these can be considered in the assessment and reflected in the proposals for mitigation. |

## 1.5 Approach to PESIA

In line with the requirements set out in the ToR, the Consultant will undertake the PESIA in two phases:

Phase 1: Environmental and Social Scoping Study (ESSS);

Phase 2: Preliminary Environmental and Social Impact Assessment (PESIA).

This document, is the deliverable of the Phase 2 (PESIA), and aims at:

Providing a more detailed description of the Project;

Describing the existing environmental and socioeconomic baseline;

Identifying potential environmental and socioeconomic issues associated with the proposed Project at the level of PESIA;

Obtaining input from key stakeholders in the identification of potential impacts and mitigation measures; and

Identifying key data gaps and orientate the Consultant who will be responsible for the preparation of the ESIA to where his attention should be given.

The PESIA has been prepared in accordance with international requirements as defined by the potential lender to the Project – the EBRD.

## 1.6 PESIA Structure

The remainder of this report is structured as follows:

**Table 1-4 Structure of the PESIA Report**

| Chapters | Context |
|---|---|
| Chapter 2 | *Regulations and Guidelines* provides a brief overview of the relevant Albania and International ESIA regulatory framework and international best practice with regards to scoping; |
| Chapter 3 | *Project Description:* describes the main components of the Project and the main construction and operation activities; |
| Chapter 4 | *Baseline Conditions*: provides an overview of the baseline environmental, socioeconomic and cultural heritage characteristics of the Study Area; |
| Chapter 5 | *Description of Selected Options*: summarizes the alternatives road alignments and proposes the "base case" route; |
| Chapter 6 | *Potential Impacts and mitigation measures:* summarizes potential significant environmental, socioeconomic and cultural heritage impacts at the level of PESIA and provides an indication of potential mitigation and management measures at the level of PESIA; |
| Chapter 7 | *Stakeholder Engagement:* summarises objectives of the stakeholder engagement plan (SEP), consultation activites undertaken in the PESIA preparation process so far. Identified groups of |

| Chapters | Context |
|---|---|
| | the external stakeholders and key steps of disclosure of information. The chapter is summarized as there is separate document, SEP which provides detailes related to Stakeholder engement. |
| Chapter 8 | *Preliminary environmental and social management plan and monitoring*: presents a preliminary activities plan for the Contractor and the Operator and proposes indicative issues that should be monitored per parameter |
| Chapter 9 | *Uncertainty and Difficulties Faced in Undertaking the PESIA* presents the difficulties faced as well as studies, measurements and activities to be done under ESIA |
| Annexes | 1. Maps<br>2. Photo log<br>3. Flora and fauna with specific status in habitats surrounding the AIC Sections<br>4. Specific detailes related to socioeconomic baseline;<br>5. Bill of Quantities<br>6. Stakeholder meeting log<br>7. Preliminary ESMP |

## 1.7 Project consultants

The IPF5 team for this particular sub-project under WBIF, namely WYG consortium (composed of WYG International Limited / COWI A/S / WS Atkins International Limited / Ove Arup & Partners International Ltd / CeS COWI d.o.o. / COWI SPRL / COWI AB / Systema Transport Planning & Engineering Consultants Limited), was contracted in July 2016 as the executing agent for the mentioned sub-project.

# 2. Regulations and guidelines

The Project is expected to be designed, constructed and operated in full accordance with the EBRD's Environmental and Social Policy that was approved by the EBRD Board of Directors on 7 May 2014 and will apply to projects that are initiated after November 7, 2014.

The EBRD has adopted a comprehensive set of specific Performance Requirements (PR) that the Project is required to meet. The EBRD will seek within its mandate to ensure through its environmental and social appraisal and monitoring processes that projects are designed, implemented and operated in compliance with applicable Policy Requirements and good international practice (GIP ).The EBRD, as a signatory to the "European Principles for the Environment" is committed to promoting the adoption of EU environmental principles, practices and substantive standards by EBRD-financed projects, where these can be applied at the project level, regardless of their geographical location. Also, the EBRD recognizes the responsibility of clients and their business activities to respect human rights. This responsibility involves respecting human rights, avoiding infringement on the human rights of others, and addressing adverse human rights impacts that their business activities may cause, or to which they may contribute. In this, the EBRD is guided by the International Bill of Human Rights, the UN Declaration of Human Rights and the eight core conventions of the International Labour Organization (ILO).

The Project is also expected to meet all Albanian (national) as well as EU laws and Directives. This Section presents a list and a summary of the most relevant national and EU laws applicable to the social and environmental component of the Project and the EBRD's Environmental and Social Policy.

## 2.1 Overview of the Main Relevant National Legislation

Regarding the environmental field, the primary authority responsible for the environmental management and policy at the national level in Albania is the Ministry of Tourism and Environment (MTE). Under this Ministry, the National Environmental Agency (NEA) and Inspectorate of Forests, Environment, Waters and Tourism function with their branches in each Region.

The MTE compiles and implements the government policy on environmental protection, drafts or approves the relevant legal and sub-legal acts for the purpose of sustainable development, environmental protection and management. Additionally, it coordinates the activities of the relevant institutions for environmental issues, organizes and coordinates the work for environmental monitoring, prepares international or bilateral documents for the protection of the environment, etc.

The national environmental legislation is undergoing an intensive transposition phase through the inclusion of the EU Environmental Directives. The main principles of EU environmental laws are already transposed into the Albanian legislation. The legislation reflects the requirements of the conventions in which Albania is a signatory party.

The Environmental Regulatory framework in Albania consists inter alia of the environmental legislation, legislation regarding EIA, Protected Areas, other Laws related to the environmental parameters such as, waters, soils, air, noise, waste etc.

The legal basis for the protection of nature derives from the Constitution of the Republic of Albania, 1998 approved by Law No. 8417, dated 21.10.1998. Article 59 of the Constitution emphasizes that "the State aims at a healthy and sustainable ecological environment for the present and future generations, and the rational utilization of natural resources on the basis of the principle of sustainable development" and aims at ensuring the expansion and strengthening of the protected area network.

In order to address the socio-economic aspects, there are also applied the national laws covering Health Protection, Occupational Health & Safety, Labor Relations, Occupational Safety, Employment, Social Protection, Land Acquisition, etc.

The main legislation in relevance with ESIA preparation and environmental and social parameters, which is generally aligned with the EU environmental directives and standards, is presented in the following table.

**Table 2-1 Summary of the main legal acts in relevance to ESIA**

| Number of the law | Law | Compatibility to EU Directive | Relevance to the ESIA |
|---|---|---|---|
| **Environmental legislation** | | | |
| Law no. 10 431, dated on 09.06.2011 | On Environmental Protection | Partially compatible to Directive 2004/35/EC date 21 April 2004.' on environmental liability with regard to the prevention and remedying of environmental damage[1] | Article 25 of this Law refers to the EIA as a process that applies the principle of prevention at an early stage of project planning in order to avoid or minimize adverse environmental effects.<br>Pursuant to Article 41 of this Law, a National Environmental Monitoring Network on water, air, noise etc., is established. |
| Law No.10440, amended by the law no.12/2015 | On Environment Impact Assessment | Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment[2] | The purpose of this Law is to ensure high level of environmental protection through prevention, minimization and compensation of damage on environment from proposed projects, prior to their approval for development;<br>Article 7 of this Law sets out the procedures of the EIA.<br>Annexes 1 and 2 of this Law include the developments that are subject to the preliminary and profound EIA procedure<br>Article 23 stipulates the environmental procedures in the transboundary context, in case a project may have significant effects on the environment of one or more neighbouring countries or when receiving a request from another country, |
| Law No 8868, dated on 04/02/2008, amended by the new law in 2017 | On Protected Areas | Council Directive 92/43/ECC, date 21 May 1992, 'on the conservation of natural habitats and of wild fauna and flora'[3] | The aim of this Law is to establish the framework for protection, administration, sustainable use of natural protected areas and their natural and biological resources, to guarantee fulfilment of environmental, economic and socio-cultural functions, in interest of the society, and to define the responsibilities of public institutions and physic/juridical persons for conservation and sustainable administration/use.<br>Article 12 of this Law gives the structure of the zoning of Protected Areas:<br>For protected areas such as "Strict Protected Reserve" and "Nature Monuments" categories, there are not established specific buffer zones . |
| Law no. 10448, date 14.07.2011 | On Environmental Permit | Directive 2010/75/EU 'On Industrial Emissions'[4]<br>Directive 2008/1/EC 'concerning integrated pollution prevention and control'[5]<br>Directive 2008/105/EC, 'on environmental quality standards in the field of water policy, | This Law aims at preventing, reducing and controlling the pollution caused by certain categories of activities in order to achieve a high level of protection of the environment, human health and quality of life.<br>Article 4 of this Law defines the type of the Environmental Permits which are obligatory for the developments/activities and which are listed in the Annexes of this Law. |

| Number of the law | Law | Compatibility to EU Directive | Relevance to the ESIA |
|---|---|---|---|
| | | amending and subsequently'[6] | |
| Law no. 107, dated 10/07/2014 | On territorial planning and development | | This Law aims at ensuring the sustainable development of the territory through the rational use of land and natural resources and at evaluating the current and prospective potential for the development of the territory at national and local level, based on balancing of natural resources, economic and human needs and public and private interests, by coordinating the work |
| Law no.111, dated 15.12.2012 amended by Law No. 6/2018 | For Integrated management of Water resources | Directive 2000/60/EC of European and Parliament Council date 23 October 2000 'establishing a framework for Community action in the field of water policy'[7] | The purpose of this Law is to protect and improve the water environment, ensure, maintain, develop rational use of water resources, fair distribution of water resources as well as to protect water resources from pollution,<br>Article 28 of this Law defines the water quality standards for all water sources |
| Law no.10266, dated 15.04.2010 | To protect the air from pollution | European Parliament and Council Directive 2008/50/EC, date 21 May 2008, 'on ambient air quality'[8] | Article 1 states that the scope of this Law is to improve public health and ensure a high level of environmental protection, by integrating the issue of air protection into other policies, and by defining the requirements for reducing the emissions.<br>Article 13 of this Law states that the Council of Ministers, upon the proposal of the Minister responsible for environment and the Minister responsible for transport, approves the decision on the measures to be taken against air pollution from the discharges of motor vehicles. |
| Law no. 9774, dated 12.7.2007 Amended by the law no.39/2013 | On Assessment and Management of Environmental noise | Directive 2002/49/EC 'assessment and management of environmental noise'[9] | This Law defines ways of avoidance and measures to prevent, reduce and eliminate the harmful effects of exposure against them, including noise annoyance, in order to protect the health and the environment from noise. |
| Guidance No.8, date 27.11.2007 | On Limit Level of Noises in Defined Environment | Directive 2002/49/EC 'assessment and management of environmental noise | This Guidance gives the limits of noise levels in different environments. |
| Law no. 10463, dated 22.09.2011 | For integrated waste management | European Parliament and Council Directive 2008/98/EC, 'on waste'[10] | This Law sets out the general rules for integrated waste management, including the prevention or reduction of adverse impacts from their creation and management, by reducing the use of resource and by improving the efficiency of this use. Based on this Law, the requirements for inert waste management during the collection transport, delivery and treatment of inert waste in the field of construction are defined and approved |
| Law no. 9537, date 18.5.2006 | On Administration of Hazardous Waste | Directive 91/689/EEC on hazardous waste[11] | This Law describes the procedure for the administration of hazardous wastes and penalties in cases of Law violation. |
| **Social legislation** | | | |

| Number of the law | Law | Compatibility to EU Directive | Relevance to the ESIA |
|---|---|---|---|
| Law No. 8308 date 1998, amended by; Law no. 8908/2002; Law no. 9096/2003; Law no. 9373/2005; Law no.9760/2007; Law no.10488/2011. | On Road Transport | Directive 96/26/EC of 29 April 1996 'On admission to the occupation of road haulage operator and road passenger transport operator and mutual recognition of diplomas, certificates and other evidence of formal qualifications intended to facilitate for these operators the right to freedom of establishment in national and international transport operations | This law addresses such issues as: a) laying the rules covering the passenger transport companies; b) laying the legal foundations of the Road Transport Commission; c) the licenses to foreign owned transport companies; d) procedures and criteria applying to road transport companies; e) transport of hazardous materials; f) driver licenses; g) technical inspections of vehicles; h) oversized vehicles; and i) road safety and road traffic. |
| Law no.8378/1998 | On the Road Code of the Republic of Albania | Partially approximated to the Council Directive 96/53/EC, 1996 'laying down for certain road vehicles circulating within the Community the maximum authorized dimensions in national and international traffic and the maximum authorized weights in international traffic'. | Regulates the road categories, competencies, road control agencies, maximum permissible dimensions and the maximum authorized weight of vehicles.<br>Article 13-34 defines the norms for construction and administration of roads, reserved roads in curves outside residential areas and reserved roads inside residential areas, road safety distances, occupation of road surface, construction, walls and protective works close to the roads. |
| Law no. 7961, date 12.07.1995, amended by the law no.136/2015 | On Labour Code in Albania | Partially adopted to Council Directive 91/533/ECC, Directive 92/85/ECC, Directive 94/33/ECC, Directive 96/71/EC, Directive 97/81/EC, Directive 98/59/EC, Directive 1999/70/EC, European Parliament and Council Directive 1999/92/EC, Directive 2000/43/EC, Directive 2000/78/EC, Directive 2001/23/EC | This law regulates relations between employers and employees and reflects the basic principles of international conventions on labour, trade unions, prevention of discrimination, etc. The Labour Code provides for basic rights regarding the prohibition of compulsory labour, prohibition of discrimination, the freedom to join a trade union and collective bargaining. |
| Law no.9198, dated 26.02.2004 amended by the law no.9534, dated 15.05.2006; law no.9970, dated 24.07.2008; | On gender equality in society | Directive 2002/73/EC 'on the implementation of the principle of equal treatment for men and women as regards access to employment, vocational training | The purpose of this law is; To ensure equal rights to women and men as provided for in article 18 of the Constitution of the Republic of Albania;<br>To set out measures that promote equal opportunities for men and women aimed at eliminating direct and indirect discrimination on the grounds of gender in public life; and |

| Number of the law | Law | Compatibility to EU Directive | Relevance to the ESIA |
|---|---|---|---|
| | | and promotion, and working conditions' Directive2006/54/EC | To set out the responsibilities of central and local administration for drafting policies aimed at promoting an equal gender society. |
| Law no.10237, dated 18.02.2010 | On Safety and Health at Work | The Directive of the European Council 89/391/EEC, 'on the introduction of measures to encourage improvements in the safety and health of workers at work'<br>The Directive of the European Council 94/33 EEC<br>The Directive of the European Council 92/85 EEC | The purpose of this law is to define measures aimed at ensuring safety and health of the employees in work. The law aims to:<br>a) Ensure the safety and health protection through the prevention of occupational risks, elimination of factors that pose risk and accident, information, counselling, balanced participation, in accordance with the law, the formation of employees and their representatives;<br>b) Determine the general guidelines for the implementation of this purpose. |
| Law no.9148, dated on 30.03.2004 | On the ratification of the Protocol to the Convention 155 "For Occupational Safety and Health and Working Environment" | Directive 89/391 / EEC 'on the introduction of measures to encourage improvements in the safety and health of workers at work' | The purpose of this law is to prevent accidents and injury to health caused or occurring during working hours, minimizing as far as is reasonably practicable, the causes of hazards present in the working environment. |
| The Law No. 27/2018 | On Cultural Heritage And Museum". | European Parliament and Council Directive 2014/60/EC 'on the return of cultural objects unlawfully removed from the territory of a Member State and amending Regulation'<br>Order 116/2009/EC of European Council | Article 7 of the law defines that 'the protection of cultural assets is the system of measures undertaken, including legal initiatives aimed at harmonizing valuable practices to ensure the preservation of these assets for public interest use.<br>Article 134 of this law emphasize that;<br>1. In the case of major developments such as roads, highways, airports, ports, industrial works, other works, as well as any transformation of the territory including state-owned or private mining projects, before obtaining the respective permit, the investor must obtain approval for the project from the National Council of Material Cultural Heritage, according to the legislation in force.<br>2. Specialized institutions or licensed entities, according to the law in force perform control of the area and prepare the relevant documentation. When the area contains significant archaeological, ethnographic or trace of ancient or traditional architecture, the investor must change the project. |
| Law No. 8561, dated 22.12.1999 | On Expropriations and taking in Temporary Use Of Private Property For Public Interest | Directive 94/47 EEC | Provides the entire procedure on how an expropriation of public interest procedure begins, for which reason, from which subject and the right of the owners to contest the evaluation of the property made unilaterally from the state institutions. |

| Number of the law | Law | Compatibility to EU Directive | Relevance to the ESIA |
|---|---|---|---|
| | | | Its article 8, point b quotes that the expropriation can be done for public interest such as 'the realization of the projects and of the investments with a national or local territorial interest or expansion in the field of transports of any kind, of energy, telecommunication, water works of any kind in the service of the public interest |
| The Council of Ministers Decision No. 138 dated 23. 3. 2000 | On legal criteria for the evaluation of properties affected by expropriation. | | Defines the criteria for assessing the amount of compensation remuneration for private property (land, residential buildings, construction, industrial and agricultural objects, fruit plants, forests, pastures, etc.) that will expropriate, of the assets that are depreciated and the rights of third persons, for public interest |
| No. 7843, dated 13.7.1994 | Legal Package "On the Registration of Immovable Property | | According to this law, the object of the activity of the immovable property registration office is the registration of property titles and other real rights on immovable property on the basis of legal documents proving ownership of immovable property. |

## 2.2 Albanian Legal Framework regulating EIA procedure

### 2.2.1 Legal Framework on EIA procedure

The EIA procedure is stated in the Article 25 of the Law no. 10 431'on Environmental protection' as a process that applies the principle of prevention at an early stage of project planning in order to avoid or minimize adverse environmental effects. Article 3 of the Law no.10440 'On Environmental Impact Assessment' states that "any proposed, private or public projects that may cause significant negative impacts in the environment directly or indirectly, due to their size, nature or location are subject to EIA procedures. EIA procedures are prescribed in the second chapter of the Law no. 10440 'On Environmental Impact Assessment'. In compliance with this chapter of the Law, there are two levels of EIA procedures for projects; (i) preliminary EIA and (ii) profound EIA.

For all projects of Annex II, the developer should ask the MTE if the project should be a subject or not of profound EIA process. For projects listed in Annex I, for which a profound EIA has to be carried out, the project developer should ask the MTE for an Environmental Declaration which will contain a suggestion for the Planning Authority related to approval or refusal of the permit/license for development of that project.

Apart from the project developer and the relevant ministries, the public and Civil Society Organizations (CSOs) are also important third parties during the EIA process. The Act 17 of the Law no. 10 440, dated on 7.7. 2011, on EIA conditions, describes the public hearing process during EIA and the relevant procedures to organize it. According to the Decision no. 686, dated 29.7.2015 'On adoption of the rules, responsibilities and deadlines for development of the EIA procedure and the procedure for transferring of the Decision and Environmental Declaration, the ESIA approval process includes the following steps:

Preliminary opinion: the developer may request a preliminary opinion from the MTE on the content determining whether the project falls under Annex I or Annex II of the law;
Reviewing of the documentation from the Ministry and submission of the application to NEA, accompanied with the suggestion of the technical directorates whether the application will be subject of profound EIA process;

Request for opinion by NEA to the in-line ministries, other institutions and Regional Environmental Agency (REA) related to profound EIA report;

Review of the profound EIA report where there are included the recommended issues by NEA, public hearing consultation and submission of the EIA to NEA accompanied with suggestive opinion of the technical directorates regarding the suggestion to be given to the planning authority as well as the conditions to be set out in the environmental declaration;

Review of documentation and drafting of declaration by NEA;
The Ministry issues the environmental declaration and delivers it to the project developer.

Annex II of the Law 'On Environmental Impact Assessment' lists the projects that need a preliminary EIA and Annex I lists the projects that need a profound EIA.

According to the above-mentioned legislation and more specifically to Annex 1, point 7/c, "in case of Construction of highways and expressways and point ç) in case of Construction of a new road of four or more lanes, or rehabilitation/widening of an existing road, which has two or less lanes, to become with four or more lanes, when the new road or the rehabilitated road is 10 or more km long of continuous length", it is necessary to implement a profound EIA process.

A summary of the ESIA process steps in Albania is presented in the following figure, based on the Decision no. 686, dated 29.07.2015, amended by the DCM no.714/2019 'On approval of rules, responsibilities and deadlines for development of Environmental Impact Assessment Procedure (EIA) and transferring procedure of the decision and environmental declaration, as amended by DCM no. 95 dated 14 February 2018 and the article 7 of law 10440 and DCM No 714, 9, 11, 2019 on changes and additions in the DCM no 686, dated 29.-7.2015.

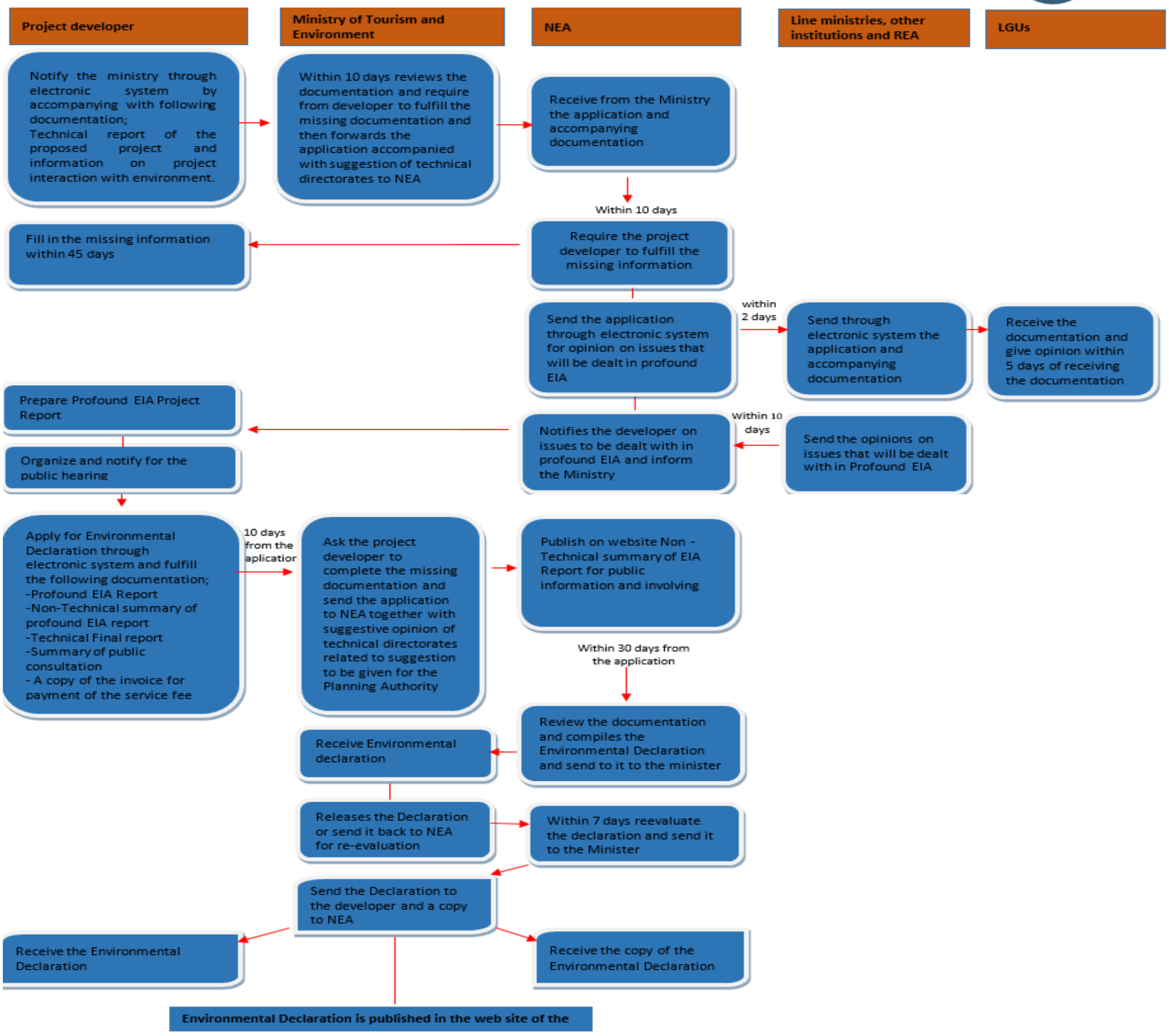



**Figure 2-1 EIA process steps in Albania**

### 2.2.2 Permitting process

The permitting process involves different institutions. As the geographical area of the AIC Corridor is large, an approval from the National Territorial Council (NTC) is required. The Head of this council is the Prime Minister. There are development and construction permits needed for the project. Application process for obtaining of the approval for these permits is regulated with the set of prescribed documents elaborated below[2]. The documents must be submitted from the developer and they include also the approvals and permits which have to be obtained at different stages of the Project planning process from the relevant Ministries, Agencies and Councils. The application for development/construction permit from developer will be done through the electronic system and the permits or decision to reject it will be sent to the applicant through the electronic system.

Documentation required for obtaining of the development permit:

1. Documentation that have to be submitted by the developer
   a) Request for permit, as defined by the regulation (DCM 408/2015, amended by VKM 355/2017) and by the electronic permit system;
   b) Proxy or authorization, on behalf of an individual or legal person, if the request is submitted by a representative of the owner or developer;
   c) Document certifying the property rights of the property/individuals participating in the development process and, if any, copies of the property agreements
   d) Topographic map, in a scale of 1: 500, by a licensed topographer;
   e) Architectural development concept design;
   f) Copy of the license of the topographer and designer;
   g) Mandate payment of the application fee, if provided.
2. In the case of a request for a development permit to the National Territorial Council (NTC), the applicant must, in any case, submit the relevant feasibility study.

Documentation required for obtaining a construction permit:

1. The documents that the developer must submit to obtain an infrastructure construction permit are:
   a) Documents which certify the property rights of the property/individuals (DCM of expropriation[3])
   b) The plan of placing the construction on the fragment of the map in the existing condition;
   c) Design project and the relevant report in pdf format, signed electronically, as well as in pdf format, (For infrastructure construction permits, the technical construction design should contain only the technical design of implementation)
   d) Preliminary chart of works and deadline for delivery of facilities, according to the implementation phases;
   e) Projection;
   f) Declaration of the licensed designer, according to the application format, defined in the electronic system of construction permits, through which the compliance of the project with the development permit is confirmed,
   g) Permits, licenses, authorizations or acts of approvals such as:
      - Decision (Environmental Declaration) issues by Ministry of Tourism and Environment (MTE) in accordance with the EIA law (please refer to Law no. 10440'On EIA', mentioned above);
      - Decision by the National Council of Cultural/Material Heritage

[2] Provided from consultation with environmental specialist of ARA

[3] DCM no. 7, dated 6.1.2020 "On conditions and procedure for expropriation and/or exchange of property for public interest, in function of reconstruction processes

- Decision of the Technical Council of ARA.
- Opponency[4] from the Institute of Construction (under the Ministry of Infrastructure and Energy)

h) Copy of the insurance policy of the designers, for covering the professional responsibilities.
i) Copy of the development permit, when necessary

Regarding the preliminary design and ESIA phase, the legislation requires an Environmental Declaration (as mentioned above) issued by the MTE. The ARA (the Client) requires officially through electronic system the opinion of the MTE and NEA for ESIA study and then starts the project in compliance with the requirements. Also, in case there is a possibility of Cultural/Archaeological and/or Historic assets to be affected, an approval is required by the National Council of Cultural/Material Heritage.

Once these documents and decision are obtained, the Client (ARA) will complete all documentation and provide it to the National Council of Territorial Planning.

The relevant laws regarding Permitting process are summarized in the following table.

**Table 2-2 Law governing permitting process**

| Number of the Law | Law | Relevance of the ESIA |
|---|---|---|
| Law no. 10 448, date 14.7.2011 | On Environmental Permits | This Law stipulates the rules for allowing the development of certain activities that cause environmental pollution in Republic of Albania |
| Law no. 107/2014, amended by the law no. 28/2017 | On Territorial Planning and Development | Article 38, point 1 stipulates that a Development permit is a document issued by the responsible authority that determines the development conditions for a certain property. By point 1 of Article 39, point 1 of this Law. a Construction permit is required for any construction, repair, restoration or demolition of existing buildings, installation or erection of temporary constructions, except for the cases provided by Article 41 of this Law |
| DCM 408/2015, amended by VKM 355/2017 | On Approval of Regulation for Territory Development | Head I and II of TITLE II of this DCM defines the documentation and development control procedures for obtaining the construction and development permit |
| Law no. 27/2018 | On Cultural Heritage and Museum | Article 48 of this Law stipulates that in case of reconstruction of buildings and infrastructures in historic centers, archaeological sites A, B, a Development permit should be initially approved by the NCCMH (National Council of Cultural/Material Heritage) and then according to territorial planning and development legislation.<br><br>Article 134, point 1 of this Law defines also that in the case of major developments such as: roads, highways, airports, ports, industrial works, new residential centers, other works, as well as any transformation of the territory, |

[4] Based on Minister Order No.197, dated 09.10.2014, "On the approval of the general conditions of the agreement for performance of technical opponency for construction works projects".

| Number of the Law | Law | Relevance of the ESIA |
|---|---|---|
| | | including mining projects, state-owned or private, prior to obtaining the respective permit, according to the legislation in force for territorial planning and development, the investor must obtain approval for the project from the National Council of Cultural/ Material Heritage, according to the legislation in force. |

### 2.2.3 Land Acquisition/Expropriation

Albanian legislation that regulates involuntary resettlement and livelihood restoration is based on the legal framework for expropriation. The expropriation process of immovable property in Albania is governed by the Law No 8561 dated 22. 12. 1999 "On Expropriations and Temporary Takings of the Private Property for Public Interest". The law guarantees that the expropriation of private property occurs for public interest only and within a fair compensation process.

The Law on Expropriation regulates the procedure for expropriation of property for projects that are of public interest, and the connected rights for real estate (immovable properties). The issue of public interest with regards to the expropriation is reflected on the Law on Expropriations (No: 8561), article 8, point 8c and 8ç. The construction of roads is in the domain of public interest. Prior to the start of the expropriation process, the public interest of the Project shall be acknowledged by the Expropriation authority based on a legal justification of the Project Proponent.

Land expropriation and resettlement in Albania may be undertaken by administrative bodies ("the expropriating authority") at two levels:

Municipalities (in cases when the affected property lies wholly within a municipality's borders): the municipal mayors or any designated municipal body act as the expropriating authority on behalf of the municipality;

Albanian Government (in cases when the affected property falls within the territory of two or more municipalities): The Ministry of Infrastructure and Energy acts as the expropriating authority on behalf of all central level authorities.

Other key institutions involved in the expropriation process are:

Immovable Properties Registration Office within the Ministry of Justice, the only public authority competent for the registration of property titles and other real rights on immovable property on the basis of legal documents proving ownership of immovable property, as well as the preparation, keeping and administering immovable property registers, indicative registration maps and documentation, which certify the right of ownership and other real rights on immovable property;

Municipal Cadastral Office, helps to prepare expropriation documentation in cases where cadastral zones have not entered in registration system;

The general Directory of Legalizations within the Ministry of Infrastructure and Energy competent for legalization of informal buildings / facilities without permits, with informal additions to the facility and establishment.

According to the law, the owners of properties are to be compensated for their losses, mostly in monetary terms. Compensation can be provided in the form of replacement property, if available, or in cash.

The expropriation - compensation price cannot be lower than the market value of the affected residential and / or non-Residential Properties (businesses). The price should be sufficient to acquire new, resettle and / or re

- establish properties at other locations. The property value is assessed, and the compensation price is set in accordance with the Methodology for assessment of for the market value of the property, which is issued by the Ministry of Finance.

The expropriation is often not a straightforward process, and people generally need additional assistance to be able to restore their living standards and improve them further. This becomes even more evident when the affected population includes vulnerable groups. The most difficult cases involve those who do not possess a legal title for the land ownership.

### 2.2.4 Expropriation Authority of the Project

The Expropriation Authority for the Project is the Government of Albania, specifically the Department of Expropriation within Ministry of Infrastructure and Energy; In this case the Applicant is the Ministry of Infrastructure and Energy, but it can be any ministry that conducts investments for public interest.

The steps involved in the expropriation procedure are described on the table below.

**Table 2-3 Description of Expropriation Procedure Steps according to Albanian Legislation**

| Steps | Institution | Description | Remarks |
|---|---|---|---|
| ***Step I*** | Interested Institution, i.e ARA, and MIE | ▪ Request for expropriation for public interest; | Fulfil of criteria provided by law, especially the necessary documents that prove the expropriation needs; |
| ***Step II*** | Ministry of Infrastructure and Energy | ▪ Commission for expropriation at (MIE) has to examine the request and documents;<br>▪ If the legal criteria are fulfilled the MIE starts the expropriation procedures;<br>▪ If not, the request will be rejected; | |
| ***Step III*** | Ministry of Infrastructure and Energy | ▪ Agreement with the subjects about expropriation;<br>▪ Publication of the notice for the expropriation;<br>▪ Examine the suggestions and the complaints of persons affected by the process;<br>▪ Prepare the draft decision for the Council of Ministers; | Important: the fair evaluation of the properties;<br>The procedure must be followed carefully and respecting the right of the third persons to prevent the complaint to the Court;<br>The expropriation it will be done for the persons will accept with free will to be compensated with the conditions published. |
| ***Step IV*** | Council of Ministers | ▪ Approve the decision of the expropriation for public interest;<br>▪ or<br>▪ Reject the proposal to MIE with the suggestion to review, if it is not in conformity with the law; | |
| ***Step V*** | Ministry of Infrastructure and Energy | ▪ Pay the compensation to persons affected by the expropriation, before the civil works begin; | |

### 2.2.5 Cut-off Date

The Cut-Off Date is the date after which persons found to settle in the Project area are not eligible to Project compensation or other resettlement benefits, while similarly immoveable assets or crops established after the Cut-Off Date are not to be compensated.

The intent of the Cut-Off Date is to "freeze" eligible individuals or households and eligible properties thereby avoiding opportunistic attempts at maximizing compensation through structures erected intentionally or crops established on purpose. Potentially affected people need to be informed of the Cut- Off Date in order to minimize potential claims related with eligibility. Where opportunistic and/or fraudulent attempts at maximizing compensation are assessed as a significant risk, caution must be exerted in disclosing the Cut-Off Date.

As per the Albanian legislation the Cut-off Date is established with the Decision of Acceptance of the application for the expropriation and the disclosure of the decision in public media. The Cut-Off Date is established when:

The notification of intent of expropriation is delivered to affected owners where expropriation is applicable; or

The census is completed.

### 2.2.6 Legal framework for cultural heritage protection

The Central Institution responsible for the conservation, protection, evaluation and management of cultural assets in accordance with the provisions of the legislation in force is the Ministry of Culture (MC). Other specialized institutions that operate and develop activities in the field of cultural heritage are: The National Institute of Cultural Heritage; The National Institute for the Registration of Cultural Heritage; Regional Cultural Heritage Directorates; The National Center of Traditional Activities; Institute of Cultural Anthropology and Art Studies and the Institute of Archaeology. Local government units cooperate with the MC in performing the functions for preservation and protection of cultural assets, according to the provisions of the law in force.

The basic legislation for protection of Cultural heritage is the Law No. 27/2018 "On Cultural Heritage and Museum". This law aims to preserve, protect, evaluate and administer national cultural heritage, museum cultural heritage, landscapes, providing and preventing the illegal approaching of cultural objects.

Article 7 of the law defines that 'the protection of cultural assets is the system of measures undertaken, including legal initiatives aimed at harmonizing valuable practices to ensure the preservation of these assets for public interest use.

Related to the project in term, article 134 of this law emphasize following:

1. In the case of major developments such as roads, highways, airports, ports, industrial works, new residential centers, other works, as well as any transformation of the territory including state-owned or private mining projects, before obtaining the respective permit according to the legislation in force for territorial planning and development, the investor must obtain approval for the project from the National Council of Material Cultural Heritage, according to the legislation in force.
2. Specialized institutions or licensed entities, according to the law in force perform control of the area and prepare the relevant documentation. When the area contains significant archaeological, ethnographic or trace of ancient or traditional architecture, the investor must change the project.

Other laws and by-laws related the protection of Cultural Heritage are presented below.

Law no.9490, date 13.3.2006 "On ratification of the Convention for the safeguarding of Intangible Cultural Heritage", Paris 2003

Law no.9806, date 17.9.2007 "For accession of the Republic of Albania in European Convention on the Protection of the Archaeological Heritage"

Law no.10 027, date 11.12.2008 "On the Accession of the Republic of Albania to the Convention for the Protection of the Underwater Cultural Heritage", Paris 2001

Article 96 of DCM no.671, date 29.07.2015 "On Cultural Heritage Sites and Objects" emphasizes following aspects:

Any development, including maintenance and restoration, in cultural sites and monuments and in their vicinity shall be conducted in accordance with the legislation in force.

The objects classified as cultural monuments (according to the classifications provided in point 1 of this Article 96) shall be defined as protected area, in accordance with their architectural values, urban, territorial and aesthetic suitability and with environmental conditions. The size of the protected area, rules and its development conditions shall be determined in accordance with the relevant legislation on cultural heritage.

If the size of protected area (as per the point 2 of this article 96) is not determined by laws or sub-legal acts and the protected area is not yet been announced by the minister responsible for cultural heritage, its continuous withdrawal shall not be less than 100 meters.

The Minister Order no. 297, date 31.07,2015, on Proclamation of Buffer Zone of Cultural Monuments;

The buffer Zone of the Cultural Monument is considered the surface of the territory, inside the borders of property in which is located the Monument.

Point 2/b of this order emphasizes that in case that the border of the propriety, much/comply with the "Mark" of the Cultural Monument object, the Buffer Zone in rural areas is considered: The surface not closer than 100m of the territory around of the Monument.

## 2.3 Overview of the Main Relevant International Regulatory Framework

### 2.3.3 The EU EIA Directive

The Environmental Impact Assessment (EIA) was introduced for the first time in Europe in 1985 by the EIA Directive (85/337/EEC) and represents a key instrument for European Union environmental policy. The EIA Directive of 1985 has been amended three times:

- Directive 97/11/EC brought the EIA Directive in line with the UN ECE Espoo Convention on EIAs in a Transboundary Context. The 1997 Directive widened the scope of the EIA Directive by increasing the types of projects covered and the number of projects requiring mandatory environmental impact assessment (Annex I). It also provided for new screening arrangements, including new screening criteria (included in Annex III) for Annex II projects, and established minimum information requirements;
- Directive 2003/35/EC sought to align EIA Directive provisions with the Aarhus Convention on public participation in decision-making and access to justice in environmental matters; and
- Directive 2009/31/EC amended Annexes I and II of the EIA Directive, adding projects related to the transport, capture and storage of carbon dioxide ($CO_2$).

On 28 January 2012, Directive 2011/92/EU on the effects of public and private projects on the environment was published in the Official Journal. Directive 2011/92/EU codifies Council Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment (EIA Directive) and its associated amendments. Directive 2011/92/EU fully preserves the content of the acts being codified and does no more than bring them together with only such formal amendments as are required by the codification exercise itself.

The scope of this Directive is to ensure that plans, programmes and projects likely to have significant effects on the environment undergo an Environmental Assessment prior to their approval or authorisation. While Annex I contain a list of projects for which the EIA is mandatory, Annex II defines those categories of projects whose ESIA is optional and at the discretion of the community member states.

According to the Directive 97/11 EC, the proposed Project falls into Annex I, Category 7 (c) "Construction of a new road of four or more lanes, or realignment and/or widening of an existing road of two lanes or less so as to provide four or more lanes, where such new road or realigned and/or widened section of road would be 10 km or more in continuous length".

The EU Directive on Environmental Impact Assessment (EIA Directive[5)] 2014/52/EU) defines the requirements for assessment of potential adverse effects on the environment of some public and private projects that are expected to have significant impact on the environment. The EIA is conducted prior to the issue of the construction permit and approval for project implementation. The environmental impact may be the impact on human beings or on biological diversity, on the quality of soil, water, air or other natural resources, on the climate, or on the historical and cultural heritage, as well as on the interaction between these elements. This EU Directive has been transposed into legislation in the Republic of Albania. Thus, prior to requesting issue of the construction permit or approval for the implementation of certain types of projects, it is mandatory to conduct the EIA.

The public and other parties are to be consulted on the EIA as the consultation with the public is a key feature of environmental assessment procedures.

### 2.3.4 Other Most Relevant EU Directives

Other relevant EU Directives that will be taken into account are the following:

- Water Framework Directive establishing a framework for Community action in the field of water policy (2000/60/EC)
- Directive on the assessment and management of flood risks (2007/60/EC) - Floods Directive
- Directive 2008/105/EC on environmental quality standards in the field of water policy(amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC) establishes, among others: (1) limits on concentrations in surface waters of 33 priority substances and 8 other pollutants (Annex I); (2) the possibility of applying Environmental Quality Standards (EQS) for sediment and biota, instead of those for water; (3) the possibility of designating mixing zones adjacent to discharge points where concentrations of the substances in Annex I might be expected to exceed their EQS; and (4) a requirement for Member States to establish an inventory of emissions, discharges and losses of the substances in Annex I.
- Directive 2006/11/EC on Dangerous Substances lays down rules for protection against, and prevention of, pollution resulting from the discharge of certain substances into the aquatic environment of the Community.
- Groundwater Directive 2006/118/EC established a regime which sets groundwater quality standards and introduces measures to prevent or limit inputs of pollutants into groundwater.
- Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances (amending and subsequently repealing Council Directive 96/82/EC), obliges Member States to ensure that operators have a policy in place to prevent major accidents.

[5)]Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment

- Environmental Noise Directive 2002/49/EC defines a common approach intended to avoid, prevent or reduce on a prioritized basis the harmful effects, including annoyance, due to exposure to environmental noise, including, among other, assessment methods for the noise indicators.
- Directive 2000/14/EC on the approximation of laws of the Member States relating to noise applies to equipment for use outdoors listed in Articles 12 and 13 and defined in Annex I of this Directive.
- Directive 2008/50/EC 16 on ambient air quality and cleaner air for Europe;
- Directive 2008/98/EC 18 on waste (Waste Framework Directive)
- Habitats Directive 92/43/EEC aims to contribute towards ensuring biodiversity through the conservation of natural habitats and of wild fauna and flora in the territory of the Member States.
- Birds Directive 2009/147/EC relates to the conservation of all species of naturally occurring birds in the wild state in the territory of the Member States.
- Directive 2008/96/EC on road infrastructure safety management
- Directive 89/391/EEC – Occupational Health and Safety

### 2.3.5 Relevant International Multilateral Agreements

The International Agreements and Conventions are an important part of the environmental framework that have to be taken into consideration in the current study.

The international policy results with the assignment of different agreements and conventions related to environmental and social issues are outlined below:

- Bern Convention for the Protection of flora, wild fauna and nature environment of Europe, signed in 1995 and ratified by the GoA in 1999, ratified by the law 8294/1998.
- CITES Convention on International Trade in Endangered Species of Wild Fauna and Flora, ratified by the GoA in 2003.
- Convention on Protection of Marine Environment and Coastal Area of Mediterranean Sea, ratified by the law no.8690/2000
- Convention on Protection and use of water streams and international lakes
- Convention of Biological Diversity (CBD) Rio de Janeiro, signed in 1996 and ratified by the GoA in 2004.
- RAMSAR Convention on Wetlands of International Importance Especially as Waterfowl Habitat, to which Albania is party since 1996.
- Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus, 1998), ratified by the law no.8672/2000.
- United Nations Convention to Combat Desertification (UNCCD) was ratified in 1999.
- Convention on the protection of the Mediterranean Sea from pollution, and the Protocol on Specially Protected Areas, was ratified in 1990.
- Convention on the Conservation of Migratory Species of Wild Animals (CMS or the Bonn Convention) ratified by the GoA in 2002.
- ESPOO Convention (Finland) "On Environmental Impact Assessment in a Transboundary Context.", ratified by the law no 9478/2006.
- United Nations Framework Convention on Climate Change (UNFCCC) ratified by the GoA in 2005.

- Kyoto protocol to the United Nations Framework Convention on climate change 1998 ratified by Albanian government 2004.
- Paris Agreement, United Nations 2015, ratified by the law no. 75/2016.
- Protocol on Strategic Environmental Assessment ratified by Albanian government at the end of 2004,
- The European Landscape Convention, Florence, 2000, ratified by the law 87/2016.
- International Convention on the Elimination of all forms of Racial Discrimination, New York, 7.03.1966
- National Convention on Economic, Social and Cultural Rights New York, 16.12. 1966, ratified by Republic of Albania in 1991
- International Labour Organization Convention No. 155: Occupational Safety and Health, 1981, ratified by the law no. 9147, date 30/10/1981.
- *UNESCO Convention* for the Safeguarding of the *Intangible Cultural Heritage, 2003,* ratified in 2006.
- The UNESCO *Convention on the Protection* of the *Underwater Cultural Heritage,2001, ratified by the law no.10 027, date 11.12.2008.*
- EUROPEAN Convention "For the Protection of Archaeological Heritage", *ratified in* 2007.

### 2.3.6 EBRD Environmental and Social Policy

The EBRD is committed to promote "environmentally sound and sustainable development" in the full range of its investment and technical cooperation activities. This Policy outlines how the Bank will address the environmental and social impacts of its projects by defining the respective roles and responsibilities of both EBRD and its clients in designing, implementing and operating projects in line with this Policy.

In order to translate this objective into successful practical outcomes, the EBRD has adopted a comprehensive set of specific Performance Requirements (PR) that clients are expected to meet, covering key areas of environmental and social impacts and issues. EBRD's document "Environment and Social Policy" (the Policy) and related Performance Requirements (PRs) detail the commitments of the Bank to promote environmentally sound and sustainable development across the full range of its activities.

EBRD categorizes proposed projects as A / B / C based on environmental and social criteria to: (i) reflect the level of potential environmental and social impacts and issues associated with the proposed project; and (ii) determine the nature and level of environmental and social investigations, information disclosure and stakeholder engagement required for each project, taking into account the nature, location, sensitivity and scale of the project, and the nature and magnitude of its possible environmental and social impacts and issues.

Projects categorized by EBRD as "A", like the proposed one, require special, formalized and participatory assessment processes.

In general, a project funded by the EBRD has to meet following EBRD's PRs that are presented more analytically in the following table.

**Table 2-4 EBRD Requirements**

| No | Name | Requirements |
|---|---|---|
| **PR 1** | **Assessment and Management of Environmental and Social Impacts and Issues** | establishes the importance of integrated assessment to identify the environmental and social impacts and issues associated with projects,<br>defines Environmental and Social Management System (ESMS),<br>requires development and implementation of an Environmental and Social Action Plan (ESAP), which will constitute an integral part of the financing agreements,<br>obligation to carry out a comprehensive Environmental and Social Impact Assessment (ESIA) (for projects type A), |

| No | Name | Requirements |
|---|---|---|
| | | obligation to develop Environmental and Social Management Plan (ESMP),<br>obligation to establish, maintain and strengthen, as necessary, an organisational structure that defines roles, responsibilities and authority to implement the ESMS<br>obligation of the client to identify social and environmental risks associated with its supply chain,<br>obligation of Monitoring, Reporting and Review during the complete Project cycle. |
| **PR 2** | **Labour and working conditions** | promotes fundamental principles and rights of workers by requirement that the client and third parties (contractors, sub-contractor) comply,<br>obligation of the client to document and communicate to all workers their rights,<br>promotes Non-Discrimination and Equal Opportunity for workers during the complete Project cycle,<br>promotes workers organisations,<br>obligation to offer wages, benefits and conditions of work offered at least comparable to equivalent employers in the relevant country/region and sector concerned,<br>other issues of labour and working conditions |
| **PR 3** | **Resource Efficiency and Pollution Prevention and Control** | identify opportunities and alternatives for resource efficiency relating to the project in accordance with GIP,<br>apply the appropriate pollution prevention and control methods, technologies and practices ("techniques"),<br>avoid or minimise project-related greenhouse gas (GHG) emissions during the design and operation of the Project.<br>apply other measures of resource efficiency and pollution prevention and control. |
| **PR 4** | **Health and Safety** | provide workers with a safe and healthy workplace, considering inherent risks in its particular sector,<br>identify the health and safety risks and protection measures appropriate to the stage, size and nature of the project in accordance with relevant substantive EU Occupational Health and Safety (OHS) standards and GIP,<br>identify and assess project-related risks and adverse impacts to the health and safety of the potentially affected communities,<br>develop protection, prevention and mitigation measures proportionate to the impacts and risks in accordance with good international practice (GIP),<br>identify and implement other occupational and public health and safety issues and measures. |
| **PR 5** | **Land Acquisition, Involuntary Resettlement and Economic Displacement** | avoid or, when unavoidable, minimise, involuntary resettlement by exploring alternative project designs,<br>mitigate adverse social and economic impacts from land acquisition or restrictions on affected persons' use of and access to assets and land,<br>restore or, where possible, improve the livelihoods and standards of living of displaced persons to pre-displacement levels,<br>improve living conditions among physically displaced persons through the provision of adequate housing,<br>preparation of resettlement and project level policy instruments RAP and LARF, the process and disclosure,<br>defines monitoring of the resettlement and livelihood restoration process,<br>defines other issues of importance for land acquisition and resettlement |
| **PR 6** | **Biodiversity Conservation and Sustainable Management of Living Natural Resources** | protect and conserve biodiversity using a precautionary approach,<br>adopt the mitigation hierarchy approach, with the aim of achieving no net loss of biodiversity, and where appropriate, a net gain of biodiversity,<br>promote GIP in the sustainable management and use of living natural resources,<br>defines critical habitat as most sensitive biodiversity features, |

| No | Name | Requirements |
|---|---|---|
| | | defines legally protected[6] and internationally recognised7 areas of biodiversity value,<br>defines other issues and measures for protection of biodiversity and living natural resources. |
| **PR 7** | **Indigenous Peoples** | not relevant to the Project. |
| **PR 8** | **Cultural Heritage** | support the protection and conservation of cultural heritage,<br>adopt the mitigation hierarchy approach to protecting cultural heritage from adverse impacts arising from the Project,<br>address relevant requirements as an integral part of the client's overall Environmental and Social Management System (ESMS) and/or the project's Environmental and Social Management Plan (ESMP),<br>identify if any cultural heritage is likely to be adversely affected by the project, and consult with relevant authorities, experts, local communities and other stakeholders as appropriate. The intensity of the study of cultural resources should be adequate for characterising the potential impacts and issues,<br>avoid adverse impacts on cultural heritage during the design and site selection phases, by exploring alternatives,<br>if impacts cannot be avoided, undertake studies and consultation to assess potential impacts and, if necessary, the required changes in design,<br>define procedure for chance finds cultural heritage encountered unexpectedly during Project,<br>defines other issues and measures for cultural heritage protection. |
| **PR 9** | **Financial Intermediaries** | not relevant to the Project. |
| **PR 10** | **Information Disclosure and Stakeholder Engagement** | stakeholder engagement is an integral part of their overall ESMS, the project's environmental and social assessment process and the ESMP,<br>conduct stakeholder identification in the Project preparation phase, by identifying individuals or groups who are affected or likely to be affected, or may have an interest in the Project,<br>identify individuals and groups that may be disproportionately affected by the project because of their disadvantaged or vulnerable status,<br>develop and implement a SEP for Projects that are likely to have adverse environmental or social impacts and issues,<br>establish an effective grievance mechanism, process or procedure to receive and facilitate resolution of stakeholders' concerns and grievances, in particular, about the client's environmental and social performance,<br>defines other issues regarding Project information disclosure and stakeholder engagement. |

This Project proposal falls under category "A" of the EBRD screening categorization as it is listed in Appendix 1, item 6. "Construction of motorways, express roads and lines for long-distance railway traffic; airports with a basic runway length of 2,100 metres or more; new roads of four or more lanes, or realignment and/or widening of existing roads to provide four or more lanes, where such new roads, or realigned and/or widened sections of road would be 10 km or more in a continuous length" of the EBRD's 2014 Policy document. As such, the Project requires a special, formalized and participatory assessment process in compliance to the EBRD's comprehensive set of specific Performance Requirements (PRs) that it is expected to meet, covering key areas of environmental and social impacts and issues.

The process should include:

[6]This PR is guided by the IUCN definition of "Protected Area".

[7]Sites identified under international conventions or agreements, including, but not limited to, UNESCO Natural World Heritage Sites, UNESCO Man-and-Biosphere Reserves and the Ramsar List of Wetlands of International Importance.

- A comprehensive ESIA in compliance with PR 1 Environmental and Social Appraisal and Management and PR 10 Information Disclosure and Stakeholder Engagement;
- ESIA should identify the main issues regarding Pollution Prevention and Control (PR 3);
- ESIA (while addressing PR 2 and PR 4) should identify the issues related to potential risks related to community health, safety and security, as well as labour and working conditions;
- An assessment of involuntary resettlement issues according to PR 5 Land Acquisition, Involuntary Resettlement and Economic Displacement;
- The sustainable use of the natural resources and the protection of biodiversity will have to be considered as instructed by PR 6;
- An assessment of impacts on cultural heritage according to PR 8 Cultural Heritage.

PR 7 on indigenous people has been scoped out of the Project because no social and/or cultural group that is distinct from dominant groups within Albanian society is expected to be affected by the Project.

PR 9 on financial intermediaries has been scoped out of the Project because no delegated responsibility for environmental and social assessment, risk management and monitoring or overall portfolio management is expected to be required for the Project.

## 2.4 Legislative gap analysis

According to the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, 2019 Communication on EU Enlargement Policy, Albania shows some level of progress in the field of Environment and Climate Change . Limited progress has been made in further aligning the policies and legislation with the *acquis*, in areas such as water management and climate change and significant efforts are needed on their implementation and enforcement. The report underlines the importance for improvement in water and waste management, in Environmental and Strategic Impact Assessment, in the national strategy and legislation on climate change, and in the initiation to the development of the integrated National Energy and Climate Plans in line with the Energy Community obligation.

Not proper and effective public participation and consultation in the decision-making process has been applied. The existing national legislation is not really applied on environmental liability, environmental crime and environmental inspection.

Gaps of secondary legal framework is hampering the establishment of an adequate process and assessment of environmental liability for damage to the environment. The Law on ambient air quality needs to be properly enforced and the current air quality monitoring network and practices to be aligned with EU standards. The Environment agency should conduct regular monitoring of industries and installations, roads etc which potentially emit large quantities of pollutants in the air. Further efforts are needed to rehabilitate the over 199 non-compliant landfills and dumpsites, and to start implementing separate collection of waste streams, increase recycling and reuse, and start composting bio-waste. Capacities and financial instruments for the National Protected Areas Agency remain very limited, with the Law forbidding its financial autonomy.

Floods remain a major hazard; however, no progress has been made on the transposition of the floods directive.

Albania has achieved some level of preparation to climate change, but alignment with the EU *acquis* is still limited. Some progress was made by ratifying the Kigali Amendment to the Montreal Protocol. A national strategy on climate change consistent with the EU 2030 framework on climate and energy policies needs to be adopted and a National Energy and Climate Plan in line with Energy Community recommendation has to be developed. No specific administrative structure for handling climate change issues is in place. Further efforts should be made on emission standards for new cars and vans and related consumer information. Similar efforts are needed regarding effort sharing, geological storage of $CO_2$, and greenhouse gas emissions from land use, land use change, and forestry.

The existing civil emergencies law and national plan are outdated and do not take into account recent institutional and organizational changes. The new civil Protection Law under elaboration is not yet finalized. There is very limited administrative capacity, and the envisaged creation of a civil protection agency has not materialized.

# 3. Project Description

## 3.1 Technical Description of the Road Corridor

### 3.1.1 General

The aim of the actual study and design work under this assignment is, among other, to prepare a conceptual design for the preferred A-I Corridor in Albania, extending for about 318 km from Murriqan border crossing with Montenegro in the northwest to Kakavije border crossing with Greece in the south, as part of the wider TEN-T corridor that connects Trieste (ITA) with Kalamata (GRE).

Preparation of Conceptual Design for the preferred AIC option in Albania builds-up upon the previous design work performed during the development of alternative options. The actual design work followed the earlier assessment of proposed alternatives and the selection of preferred option, via Simplified Cost-Benefit Analysis (CBA) and Multi-Criteria Analysis (MCA), and relevant approval of the draft Option Analysis report provided officially by the Beneficiary in Albania (MIE/ARA) on May 29th, 2019.

During the time period from January to May 2019, the design team has been working on optimising/refining the initial designs and cost estimates for those AIC sections with no alternatives, namely sections 1, 2, 3, 4, 6, 7, 10, 11 and 12. Similar work for remaining sections/alternatives 5B, 5C, 9A-2, 9B-2 and 13A continued through the month of June 2019, following the approval of draft Option Analysis report in late May 2019. The results of such work with associated drawings and cost estimates are presented in this draft Conceptual Design report (Interim).

It is noted that four (4) AIC sections are in different stages of development by the Government of Albania (GoA), as presented below:

- Section 8 (Fier bypass): This is a new section and actually under construction. The related works are foreseen by GoA to be completed in 2019. This section has not been, therefore, considered further by the Consultant in the option analysis and preparation of conceptual design for the preferred AIC option.
- Section 12 (new Gjirokaster bypass): This section has an approved design by the Albanian Roads Authority (ARA), which was made available to the Consultant and considered in the design and cost estimate for this section.
- Section 2 and 4: GoA has been recently considering the development and implementation of construction works for these two sections through PPP contracts. Both sections have already a preliminary and detailed design respectively. The design team has produced its own design and cost estimation for section 2 by considering, as much as possible, the available data obtained from the preliminary design prepared by a potential PPP investor, while the preparation of the design for section 4 was based on the detailed design approved by ARA in 2017. This was, however, revised by a potential PPP investor and his proposed changes agreed by MIE/ARA. The Consultant has been therefore requested by MIE/ARA to consider in the design for section 4 the final approved alignment of ongoing PPP project.

Therefore, as requested by the Beneficiary (MIE/ARA), the alignment for above sections 2, 4 and 12 is considered by the Consultant as 'fixed'. Sections 4 and 12 are completely new alignments, while section 2 requires mostly the doubling/upgrading of the existing 1x2 highway, Sh1 (Tirane-Shkoder). Complete new alignments include also sections 5B and 10.

While, for sections 3, 6, 7, 9A-2, 11 and 13A and, partially, sections 1 and 9B-2, as reasonably proposed by the Consultant and agreed with MIE/ARA, the study team has considered in the preparation of conceptual design the doubling and/or upgrading of existing highways. However, except for section 3 (Milot-Thumane), the asphaltic layers and most of existing structures along the above-mentioned sections, requiring the doubling and/or upgrading of existing highways, cannot be saved due to higher geometrical standards required for the AIC.

The preferred option of the AIC in Albania is schematically presented in the map below. An overview of the AIC sections and their respective lengths, design speeds and types of proposed interventions are summarized in the following Table.

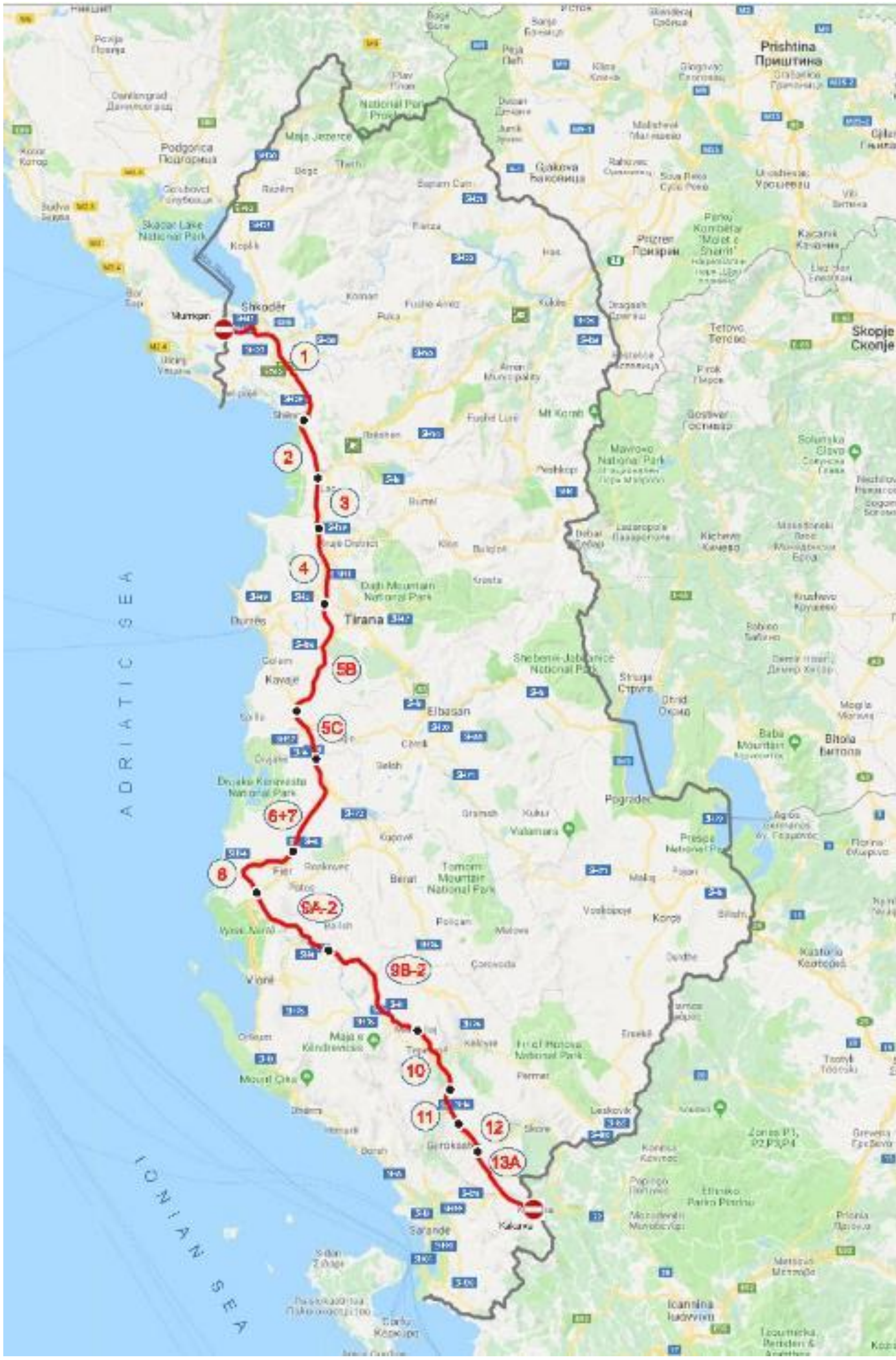



**Figure 3-1 Preferred option of the A-I Corridor in Albania, section names and lengths, design standards and type of proposed intervention.**

**Table 3-1 Overview of the AIC Sections**

| Sec. | Alt. | From | To | Length (km) | Motorway/ express road | Proposed design category (ARDM, 20158) | Design speed (km/hr) | Type of proposed intervention |
|---|---|---|---|---|---|---|---|---|
| 1 | | Murriqan | Balldren (Lezhe) | 40.946 | Motorway | Category A | 120 | New alignment + doubling of existing 1x2 lane highway. |
| 2 | | Balldren (Lezhe) | Milot | 16.19 | Motorway | Category A | 120 | New alignment + doubling of existing 1x2 lanes highway. |
| 3 | | Milot | Thumane | 13.455 | Motorway | Category A | 120 | Improvement of existing 2x2-lane highway. |
| 4 | | Thumane | Kashar | 21.05 | Motorway | Category A | 120 | New alignment. |
| 5 | B | Kashar | Lekaj | 33.573 | Motorway | Category A | 120 | New alignment. |
| 5 | C | Lekaj | Konjat | 14.168 | Motorway | Category A | 120 | Widening/improvement of existing 2x2-lane highway. |
| 6+7 | | Konjat | Fier bypass | 28.037 | Motorway | Category A | 120 | Widening/improvement of existing 2x2-lane highway. |
| (8) | | Fier Bypass | | (22.185) | Express Road (Primary Interurban Road) | Category B | (100) | New alignment (under construction). |
| 9A | 2 | Fier bypass (Levan) | Pocem (Hekal) | 26.901 | Express Road (Primary Interurban Road) | Category B | 120 | Doubling of existing 1x2 lanes highway. |
| 9B | 2 | Pocem (Hekal) | Memaliaj | 37.694 | Express Road (Primary Interurban Road) | Category B | 80-110 | New alignment + doubling of existing 1x2 lanes highway. |
| 10 | | Memaliaj | Subashi Bridge | 20.143 | Motorway | Category A | 120 | New alignment. |
| 11 | | Subashi Bridge | Gj/Bypass | 10.26 | Motorway | Category A | 120 | Doubling of existing 1x2 lanes highway. |
| 12 | | Gjirokaster Bypass | Gjirokaster Bypass | 9.70 | Motorway | Category A | 120 | New alignment. |
| 13 | A | Gj/Bypass | Kakavije | 23.79 | Motorway | Category A | 120 | Doubling of existing 1x2 lanes highway. |
| | | Total AIC length (km): | | 295.907 | | | | |

It is noted that, by adding the length of Fier bypass (22.2 km) to the above figure of 295.9 km, the total length of AIC in Albania becomes approx. 318 km.

Due to different characteristics and type of proposed interventions, the design team has reasonably considered to split the section 5B+C into two separate sections, namely section 5B and section 5C. Section 5B is completely new alignment, while section 5C requires the widening/upgrading of existing 2x2 lanes highway, Sh4 (Durres-Fier-border with Greece). Consultant also proposed merging together the AIC sections 6 and 7 into one single section 6+7. This is because sections 6 and 7 have similar geometrical characteristics and proposed interventions for both sections require the widening/upgrading of existing 2x2 lanes highway, Sh4.

Regarding the division of section 9 to two sub sections, it can be explained as follows:

- Section 9 is too long as one section, since 9A+9B since together they sum up to 26+37=63km, something which would be difficult to finance.
- Secondly, the topography is quite different. Section 9A is totally flat (with a minor exception), while 9B has a lot of bridges and tunnels. Due to the topography, Section 9B follows partly the existing highway.

It is noted that the resulting lengths in some AIC sections have slightly changed due to the refining and optimisation of previous designs prepared in 2018 during the development of alternative options. In section 1, for instance, the change has moreover resulted from the need to avoid, as much as possible, the impact of AIC alignment on the protected area of Buna river.

The Consultant has also carefully considered that several national roads as well as local/regional roads will be affected to certain degrees by the construction of proposed new motorway/express road and, therefore, the planning for new local/service roads was required. The extent, type and proposed connections of these roads to the AIC and local road network - including the location, type and number of interchanges and underpasses/overpasses, has been carefully investigated by considering the economic, technical and social factors.

### 3.1.2 Description of the Road Corridor

The general road alignment characteristics for each section of the A-I Corridor in Albania being considered in the preparation of conceptual design are presented below. More details will be presented in the PESIA.

#### 3.1.2.1 Section 1: Murriqan - Balldren (L=40.946 km)

Section 1 is designed as motorway category A according to Albanian Road Design Manual (2015) and TEM Standards and Recommended Practice (2002). It lies almost 100% over flat terrains. The alignment has a total length of 40.946 km, which can be divided into three distinct sub-sections.

First sub-section is a completely new alignment and starts at the border with Montenegro (Sukobin/Murriqan). It extends in east-west direction for about 14.5 km (south of national road to Murriqan, Sh41), until the intersecting point with existing single carriageway highway Sh1 (Tirane-Shkoder), where the construction of a diamond interchange is foreseen. The second sub-section involves the doubling/upgrading of exiting highway Sh1 over a length of approx. 12.6 km (km 20.4 to km 33.0), which represents about 30% of the entire section 1. The last sub-section is again a new alignment and extends until the end of section 1 in Balldren (Lezhe).

Except for two short road sections in cut areas, totalling both approx. 300 m in length, the entire section 1 is designed over embankments of varying heights using appropriate fill materials. The maximum and minimum project elevations at asphalt level are 21.8 m above sea level (a.s.l.) at km 19.7 and 2.9 m a.s.l. at km 34.5 respectively.

**Figure 3-2 View of the second sub-section (approx. 12.6 km) of AIC section 1**

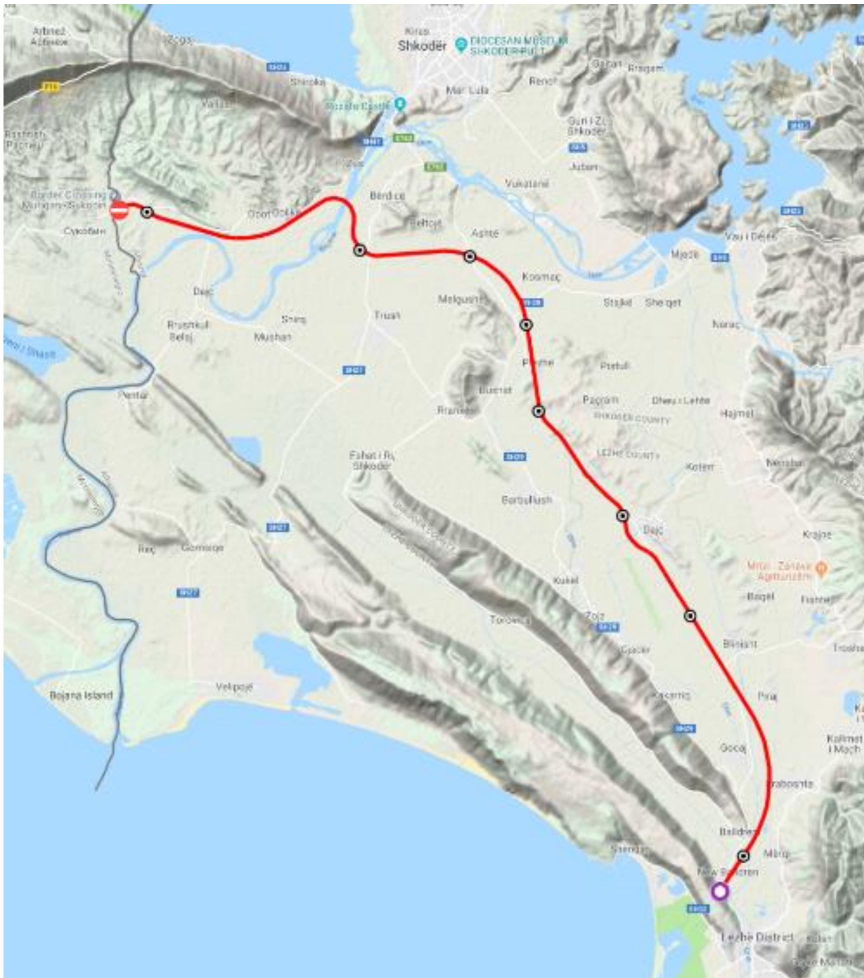



**Figure 3-3 Schematic map presentation of Section 1**

The resulting proposal on route alignment along the first sub-section was achieved by trying to avoid the most environmentally sensitive areas by closely cooperating with the environmental, hydrological, geotechnical, and structure experts on viable solutions and possible mitigation measures. As a result of such cooperation, the alignment was moved towards the north to minimise, as much as possible, the impact on the protected area of Buna river with different categories of protection (according to relevant Albanian laws). Also, the location of a new bridge over Buna river, foreseen from Ch. 8+450 to Ch. 8+850, has finally resulted in a reduced length of 300m (from 700m to 400m). The proposed bridge structure can also allow the navigation of small touristic boats, sailing potentially in the future between the Adriatic coast and Shkoder lake. Underpasses and service roads for agricultural use and local access are also foreseen in several locations.  The main design characteristics of the AIC alignment in section 1 are presented in the Table below.

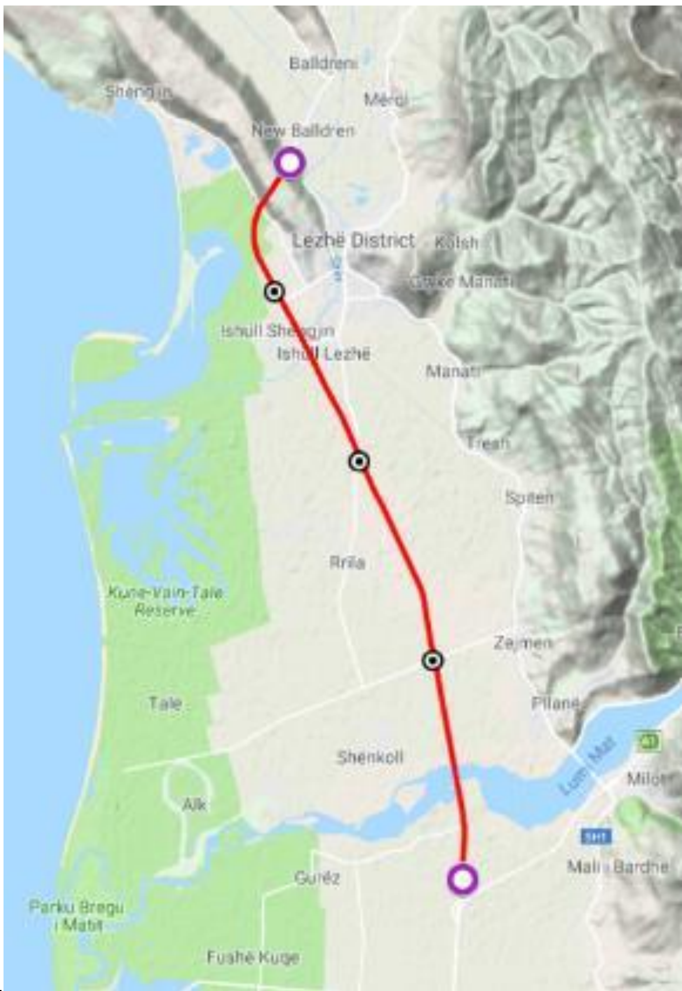
**Table 3-2 Summary table - Main design characteristics in Section 1**

| Murriqan – Balldren (Lezhe) | Section 1 |
|---|---|
| Length (km) | 40.946 |
| Design category | Motorway, category A |
| Design speed (km/hr) | 120 |

| Murriqan – Balldren (Lezhe) | Section 1 |
|---|---|
| Proposed intervention | New alignment + doubling of existing highway |
| Tunnels (km) | 0.00 |
| Bridges (km) | 1,21 |
| Interchanges (pcs) | 8 |

#### 3.1.2.2 Section 2: Balldren-Milot (L=16.19 km)

The AIC alignment in section 2 is a combination of new alignment and doubling/upgrading of existing single carriageway highway Sh1 into motorway standard category A according to Albanian Road Design Manual (ARDM 2015) and TEM Standards and Recommended Practice (2002). The total length of Section 2 is 16.190 km.




.

**Figure 3-4 Schematic map presentation of Section 2**

In follow up the recent PPP proposal and subsequent cooperation with the Beneficiary in Albania (MIE/ARA), the Consultant has considered as 'fixed' the alignment of this section. The construction of new Lezhe bypass, including a tunnel (ca. 1,000m long) under Renci mountain, new interchanges as well as improvement of existing ones, and provision of service roads (totalling 9,500 m) has been foreseen in the design of the PPP proposal.

**Figure 3-5 View of the second part (approx. 13.2 km) of AIC section 2**

The alignment along the initial 3.0 km is totally new, bypassing completely the city of Lezhe, until a new interchange (trumpet) at the roundabout on existing highway Sh1. This part of section 2 also includes the construction of the tunnel under Renci mountain. Conceptual design for the rest of Section 2 (ca. 13.2 km) considers the doubling and upgrading of existing highway Sh1 (Tirane-Shkoder) until the existing interchange (trumpet) with highway A1 to Kosovo. Existing major bridges over Drini and Mati rivers, with lengths of 225m and 625m respectively, are included in the design of new motorway but the construction of two new bridges in respective locations, in parallel to the existing ones, is required for the provision of second carriageway.

The alignment of Section 2 is designed over road embankments of varying heights using appropriate fill materials. The maximum and minimum design elevations at asphalt level are 20.4 m a.s.l. at km 15.1 and 4.8 m a.s.l. at km 3.9 respectively. It is noted that, during the preparation of conceptual design, several improvements to the PPP design proposal were necessary to undertake. These improvements include the number of interchanges, location of underpasses/overpasses, changes in longitudinal profile to respect the minimum gradient (0.7%), extent of service roads, etc., which were aimed to better fulfil all the design and safety requirements for motorway category A according to Albanian Road Design Manual (ARDM, 2015) and TEM Guidelines (UNECE, 2002).

The main design characteristics of the AIC alignment in section 2 are presented in the Table below.

**Table 3-3 Summary table - Main design characteristics in Section 2**

| Balldren (Lezhe)– Milot | Section 2 |
|---|---|
| Length (km) | 16.19 |
| Design category | Motorway, category A |
| Design speed (km/hr) | 120 |
| Proposed intervention | New alignment + doubling of exist 1x2 lanes highway |
| Tunnels (km) | 1.00 |
| Bridges (km) | 0.90 |
| Interchanges (pcs) | 3 |

#### 3.1.2.3 Section 3: Milot-Thumane (L=13.455 km)

Section 3 has a length of 13.455 km. It lies on flat terrain in the midst of quite productive agricultural areas and with a lot of rural/urban settlements located on both sides of the route. A significant number of uncontrolled housing/business developments have been stretched in a ribbon-like pattern with a lot of uncontrolled entry/exits to the main highway, posing consequently a great risk to the safety of through traffic and local users alike.

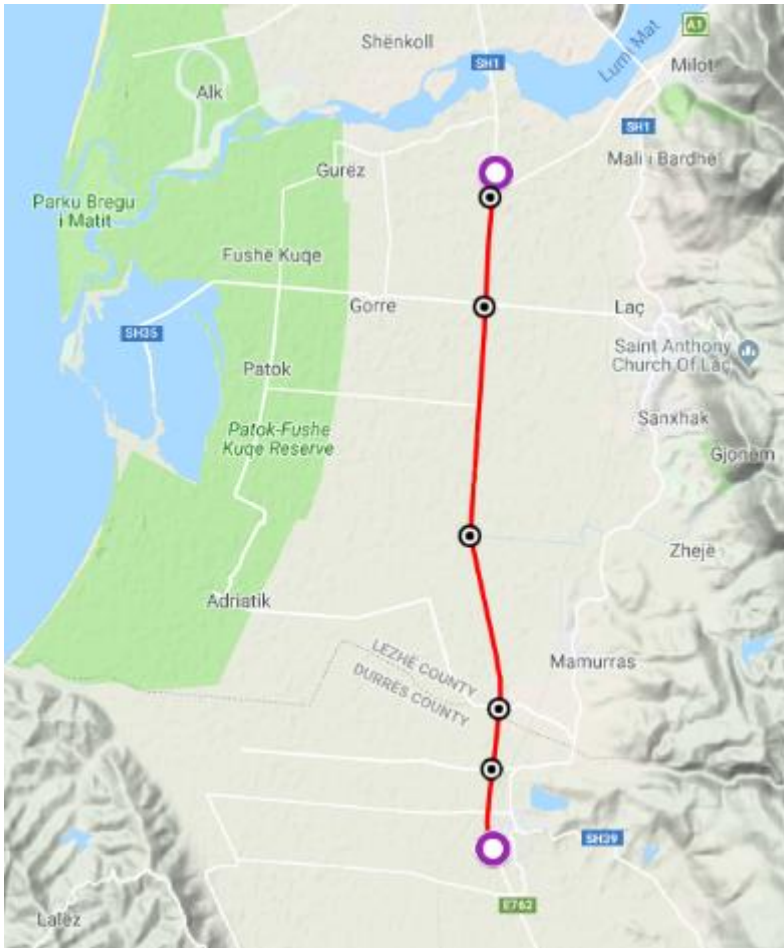



**Figure 3-6 Schematic map presentation of Section 3**

This section starts north at Milot interchange (trumpet) with highway A1 to Kosovo and ends up in Thumane. The alignment of Section 3 is designed to follow completely the existing dual carriageway highway Sh1 (Tirane-Shkoder), which is furnished with a central median and emergency lane.

The existing dual carriageway highway Sh1 is partially constructed as an express road, but several important road elements are either not properly designed, insufficient in number or missing at all, such as interchanges underpasses/overpasses, safety fences, service roads and controlled entry/exit accesses. Therefore, in the preparation of the conceptual design for this section, planned interventions by the Consultant has considered primarily the closure of uncontrolled local entrances, provision of new service roads and improvement of existing interchanges.


**Figure 3-7 View of the existing AIC section 3 (Sh1 Tirane-Shkoder)**

The main design characteristics of the AIC alignment in section 3 are presented in the Table below.

**Table 3-4 Summary table - Main design characteristics in Section 3**

| Milot – Thumane | Section 3 |
|---|---|
| Length (km) | 13.455 |
| Design category | Motorway, category A |
| Design speed (km/hr) | 120 |
| Proposed intervention | Improvement of exist. 2x2-lane highway |
| Tunnels (km) | 0.00 |
| Bridges (km) | 0.23 |
| Interchanges | 5 |

#### 3.1.2.4 Section 4: Thumane-Kashar (L=21.05 km)

Section 4 (Thumane-Kashar) is a completely new alignment, extending in a north-south direction, with a total length of approx. 21.05 km. It starts north in Thumane, at the end of AIC Section 3, and ends up in Kashar just after the new proposed interchange (cloverleaf) with existing dual carriageway highway Sh2 (Tirane-Durres).

This section lies between the existing national highways F.Kruje-Vore (Sh52) and Tirane-Shkoder (Sh1). The alignment intersects at km 9.0 with highway Sh52. The existing old single-track railway Vore-Shkoder is located on the west of Section 4, whereas the other railway track Durres-Tirane intersects the AIC alignment near Ch. 20+270. Tirana's International Airport is situated on the east of this section and could be accessed through the IC no.3 at Ch.14+440.

This section was awarded for construction in 2018 to a local investor through a PPP agreement with GoA. The implementation of works according to this agreement is however suspended momentarily due to legal litigations between the investor and Albanian authorities. It is noted that the earlier detailed design for section 3, as motorway category A according to Albanian Road Design Manual (ARDM, 2015), produced by 'SPEA Engineering' consultants (Italy) and approved by ARA in 2017, has been considered with minor changes in the PPP agreement.

Similar to section 2 above and, as agreed with the Beneficiary in Albania (MIE/ARA), the alignment for this section is considered by the Consultant as a 'fixed' section and subsequent work for the preparation of conceptual design follows the approved design alignment of the PPP proposal.

Section 4 is designed over road embankments of varying heights by using adequate fill material from nearly quarries of Kruje. Minimum and maximum design elevations at asphalt level are 9.2 m a.s.l. at km 2.1 and 63.4 m a.s.l. at km 20.4 respectively, whereas design elevations at the starting and ending points of Section 4 are 14.2 m a.s.l. and 61.4 m a.s.l. respectively.

In addition to several underpasses/overpasses and service roads for local access, the design of section 4 requires also the construction of 4 interchanges and 8 bridges, the longest of which is 400m.


**Figure 3-8 Schematic map presentation of Section 4 (PPP)**

Main design characteristics of the AIC alignment in section 4 are presented in the table below.

**Table 3-5 Summary table - Main design characteristics in Section 4**

| Thumane – Kashar | Section 4 |
|---|---|
| Length (km) | 21.05 |

| Thumane – Kashar | Section 4 |
|---|---|
| Design category | Motorway, category A |
| Design speed (km/hr) | 120 |
| Proposed intervention | New alignment |
| Tunnels (km) | 0.00 |
| Bridges (km) | 1.185 |
| Interchanges | 4 |

#### 3.1.2.5 Section 5B: Kashar-Lekaj (L=33.573 km)

Section 5B is a completely new alignment, extending in a north-southwest direction, with a total length of 33.573 km.

The alignment of Section 5B starts in Kashar area, at the exit point of new proposed interchange (cloverleaf) between the AIC Section 4 and existing Tirane-Durres highway (Sh2), and it ends up at the exit point of new trumpet interchange in Lekaj (Kavaje) with existing dual carriageway highway, Sh4 (Durres-Fier-Gjirokaster). Section 5B is designed as motorway category A according to Albanian Road Design Manual (2015) and TEM Guidelines (2002).

The new motorway alignment follows initially a flat terrain, located on the right side of Limuthi river valley, with an upward slope of 0.7%. Until Kus reservoir (Ch. 2+900) the alignment is designed over road embankment (fill) with heights ranging from 5 to 6 m above the terrain level. From Kus to Allgjate village (Ch. 2+900 to 5+200) the alignment continues through steep hilly terrains, requiring the construction of an 870 m long tunnel from Ch. 4+215 to Ch. 5+085. The longitudinal profile reaches a maximum gradient of 4% before and after the tunnel. During the detailed design of the Tirana Bypass, which is ongoing at the time of writing this report, adjustments to the alignment over this section may take place.

From Allgjate village (Ch. 5+200) the AIC alignment continues through moderately steep terrains along a narrow river valley. An elongated trumpet-shape interchange between the AIC Corridor and Tirana Bypass motorways is foreseen at Ch. 7+870. The final form of this interchange will be determined as part of the Tirana Bypass detailed design, which is ongoing at the time of writing this report.

The alignment of Section 5B continues in a southwest direction along the right side of Erzeni River valley (from Ch. 8+700 to Ch. 9+900), with varying terrain elevations from 71.2 a.s.l. to 63.7 m a.s.l. Three consecutive bridges over this river with lengths of 200m, 220m and 250m are foreseen in the conceptual design (Ch. 9+990 - 10+190; Ch. 10+885 - 11+105; and, Ch. 11+450 - 11+700).

The alignment of Section 5B follows from Ch. 13+000 to 17+200 the valley of Peze River. A diamond-type interchange is foreseen at Ch. 13+010 between the AIC motorway and existing 1x2 lanes national road, Sh56 (Tirane-Durres). From this point to the next interchange (diamond type) at Ch. 16+845 the alignment has a north-south direction, extending over flat terrains through the valley of Peze River - a tributary to the major Erzeni River – beside the village of Maknor and in parallel to the local road to Peze, both located on the east side of AIC route.

The design of new motorway from Ch. 13+010 to 16+845 presents a low upward slope of less than 1% and is constructed over gentle cut and fill areas.


**Figure 3-9 Schematic map presentation of Section 5B**

After the interchange at Ch. 16+845, the alignment of Section 5B turns toward the southwest direction, passing through steep hilly terrain. The highest terrain elevation is 318.22 m a.s.l. and observed in Ch. 18+900. Here the design of the new motorway presents an upward gradient of 4%, passing through several cut and fill areas, over two bridges and through a tunnel with a length of 1,680m. Starting in Ch. 19+800, the AIC alignment slopes down towards the ending point of Section 5B in Lekaj through a series of hills and depressions, requiring the undertaking of engineering measures in cut and fill areas and the construction of several bridges over small rivers and streams. A 'Cut & Cover' structure with a length of 250m is foreseen from Ch. 21+565 to Ch. 21+815, while the construction of a 450m-long tunnel is required from Ch. 30+670 to Ch. 31+120.

From the interchange in Peze (Ch. 16+845) to the ending point of Section 5B in Lekaj (Ch. 33+573), the alignment passes mostly through a rugged and steep terrain with almost no inhabited settlements. The flatter terrains are observed along the valley of Darsi River (Ch. 26+500 to Ch. 30+400) and in the ending part of Section 5B (Ch. 31+100 to Ch. 33+573).

The main design characteristics of the AIC alignment in section 5B are presented in the Table below.

**Table 3-6 Summary table - Main design characteristics in Section 5B**

| Kashar –Konjat (Lushnje) | Section 5B |
|---|---|
| Length (km) | 33.573 |
| Design category | Motorway, category A |
| Design speed (km/hr) | 120 |
| Proposed intervention | New alignment |
| Tunnels (km) | 3.00 |
| Bridges (km) | 1.75 |
| Interchanges | 5 |

#### 3.1.2.6 Section 5C: Lekaj-Konjat (L=14.168 km)

Section 5C has a length of 14.168 km. The conceptual design for this section considers the widening and upgrading of the existing 2x2-lane highway Sh4 to motorway category A according to Albanian Road Design Manual (2015) and TEM Standards and Recommended Practice (2002).

Section 5C starts in the north at a new trumpet interchange in Lekaj (Kavaje) with the existing dual carriageway highway (Sh4) and ends up in Konjat. The existing highway connects Durres city with other cities in southern Albania until the border with Greece (Kakavije). The highway lies on flat terrain, extending over quite productive agricultural areas, mostly located on the west side of the route.

**Figure 3-10 View of AIC section 5C**

The AIC route follows mostly the alignment of existing dual carriageway highway, Sh4. This later is furnished with a narrow central median and paved strip on both carriageways, but no emergency lanes are provided. It is also noted that, although the existing highway Sh4 has been partially constructed as interurban primary road category B ('express road'), several important road elements are either not properly designed, insufficient in number or missing at all, such as interchanges, controlled accesses, safety fences, service roads, etc. The old single-track railway line follows the existing highway (Sh4) in parallel, on the east side of it.

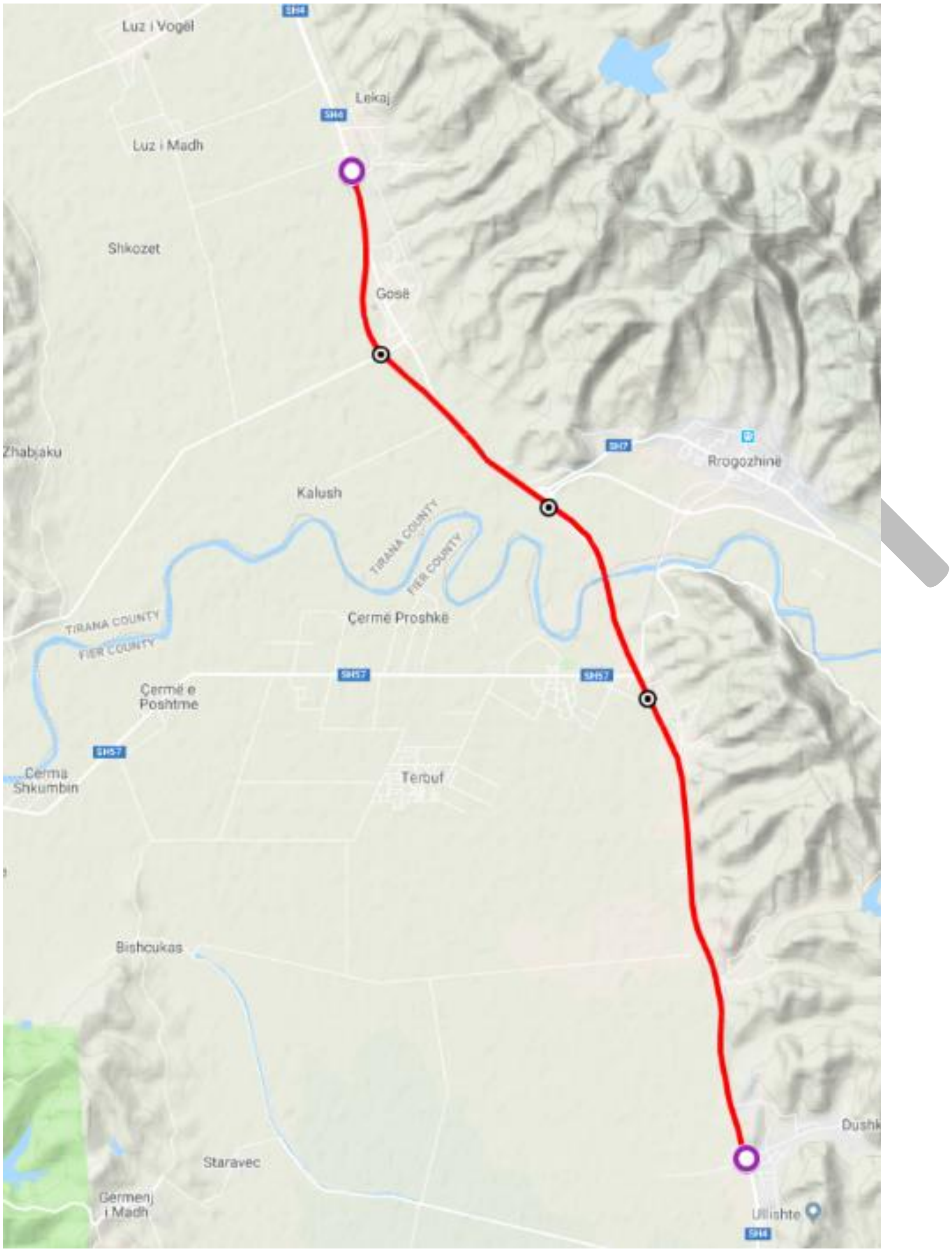



**Figure 3-11 Schematic map presentation of Section 5C**

As a result of above circumstances, planned interventions by the Consultant during preparation of conceptual design for this section, has primarily considered the widening and upgrading of existing highway Sh4 into motorway standard, category A. This implies among other the provision of emergency lanes, improvement of vertical alignment, closure of uncontrolled accesses, provision of new interchanges, service roads, etc. The

Consultant has considered to keep in the design for section 5C the existing bridge over Shkumbin River (300m). In this regard, a limited improvement of the bridge deck, the actual bridge cross-section becomes compliant with the requirements for interurban primary road category B (express road) according to the Albanian Road Design Manual (ARDM 2015).

It is noted that the longitudinal profile of the new motorway changes completely from the actual profile of existing highway Sh4. This is due to higher design requirements to assure better drainage of surface waters through the provision of a minimum gradient of 0.7% in the longitudinal profile. Due to such requirement, as in other AIC sections requiring the widening and upgrading of existing highway (except for section 3), the asphalt layers and structures cannot be saved.

The design of Section 5C proposes the construction of new interchanges at Ch. 5+300 (trumpet type), that provides connection to existing highway Sh7 to Elbasan, and Ch. 8+120 (diamond type) at the intersection with national road Sh57 to Divjake on the Adriatic coast. While, the existing interchange in Gose at Ch. 2+380 is redesigned into a diamond shape interchange. In addition to the interchanges, five (5) overpasses are foreseen in the conceptual design. The above structures, together with the provision of an intense network of service roads, are aimed to assure proper connection of local settlements to the new motorways and adjacent land properties.

The main design characteristics of the AIC alignment in section 5C are presented in the Table below.

**Table 3-7 Summary table - Main design characteristics in Section 5C.**

| Kashar –Konjat (Lushnje) | Section 5C |
|---|---|
| Length (km) | 14.168 |
| Design category | Motorway, category A |
| Design speed (km/hr) | 120 |
| Proposed intervention | New alignment |
| Tunnels (km) | 0.00 |
| Bridges (km) | 0.30 |
| Interchanges | 3 |

#### 3.1.2.7 Section 6+7: Konjat-Fier bypass (L=28.037 km)

Section 6+7 has a length of 28.037 km. Similar to sub-section 5C, this section is considered by the Consultant as a 'fixed' section. This is in line with the proposed approach by the Beneficiary (MIE/ARA). As a result, the conceptual design for this section considers the widening and upgrading of existing 2x2-lane highway Sh4 to motorway category A according to Albanian Road Design Manual (2015) and TEM Standards and Recommended Practice (2002). The issues, assumptions and design challenges faced in section 6+7 are quite similar to those described in section 5C.

This section lies in the midst of vast agricultural areas (Myzeqe fields), which are located on both sides of the AIC route. Some of these fields may be subject to flooding during torrential rains.

The horizontal alignment of Section 6+7 follows in general the existing 2x2-lane highway Sh4. A few exceptions are made however in the following three locations with a combined length of about 6.1 km (or about 21.8% of the entire section). These are completely new alignments and aimed to improve the design parameters as well as avoid additional requirements for expropriation.

The AIC vertical alignment in longitudinal profile changes almost completely from the actual levels of existing highway Sh4. This is due to higher design requirements to assure a better drainage of surface waters through the provision of a minimum gradient of 0.7% in the longitudinal profile. Therefore, as in other AIC sections, requiring the widening and upgrading of the existing highways (except for section 3), the actual pavement construction of existing highway cannot be saved.

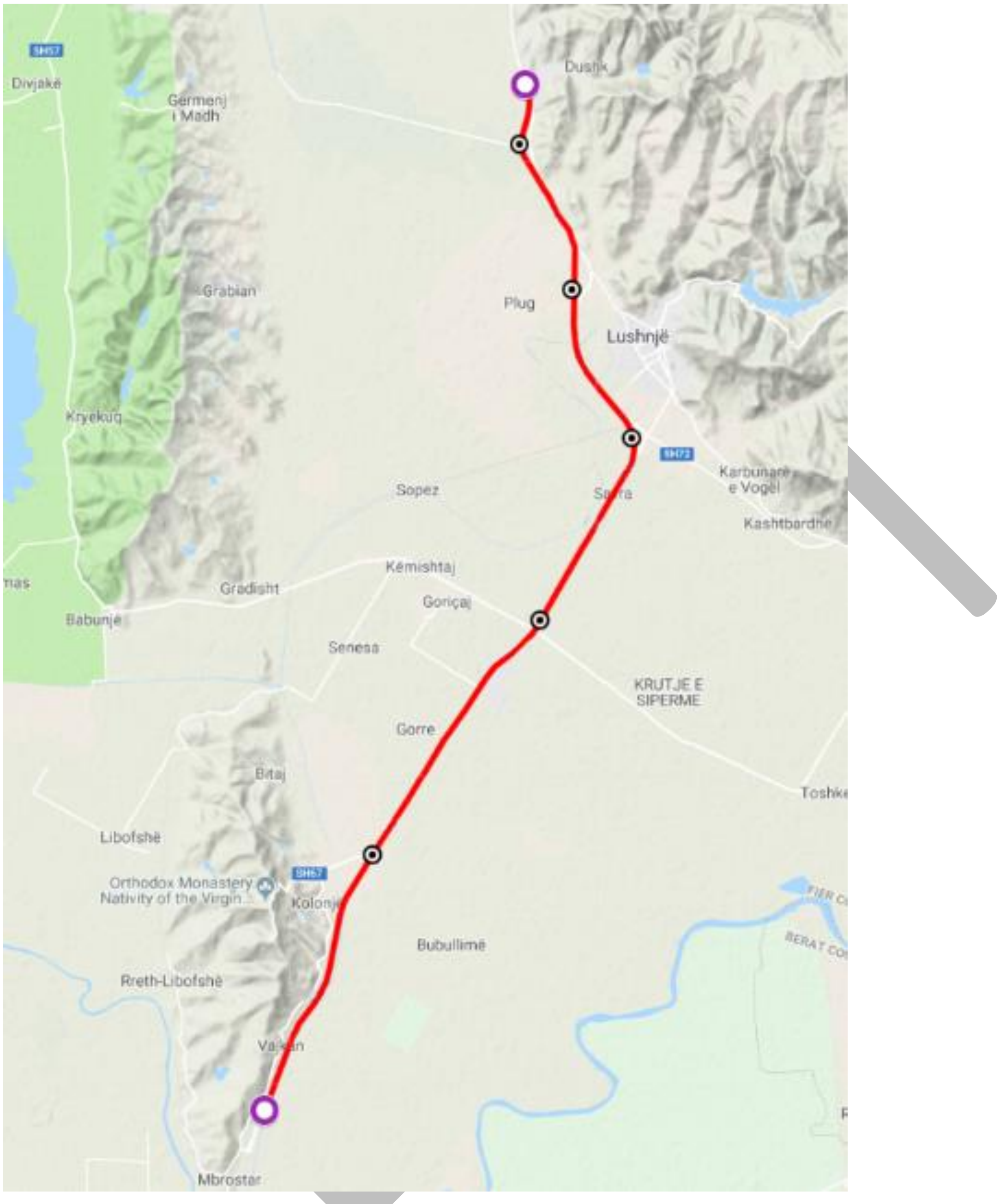



**Figure 3-12 Schematic map presentation of Section 6+7**

Section 6+7 intersects at Ch. 14+300 with national road Fiershegan-Divjake, where an interchange (diamond type) is planned in the conceptual design. Another 4 interchanges are foreseen at Ch. 1+460, Ch. 5+300, Ch. 9+300 and Ch. 21+250. The interchanges located at Ch. 5+300 (diamond type) and Ch. 9+300 (trumpet type) provide the connection of Lushnje city with the bypass (part of section 6+7), in the north and west respectively. The later interchange is also connected with the national highway Sh72 to Berat and Corovode.


**Figure 3-13 View of Section 6+7**

In addition to 5 interchanges, the conceptual design of section 6+7 includes also 8 underpasses and 3 overpasses. These structures, together with the provision of an intense network of service roads, are aimed to assure an adequate connection of local settlements to the new motorway and adjacent properties.

Due to the absence of rivers, no major bridges in Section 6+7 are required. A short bridge of about 30 m long is located at Ch. 22+980 to 23+010, while another one serving as a railway underpass (ca. 45 m long) is foreseen at Ch. 8+965 to 9+010. The need for the crossing of drainage and irrigations channels is achieved through the planning of an appropriate number of box culverts.

The main design characteristics of the AIC alignment in section 6+7 are presented in the Table below.

**Table 3-8 Summary table - Main design characteristics in Section 6+7.**

| Konjat – Fier | Section 6+7 |
|---|---|
| Length (km) | 28.037 |
| Design category | Motorway, category A |
| Design speed (km/hr) | 120 |
| Proposed intervention | Widening/improvement of exist. 2x2-lane highway |
| Tunnels (km) | 0.00 |
| Bridges (km) | 0.075 |
| Interchanges | 5 |

#### 3.1.2.8 Section 8: Fier bypass (L=22.185 km)

Section 8 has a total length of 22.185 km. This section is under construction and, as agreed with the Beneficiary (MIE/ARA), is considered as a 'fixed' section and excluded from the design scope of the Consultant.

The new Fier bypass is designed as interurban primary road category B ('express road') according to Albanian Road Design Manual (2015) and the ongoing works are scheduled for completion in 2019.

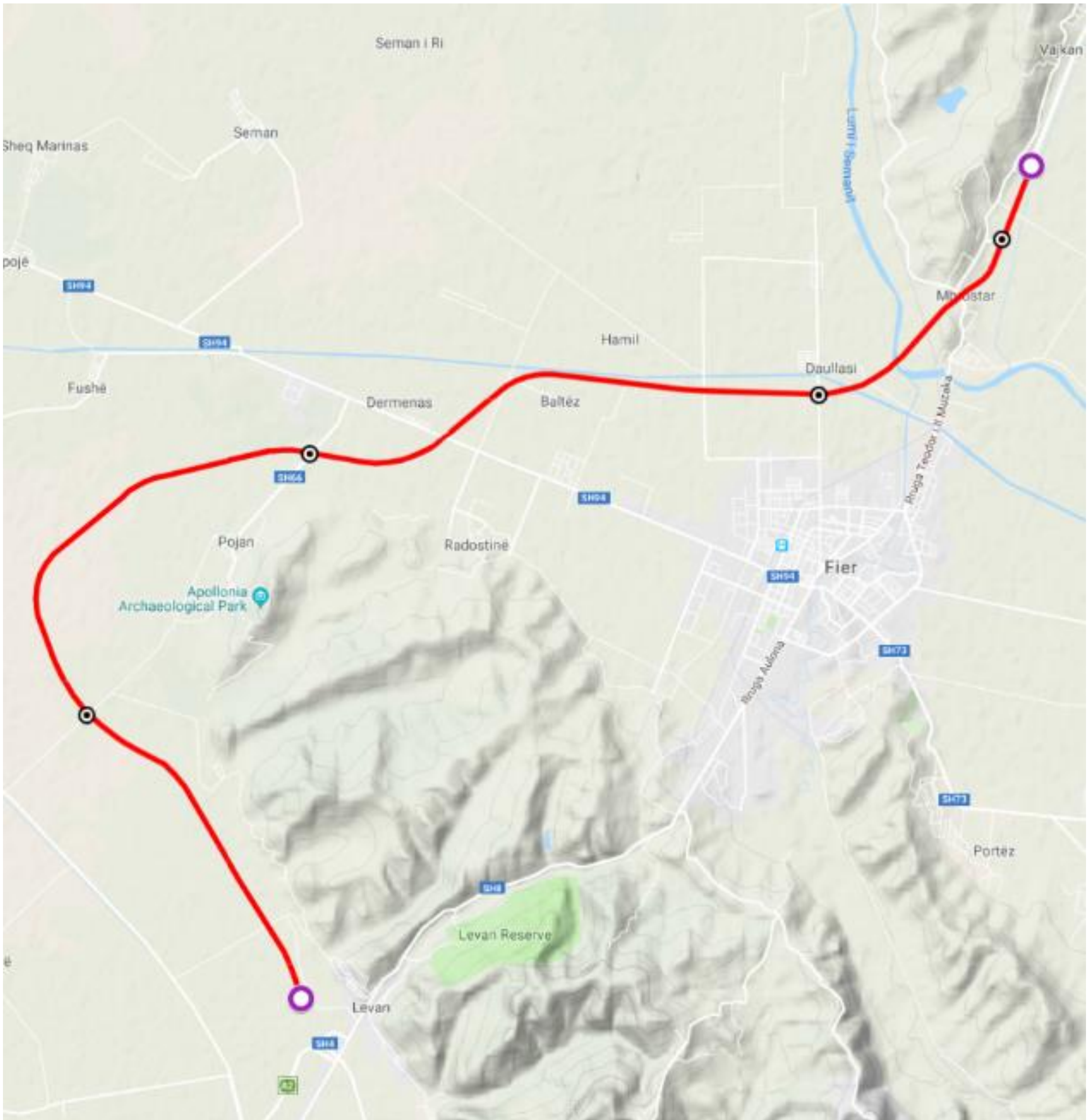



**Figure 3-14 Schematic map presentation of Section 8**

#### 3.1.2.9 Section 9A-2: Fier bypass (Levan)-Pocem (L=26.901 km)

Section 9A-2 has a total length of 26.901 km and the proposed AIC alignment follows almost completely the existing single carriageway highway (national route Sh4), extending from Levan to the end of this section in Pocem (Hekal).

The alignment starts at the end of new Fier bypass (Levan), at the interchange with existing motorway A1 to Vlore. It follows the gentle plains located on the right side of Vlosa River valley. Most of the rural settlements are found to the north of the AIC alignment, along the bottom part of a range of low to medium height hills at a distance of a few kilometers from the route. Only a few villages are located in close vicinity and on both sides of the alignment.

The conceptual design of Section 9A-2 assumes the doubling (left side) and upgrading of the existing 1x2 lanes national highway Sh4 into primary interurban road ('express road') category B according to Albanian Road Design Manual (2015), while also respecting the relevant requirements of TEM Standards and Recommended Practice (2002). The design of the new 'express road' necessitates the construction of road embankments of varying heights, but still below 9.0 m, with rising and declining gradients ranging from 1% to 2% in the longitudinal profile.

The study team has included in the conceptual design a proposal for the interchange solution in Levan, which considers the future development of the A-I corridor in Albania. The proposed interchange assumes the connection between two motorways, namely the motorway A1 to Vlore and the future A-I Corridor. This interchange has an elongated Trumpet-shape and is provided with appropriate lengths of exit and entry ramps in all traffic directions, including the connection with the existing road network (Sh8). It is therefore strongly advised to protect the area that will be likely occupied in the future by this interchange free of any construction (no building permits).


**Figure 3-15 Schematic map presentation of Section 9A-2**

Shortest distances from the AIC route to Vlosa river are observed in three locations, namely at km 9.5 in a distance of about 500 m, at km 22 (after Selishte village) in a distance of about 540 m and at the end of Section 9A-2 in a distance of about 300 m.

The main design characteristics of the AIC alignment in section 9A-2 are presented in the Table below.

**Table 3-9 Summary table - Main design characteristics in Section 9A-2.**

| Fier Bypass (Levan) – Pocem | Section 9A-2 |
|---|---|
| Length (km) | 26.901 |
| Design category | Interurban Primary Road, category B (express road) |
| Design speed (km/hr) | 120 |
| Proposed intervention | Doubling of existing 1x2 lanes highway |
| Tunnels (km) | 0.00 |
| Bridges (km) | 0.34 |
| Interchanges | 7 |

#### 3.1.2.10 Section 9B-2: Pocem-Memaliaj (L=37.694 km)

Section 9B-2 has a total length of 37.694 km. The AIC alignment extend over hilly/mountainous terrain that is located on the right side of the Vjosa River. The design of section 9B-2 assumes both new alignment and doubling of existing 1x2 lanes national highway Sh4 into primary interurban road ('express road') category B according to Albanian Road Design Manual (2015). The design speed considered in the conceptual design for this section ranges from 80 km/hour to 110 km/hour. The minimum horizontal radius is 250m, while the maximum gradient reaches up to 6%.

In many locations the improvement of the existing route requires the adoption of new variants as well as the construction of several bridges, tunnels and cut and cover structures. The new alignment can follow the existing highway Sh4 only for a total length of about 13 km, whereas the remaining part of it requires new alignment of about 24.7 km.

Again, as in other sections of the AIC in Albania, the provision of new interchanges (mostly diamond-shape), underpasses/overpasses and service roads for agricultural use and local access is foreseen in several locations.

**Figure 3-16 Section 9B-2 – View of the existing 1x2 lanes highway, Sh4**


**Figure 3-17 Schematic map presentation of Section 9B-2**

It should also be mentioned that AIC alignment crosses twice over the Vjosa river, just before the entrance to Memaliaj town at the end of Section 9B-2. The closest distances from the alignment to Vjosa riverbanks are about 100 m (Ch. 33+600) and 120 m (Ch. 28+100) respectively.

The main design characteristics of the AIC alignment in section 9B-2 are presented in the Table below.

**Table 3-10 Summary table - Main design characteristics in section 9B-2**

| Pocem – Memaliaj | Section 9B-2 |
|---|---|
| Length (km) | 37.694 |
| Design category | Interurban Primary Road, category B (express road) |
| Design speed (km/hr) | 80-110 |
| Proposed intervention | New alignment + doubling of existing 1x2 lanes highway |
| Tunnels (km) | 3.05 |
| Bridges (km) | 4.754 |
| Interchanges | 8 |

#### 3.1.2.11 Section 10: Memaliaj-Subashi Bridge (L=20.143 km)

Section 10 has a total length of 20.143 km and is completely new alignment. This section is designed as motorway category A according to Albanian Road Design Manual (2015) and TEM Standards and Recommended Practice (2002).

The proposed AIC alignment in Section 10 extends over the right side of the Vlosa and Drinos rivers. The terrain is hilly/mountainous, but still allowing enough space for the construction of a motorway Category A without incurring major additional costs for the construction of structures. Moreover, except for a few rural settlements, the areas along the route has a very low density of settlements.

Figure 3-18 Schematic map presentation of Section 10

Figure 3-19 View of terrain at the start of AIC section 10 (left side).

The construction of a trumpet interchange at Ch. 7+520 and new bridge over the Vjosa River (ca. 300m long) are required to provide access to Tepelene town as well as new link with national road Sh75 to Permet. The bridge connection to this interchange is achieved through an underpass (9.1x5.0m) located in Ch. 6+390. Another bridge over the Vlosa River (ca. 220 m long) is also required from Ch. 9+935 to 10+155, near to the old metallic Shpregel system bridge of Dragoti (with limited long-life capacity) over the national road Sh75 to Permet.

From this point until the end of Section 10 (Subashi bridge), which represents the second half of this section, the alignment continues along the right side of Drinos River (a branch of Vjosa River). The topography and terrain features are quite similar to those in the initial part of AIC route from Memaliaj to Tepelene town. The construction of a new bridge (ca. 425 m long) over the Drinos River is required from Ch.19+420 to Ch.19+845 just before the end of Section 10 (close to existing Subashi Bridge).

The construction of three short tunnels, totaling 1.52 km, is required in a few hilly areas, located at Ch. 5+170 to Ch. 6+100 (0.93 km), Ch. 10+330 to Ch. 10+720 (0.39 km) and Ch. 18+830 to Ch. 19+030 (0.2 km) respectively.

In addition to above major structures, in order to achieve the required design parameters, the alignment of Section 10 requires also the construction of a number of retaining walls (in several cut and fill areas) and box culverts. These walls are mostly planned for in Ch. 4+500 to 4+800, Ch. 5+000 to 5+200, Ch. 6+200, Ch. 11+600, Ch. 12+600 to 13+300, Ch. 14+000 to 14+700, Ch. 15+400 to 16+200, Ch. 17+600, Ch. 19+200, etc. In addition to interchanges, the provision of several underpasses/overpasses and minor service roads of limited extent for agricultural use and local access is also foreseen at adequate locations.

Main design characteristics of the AIC alignment in section 10 are presented in the table below.

Table 3-11 Summary table - Main design characteristics in section 10

| Memaliaj – Subashi Bridge | Section 10 |
|---|---|
| Length (km) | 20.143 |
| Design category | Motorway, category A |
| Design speed (km/hr) | 120 |

| Memaliaj – Subashi Bridge | Section 10 |
|---|---|
| Proposed intervention | New alignment |
| Tunnels (km) | 1.525 |
| Bridges (km) | 0.645 |
| Interchanges | 2 |

#### 3.1.2.12 Section 11: Subashi Bridge-Gjirokaster bypass (L=10.26 km)

Section 11 has a total length of 10.260 km and its alignment extends primarily in a north-south direction. In contrast with the two previous AIC sections, this section lies on a flat plain located on the left side of Drinos River. Section 11 cuts across the valley by following completely the alignment of existing highway Sh4. A few rural settlements are located along the AIC route, mostly on the west side of it.

The conceptual design for this section considers the doubling/upgrading of highway Sh4 to motorway category A according to Albanian Road Design Manual (2015) and TEM Standards and Recommended Practice (2002).

The new motorway is almost entirely constructed over fill embankments of different heights. Only a short section, located on the left of the alignment with a length of approx. 0.1 km (Ch. 2+900 to Ch. 3+000), is designed in cut area on a hill slope.

**Figure 3-20 View of AIC Section 11**


**Figure 3-21 Schematic map presentation of section 11**

The closest distances, measured between the banks of Drinos river and the edge of motorway embankment, vary from a few meters (Ch. 1+000 to Ch. 1+100) to 30 m (Ch. 0+000 to Ch. 0+400; and Ch. 3+000 to Ch. 3+500).

The motorway design includes the provision of three interchanges, several overpasses and service roads, which provide adequate access to the local villages and land properties. Moreover, the interchange in Kardhiq located at Ch. 6+800 (diamond shape) provides the connection with new highway to Sarande city.

The proposed design for Section 11 considers the existing Kardhiq Bridge, which has a length of 270m (from Ch. 6+330 to Ch. 6+600), but the construction of a similar bridge, in parallel to it, is required for the second carriageway.

Main design characteristics of the AIC alignment in section 11 are presented in the Table below.

**Table 3-12 Summary table - Main design characteristics in section 11.**

| Subashi Bridge – Gjirokaster Bypass | Section 11 |
|---|---|
| Length (km) | 10.260 |
| Design category | Motorway, category A |
| Design speed (km/hr) | 120 |
| Proposed intervention | Doubling/upgrading of existing 1x2 lanes highway |
| Tunnels (km) | 0.00 |
| Bridges (km) | 0.30 |
| Interchanges | 3 |

#### 3.1.2.13 Section 12: Gjirokaster bypass (L=9.7 km)

This section has a total length of 9.700 km. The bypass alignment extends over almost flat terrain and its construction is aimed to releave the city's road network from the through traffic. Section 12 is a completely new alignment, located on the opposite side of the Drinos River, that bypasses the town of Gjirokaster. The medieval city of Gjirokaster, a site protected by UNESCO, is located on the west of Section 12.

A number of rural settlements are located on the east, at a relatively small distance from the AIC route. All these villages are connected in an east-west direction with Gjirokaster city through the regional road to Valare, which crosses in a wide angle the alignment of Section 12. This road is connected to the new motorway by a proposed interchange (half cloverleaf) at Ch. 3+950. Two other interchanges (trumpet shape) are planned at the beginning and end of Section 12, which are both linked to the existing national highway Sh4.

In addition to the interchanges, the conceptual design provides for the construction of a few underpasses, aimed to provide adequate access to the local villages and land properties, as well as the construction of 5 new bridges.

For this section there is already an approved detailed design by ARA for the motorway (category A) that fulfils the requirements of Albanian Road Design Manuals (2015). Since it is basically considered as a 'fixed' section, except for a minor design improvement, the design team did not perform further activities.

The length of Gjirokaster bypass, as presented in the detailed design by ARA, is approx. 10.4 km. However, for design purposes under this assignment, the design team has excluded the last 500 m from the existing detailed design and included it in the forthcoming Section 13A to Kakavije (border crossing point with Greece) and the end of AIC in Albania.

The alignment of section 12 is designed over road embankments with different height.


**Figure 3-22 Schematic map presentation of section 12**

Main design characteristics of the AIC alignment in section 12 are presented in the table below.

**Table 3-13 Summary table - Main design characteristics in section 12.**

| Gjirokaster Bypass | Section 12 |
|---|---|
| Length (km) | 9.700 |
| Design category | Motorway, category A |
| Design speed (km/hr) | 120 |
| Proposed intervention | New alignment |
| Tunnels (km) | 0.00 |
| Bridges (km) | 0.685 |
| Interchanges | 3 |

#### 3.1.2.14 Section 13A: Gjirokaster-Kakavije (L=23.79 km)

Section 13A has a total length of 23.79 km. The proposed AIC alignment starts at the end of Gjirokaster Bypass, near to Dervican village, and ends up in Kakavije at the border crossing with Greece. It follows in most of its part, the existing single carriageway highway (Sh4), located on the west side of Drinos river.

The hhighway Sh4 is almost entirely free from uncontrolled ribbon development except for a limited number of buildings (petrol stations, warehouses, etc.).

The conceptual design of section 13A considers mostly the doubling/upgrading of existing highway Sh4 to motorway category A according to Albanian Road Design Manual (2015) and TEM Standards and Recommended Practice (2002). However, due to legal requirements to provide a minimum distance (as buffer zone) from the existing cultural monuments, in three locations the AIC alignment is shifted away from the existing highway, totaling approx. 2.2 km in length.


**Figure 3-23 View of Section 13A**

Several rural settlements are located on the west side of the alignment at the foot of a range of hills and mountains. These settlements are provided with access roads, connecting them to the new motorway and nearby land properties through an adequate number of interchanges, underpasses and overpasses. Two national roads are connected to the AIC alignment, including the existing national roads to Sarande (Sh99) and Libohove (Sh96).

The provision of four interchanges (diamond-shape) and a few underpasses/overpasses for local access to agricultural fields are foreseen. Alternative 13A does not require the construction of major structures except for a limited number of small bridges and culverts.

Due to design requirements, the AIC alignment lies on fill embankments of low to medium height. The maximum embankment height is about 11.4 m above the ground level and located in Ch. 9+900.

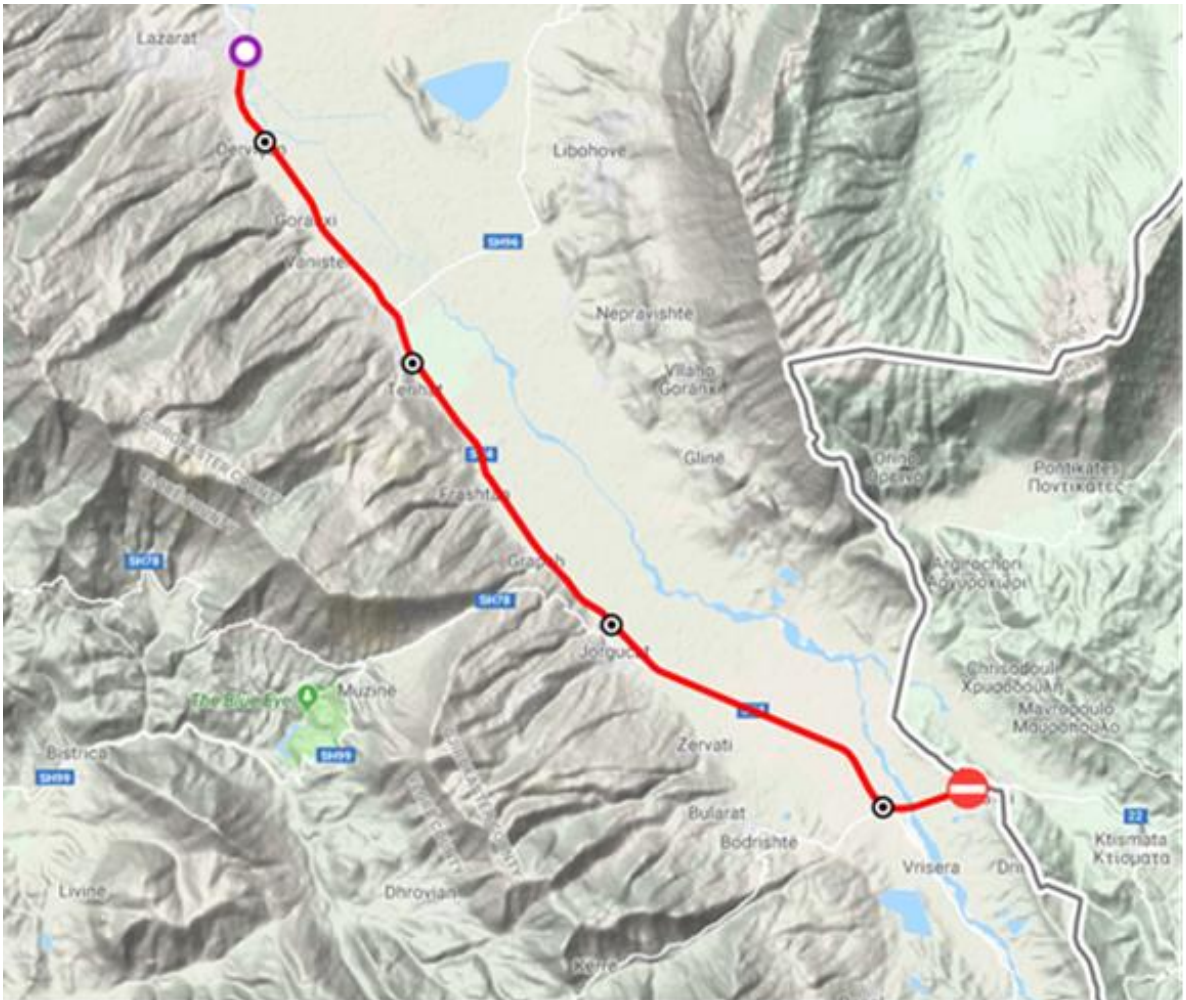



**Figure 3-24 Schematic map presentation of section 13A**

The main design characteristics of the AIC alignment in section 13A are presented in the table below.

**Table 3-14 Summary table - Main design characteristics in section 13A**

| Gjirokaster Bypass – Kakavije | Section 13A |
|---|---|
| Length (km) | 23.790 |
| Design category | Motorway, category A |
| Design speed (km/hr) | 120 |
| Proposed intervention | Doubling/upgrading of existing 1x2 lanes highway |
| Tunnels (km) | 0.00 |
| Bridges (km) | 0.19 |
| Interchanges | 4 |

#### 3.1.2.15 Summary table - Main design characteristics of the AIC sections in Albania.

The main conceptual design characteristics of all AIC sections in Albania are presented in the summary table below.

**Table 3-15 Summary table - Main characteristics for all AIC sections in Albania.**

| Sections | Length (km) | Design speed (km/h) | Proposed intervention | Tunnels (km) | Bridges (km) | Interchanges |
|---|---|---|---|---|---|---|
| **1 (Murriqan - Balldren (Lezhe))** | 40.946 | 120 | new alignment and doubling of existing road. | 0 | 1,21 | 8 |
| **2 (Balldren (Lezhe)-Milot)** | 16.190 | 120 | New alignment and doubling of exist 1x2 lanes highway | 1.00 | 0.90 | 3 |
| **3 (Milot-Thumane)** | 13.455 | 120 | Improvement of exist. 2x2-lane highway | 0 | 0.23 | 5 |
| **4 (Thumane-Kashar)** | 21.050 | 120 | New alignment | 0 | 1.185 | 4 |
| **5B (Kashar-Lekaj)** | 33.573 | 120 | New alignment | 3.00 | 1.75 | 5 |
| **5C (Lekaj-Konjat)** | 14.168 | 120 | New alignment | 0 | 0.3 | 3 |
| **6&7 (Konjat-Fier bypass)** | 28.037 | 120 | Widening/improvement of exist. 2x2-lane highway | 0 | 0.075 | 5 |
| **8 (Fier Bypass)*** | 22.185 | | | | | |
| **9A2 (Fier Bypass-Pocem)** | 26.901 | 120 | Doubling of existing 1x2 lanes highway | 0 | 0.34 | 7 |
| **9B2 (Pocem-Memaliaj)** | 37.694 | 80-110 | New alignment + doubling of existing 1x2 lanes highway | 3.05 | 4.754 | 8 |
| **10 (Memaliaj-Subashi Bridge)** | 20.143 | 120 | New alignment | 1.525 | 0.645 | 2 |
| **11 (Subashi Bridge-Gjirokaster bypass)** | 10.260 | 120 | Doubling/upgrading of existing 1x2 lanes highway | 0 | 0.3 | 3 |
| **12 (Gjirokaster bypass)** | 9.700 | 120 | New alignment | 0 | 0.685 | 3 |
| **13A (Gjirokaster bypass-Kakavije)** | 23.790 | 120 | Doubling/upgrading of existing 1x2 lanes highway | 0 | 0.19 | 4 |

By adding the length of Fier bypass (22.185 km) to the above figure of 295.907 km, the total length of AIC in Albania is approx. 318.092 km.

## 3.2 Design speed and elements of the Corridor

For the needs of this study and in respect to earlier recommendations, the Albanian Road Design Manuals (ARDM, 2015) and TEM Standards and Recommended Practice (UNECE-Third Edition, February 2002) were used. This follows the ToR and the Beneficiary's requirements.

In order to unify the different standards used in the past, the Consultant's team proposed to design the new AIC in Albania as a Category A motorway with design speed of 120 km/hr (according to ARDM, 2015) for most of its part. However, it is agreed in principle to use the best technical parameter(s) in case of discrepancy between the TEM and ARDM requirements (e.g. with respect to the minimum/maximum gradients, minimum horizontal radii in curves, etc.).

It is also noted that the study team has applied a lower design standard for two AIC sections in Albania, sections 9A-2 and 9B-2. According to the Albanian Road Design Manual (ARDM 2015, Vol.2), the lower design standard refers to 'Primary Interurban Roads' category B, known in many EU countries as 'express roads', with at least two lanes per direction and design speeds ranging from 70 to 120 km/hour. For the purposes of the present study and in order to be compliant with the TEM requirements, the minimum design speed considered for such roads is 80 km/hour.

As agreed with the Beneficiary (MIE/ARA) in Albania, the Consultant has applied the best technical parameter(s) in case of discrepancy between the TEM and ARDM requirements. The Table below provides highway cross section characteristics while the main design parameters considered for the preparation of conceptual design for all AIC sections in Albania will be presented in more details in the PESIA.

**Table 3-16 Highway cross section characteristic in the conceptual design of AIC in Albania.**

| | Parameter | Minimum values |
|---|---|---|
| HIGHWAY CROSS SECTION | Carriageway lanes (width) | 2x 3.75 m (same) |
| | Emergency lane (width) | 3.00 m (hard strip = 1.75 m) |
| | Edge strip between the traffic lane and emergency lane or hard strip | 0.25 m (same) |
| | Median width | 2.6 m (2.5 m) |
| | Hard strip (inner) width | 0.7 m (0.5 m) |
| | Emergency lane + shoulder width | 4.5 m (3.25 m) |
| | Vertical clearance | 5.0 m |
| | The equivalent traffic load calculation shall be made with the reference axis of 115 kN load | 115 kN |

Considering the requirements of TEM standards, the study team also estimated the minimum distances between rest and service areas along the AIC in Albania, which are 15 km and 30 km respectively. It is noted that lay-bys are not required for motorways, but necessary to be provided (at suitable distances) for interurban primary roads, category B (express roads), as in the case of sections 9A-2 and 9B-2.

## 3.3 Interchanges

According to TEM Guidelines and Recommended Practice (UNECE, Third Edition, February 2002) for motorways/express roads, the interchanges are grade-separated intersections and they consist of the principal carriageways and slip roads. The choice of layout is based upon the criteria of simplicity, uniformity, regularity and economy. The form of selected interchanges is influenced by the topography, volume and composition of traffic, and type of intersecting roads.

The location of interchanges in the conceptual design for the AIC has been made by considering factors such as trip length, size of the urban area, predicted traffic volumes, cost of Interchange construction, congestion control and possibility of advanced signing.

Main types of intersecting roads include:

- Interchanges between motorways;
- Interchanges between motorway and all-purpose roads.

Some examples of the main types of interchanges that are considered for the corridor in Albania are presented.

1. *Type "A"* - "Diamond" shape: Intersection of AIC with all-purpose roads.

**Figure 3-25 Typical layout of Type "A" (diamond) interchange**

2. *Type "B"* - "Trumpet" shape: Intersection of AIC with a motorway (or express roads) and all-purpose roads. This type has been elaborated in two (2) geometrical shapes consisting of: B1) compact shape (for all-purpose roads) and B2) elongated shape (for motorways).

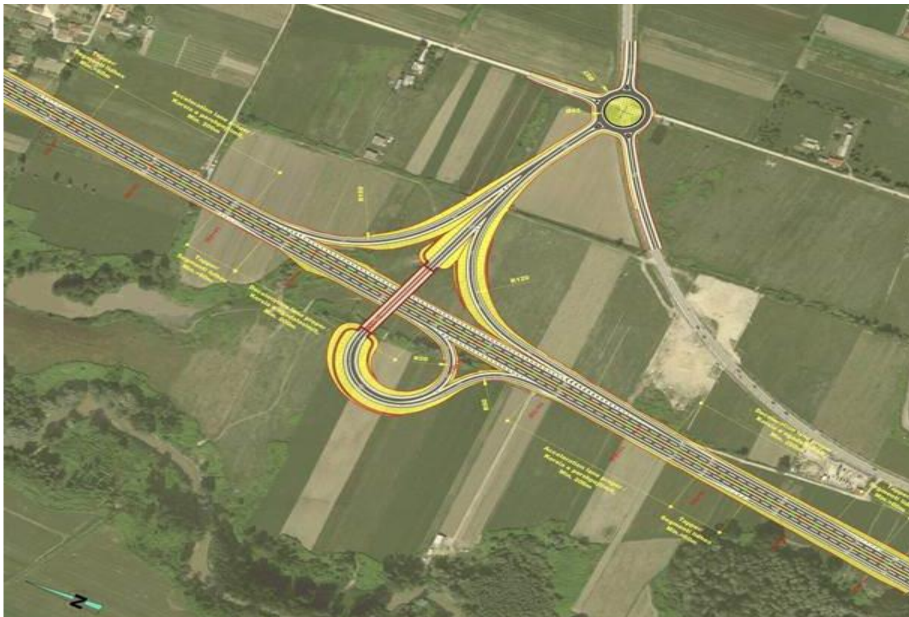


**Figure 3-26 Typical layout of Type "B1" (compact trumpet) interchange**

**Figure 3-27 Typical layout of Type "B2" (elongated trumpet) interchange**

3. *Type "C"* - "Half Clover Leaf" shape: Intersection of AIC with all-purpose roads.

**Figure 3-28 Typical layout of Type "C" (half clover leaf) interchange**

4. *Type "D"* **-** "Clover Leaf" shape: Intersection of AIC with a motorway (or express roads) and other categories of highways.

Figure 3-29 Typical layout of Type "D" (clover leaf) interchange

The number and type of proposed interchanges proposed for each section of the A-I corridor in Albania is presented in the table below.

**Table 3-17 Proposed interchanges for each section of the AIC n in Albania.**

| SEC. | ALT. | FROM | TO | LENGTH (M) | IC NO. | "Diamond" IC | "Trumpet" IC | "Half Clover Leaf" IC | "Clover Leaf" IC |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | Murriqan | Lezhe (Balldre) | 40,946 | 8 | 4 | 4 | - | - |
| 2 | | Lezhe (Balldre) | Milot | 16,190 | 3 | - | 2 | 1 | - |
| 3 | | Milot | Thumane | 13,455 | 5 | 1 | 1 | 3 | - |
| 4 | | Thumane | Kashar | 21,050 | 4 | 2 | 1 | - | 1 |
| 5 | B | Kashar | Lekaj | 33,573 | 5 | 3 | 2 | - | - |
| 5 | C | Lekaj | Konjat | 14,168 | 3 | 1 | 1 | 1 | - |
| 6+7 | | Konjat | Fier | 28,037 | 5 | 4 | 1 | - | - |
| 8 | | Fier (Bypass) | | 22,185 | Under construction | | | | |
| 9A | 2 | Levan | Pocem | 26,901 | 7 | 6 | 1 | - | - |
| 9B | 2 | Pocem | Memaliaj | 37,694 | 8 | 8 | - | - | - |

| SEC. | ALT. | FROM | TO | LENGTH (M) | IC NO. | "Diamond" IC | "Trumpet" IC | "Half Clover Leaf" IC | "Clover Leaf" IC |
|---|---|---|---|---|---|---|---|---|---|
| 10 | | Memaliaj | Subashi Bridge | 20,143 | 2 | 1 | 1 | - | - |
| 11 | | Subashi Bridge | Gj/Bypass | 10,260 | 3 | 3 | - | - | - |
| 12 | | Gjirokaster Bypass | | 9,700 | 3 | - | 2 | 1 | - |
| 13 | A | Gj/Bypass | Kakavije | 23,790 | 4 | 3 | 1 | - | - |
| | | | Total: | 295.907 | 60 | 36 | 17 | 6 | 1 |

## 3.4 Service and access roads

The Consultant has carefully considered during the preparation of the conceptual design for each section of the AIC in Albania, the need for service and access roads (their type and extent). These roads are not intended, however, to serve as alternative routes in case of toll motorways, but merely to reinstate and even improve the interrupted movement of local traffic and the split of economic activities on both sides of the new motorway/express road.

**Table 3-18 Proposed local roads for each section of the AIC n in Albania.**

| Section | Alt. | Length (km) | Category F2, roads | Agriculture roads | Paved | Unpaved | Total |
|---|---|---|---|---|---|---|---|
| 1 | | 40.946 | 14.03 | 10.06 | 10.06 | 0.0 | 24.09 |
| 2 | | 16.190 | 17.01 | 5.97 | 5.97 | 0.0 | 22.98 |
| 3 | | 13.455 | 10.20 | 14.98 | 8.66 | 6.32 | 25.18 |
| 4 | PPP | 21.050 | 3.53 | 9.99 | 0.07 | 9.92 | 13.52 |
| 5 | B | 33.573 | 0.00 | 15.71 | 6.15 | 9.56 | 15.71 |
| 5 | C | 14.168 | 23.99 | 5.94 | 4.48 | 1.46 | 29.93 |
| 6+7 | | 28.037 | 24.20 | 20.72 | 20.72 | 0.00 | 44.92 |
| (8) | | (22.185) | (under construction by GoA) | | | | |
| 9A | 2 | 26.901 | 5.25 | 26.16 | 20.75 | 5.41 | 31.41 |
| 9B | 2 | 37.694 | 0.00 | 20.02 | 18.06 | 1.96 | 20.02 |
| 10 | | 20.143 | 1.11 | 7.97 | 1.06 | 6.91 | 9.08 |
| 11 | | 10.260 | 0.00 | 16.84 | 11.84 | 5.00 | 16.84 |
| 12 | | 9.700 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 13 | A | 23.790 | 6.73 | 37.36 | 37.36 | 0.00 | 44.09 |
| | Total: | 295.907 | 109.57 | 201.71 | 145.25 | 56.46 | 311.28 |

As it can be observed in this table, the average length of service and access roads per km of motorway is slightly above 1 km. It is noted that AIC section 12 (Gjirokaster bypass) does not need the provision of such roads, while section 8 (Fier bypass) is under construction and, therefore, not considered part of the study under this assignment.

## 3.5 Earthworks

The objective of this part is to determine the amount of the material that is created mainly from the construction of excavations (cuttings) and embankments (fillings) and the required transport distance to allocate the materials. For the construction of the embankments, the study team (using the recent Geological and Geotechnical data) has firstly analysed the possibility to use the excavated materials and, if that is not possible, borrowed quantities in the nearest distance have been estimated.

To determine the thickness of topsoil, the depth of excavation of filling bases, the condition of material resources and quarries and the acceptance criteria of the materials to be used, the study team used data provided by existing Geological and Geotechnical reports. The borrowing materials and depositing areas are examined to ensure the adaptation of materials and their use in accordance with the environment to minimize the negative effects.

It is important to note that most of the sections in the Albania territory (1, 2, 3, 4, 5C, 6, 7, 8, 9A-2, 12 and 13A) are in flat a terrain which means that earthworks will be represented mostly by fill materials. Therefore, it is foreseen that embankments along this section will be constructed with borrowed materials from nearest borrow pits. The rest of the sections (5A, 5B, 9B-2, 10, and 11) represent completely new alignments in hilly and mountainous terrains. In these sections a mass earthworks balance is more evident, so the necessity for borrow material is less than in previous sections.

The respective estimated earthworks amounts are presented in the Table below:

**Table 3-19 Earthwork amount for each section of the AIC in Albania.**

| SECTION | | FROM | TO | LENGTH (m) | CUT (m3) | FILL (m3) | BALANCE C-F (m3) |
|---|---|---|---|---|---|---|---|
| 1 | | Murriqan | Balldren (Lezhe) | 40,946 | 122,495 | 8,204,180 | -8,081,685 |
| 2 | | Balldren (Lezhe) | Milot | 16,190 | 9,550 | 2,583,800 | -2,574,250 |
| 3 | | Milot | Thumane | 13,455 | 0 | 0 | 0 |
| 4 | | Thumane | Kashar | 21,050 | 10,970 | 2,907,765 | -2,896,795 |
| 5 | B | Kashar | Lekaj | 33,573 | 5,464,905 | 5,486,151 | -21,246 |
| 5 | C | Lekaj | Konjat | 14,168 | 159,760 | 345,399 | -185,639 |
| 6+7 | | Konjat | Fier | 28,037 | 68,000 | 3,179,224 | -3,111,224 |
| 8 | | Fier (Bypass) | | 22,185 | Under construction | | |
| 9A | 2 | Levan | Pocem | 26,901 | 118,955 | 3,726,657 | -3,607,702 |
| 9B | 2 | Pocem | Memaliaj | 37,694 | 3,743,784 | 4,327,571 | -583,787 |
| 10 | | Memaliaj | Subashi Bridge | 20,143 | 4,393,580 | 2,520,530 | 1,873,050 |
| 11 | | Subashi Bridge | Gj/Bypass | 10,260 | 131,075 | 348,465 | -217,390 |
| 12 | | Gjirokaster Bypass | | 9,700 | N/A | N/A | N/A |
| 13 | A | Gj/Bypass | Kakavije | 23,790 | 49,481 | 2,266,882 | -2,217,401 |
| Total | | | | 295.907 | 14,272,555 | 35,896,624 | -21,624,069 |

## 3.6 Structures

### 3.6.1 Bridges and Viaducts

The following table provides the total number and overall lengths of bridges/viaducts for each section of the A-I road corridor in Albania.

**Table 3-20 Number and length of bridges/viaducts for each AIC section in Albania.**

| Sec. | Alt. | From | To | Length (m) | Bridges no. | Bridges length (m) |
|---|---|---|---|---|---|---|
| 1 | | Murriqan | Balldren (Lezhe) | 40,946 | 8 | 1,210 |
| 2 | | Balldren (Lezhe) | Milot | 16,190 | 4 | 900 |
| 3 | | Milot | Thumane | 13,455 | 8 | 228 |
| 4 | | Thumane | Kashar | 21,050 | 12 | 1,185 |
| 5 | B | Kashar | Lekaj | 33,573 | 17 | 1,750 |
| 5 | C | Lekaj | Konjat | 14,168 | 1 | 298 |
| 6+7 | | Konjat | Fier | 28,037 | 2 | 75 |
| 8 | | Fier (Bypass) | | 22,185 | Under construction | |
| 9A | 2 | Levan | Pocem | 26,901 | 13 | 340 |
| 9B | 2 | Pocem | Memaliaj | 37,694 | 19 | 4,754 |
| 10 | | Memaliaj | Subashi Bridge | 20,143 | 2 | 645 |
| 11 | | Subashi Bridge | Gjirokaster Bypass | 10,260 | 2 | 300 |
| 12 | | Gjirokaster Bypass | | 9,700 | 5 | 685 |
| 13 | A | Gjirokaster Bypass | Kakavije | 23,790 | 4 | 190 |
| | | | Totals: | 295,907 | 133 | 12,560 |

The following table indicates the total number of underpasses and overpasses for each section of the A-I road corridor in Albania.

**Table 3-21 Number of underpasses and overpasses for each AIC section in Albania.**

| Sec. | Alt. | From | To | Length (m) | Overpass no. | Underpass no. |
|---|---|---|---|---|---|---|
| 1 | | Murriqan | Balldren (Lezhe) | 40,946 | 0 | 23 |
| 2 | | Balldren (Lezhe) | Milot | 16,190 | 1 | 9 |
| 3 | | Milot | Thumane | 13,455 | 2 | 2 |
| 4 | | Thumane | Kashar | 21,050 | 3 | 15 |
| 5 | B | Kashar | Lekaj | 33,573 | 3 | 11 |
| 5 | C | Lekaj | Konjat | 14,168 | 5 | - |
| 6+7 | | Konjat | Fier | 28,037 | 3 | 8 |
| 8 | | Fier (Bypass) | | 22,185 | Under construction | |
| 9A | 2 | Levan | Pocem | 26,901 | 2 | 9 |
| 9B | 2 | Pocem | Memaliaj | 37,694 | 2 | 7 |
| 10 | | Memaliaj | Subashi Bridge | 20,143 | 2 | 13 |
| 11 | | Subashi Bridge | Gj/Bypass | 10,260 | 4 | - |
| 12 | | Gjirokaster Bypass | | 9,700 | 1 | 1 |

| Sec. | Alt. | From | To | Length (m) | Overpass no. | Underpass no. |
|---|---|---|---|---|---|---|
| 13 | A | Gj/Bypass | Kakavije | 23,790 | 5 | 5 |
| | | | Totals: | 295,907 | 33 | 103 |

#### 3.6.1.1 Underpasses

The new AIC interrupts in a lot of places the existing alignment of many local and national roads and also the railway. Another issue is the split of agricultural and pasture lands due to the construction of the new motorway/express road. For this reason, together with the provision of interchanges and service roads, it is necessary to include in the conceptual design, an adequate number of road and railway underpasses/overpasses. Most of the proposed structures along the AIC route are underpasses. The selection of the most appropriate cross-section will depend on the traffic flow and road category. Service level, traffic safety and economic benefit should be also considered in the analysis.

The cross-section elements of underpasses are defined according to the road classification provided in ARDM, 2015, as presented in the following Figure.

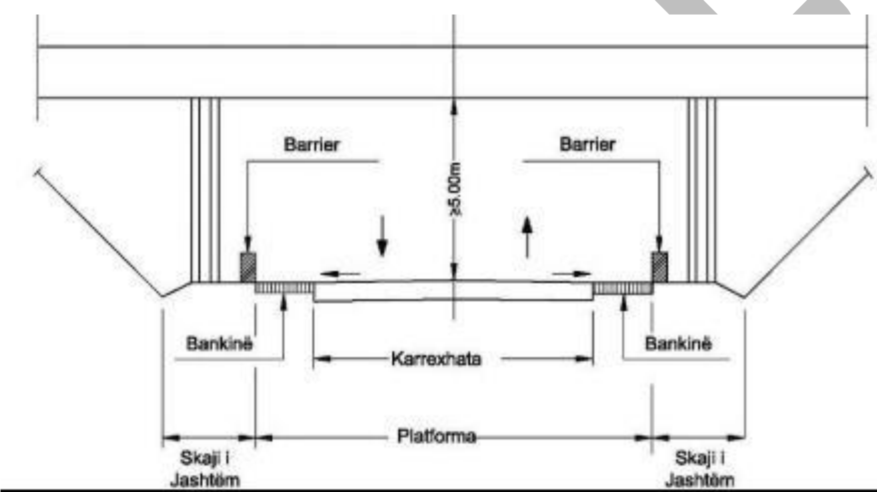



**Figure 3-30 Cross-section of a typical underpass according to ARDM, 2015**

Based on the road classification, the underpass dimensions should be kept equal to those of the intersecting road. Therefore, underpasses are selected according to the road category, their relevant cross-section and geometrical properties, and tolerances of moving vehicles. The proposed types of underpasses (box structure) for all-purpose roads, intersecting the AIC route, and their relevant dimensions are:

- 10.0m (W) x 5.0m (H), underpasses for rural/interurban secondary roads, category C3; used at interchanges only;
- 9.1m (W) x 5.0m (H), underpasses for rural/interurban local roads, category F2;
- 6.0m (W) x 3.5m (H), underpasses for agriculture roads (paved/unpaved).

#### 3.6.1.2 Overpasses

Generally, the structure type of an overpass is represented by a two-span simple supported bridge. The length of span depends on the intersection angle between the local road and motorway. While, the cross-section width shall follow the category of local roads, based on ARDM 2015, Vol.2.

In the Figures below, examples of typical overpass solutions at interchanges and crossings over railway are presented.

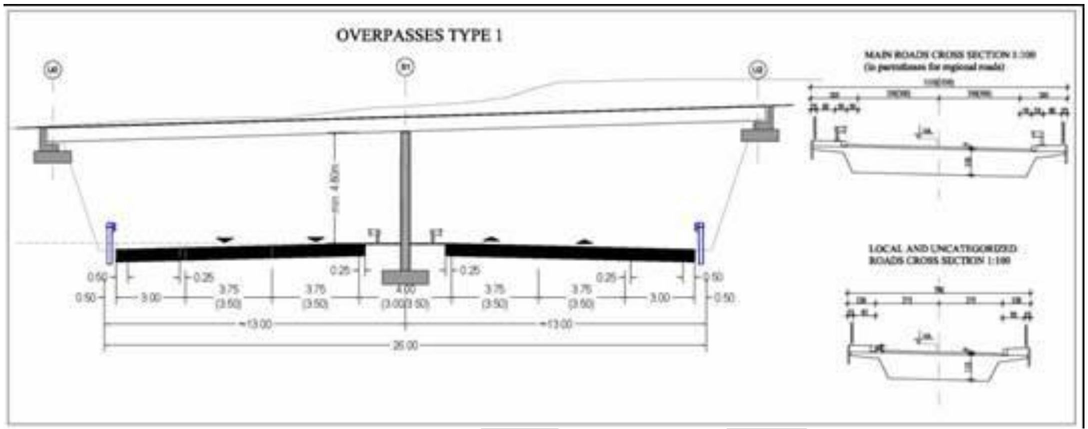



**Figure 3-31 Typical overpass solution at interchanges (crossing over motorways) according to ARDM, 2015**

#### 3.6.1.3 Modification of major existing bridges

A brief description of four (4) major existing bridges, which are proposed to remain in the future AIC (sections 2, 5C and 11), with a summary of the main interventions (when required), are included in the present sub-chapter.

*Existing bridges in Section 2 (Milot-Balldren)*

- Existing bridge over the Drini river in Lezhe, L= 225 m (Ch. 4+175 – Ch. 4+400)

This bridge is part of the existing single carriageway highway Sh1 (Tirana-Shkoder) and constructed in years 1998-2002. Some photographs are provided in the following Figures.

**Figure 3-32 View of the existing bridge platform over Drini river in Lezhe (225 m long)**

**Figure 3-33 Existing bridge over Drini river in Lezhe (225m long) - View of the piers, steel girders and reinforced concrete deck**

- Existing bridge over the Mati river, L= 625 m (Ch. 13+720 – Ch. 14+345)

This bridge is also part of existing single carriageway highway Sh1 (Tirana-Shkoder) and constructed in years 1998-2002. Some photographs are presented in the following Figures.

Figure 3-34 View of existing bridge platform over Mati river (625 m long)

Figure 3-35 Existing bridge over Mati river - view of the piers, steel girders and reinforced concrete deck

The upgrading (doubling) of the existing single carriageway highway (Sh1) to a dual carriageway motorway (Category A) requires the construction of a new bridge for the second carriageway. This bridge is proposed to be constructed in parallel to the existing bridge with the same structure deck and dimensions.

*Existing bridge in Section 5C (Lekaj-Konjat):*

The existing bridge over Shkumbini river is 300m long and part of the dual carriageway highway Rrogozhine-Lushnje (Sh4). This bridge is constructed in years 1997-2001 and its overall width is 22.6 m in total. Some photographs are provided in the following Figures.

**Figure 3-36 Existing bridge over Shkumbini river (300 m long) – View of the bridge platform and sidewalk**

The bridge cross-section can be adapted to the dimensions required for rural/interurban primary road category B (express road) according to the ARDM 2015.

*Existing bridge in Section 11 (Subashi bridge-Gjjirokaster Bypass):*

The bridge in section 11 is part of the existing single carriageway highway Sh4 (Tepelene-Gjirokaster). Some photographs of the bridge are given below.

**Figure 3-37 View of the bridge platform on left and right sides**

**Figure 3-38 View of the existing bridge structure**

The upgrading (doubling) of the existing single carriageway highway (Sh4) to a dual carriageway motorway (Category A) requires the construction of a new bridge for the second carriageway. This bridge will be constructed in parallel to the existing bridge.

### 3.6.2 Tunnels

The conceptual design proposes the construction of several tunnels in four sections of the corridor in Albania, namely in sections 2, 5B, 9B-2 and 10, in order to meet with the required design parameters for motorway category A or rural/interurban primary road category B ('express road'). In specific places of the sections 5B, 9B-2 and 10, the Consultant also proposed the use of half and full 'Cut & Cover' structures.

In the following Tables, a brief overview of the proposed tunnels and 'Cut & Cover' structures, including their respective lengths and locations, soil/rock types and problems encountered/envisaged, is presented.

**Table 3-22 Summary table – Proposed tunnels and their characteristics in AIC sections 2, 5B, 9B-2 and 10.**

| Sec | From - To | Length (m) | Tunnels Characteristics | | | | |
|---|---|---|---|---|---|---|---|
| | | | No | Length (m) | Chain. | Rock Types | Notes / Problems |
| 2 | Balldren (Lezhe) – Milot | 16,190 | 1 | 1,000 | 0+000 ÷ 1+000 | Strong rocks: Limestones | Cl. III (Bieniawski RMR), Entrance debris flow |
| 5B | Kashar – Lekaj | 33,573 | 1 | 870 | 4+215 ÷ 5+085 | Weak to very weak rocks: sandstones to silt/claystones | Cl. IV; Entrance slope stability problems |
| | | | 2 | 1,680 | 18+430 ÷ 20+110 | Weak to very weak rocks: sandstones to silt/claystones | Cl. IV-V; Entrance slope stability problems |
| | | | 3 | 450 | 30+670 ÷ 31+120 | Weak to very weak rocks: sandstones to silt/claystones | Cl. IV; Entrance slope stability problems |
| 9B-2 | Pocem –Memaliaj | 37,694 | 1 | 480 | 1+680 ÷ 2+160 | Weak rocks-Flysch | Cl. IV; Entrance slope stability problems, Non symmetric loads |
| | | | 2 | 590 | 13+605 ÷ 14+195 | Weak rocks-Flysch | Cl. IV to III; Entrance slope stability problems |

| Sec | From - To | Length (m) | Tunnels Characteristics | | | | |
|---|---|---|---|---|---|---|---|
| | | | No | Length (m) | Chain. | Rock Types | Notes / Problems |
| | | | 3 | 620 | 24+740 ÷ 25+360 | Very Weak rocks. Siltstone & claystone | Cl. V; Entrance slope stability problems, Non symmetric loads |
| | | | 4 | 250 | 27+520 ÷ 27+770 | Weak rocks-Flysch | Cl. IV; Entrance slope stability problems |
| | | | 5 | 440 | 34+300 ÷ 34+740 | Weak rocks-Flysch | Cl. IV; Entrance slope stability problems |
| | | | 6 | 670 | 36+280 ÷ 36+950 | Very Weak rocks. Siltstone & claystone | Cl. V; Entrance slope stability problems |
| 10 | Memaliaj – Subashi Bridge | 20,143 | 1 | 930 | 5+175 ÷ 6+105 | Weak rocks: sandstones to silt/claystones | Cl. IV; Entrance slope stability problems, Non symmetric loads |
| | | | 2 | 390 | 10+325 ÷ 10+715 | Weak rocks: sandstones to silt/claystones | Cl. IV; Entrance slope stability problems |
| | | | 3 | 205 | 18+825 ÷ 19+030 | Weak rocks: sandstones to silt/claystones | Cl. IV; Entrance slope stability problems, Non symmetric loads |
| | | Total: | 13 | 8,575 | | | |

**Table 3-23 Summary table – proposed 'Cut & Cover' structures and their characteristics in AIC sections 5B, 9B-2 and 10.**

| Sec | From - To | Length (m) | 'Cut & Cover' Characteristics | | | | |
|---|---|---|---|---|---|---|---|
| | | | No | Length (m) | Chain. | Rock Types | Notes / Problems |
| 5B | Kashar – Lekaj | 33,573 | 1 | 250 | 21+565 ÷ 21+815 | Weak to very weak rocks: sandstones to silt/claystones | Cl. IV; Slope stability problems. High lateral pressure |
| 9B-2 | Pocem – Memaliaj | 37,694 | 1 | 95 | 7+010 ÷ 7+105 | Strong rocks: Limestones | Cl. III; Surface soil flow. Small lateral pressure |
| | | | 2 | 80 | 8+140 ÷ 8+220 | Strong rocks: Limestones | Cl. III; Surface soil flow. Small lateral pressure |
| | | | 3 | 100 | 8+330 ÷ 8+430 | Strong rocks: Limestones | Cl. III; Surface soil flow. Small lateral pressure |
| | | | 4 | 180 | 23+030 ÷ 23+210 | Weak rocks to Soils. Siltstone& claystone upon river terrace layers | Cl. V; Slope stability problems. High lateral pressure |
| | | | 5 | 335 | 26+135 ÷ 26+470 | Weak rocks to Soils. Siltstone& claystone upon | Cl. V; Slope stability problems. High lateral pressure |

| Sec | From - To | Length (m) | 'Cut & Cover' Characteristics | | | | |
|---|---|---|---|---|---|---|---|
| | | | No | Length (m) | Chain. | Rock Types | Notes / Problems |
| | | | | | | river terrace layers | |
| | | | 6 | 350 | 27+770 ÷ 28+120 | Weak rocks. Siltstone& claystone. | Cl. V; Slope stability problems. High lateral pressure |
| | | | 7 | 175 | 30+790 ÷ 30+965 | Weak rocks to Soils. Siltstone& claystone upon river terrace layers | Cl. V; Slope stability problems. High lateral pressure |
| | | | 8 | 350 | 31+215 ÷ 31+565 | Weak rocks to Soils. Siltstone& claystone upon river terrace layers | Cl. V; Slope stability problems. High lateral pressure |
| 10 | Memaliaj – Subashi Bridge | 20,143 | 1 | 285 | 12+805 ÷ 13+090 | Weak rocks: sandstones to silt/claystones | Cl. IV; Slope stability problems. High lateral pressure |
| | | | 2 | 180 | 14+340 ÷ 14+520 | Weak rocks: sandstones to silt/claystones | Cl. IV; Slope stability problems. High lateral pressure |
| | | Total: | 11 | 2,380 | | | |

The cross-section of tunnels is determined on the basis of traffic demand, utilisation and geological/geotechnical requirements. For road tunnels the specific requirements on stopping and sight distances, longitudinal inclination and safety measures are considered.

Based on the above requirements, two typical cross-sections for different geological conditions are selected. In each case the minimum cross-section includes two lanes of 3.75m each, two shoulders of 0.5m each, and two sidewalks of 1.0 m each.

'Cut and cover' structures are deemed as necessary in some sections of the AIC (sections 5B, 9B-2 and 10) due to specific environmental, geological and topographic requirements. Their functional cross-section is similar to other tunnels. The most typical types of cross-sections for tunnels constructed with the 'Cut & Cover' methodology are presented in the following Figures. The height of artificial cover will differ according to topographic requirements and to maintain a low-cost lining. In dual carriageway highways, depending on the case, 'cut and covers' can be half or full structures.

More specifically, regarding:

*Section 2 (Balldren-Milot)*

There is only one (1) tunnel proposed in section 2. The tunnel starts at the beginning of this section, extending below the Renci mountain. No 'Cut & Cover' structures are found necessary for this section. This tunnel has a length of about 1,000 m (one tube). The local geological conditions are favorable with fractured limestone of class 3 according to the Bienawsky rock classification. The maximum depth of the tunnel shall be about 135-145m. This depth does not present significant problems for limestone rocks and natural stresses are lower than the rock strength. The slopes at tunnel entrances have an inclination of about 35% and may present some local stability concerns due to rock-falling and surface weathered rocks.

*Section 5B (Kashar-Lekaj)*

The conceptual design for this section foresees the construction of three (3) tunnels. Their lengths, positions and soil/rock characteristics are given in the summary Table at the end of this subchapter.

The rock conditions for most of the tunnels are bad and very weathered near to the surface. There are no major tectonic faults in the area, but tunnel No. 2 will face major difficulties at the entrances. The portal slopes may have stability problems and flows of surface soil material.

Tunnel No 1 (870 m long - Ch. 4+215 ÷ Ch. 5+085)

It starts before Kus reservoir and ends up in Allgjate village, extending below the hills with the same name, as presented in the Figure below. The major issues foreseen for this tunnel are the slope stability in both entrances and nonsymmetrical loads. The maximum cover height is 65 m.

Tunnel No2 (1680 long – Ch. 18+430 ÷ Ch. 20+110)

It starts after Peze village and is the longest one in section 5B. The major issues foreseen are the slope stability in both entrances, nonsymmetric loads, possibility of developed cracks and minor faults. The maximum cover height is 170 m.

Tunnel No 3 (450m long – Ch. . 30+670 ÷ Ch. 31+120)

It is located just before the end of section 5B, as shown in the Figure below. The major issues for this tunnel are the slope stability in both entrances and nonsymmetrical loads. The maximum cover height is about 50 m.

In section 5B, there is one short 'Cut & Cover' structure foreseen (250m long -Ch. 21+565 ÷ Ch. 21+815). The position and the length of this structure are given in the summary Table below. The rock conditions are poor and very weathered near to the surface. The slopes have the potential of active surface slides that will influence the design and construction.

*Section 9B2*

The conceptual design for this section foresees the construction of six (6) tunnels. Their lengths, positions and soil/rock characteristics are given in the summary Table at the end of this subchapter.

The rock conditions for most of the tunnels poor bad and very weathered near the surface. There are no major tectonic faults in the examined areas, however, tunnel no. 5 presents difficulties due to different rock types contact (flysch rocks upon very bad siltstone).

Also, for AIC section 9B-2, eight (8) 'Cut & Cover' structures are also included. The rock conditions in the examined areas are very poor and very weathered near the surface. In some parts even soil interference may be encountered. They are generally above the river terrace and presented by poorly consolidated gravels and sand layers. The slopes have the potential of active surface slides that will influence the design and construction of these structures.

A brief description of all foreseen tunnels and 'Cut & Cover' structures for section 9B-2 is presented as follows.

Tunnel No.1 – 480 m long (Ch. 1+680 ÷ Ch. 2+160)

The major issues foreseen for this tunnel are the slope stability at both entrances and nonsymmetrical loads. The maximum cover height is 60 m.

Tunnel No. 2 – 590 m long (Ch. 13+605 ÷ Ch. 14+195)

The major issues foreseen for this tunnel are the slope stability at both entrances and nonsymmetrical loads. The maximum cover height is 90 m.

Tunnel No. 3 – 620 m long (Ch. 24+740 ÷ Ch. 25+360)

The major issues foreseen for this tunnel are the slope stability and nonsymmetrical loads at both entrances. The maximum cover height is 50 m.

Tunnel No. 4 – 250 m long (Ch. 27+520 ÷ Ch. 27+770)

The major issues foreseen for this tunnel are the slope stability at both entrances. The maximum cover height is 50 m.

Tunnel No. 5 – 440 m long (Ch. 34+300 ÷ Ch. 34+740)

The major issues foreseen for this tunnel are the slope stability and nonsymmetrical loads near to both entrances. The maximum cover height is 60 m.

Tunnel No. 6 – 670 m long (Ch. 36+280 ÷ Ch. 36+950)

The tunnel is located at the end of section 9B-2, in front of Memaliaj town. The major issues foreseen are the presence of very weak soils/rocks and slope stability at both entrances. The maximum cover height is 110m.

'Cut & Cover' No. 1 – 95 m long (Ch. 7+010 ÷ Ch. 7+105)

The major issue foreseen for this structure is the slope surface soil/rock flow.

'Cut & Cover' No. 2 and No. 3 – 80 and 100 m long (Ch. 8+140 ÷ Ch. 8+220, and Ch. 8+330 ÷ Ch. 8+430 respectively)

The major issues foreseen for these two structures are the slope surface soil/rock flow.

'Cut & Cover' No. 4 – 180 m long (Ch. 23+030 ÷ Ch. 23+210)

The major issue foreseen for this structure are the slope stability, surface debris flow and high lateral pressure.

'Cut & Cover' No. 5 – 335 m long (Ch. 26+135 ÷ Ch. 26+470)

The major issue foreseen for this structure are the slope stability, surface debris flow and high lateral pressure.

'Cut & Cover' No. 6 – 350 m long (Ch. 27+770 ÷ Ch. 28+120)

The major issue foreseen for this structure are the slope stability, surface debris flow, high lateral pressure, river terrace layers stability/deterioration from the water and river level.

'Cut & Cover' No. 7 and No. 8 – 175 and 350 m long (Ch. 30+790 ÷ Ch. 30+965, and Ch. 31+215 **÷ Ch.** 31+565)

The major issues foreseen for these structures are the slope stability, surface debris flow, high lateral pressure, river terrace layers stability/deterioration from the water and river level.

*Section 10*

The conceptual design of AIC section 10 includes three (3) tunnels and two (2) 'Cut & Cover' structures. The rock conditions in most of these tunnels/'Cut & Cover' structures are bad and very weathered near the surface. Tunnel areas in this section do not present major tectonic faults. At the same time, the slopes near the 'Cut & Cover' structures have the potential of active surface slides that will influence their design and construction.

Tunnel No. 1 – 930 m long (Ch. 5+175 ÷ Ch. 6+105)

Major issues foreseen in this tunnel are the slope stability at both entrances, non-symmetrical loads, possibility of developed cracks and minor faults. The maximum cover height is 90 m.

Tunnel No. 2 – 390 m long (Ch. 10+325 ÷ Ch. 10+715)

The most significant issue foreseen for this tunnel is the slope stability at both entrances. The maximum cover height is 60 m.

Tunnel No. 3 – 205 m long (Ch. 18+825 ÷ Ch. 19+030)

The most significant issue foreseen for this tunnel is the slope stability at both entrances. The maximum cover height is 60 m.

'Cut & Cover' No. 1 – 285 m long (Ch. 12+805 ÷ Ch. 13+090)

The major issues identified for this structure include surface debris flow, high lateral pressure, river terrace layers stability/deterioration from water and river level.

'Cut & Cover' No. 2 – 180 m long (Ch. 14+340 ÷ Ch. 14+520)

The major issues identified for this structure include surface debris flow, high lateral pressure, river terrace layers stability/deterioration from water and river level.

## 3.7 Pavement structure

The pavement structure is designed for the full motorway cross section, consisting of two carriageways separated by a central reserve, which have a traffic, overtaking and emergency lane.

Structural designing or dimensioning of pavement structure of a road implies the application of a procedure that will result in a selection of pavement layers which will be capable to endure the given traffic load and impact of environmental factors for as long as it is required. Structural designing of pavement structures primarily depends on the following factors:

- bearing capacity of road foundation,
- traffic load,
- material quality (equivalency) (structural number),
- climate - hydrological conditions (regional factor),
- pavement serviceability, and
- design period

Apart from the above-mentioned, the structural performance of a pavement structure will depend on adequacy of the surface drainage solution (measures), as well as on adequacy of the drainage within the pavement structure, shoulder design solutions and road maintenance level.

## 3.8 Other structures

### 3.8.3 Culverts

The design of the Corridor in Albania requires the construction of a significant number of minor structures, such as box culverts. The culverts are either new or intended to replace the existing ones. The proposed solution in the conceptual design includes replacing of the old culverts by constructing new ones, according to the road category, with box types of 2x2m, 3x3m and 4x4m. However, the type of culverts and their sizes are determined based on the hydrological and hydraulic study (to be undertaken during the preliminary design of the corridor – outside the present project's scope). The minimum culvert size is proposed to be 2x2m, considering the more convenient conditions for maintenance purposes, while the maximum culvert size is proposed to be 4x4m. Bigger culverts sizes are not considered as appropriate and therefore substituted by small one-span bridges less than 10m.

Depending on the terrain, the culverts are foreseen to be constructed, as appropriate, with monolithic or prefabricated structures. During the preparation of design, it is important to maintain a standard concerning space and dimensions. Based on the hydraulic calculations and the experience of the designers, it is suggested that new structures should be constructed not smaller than the existing one.

The typical cross-sections for 2x2m, 3x3m and 4x4m box culverts are presented in the Figure below.

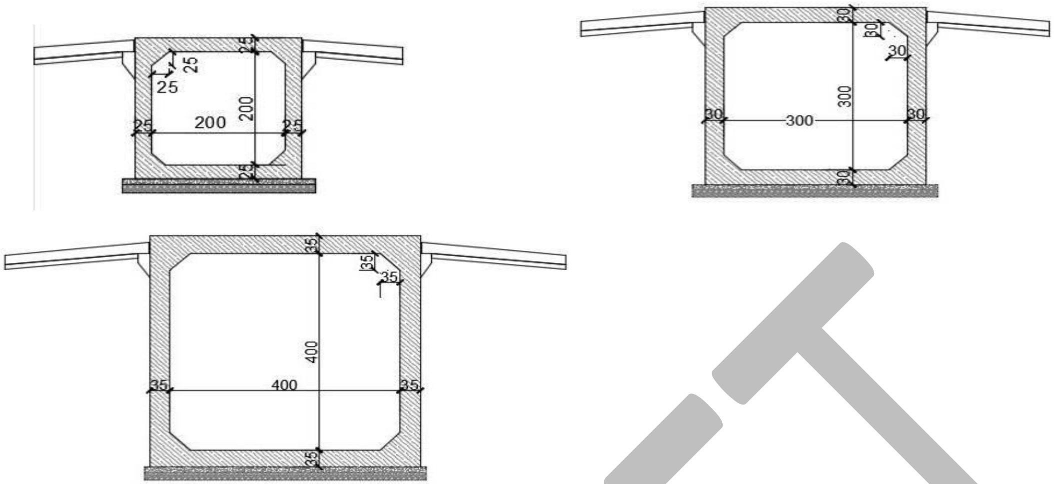



**Figure 3-39 Proposed cross-sections, for 2x 2, 3x3 and 4x4 box culverts**

### 3.8.4 Small single-span bridges (L= max.10m)

Small single-span bridges with length of up to 10m are designed in certain places as a substitute for bigger sizes of box culverts. Such bridges may be additionally used by people and animals as underpasses to move from one to other side of the motorway/express road.

A typical cross-section for small single-span bridges with a length of 10m is shown in the Figure below.

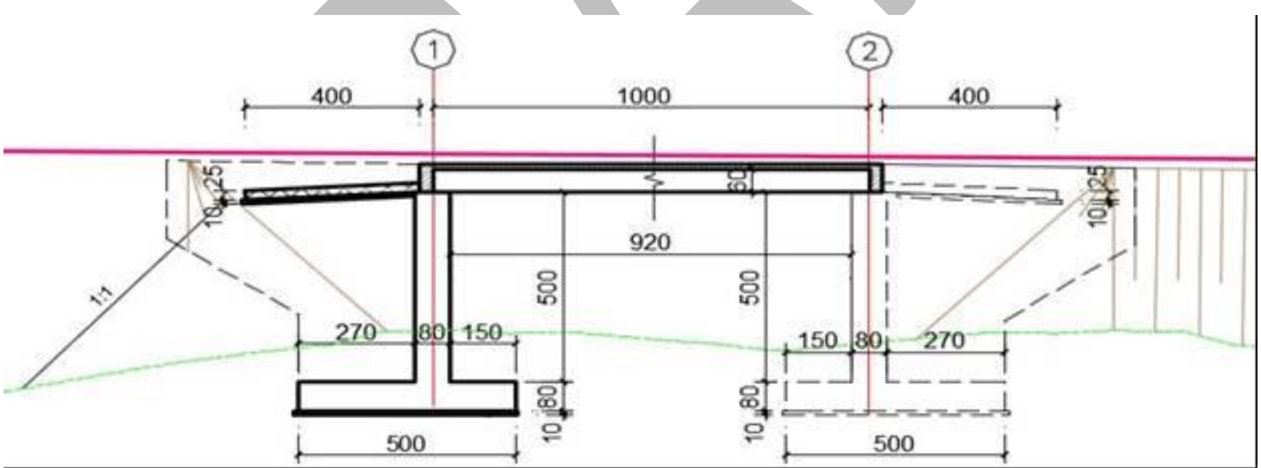



**Figure 3-40 Typical cross-section for small single-span bridges with a length of 10m**

### 3.8.5 Retaining walls

The retaining walls are used in the construction of basements below the ground level, wingwalls of bridges and to retain the slopes in hilly terrains. Retaining walls can be constructed of masonry as well as reinforced concrete. Reinforced concrete walls are nowadays most widely used, because of their high resistance to seismic activities.

The cross-sections for typical reinforced concrete walls with heights of H=4.0m and H=7.0m are presented in the following figure.

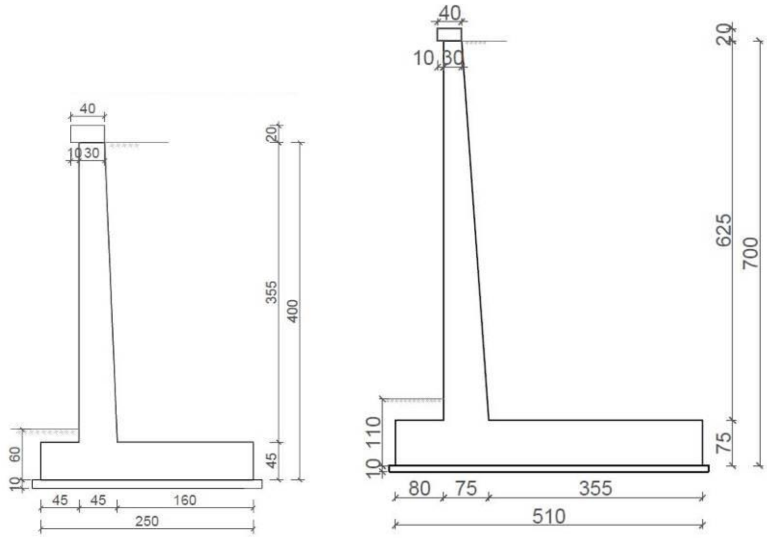



**Figure 3-41 Typical cross-section of reinforced concrete walls for heights of H=4.0 m and H=7.0m**

### 3.8.6 Reinforced earth structures

In cases when the motorway alignment is over embankments with height of more than 8.0m, it is recommended to use reinforced earth structures which are competitive with the cost required for reinforced concrete walls.

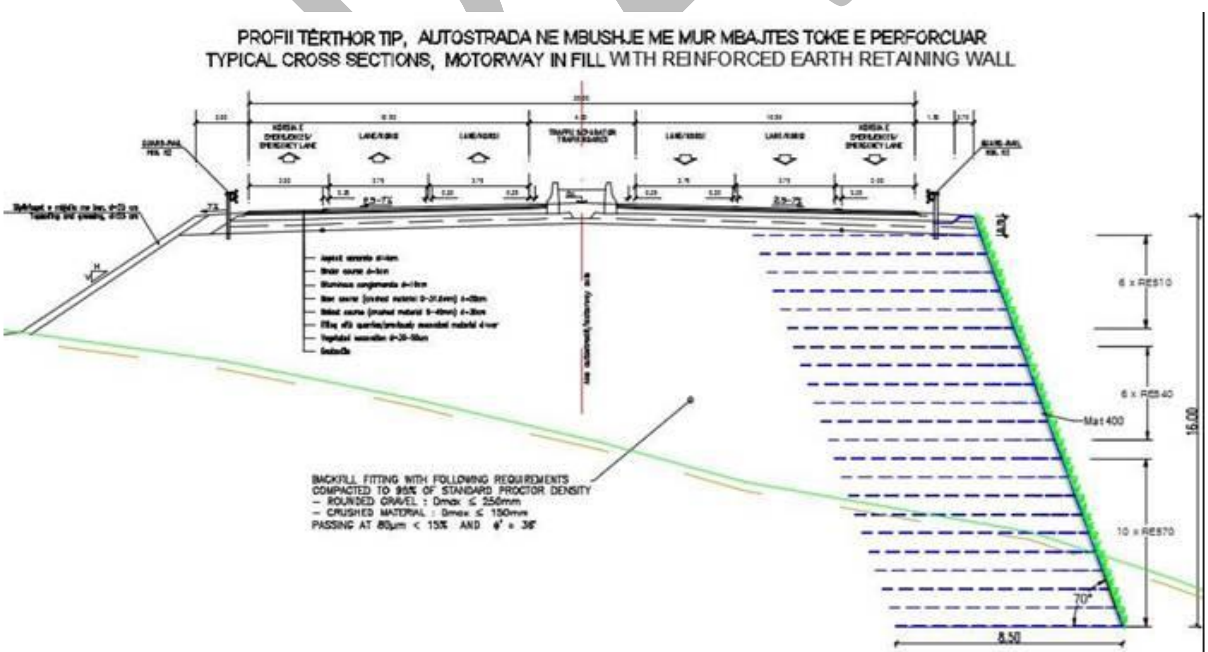



**Figure 3-42 Typical cross-section of a reinforced earth structure**

## 3.9 Roadside Equipment

According to TEM requirements, motorway facilities include:

- Rest Areas;
- Service Areas,
- Toll Facilities;
- Frontier Checkpoints.

All the above facilities should be accessible from motorway only, but pedestrian access may be provided from the ordinary road network for tradesmen and service personnel. Facilities should also be accessible to disabled people.

A number of issues and general requirements with respect to rest and service areas are presented as follows. It is noted, however, that the analysis does not include toll and frontier check-point facilities, as they are not part of the present study's scope.

### 3.9.3 Rest and service areas

Rest and service areas shall be designed with proper acceleration/deceleration lanes, road signs and marking, parking and outside lighting and provided with: (a) water supply; (b) sanitary facilities; (c) wastewater drainage. The buffer zone (from the edge of carriageway) should be minimally equal to 10 m, but not less than 7.5 m (in specific cases). The dimensions and arrangement of rest areas must be designed in accordance with expected usage.

In the Table below, the location and distances between rest and service area along the AIC in Albania are summarised.

**Table 3-24 Location and distance between rest and service areas**

| Sec. | Length (km) | SA | Location (km) | Distance (km) | RA | Location (km) | Distance (km) | Notes |
|---|---|---|---|---|---|---|---|---|
| 1 | 40.946 | X | 5+200 | | X | 5+200 | | Both sides / use space between two IC |
| | | | | | X | 17+700 | 12.5 | One sided / use IC trumpet |
| | | X | 35+400 | 30.2 | X | 35+400 | 17.7 | Both sides / use space between two IC |
| 2 | 16.190 | | | | X | 9+000 | 14.5 | Both sides / use space between two IC |
| 3 | 13.455 | X | 12+000 | 33.7 | X | 12+000 | 19.2 | One sided / use IC 1/2 cloverleaf (Europa Park) |
| 4 | 21.050 | | | | X | 14+500 | 16.0 | One sided / use IC trumpet (junction with Sh60 to Airport) |
| 5B | 33.573 | X | 2+400 | 24.9 | | | | Both sides / use space between two IC (before Kus reservoir) |
| | | | | | X | 13+010 | 19.6 | One sided / use IC diamond (after Sh56 to Peze) |
| | | | | | X | 29+500 | 16.5 | One sided / use IC diamond |
| 5C | 14.168 | X | 5+300 | 36.5 | | | | One sided / use IC trumpet (Rrogozhine roundabout) |

| Sec. | Length (km) | SA | Location (km) | Distance (km) | RA | Location (km) | Distance (km) | Notes |
|---|---|---|---|---|---|---|---|---|
| 6+7 | 28.037 | | | | X | 1+500 | 19.7 | One sided / use IC diamond (Plug roundabout) |
| | | X | 21+200 | 30.1 | X | 21+200 | 19.7 | Both sided / use IC diamond (Kolonje roundabout) |
| (8) | (22.185) | | | | X | 11+300 | 18.1 | One sided / use IC 1/2 cloverleaf (Pojan-Apolloni rd) |
| 9A-2 | 26.901 | X | 3+000 | 32.0 | X | 3+000 | 13.9 | Both sides (Frakull) |
| | | | | | X | 20+600 | 17.6 | Both sides / use IC diamond (before the cut area) |
| 9B-2 | 37.694 | X | 4+500 | 28.4 | | | | Both sides / use IC diamond (Klos/Pocem) |
| | | | | | X | 12+200 | 18.5 | Both sides / use IC diamond (junction with old nat'l rd to Ballsh) |
| | | X | 32+300 | 27.8 | X | 32+300 | 20.1 | One sided / use IC diamond (Vasjar) |
| 10 | 20.143 | | | | X | 12+200 | 17.6 | One sided / use IC diamond (juction with Sh75, Uji I Ftohte) |
| 11 | 10.260 | X | 6+800 | 32.3 | X | 6+800 | 14.7 | Both sides / use IC diamond (Ura e Kardhiqit) |
| 12 | 9.700 | | | | X | 8+500 | 12.0 | One sided / use IC trumpet (Kordhoce / Lazarat) |
| 13A | 23.790 | X | 18+500 | 31.7 | X | 18+500 | 19.7 | Both sides / use space between two IC |

### 3.9.4 Lay-Bys

It is noted that lay-bys are not required in motorways, however, they are considered necessary (at suitable distances) for interurban primary roads, category B (express roads), as in the case of AIC sections 9A-2 and 9B-2.

## 3.10 Motorway lighting and electrical installations

By taking into consideration several documentations as well as the usual practice followed in Albania by the national road administration (ARA), the scope of work for the lighting of Adriatic-Ionian Corridor in Albania may in general include the following road elements:

- Interchanges;
- Tunnels (according to EU "Directive 2004/54/EC"- April 29th, 2004);
- Bridges;
- Underpasses;
- Rest areas;
- Service areas,
- Frontier plazas;
- Toll plazas (if any)

However, the frontier and toll plazas are deemed as not part of this study and therefore not presented here.

More specifically:

*Lighting of interchanges*

The AIC in Albania includes four (4) main types of standard interchanges, as presented in Chapter 3.4: diamond (Type A), trumpet (Type B), half cloverleaf (Type C), and cloverleaf (Type D).

The proposed illumination system at each interchange is based on LED technology and provided through a set of lighting poles of different heights that are mounted safely behind the road structures and other elements (e.g. guardrails).

*Lighting of Tunnels*

Tunnel lighting shall be considered where normal daytime illumination of a roadway section is restricted such that the driver's visibility is substantially diminished. Tunnel lighting system consists of direct-beam devices located above the carriageway or situated at both sides (walls). The average luminance level on the interior tunnel section at the highest lighting level should be 2cd/m².

*Lighting of Bridges and Overpasses*

Theoretically, the bridges do not require any special lighting. However, according to BS 5489-6 standard the public perception of roadways on bridges as being less safe than at-grade roadways can cause traffic flow to deteriorate along typically long bridges, particularly over water bodies.

*Lighting of Underpasses*

Underpass lighting can be considered critical during the daytime or night-time to mitigate "dark spots". Underpasses lighting during the daytime is considered only where sidewalks are present. At night-time ligghing can be considered for pedestrian safety and to supplement for dark spots created by a structure's obstruction of light emitted by the adjacent light pole(s). Underpasses lighting consists in using floodlight lighting fixtures when the length to height ratio of the structure exceeds 10:1.

*Lighting of Rest Areas*

Rest areas incorporate both vehicular and pedestrian usage and constitute an important highway feature to the traveling public. They are available for use at night as well as by day, and their general appearance should generate a feeling of safety and security. This condition can exist only if the facility is adequately lit for permanent night-time use.

Properly designed lighting, conventional or high-tech masts, will enhance the architectural and landscape features of the facility, promote safety by easing the task of policing, and contribute to the rest and relaxation of the motorist by completely delineating the driving, parking and walking areas of the facility.

*Lighting and electrical installations in tunnels*

Based on the EC Directive 2004/54/EC (29 April 2004), an emphasis is placed on the electrical and mechanical installations which have to be implemented for security reasons in different kinds of road tunnels.

Normal lighting shall be provided so as to ensure appropriate visibility during day and night for drivers in the entrance zone as well as in the interior of the tunnel. At the same time, safety lighting shall be provided to allow a minimum visibility for tunnel users to evacuate the tunnel from their vehicles in the event of a breakdown of the power supply.

Evacuation lighting such as evacuation marker lights, at a height of no more than 1.5 m, shall be provided to guide tunnel users to evacuate the tunnel on foot, in the event of emergencies.

For the lighting of tunnels and underpasses of the AIC sections in Albania, the relevant standard CIE 88-2004, BS 5489-7 will be used.

For longer tunnels a percentage of the interior lighting would normally be powered by an uninterruptable power supply (UPS) which allows for some lighting to remain energized in the event of a power failure of the normal power supply. This allows for the safe egress of traffic within the tunnel but not for continued normal use of the route.

- Road signs: Specific signs shall be used for all safety facilities provided for tunnel users. Signs and panels for use in tunnels are given in the Third Schedule.
- Control centre shall be provided for all tunnels longer than 3,000 meters with a traffic volume higher than 2,000 vehicles per lane. Surveillance control of several tunnels may be centralized at a single control centre.
- Monitoring systems: Video Monitoring systems a system able to automatically detect traffic incidents (such as stopping vehicles) and, or fires shall be installed in all tunnels with a control centre.
- Automatic fire detection system shall be installed in all tunnels which do not have a control centre where the operation of mechanical ventilation for smoke control is different from the automatic operation of ventilation for the control of pollutants.
- Communication systems: Radio re-broadcasting equipment for emergency service use shall be installed in all tunnels longer than 1,000 meters with a traffic volume higher than 2,000 vehicles per lane. Where there is a control centre, it must be possible to interrupt radio rebroadcasting of channels intended for tunnel users, if available, in order to give emergency messages. Shelters and other facilities where evacuating tunnel users must wait before they can reach the outside shall be equipped with loudspeakers for the provision of information to users.
- Power supply and electrical circuits: all tunnels shall have an emergency power supply capable of ensuring the operation of safety equipment indispensable for evacuation until all users have evacuated the tunnel. Electrical, measurement and control circuits shall be designed in such a way that a local failure, such as one due to a fire, does not affect unimpaired circuits.
- Fire resistance of equipment: the level of fire resistance of all tunnel equipment shall take into account the technological possibilities and aim at maintaining the necessary safety functions in the event of a fire.

Light Emitting Diodes (LEDs) are proven to be the most efficient option for road lighting nowadays and can help to achieve up to 50 to 70% in energy savings over the conventional road lighting technologies such as metal halide, and high-pressure / low-pressure sodium lamps. In addition, the shift to LED based road lighting technologies would help reduce GHG emissions and generate significant budgetary savings that could be re-invested elsewhere.

## 3.11 Drainage

### 3.11.3 General

In the present chapter, the major and minor hydraulic crossings (bridges and culverts) in AIC are presented. It is noted that the analysis includes an approximately evaluation of hydraulic structures for storm water drainage, river and stream crossing, irrigation/drainage channel intersection, and those areas requiring river protection and, finally the need for relocations of existing irrigation/drainage channels.

The evaluated systems are:

- Culverts
- Pavement drainage
- Channel System

- Bridges and
- River protection

### 3.11.4 Design Criteria

A brief summary of the hydraulic design criteria is provided in the table below.

**Table 3-25 Design Frequencies for Hydraulic Design.**

| Crossing | Design frequencies |
| --- | --- |
| Bridges | 100-year (1 %[9]) Minimum |
| Culverts | 50-year (2 %) Minimum |
| Channels | 10-year (10%) Minimum |

### 3.11.5 Culvert Design

Culverts are structures used to convey surface run-off from one side of the road to another and are usually covered with embankment and composed of a structural material around the entire perimeter, although some are supported on spread footings with the streambed serving as the bottom of the culvert. For economy and hydraulic efficiency, culverts should be designed to operate with the inlet submerged during flood flows, if conditions permit.

Culverts shall be located and designed to present a minimum hazard to traffic and people. Full recovery distance is desirable without guardrail.

### 3.11.6 Pavement drainage

Effective drainage of highway pavements is essential to the maintenance of highway service level and traffic safety. Water on the pavement can interrupt traffic, reduce skid resistance, increase potential for hydroplaning, and limit visibility due to splash and spray, and cause difficulty in steering a vehicle when the front wheels encounter puddles.

Pavement drainage requires consideration of surface drainage, gutter flow, and inlet capacity. The design of these elements is dependent on storm frequency and the allowable spread of storm water on the pavement surface.

The objective in the design of a drainage system for a curbed highway pavement section is to collect runoff in the gutter and convey it to pavement inlets in a manner that provides reasonable safety for traffic and pedestrians at a reasonable cost. As spread from the curb increases, the risks of traffic accidents and delays and the nuisance and possible hazard to pedestrian traffic increase.

### 3.11.7 Drainage inlet design

The hydraulic capacity of a storm drain inlet depends upon its geometry as well as the characteristics of the gutter flow. Inlet capacity governs both the rate of water removal from the gutter and the amount of water that can enter the storm drainage system. Inadequate inlet capacity or poor inlet location may cause flooding on the roadway resulting in a hazard to the traveling public. Storm drain inlets are used to collect runoff and discharge it to underground storm drainage system. Inlets are typically located in gutter sections, paved medians, and roadside and median ditches.

9 (%) = Percentage Exceedance Probability

### 3.11.8 Roadside and median channels

Roadside and median channels are open-channel systems which collect and convey storm water from the pavement surface, roadside, and median areas. These channels may outlet to a storm drain piping system via drop inlet, to a detention or retention basin or other storage component, or to an outfall channel.

### 3.11.9 Channel design

The design of storm drainage systems is a process which evolves as an overall highway design develops. The primary elements of the process include data collection, agency coordination, preliminary concept development, concept refinement and design, and final design documentation. In all the area where the existing channels are affected by the construction of the new highway, these have to be reallocated in the new position in order to have a continuity of the water direction. Channel lining with concrete casted in place or prefabricated.

### 3.11.10 Hydraulic Structures along the A-I corridor in Albania

The Table below presents the identified number of rivers, streams and dimensions of irrigation and drainage culverts, length of irrigation and drainage channel and the length of required river protection for all the AIC sections in Albania.

**Table 3-26 Summary table of proposed hydraulic structures along the A-I corridor in Albania**

| Sec. | From – To | Length | Status / Items | Type | Units | Quantity |
|---|---|---|---|---|---|---|
| 1 | Murriqan – Balldren | 40,946 | Drainage and Irrigation Culvert | 2x2 | pcs | 173 |
| | | | Drainage Culvert | 3x3 | pcs | 10 |
| | | | Drainage Culvert | 4x4 | pcs | 5 |
| | | | Channel Relocation (Trapezoidal Concrete Lining Cannel, (bxh)m, z=1, t=20cm | 2x1 | ml | 5000 |
| | | | Bridge <10 m | Span (1x10) | pcs | 5 |
| 2 | Balldren – Milot | 16,190 | Drainage and Irrigation Culvert | 2x2 | pcs | 68 |
| | | | Drainage Culvert | 3x3 | pcs | 9 |
| | | | Drainage Culvert | 4x4 | pcs | 4 |
| | | | Bridge <10 m | (1x10) | pcs | 2 |
| 3 | Milot – Thumane | 13,455 | Drainage and Irrigation Culvert | 2x2 | pcs | 28 |
| | | | Drainage Culvert | 3x3 | pcs | 6 |
| | | | Drainage Culvert | 4x4 | pcs | 0 |
| | | | Bridge <10 m | (1x10) | pcs | 6 |
| 4 | Thumane – Kashar | 20,881 | Drainage and Irrigation Culvert | 2x2 | pcs | 107 |
| | | | Drainage Culvert | 3x3 | pcs | 7 |
| | | | Drainage Culvert | 4x4 | pcs | 0 |
| | | | Bridge <10 m | (1x10) | pcs | 2 |
| 5B | Kashar – Lekaj | 33,573 | Drainage and Irrigation Culvert | 2x2 | pcs | 74 |
| | | | Drainage Culvert | 3x3 | pcs | 11 |
| | | | Drainage Culvert | 4x4 | pcs | 4 |
| | | | Road Embankment River Protection | | ml | 15080 |

| Sec. | From – To | Length | Status / Items | Type | Units | Quantity |
|---|---|---|---|---|---|---|
| | | | Channel Relocation (Trapezoidal Concrete Lining Cannel, (bxh)m, z=1.5, t=30cm | 6x3 | ml | 5000 |
| | | | Bridge <10 m | (1x10) | pcs | 12 |
| 5C | Lekaj – Konjat | 14,168 | Drainage and Irrigation Culvert | 2x2 | pcs | 20 |
| | | | Drainage Culvert | 3x3 | pcs | 4 |
| | | | Drainage Culvert | 4x4 | pcs | 6 |
| 6+7 | Konjat – Lushnje – Fier | 28,037 | Drainage and Irrigation Culvert | 2x2 | pcs | 51 |
| | | | Drainage Culvert | 3x3 | pcs | 20 |
| | | | Drainage Culvert | 4x4 | pcs | 6 |
| | | | Bridge <10 m | (1x10) | pcs | 6 |
| 8 | Fier (Bypass) | 22,185 | Under construction (Cat B motorway) | | | Not valid |
| 9A-2 | Levan - Pocem | 26,670 | Drainage and Irrigation Culvert | 2x2 | pcs | 45 |
| | | | Drainage Culvert | 3x3 | pcs | 8 |
| | | | Drainage Culvert | 4x4 | pcs | 4 |
| | | | Bridge <10 m | (1x10) | pcs | 5 |
| 9B-2 | Pocem - Memaliaj | 37,694 | Drainage and Irrigation Culvert | 2x2 | pcs | 82 |
| | | | Drainage Culvert | 3x3 | pcs | 2 |
| | | | Drainage Culvert | 4x4 | pcs | 2 |
| | | | Bridge <10 m | (1x10) | pcs | 4 |
| 10 | Memaliaj - Subashi Bridge | 20,143 | Drainage and Irrigation Culvert | 2x2 | pcs | 32 |
| | | | Drainage Culvert | 3x3 | pcs | 9 |
| | | | Drainage Culvert | 4x4 | pcs | 2 |
| | | | River Protection (spurs Protection) | | ml | 4880 |
| 11 | Subashi Bridge-Gjirokaster Bypass | 11,261 | Drainage and Irrigation Culvert | 2x2 | pcs | 18 |
| | | | Drainage Culvert | 3x3 | pcs | 9 |
| | | | Drainage Culvert | 4x4 | pcs | 0 |
| 12 | Gjirokaster Bypass | 9,700 | Drainage and Irrigation Culvert | 2x2 | pcs | 37 |
| | | | Drainage Culvert | 3x3 | pcs | 5 |
| | | | Relocation of Irrigation channel | | ml | 2350 |
| | | | Road Embankment River Protection | | ml | 1150 |
| | | | Bridge <10 m | (1x10) | pcs | 2 |
| 13A | Gjirokaster Bypass - Kakavije | 23,617 | Drainage and Irrigation Culvert | 2x2 | pcs | 41 |
| | | | Drainage Culvert | 3x3 | pcs | 7 |
| | | | Drainage Culvert | 4x4 | pcs | 0 |
| | | | Bridge <10 m | (1x10) | pcs | 10 |

## 3.12 Construction Works

During the construction activities, earth and reinforced concrete works will be carried out for the construction of the highway foundation and the highway structures. The design and manufacturing of the highway materials and elements will follow the requirements incorporated in the TEM Standards (Trans European Highway Standards).

In general, Project construction will comprise the following activities:

Preparatory works:

- Clearance of existing land and vegetation;
- Pre-construction investigations e.g. boreholes, soil testing;
- Organising for temporary sites used for construction works or housing of construction workers;
- Erecting facilities for storage of goods or materials;
- Preparing access roads, where necessary

Construction works

- Building facilities for long term housing of operational workers;
- Development of structures (bridges, viaducts, overpasses, underpasses, interchanges etc.);
- Erosion control and drainage;
- Earthworks (cuts and fills);
- Underground works including blasting;
- Paving and finishing;

Auxiliary Works:

- Works to regulate the increased traffic for transportation of goods and materials to the construction sites;
- Management of materials and wastes;
- Maintenance of equipment;
- Transport of personnel and/or materials;
- Supply of water and energy

## 3.13 Access to the Construction Sites

The common access to the constructions will be done by usage of several access roads. Thus, a combination of access options will be used, using existing roads and tracks to allow access to construction sites wherever possible and making new tracks where necessary.

New access roads will be prepared using standard road construction heavy machinery, mainly – bulldozers. Once construction is completed it is intended to maintain access roads to enable maintenance activities. Any existing access roads disturbed by construction activities will be improved to better condition in comparison to their original state.

## 3.14 Operation and Maintenance

Operation and maintenance activities are various, however mainly consist of road repair, snow and ice removal and vegetation maintenance. When the road surface deteriorates to the extent that spot repairs and surface treatments are not useful, resurfacing will be necessary. Snow/ice removal consists of ploughing snow and ice from bridges, roadways, and shoulders. Wide ditches will facilitate the storage for ploughed snow, which otherwise would be piled along the edge of the roadway or require removal. Vegetation alongside the motorway requires periodic maintenance to enhance aesthetics and prevent encroachment i.e. potential safety hazards (e.g. reduced visibility, obstruction of signs, and debris in the roadway).

# 4. Environmental and Social Baseline

This section describes the main components of the physical and natural baseline environment in the area affected by the implementation of the proposed Project. A comprehensive desk review of a wide range of existing data sources as well as baseline field walk surveys were carried out for the characterization of the existing environment and the identification of sensitivities along the proposed road alignment. Within this section social baseline conditions are described as well. The cultural and socio-economic parameters are gathered from the secondary data available from different institutions at national and local level. This data is complemented with data gathered through in depth discussion and interviews with stakeholders which helped to identify social and cultural impacts for preliminary phase of the AIC.

## 4.1 Environmental baseline

### 4.1.3 Climate

#### 4.1.3.1 Introduction

From the north/northwest of Albania (border with Montenegro) towards the south, about two-thirds of the proposed AI Corridor (approximately 200 km) extend mostly within a flat territory, represented by the Western Lowlands, which run in parallel to the Adriatic coast from Shkoder to Vlore city. This territory is almost entirely flat with the exception of few hilly areas located in the northwest (Section 1) and central part of Albania (Section 5B).

Regarding the part of the AIC from Fier city (end of Fier bypass) up to the border crossing with Greece (Kakavije), the road sections extend over a quite rugged hilly/mountainous territory, especially along the new road Sections 9B and 10, while the other remaining sections from Fier city to the Greek border - namely Sections 9A, 11, 12, 13A and 13B - mostly pass through relatively flat and gentle terrains.

The proposed route sections of the AIC intersect with a number of rivers and streams as well as irrigation and drainage channels, while it should be noted that all rivers/streams in Albania flow from east to west until they reach the Adriatic Sea. These rivers/streams are generally short and steep and, during torrential rains, the downstream plains (Western Lowlands) and rural settlements, located along the coastline fields, are frequently prone to extensive flooding (e.g. Velipoje plain).

The Albanian part of the AIC passes generally through three (3) distinct climatic subzones:

- Mediterranean Northern Plane Subzone[10]:

The northern part of this subzone includes the plains from the border with Montenegro to Shengjin-Lezhe area (A-I corridor sections 1A and 1B). The local climatic conditions of this part are especially influenced by the presence of Drini river, which is the longest river in Albania (approximately 270 km). The average annual air temperature ranges from -5 to -7°C and, in cold winters, they reach -10°C and quite rarely up to -15°C. The summer season is usually very hot. The average air temperature in August exceeds 25°C. Rainfalls are abundant (averaging 1500-1800 mm annually) and are usually accompanied by local storms, while the most severe rainfalls are observed during the winter and autumn seasons. The number of days with precipitation ranges from 107 to 115 days per year. The area is at an annual level dominated by winds blowing from the eastern, northeastern, and southeastern directions. Snow is not an annual occurrence, but when observed, it reaches the levels of 8-20 cm, while it rarely reaches 40-50 cm in certain places. Days with snow vary from 5 to6 days per year, while the average number of days with ice varies from 18 to 30 days per year.

[10] Gjeografia Fizike e Shqiperise Vellimi 1, Tirane 1990

- Mediterranean Central Plane Subzone[11]:

This Subzone includes the central part of Western lowlands and hilly areas under 500m. The average annual air temperature is 15-16° C with unusual changes from north to south and west to east. Winters are mild due to significant influence of the Adriatic Sea. The average temperatures in January, which is the coldest month of the year, range from 5.6° to 7.5°C. The absolute minimum temperatures range from -3° to -5°C, while in cold winters this range is from -4° d to -9°C and, in rare cases, temperatures may drop down to -13°C. The precipitations in this subzone vary from 920 to1,200 mm, while in the northern part of the subzone reach 1,500-1,700 mm. The number of days with rain vary from 85 to100 days per year. The rains are not torrential and snow is not an annual phenomenon. During the cold period of the year, this subzone is dominated by south-eastern winds while, in some places, the winds blow from the northwest direction. In the warm period, the winds are predominately from the northwest direction. The height of the snow layer ranges from 5 to10 cm and in few cases the height can reach up to 15-17 cm. The freezing period is short and the days with ice are few (15-30 days per year with higher concentration in the months of January and February).

- Mediterranean Hilly Southeast Subzone[12]:

This subzone includes the geographical areas extending on both sides of the Vjosa and Drinos river valleys as well as from Fier city down to the Greek border (Kakavije). Drinos river is a tributary of Vjosa river, which is the second biggest river in Albania, while they join their waters together just before Tepelene. The climatic impact of the Adriatic Sea is dominant and more specifically this is evident along the wider downstream sections of Vjosa river valley (AIC sections 9A and partially 9B) towards the sea coast. On the contrary, the influence of the Ionian Sea over the local climate is inconsiderable.

The annual average temperature is 14-15°C. The average temperature in January (coldest month) is above 5°C, while the minimum temperatures range from -3° to -5°C and sometimes -5° to -6°C. In cold winters, the temperature can be in rare cases as low as -15 ° C.

The period of negative temperatures lasts 30-40 days per year for the downstream part and 45-55 days for the upstream part. The frosts can be observed until April.

Rainfall is abundant but with uneven distribution. Regarding the lower part of the subzone (section 9A and partly 9B, up to Sevaster village), the average rainfall is 1,000-1,100 at an annual level , regarding the valley of Drinos river, the average rainfall ranges from 1,500 to1,700 mm per year, and the valley of Shushica river, the average rainfall ranges from 2,500 to2,700 mm per year. Rainfall is often accompanied by intense storms. The number of rainy days ranges from 110 to120 days per year. Winds during the warm periods of the year blow from the northwest, and during the cold periods from the southeastern direction. The average thickness of snow layer is 10-15 cm, while the highest snow layer thickness observed reaches 30-40 cm.

The following figure presents the distribution of the sub-zones and the Corridor.

[11] Gjeografia Fizike e Shqiperise Vellimi 1, Tirane 1990

[12] Gjeografia Fizike e Shqiperise Vellimi 1, Tirane 1990

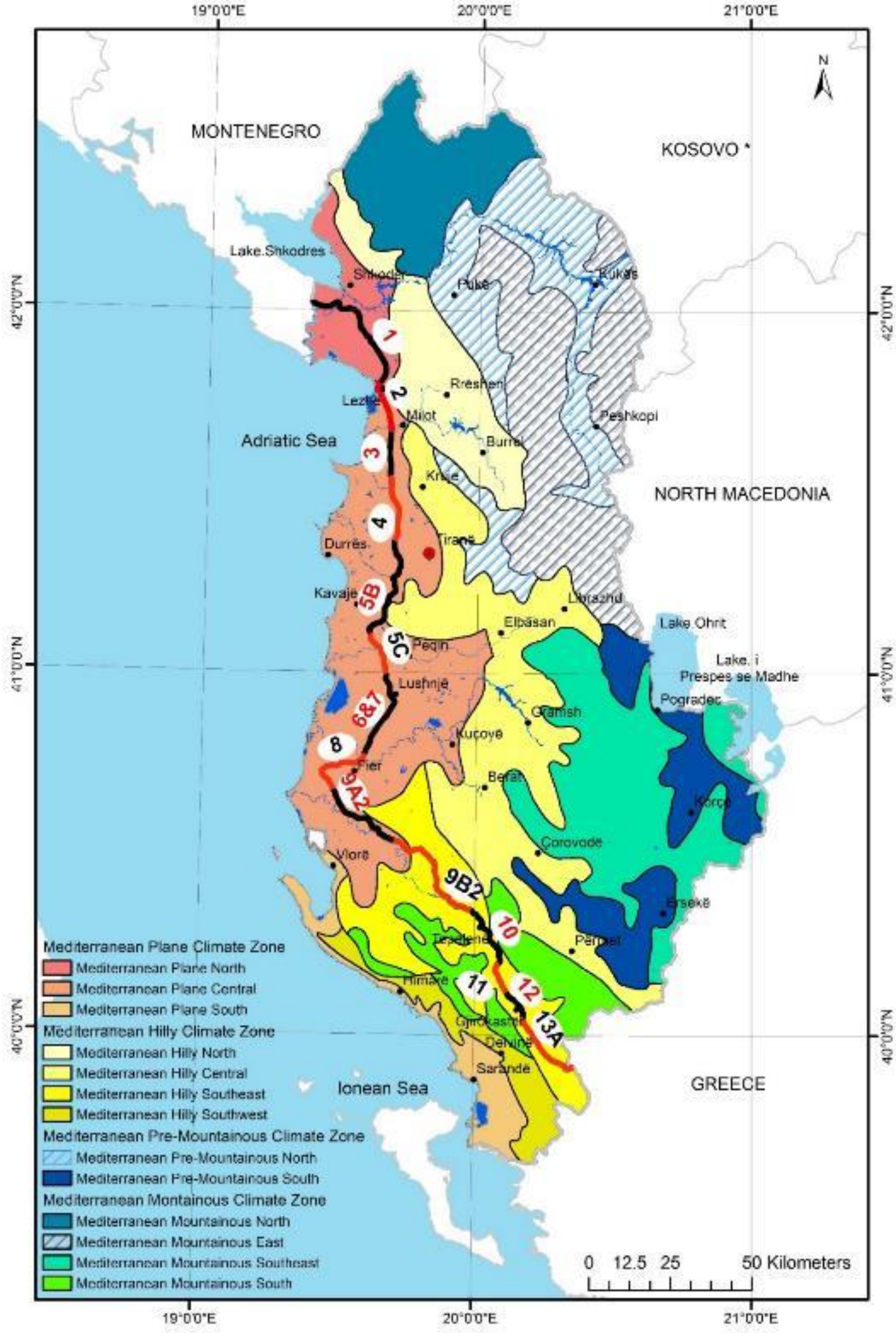



**Figure 4-1 Albania Climatic Zones**

The meteorological stations presented in the following figure and marked with red are taken into consideration for the climatic profile of the project area. These data refer to the meteorological period 1960-1990.

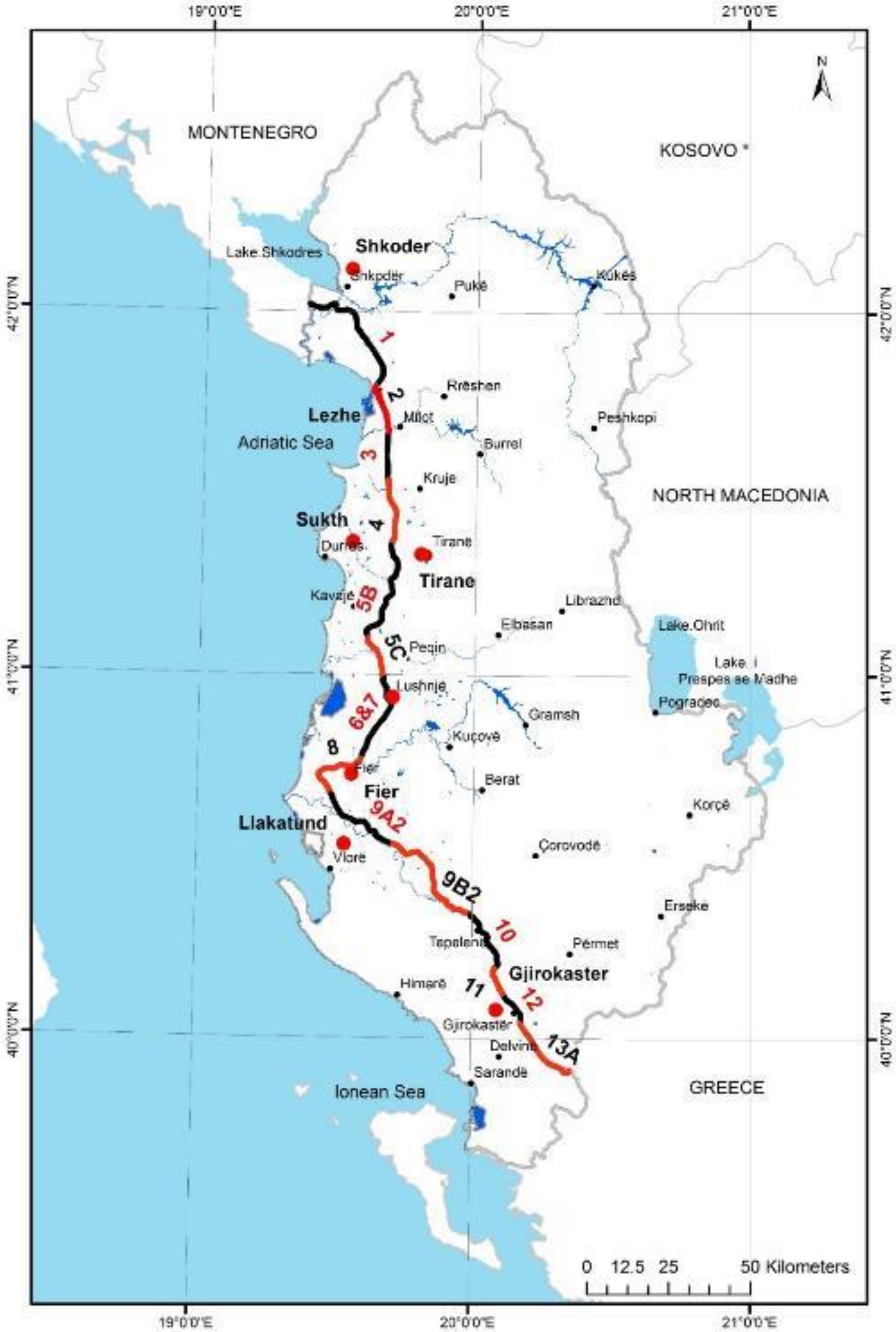


**Figure 4-2 Meteorological Stations**

#### 4.1.3.2 Meteorological parameters

*Air Temperature*

The air temperature is one of the main climatic parameters which characterize the climate of a region. By considering the sections of the AIC, it can be concluded that the majority of the corridor passes through areas where the annual average temperature is 15-16ºC, apart from limited areas after Section 10 where the annual average temperature is 14ºC.

The following table presents the annual average of air temperatures of the meteorological stations close and along the corridor.

**Table 4-1 Annual Average Air Temperatures (oC)**

| Station/Months | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | Annual average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Shkoder | 5,0 | 6,5 | 9,5 | 13,5 | 18,0 | 22,0 | 24,6 | 24,7 | 20,9 | 15,7 | 10,9 | 6,9 | 14,9 |
| Lezhe | 6,9 | 8,2 | 10,6 | 13,8 | 17,9 | 21,5 | 24,0 | 24,0 | 21,1 | 16,9 | 12,5 | 8,8 | 15,5 |
| Sukth | 7,0 | 8,0 | 9,7 | 13,2 | 17,4 | 21,1 | 23,0 | 22,9 | 20,2 | 16,0 | 12,2 | 8,6 | 14,9 |
| Tirana | 6,7 | 7,9 | 9,9 | 13,3 | 17,7 | 21,6 | 23,8 | 23,8 | 20,6 | 16,1 | 11,8 | 8,2 | 15,1 |
| Lushnje | 8,2 | 9,1 | 11,0 | 14,1 | 18,3 | 22,3 | 24,3 | 24,4 | 21,6 | 17,6 | 13,2 | 9,7 | 16,2 |
| Fier | 7,2 | 8,3 | 10,1 | 13,3 | 17,4 | 21,3 | 23,1 | 23,0 | 20,3 | 16,3 | 12,2 | 8,7 | 15,1 |
| Llakatund | 7,4 | 8,4 | 10,2 | 13,3 | 17,3 | 21,2 | 23,0 | 22,9 | 20,2 | 16,2 | 12,3 | 8,8 | 15,1 |
| Gjirokaster | 5,4 | 6,9 | 9,3 | 12,8 | 17,2 | 21,2 | 23,5 | 23,6 | 20,1 | 15,0 | 10,3 | 6,7 | 14,3 |
| Average | 6,7 | 7,9 | 10,0 | 13,4 | 17,7 | 21,5 | 23,7 | 23,7 | 20,6 | 16,2 | 11,9 | 8,3 | |

As it can be seen from the table above, Lushje has the highest annual average temperature (16,2 ºC), followed by Lezhe (15,5 ºC), Tirana (15,1 ºC) and Llakatund (15,1 ºC). The lowest annual average temperature is encountered in Gjirokastër (14,3 ºC). The lowest monthly temperatures along the corridor are encountered in January (6,7 ºC) and December (8,3 ºC) and the highest in July and August (23,7 ºC).

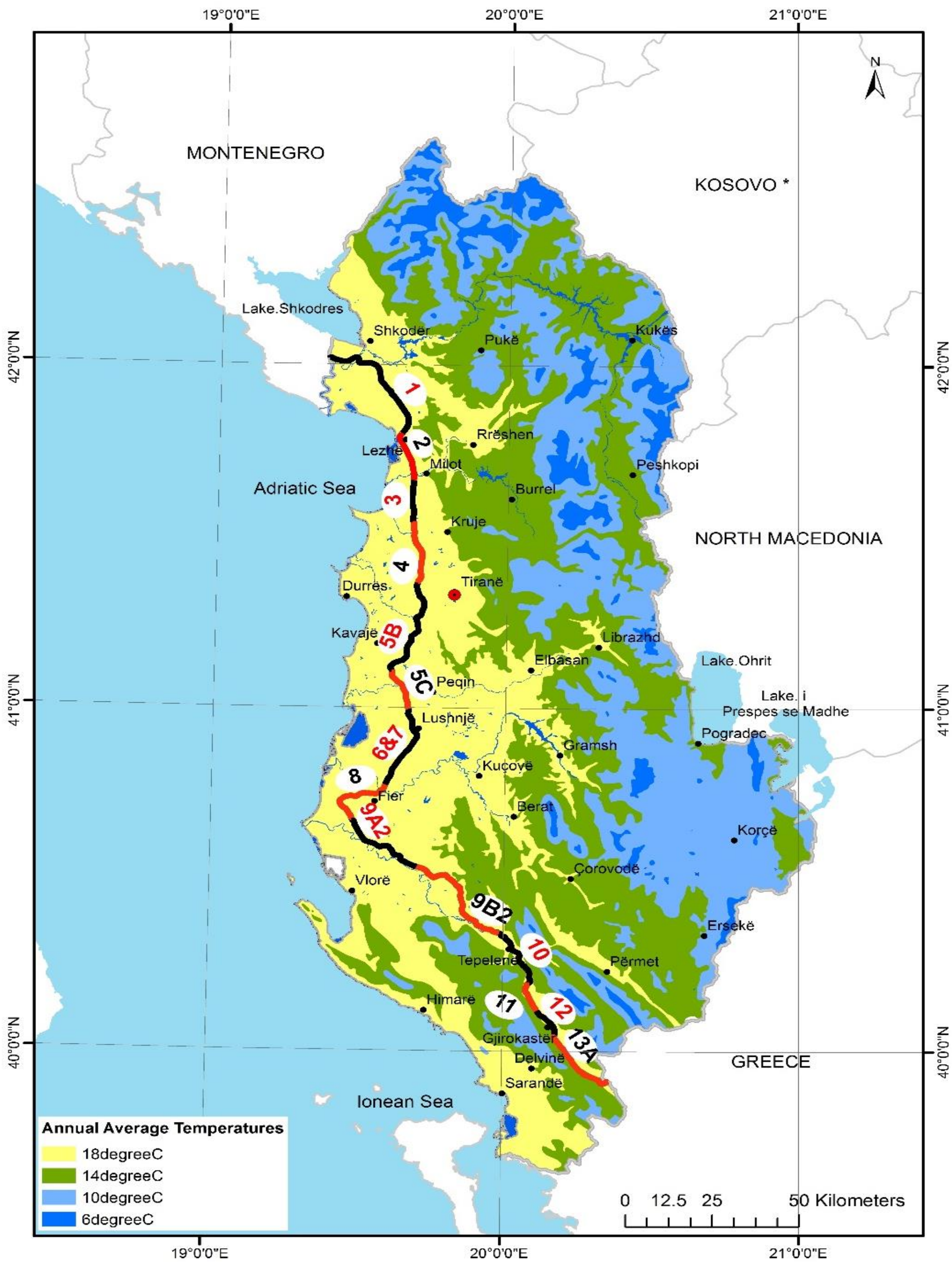



**Figure 4-3 Average Temperature (degree C)**

*Precipitation*

Precipitations are among the most important climatic indicators, which determine the climatic characteristics of an area. The factors that affect the characteristics of precipitations are the geographical location of the area, distance from the sea and orography. The following table presents the annual precipitation distribution in the meteorological stations close and along the AIC.

**Table 4-2 Average Precipitation Distribution during the year**

| Station/Months | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | Annual sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Shkoder | 242,7 | 200,2 | 179,7 | 174,0 | 126,5 | 66,9 | 41,8 | 70,1 | 179,3 | 230,5 | 273,6 | 279,9 | 2065,2 |
| Lezhe | 174,4 | 148,4 | 138,2 | 121,4 | 98,0 | 78,2 | 38,7 | 54,4 | 94,4 | 152,0 | 190,3 | 175,1 | 1463,5 |
| Kameez | 151,0 | 121,5 | 126,5 | 110,4 | 92,9 | 65,2 | 46,2 | 57,9 | 80,8 | 110,6 | 178,1 | 158,7 | 1299,8 |
| Sukth | 134,7 | 113,3 | 101,9 | 90,3 | 68,0 | 51,8 | 29,0 | 45,0 | 67,8 | 114,2 | 160,3 | 132,3 | 1108,6 |
| Tirana | 142,9 | 131,8 | 115,0 | 104,7 | 104,3 | 66,7 | 41,5 | 49,2 | 77,7 | 115,6 | 174,3 | 147,8 | 1271,5 |
| Durres | 143,0 | 132,0 | 115,0 | 105,0 | 104,0 | 67,0 | 42,0 | 49,0 | 78,0 | 116,0 | 174,0 | 148,0 | 1273,0 |
| Lushnje | 117,1 | 102,7 | 87,3 | 81,0 | 66,2 | 34,9 | 24,7 | 33,4 | 57,3 | 93,2 | 143,5 | 121,6 | 962,9 |
| Fier | 127,6 | 103,7 | 87,7 | 77,2 | 53,3 | 28,7 | 25,6 | 32,3 | 61,4 | 100,9 | 159,3 | 127,6 | 985,3 |
| Llakatund | 130,1 | 115,7 | 85,9 | 70,5 | 50,6 | 24,8 | 19,6 | 28,2 | 59,1 | 115,4 | 166,5 | 148,8 | 1015,2 |
| Gjirokaster | 281,0 | 237,0 | 163,0 | 119,0 | 77,0 | 34,0 | 20,0 | 32,0 | 94,0 | 196,0 | 324,0 | 346,0 | 1923,0 |
| Average | 164,5 | 140,6 | 120,0 | 105,4 | 84,1 | 51,8 | 32,9 | 45,2 | 85,0 | 134,4 | 194,4 | 178,6 | |

As it is indicated in the table above, the highest annual sum precipitation can be observed in Shkoder (2065,2 mm), followed by Gjirokaster (1923,0mm), while the lowest annual precipitation occurs in Lushnje (962,9mm) followed by Fier (985,3mm) and Llakatund (1015,2mm). The month with the highest average precipitation along the corridor is November (194,4mm) followed by December (178,6mm) and the month with the lowest precipitation is July (32,9mm) and August (45,2mm).

Regarding the distribution of precipitation along the corridor, the lowest precipitation occurs in sections 5C up to Section 9B2, followed by Sections 4 and 5B. Higher precipitation is observed in Sections 2 and 3 while Section 1 and Section 10 up to the Albanian - Greek border (Section 13A) indicate the highest precipitation along the corridor.

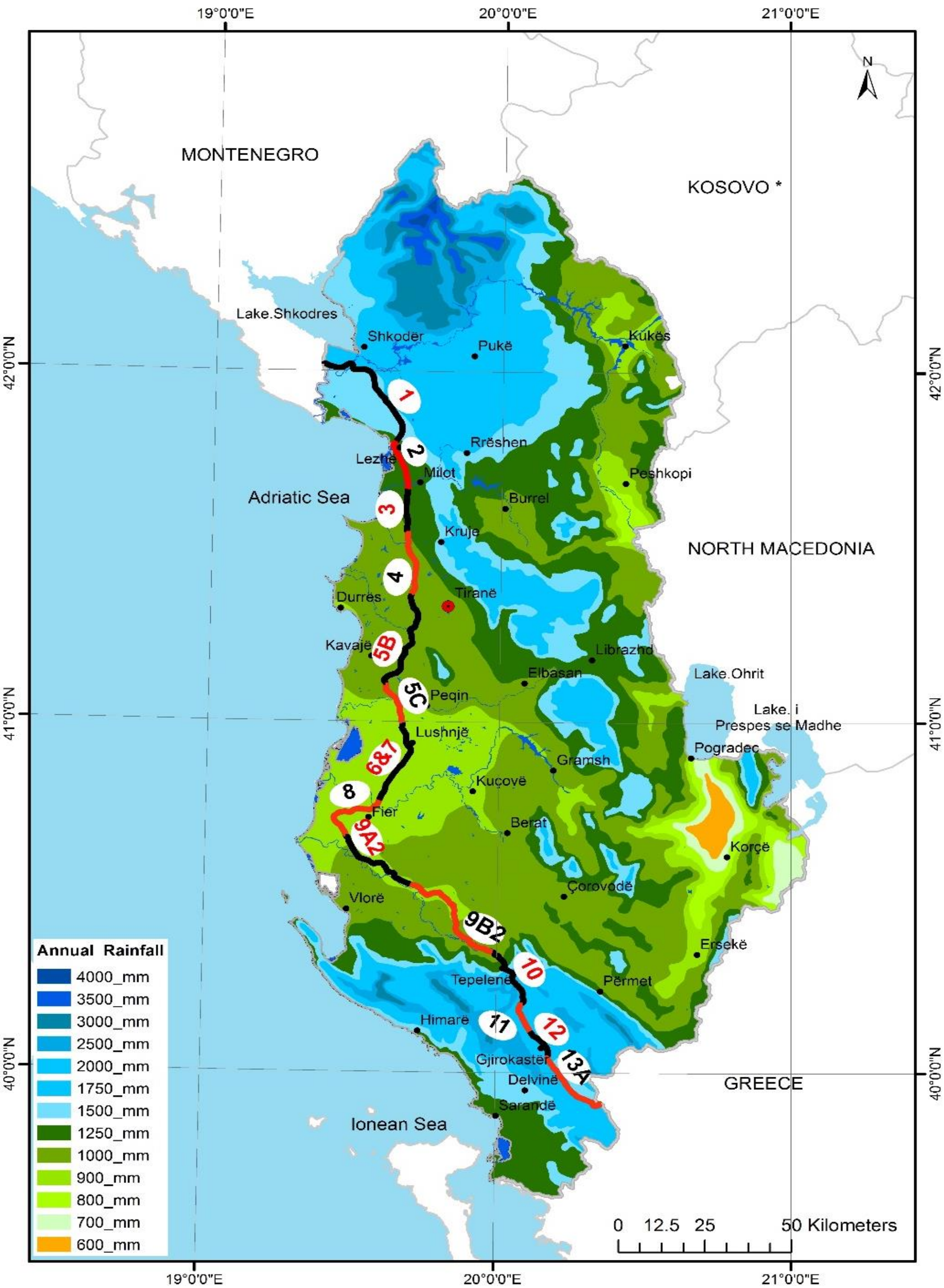



**Figure 4-4 Annual Rainfall (mm)**

The maximal 24-hour precipitations registered by meteorological stations located along the AIC are presented in the table below.

### Table 4-3 Maximum 24 - hour registered precipitation (in mm)

| Station/Months | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | Annual average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Shkoder | 130,3 | 116,5 | 189,0 | 202,3 | 131,3 | 102,3 | 69,9 | 206,4 | 291,0 | 183,4 | 185,9 | 135,0 | 161.9 |
| Lezhe | 133,1 | 65,0 | 120,5 | 91,5 | 113,2 | 160,1 | 46,5 | 89,7 | 129,5 | 116,7 | 135,1 | 75,8 | 106.4 |
| Kameez | 110,4 | 111,5 | 74,6 | 50,9 | 54,2 | 76,8 | 44,2 | 78,0 | 81,5 | 105,0 | 157,3 | 72,6 | 84.8 |
| Sukth | 130,2 | 125,8 | 73,6 | 67,5 | 120,2 | 75,0 | 44,0 | 87,7 | 73,7 | 127,4 | 117,0 | 51,9 | 91.2 |
| Tirana | 65,1 | 68,5 | 65,0 | 76,9 | 122,5 | 103,0 | 58,5 | 79,0 | 97,7 | 297,4 | 193,5 | 130,0 | 113.1 |
| Lushnje | 59,5 | 51,5 | 68,7 | 43,8 | 84,5 | 39,5 | 68,0 | 59,0 | 61,4 | 78,7 | 163,0 | 61,5 | 69.9 |
| Fier | 62,9 | 51,6 | 103,4 | 51,4 | 54,0 | 50,4 | 116,1 | 91,3 | 78,4 | 95,6 | 146,1 | 96,0 | 83.1 |
| Gjirokaster | 211,6 | 168,1 | 93,0 | 96,6 | 65,3 | 53,4 | 21,0 | 50,6 | 94,7 | 199,0 | 288,0 | 215,6 | 129.7 |

Considering the table above. the highest maximum 24-hour rainfall is observed in Shkoder and Gjirokaster, while the lowest values can be seen in Lushnje and Fier.

*Wind*

Another quite important meteorological indicator is the wind velocity. The average values of wind velocity during the year are given in the table below. The highest annual average of wind velocity is observed in Lezhe (4 m/s) followed by the wind velocity of Fier (2,8 m/s), while the lowest annual average of wind velocity maybe seen in Tirana (1,5 m/s).

### Table 4-4 Average Wind Velocity Distribution (m/sec) during the year

| Station/Months | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | Annual average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Shkoder | 2,0 | 2,3 | 2,3 | 2,0 | 1,7 | 1,7 | 1,7 | 1,8 | 1,5 | 1,6 | 1,6 | 1,8 | 1,8 |
| Lezhe | 5,8 | 5,8 | 4,0 | 3,4 | 3,0 | 2,7 | 2,8 | 3,1 | 3,3 | 4,3 | 4,2 | 5,5 | 4,0 |
| Sukth | 2,0 | 2,1 | 2,2 | 2,2 | 1,8 | 1,8 | 1,7 | 1,6 | 1,5 | 1,6 | 1,8 | 1,9 | 1,8 |
| Tirana | 1,6 | 1,8 | 1,7 | 1,6 | 1,5 | 1,3 | 1,6 | 1,5 | 1,3 | 1,3 | 1,3 | 1,4 | 1,5 |
| Lushnje | 3,0 | 2,7 | 2,6 | 2,5 | 2,3 | 2,5 | 2,5 | 2,4 | 2,4 | 2,5 | 2,2 | 2,8 | 2,5 |
| Fier | 2,8 | 3,2 | 3,1 | 3,3 | 2,8 | 2,8 | 2,6 | 2,6 | 2,5 | 2,6 | 2,7 | 2,8 | 2,8 |

*Air Humidity*

An important climatic indicator is the relative air humidity, which has a direct impact on human activity. Regarding the annual trend of this indicator, some fluctuations can be observed, which are subject to seasonal changes and terrain characteristics.

### Table 4-5 Air Humidity (%)

| Station/Months | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | Annual average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Shkoder | 75 | 72 | 68 | 68 | 67 | 63 | 56 | 56 | 64 | 70 | 76 | 76 | 68 |
| Lezhe | 66 | 63 | 65 | 70 | 72 | 69 | 64 | 66 | 67 | 66 | 69 | 64 | 67 |
| Sukth | 75 | 75 | 75 | 76 | 76 | 71 | 69 | 71 | 75 | 76 | 78 | 77 | 75 |

| Station/Months | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | Annual average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tirana | 73 | 71 | 71 | 72 | 71 | 66 | 61 | 64 | 70 | 72 | 76 | 76 | 70 |
| Lushnje | 64 | 66 | 68 | 71 | 70 | 65 | 63 | 63 | 67 | 67 | 71 | 68 | 67 |
| Fier | 76 | 75 | 75 | 73 | 72 | 68 | 67 | 70 | 74 | 76 | 79 | 78 | 74 |
| Gjirokaster | 82 | 78 | 74 | 71 | 68 | 62 | 55 | 56 | 67 | 77 | 84 | 84 | 72 |

The highest annual average humidity, as it is indicated in the table above, occurs in Sukth (75%) followed by Fier (74%) and Gjirokaster (72%). The lowest annual average humidity maybe observed in Lezhe and Lushnje (67%).

*Snow*

Snowfall is rarely observed along the Western Lowlands, and it can be considered as an extraordinary event. This can be also concluded by the following table.

### Table 4-6 Number of Days with Snow

| Station/Months | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | Annual average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Shkoder | 1.9 | 1.8 | 0.9 | | | | | | | | 0.2 | 0.7 | 1.1 |
| Lezhe | 1 | 0.8 | 0.3 | | | | | | | | 0.1 | 0.8 | 0.6 |
| Tirana | 1.3 | 0.9 | 0.4 | | | | | | | | 0.1 | 0.3 | 0.6 |
| Durres | | | | | | | | | | | | | |
| Lushnje | 0.5 | 0.3 | 0.2 | | | | | | | | | | 0.3 |
| Fier | 0.3 | 0.1 | 0.1 | | | | | | | | | | 0.2 |
| Gjirokaster | 1.5 | 1.1 | 0.4 | | | | | | | | 0.2 | 0.5 | 0.7 |

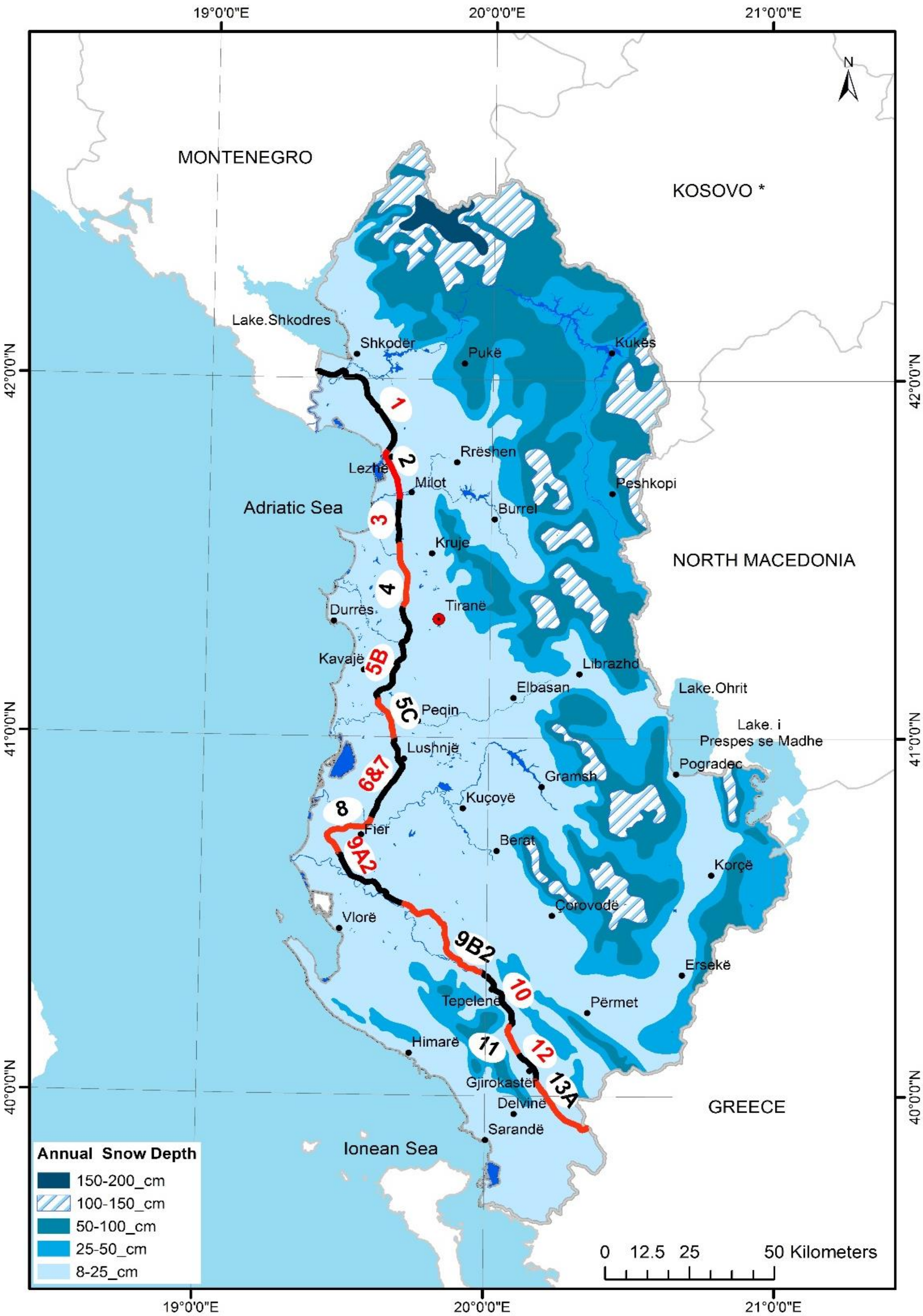

19°0'0"E
20°0'0"E
21°0'0"E
42°0'0"N
41°0'0"N
40°0'0"N
N
MONTENEGRO
KOSOVO *
NORTH MACEDONIA
GREECE
Adriatic Sea
Ionean Sea
Lake.Shkodres
Lake.Ohrit
Lake. i Prespes se Madhe
Shkoder
Pukë
Kukës
Rrëshen
Lezhë
Milot
Peshkopi
Burrel
Kruje
Tiranë
Durrës
Kavajë
Librazhd
Elbasan
Peqin
Lushnjë
Gramsh
Pogradec
Kuçovë
Fier
Berat
Korçë
Vlorë
Çorovodë
Ersekë
Tepelenë
Përmet
Himarë
Gjirokastër
Delvinë
Sarandë
1
2
3
4
5B
5C
6&7
8
9A2
9B2
10
11
12
13A
Annual Snow Depth
150-200_cm
100-150_cm
50-100_cm
25-50_cm
8-25_cm
0 12.5 25 50 Kilometers

**Figure 4-5 Annual Snow (cm)**

*Hail*

This is a solid form of precipitation and is observed almost in every period of the year. Usually it is accompanied by heavy rains. The duration of hail precipitation is generally 3-5 minutes. Hail is more common during the winter months, while during the summer the number of days with hail is lower.

**Table 4-7 Number of Days with Hail**

| Station/Months | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | Annual average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Shkoder | 0,7 | 0,6 | 0,5 | 0,5 | 0,2 | 0,1 | 0,0 | 0,1 | 0,1 | 0,2 | 0,4 | 0,5 | 0.35 |
| Lezhe | 0,4 | 0,4 | 0,4 | 0,6 | 0,2 | 0,1 | 0,1 | 0,1 | 0,1 | 0,1 | 0,8 | 0,7 | 0.33 |
| Tirane | 1,1 | 1,3 | 0,9 | 1,3 | 0,6 | 0,3 | 0,1 | 0,1 | 0,2 | 0,3 | 0,9 | 1,0 | 0.68 |
| Durres | 1,0 | 1,7 | 1,0 | 0,7 | 0,3 | 0,1 | 0,1 | 0,0 | 0,0 | 0,3 | 0,9 | 1,1 | 0.72 |
| Lushnje | 0,5 | 0,7 | 0,7 | 0,6 | 0,2 | 0,1 | 0,2 | 0,1 | 0,2 | 0,2 | 0,6 | 0,4 | 0.38 |
| Fier | 0,5 | 1,0 | 0,5 | 0,5 | 0,1 | 0,0 | 0,1 | 0,1 | 0,1 | 0,1 | 0,1 | 0,5 | 0.33 |
| Gjirokaster | 1,3 | 1,2 | 0,8 | 0,5 | 0,3 | 0,1 | 0,0 | 0,1 | 0,1 | 0,2 | 0,6 | 1,0 | 0.56 |
| Average | 0,8 | 1,0 | 0,7 | 0,7 | 0,3 | 0,1 | 0,1 | 0,1 | 0,1 | 0,2 | 0,6 | 0,7 | |

## 4.1.4 Topography and landscape

### 4.1.4.1 Introduction

Albania is a Mediterranean country with a Mediterranean landscape, which is more visible on the west and a Mediterranean landscape with small continental influence on the east. The landscape diversity ranges from areas with natural characteristics to areas associated with human activities. Traditional agriculture and stock farming have been developed, enhancing the natural characteristics of the country. Due to this diversity, for the evaluation of the landscape component, several elements will be taken into consideration, among which topography and morphology as well as naturalistic and historical-architectural are considered as key factors/criteria.

Data for the description of the landscape were obtained from the General Local Plans of all the areas through which the AIC passes (approved in 2016 -2017) and from relevant detailed studies. Field visits that were carried out along the corridor offered a lot of material in order to describe the major characteristics of all Sections.

The major part of the AIC goes through flat terrains that belong to the country's Western lowland, extending from North to South, along the Adriatic coast. The rest of the AIC, especially some parts of Section 1 and 2, 5B, 9A2, 9B2, 10, 11, 12 have a very distinctive landscape. Regarding the areas where the topography along the proposed AIC route is almost 100% flat, it can be concluded that they have a mixed use dominated by residential and industrial areas, in higher or lower density, near or in some distance.

Albania does not yet have designated areas of landscape or townscape value. For this reason, the tables of landscape areas for each section below are going to provide a brief description of the Landscape Areas (a geographical area with a distinct pattern of combination of elements that occur consistently) identified within the vicinity of the route.

### 4.1.4.2 Description of landscape per Section

There is a description below of the Sections that the AIC passes by, while there is a photo log (Annex 2), which includes photos which are accompanying the text and give a general overview of the project.

Section 1 Murriqan (Border with Montenegro) - Balldren (beginning of Lezhe bypass)

The topography along Section 1 is almost flat for the entire length, while this area is considered part of the Western Lowland of the country. More specifically, the proposed corridor extends for about 14.5 km (west-east direction) over a flat terrain, starting at the border with Montenegro (south of the existing road to Murriqan, Sh41), until the intersection with Shkoder-Lezhe highway (Sh1) near to Bushat and up to the road to Mjede (Sh28). The flat terrain continues then southwards along the existing highway Sh1 for the remaining 26.4 km until Balldren (near to Lezha town).

The major fields of Velipoje and Zadrima are well confined/ compact at varying distances by a number of hills and mountains. The terrain elevations along Section 1 are generally quite close to the sea level, ranging from 0-1 meters below the sea level to maximum 30 m a.s.l.

*Landscape Remarks*

Section 1 passes via a wide variety of landscapes (rural, lake, forest, river and mountain area nearby). The AIC passes close to settlements but not close to important cities or villages. The landscape is under pressure from several human activities, which result in environmental degradation.

This Section maybe divided into three parts according to the landscape criteria mentioned above.

**Table 4-8 Landscape characteristics of Section 1**

| Parts | Characteristics |
|---|---|
| 1. Landscapes of Ana e Malit, Berdice and the field of Kolagjini (from km 0+000 up to km 14+800) | The Buna Velipoja River, which is a designated "Protected Landscape", includes forests on the north side, bush and wetland territories along and east side of the road corridor. The pastures of Buna River are dominated by a flat, large-scale landscape with an open and exposed character and long-distant views (Figure 1). The aforementioned road part has also a harmonious rural character, which is mainly characterized by agricultural lands, areas of natural vegetation and open plains of grazing pastures for cattle such as Oblika e Madhe in Shkodër (Figure 2), and woodlands and fragmented shrub forests in hills.<br>Spread residential buildings all over the Corridor (km 1+000, Dodaj village. Figure 3).<br>Some remnant forest natural areas, starting from Maja e Tahjave and including the Murriqan hilly side and the hills of Xhakaj forests |
| 2. Landscapes of the field of Ashtë, Kosmac, Varishte–Plezhe and Shkjezë (from 14+800 up to km 21+000) | A strong rural character with a perceived sense of remoteness and tranquility away from the main road (the field of Kolagjini - Figures 4,5).<br>A flat to gently rolling large-scale landscape with an open character and strong horizons combined with inhabited areas spread throughout the territory (the field of Lymes and the village of Kozmaç - Figure 6).<br>Consistent landscape with long-distant views and strong skylines (the field of Plezhë - Figure 7).<br>Groups of mature trees among pastures (the field of Shkjeze - Figure 8) |
| 3. Landscapes area of Dajc, Blinisht and Kallmet (from km 21+000 up to km 40+946) | Hillsides of Faqja e Percellimes about 3 to 5 km distance to the east side,<br>schlerophyllous vegetation, natural meadows and the mountain of Kakarriqi in a distance of 400m up to 3 km in the west of the AIC. |

The main habitats that characterize the first and second part are agricultural lands, natural vegetation, riverine habitats with forests and shrubs. The forest vegetation and meadows are the major elements that define the landscape panorama in the third part while agricultural land and natural vegetation are also evident in the fields of Mabë (figure 9), the field of Dajç (figure 10) in Gjader Village and the field of Dajc (figure 11). Additionally, forests and shrubs as well as spread residential buildings can be seen in Balldre village and Kakarriqi hill of Lezhë (figure 12).

The following cultural monuments can be noted in the wider area as well as in close distance to the AIC:

- The walls of antic City of Liss of Lezhë (2.1 km distance from the AIC).

- Church of "Shën e Premtes" in Balldre (370 m distance from the AIC).

Section 2 Balldren (beginning of Lezhe bypass - Milot)

Section 2 includes the construction of 3.0 km of a totally new alignment (Lezhe bypass) and other 13.2 km of the existing highway Sh1 (Milot-Lezhe) until the junction with A1 to Kosovo. Except for the initial part (approximately 1.1 km), the topography along Section 2 is flat (terrains which belong to the country's Western Lowland). These terrains have a varying width from 5 to 10 kilometers in the east-west direction along Section 2 and extend on both sides of the existing highway Sh1. They are confined by the Renci Mountain in the north, the Adriatic coast on the west and a range of steep mountains on the east. More specifically, the topography along Section 2 can be classified into two main parts:

- First Part (initial): This part is about 1.1 km long and extends perpendicularly to the Renci Mountain. The highest point over the mountain is 165 m asl and lies on a very steep terrain.
- Second Part: This part represents the rest of Section 2, which is about 15.1 km long, and it lies completely over flat terrains until the interchange (trumpet shape) with A1 to Kosovo. The terrain slopes are quite low, ranging from 0 to 1%. The AIC passes in the beginning over the Road 32 to Shëngjin town and over the northern part of the Kune-Vain protected area, which is characterized by coastal marshlands. These areas have the lowest terrain altitude of Section 2 lying at (+/-) 0.0 m asl. The highest terrain altitude is about 15.5 m asl (km 13+700) and is located before the northern entrance to the Mati Bridge (625 m long).

*Landscape Remarks*

Section 2 passes by several urban, rural, forest, riverine and mountainous areas. Important elements in the wider area of the Section are the Managed Natural Reserve of Kune-Vain-Tale (the AIC passes close to a very short part of the Managed Natural Reserve on the west side) and the hills of Berzane (Managed Natural Reserve of Berzane), 2.5 km on the east side of the AIC, which is a designated Protected Landscape. The former Protected Area is crossed by the Section in its buffer zone for a very short part while the latter is more distant and not affected by the AIC. This landscape is also under pressure from several human activities.

The main landscape characteristics of Section 2 (Ishull Shëngjin, Drini Lezhës, Ishull Lezhë and Shën Koll and Fushë Milot) are as follows:

- Frequent panoramic views over the smoothly undulating hilly landscape from elevated points in the east side such as the hills of Zejmen Bardhi, Shullazi, Stanes (located 2 km distant from the AIC) as well as woodlands and fragmented shrub forests and hills in Lezhë district - Figure 13).
- Strong rural character with a general absence of large-scale infrastructure in the east side and presence of low-lying fields in the west side. Agricultural lands planted with crops in Rilë and Shën Koll district as well as in hills of Kreshë and Zejmen (Figure 14, 15).
- Open riverbed of natural flow and riverine habitats with shrubs along Mati River and near Shën Koll village (Figure16), near Gajush (Figure 17)
- Agricultural lands with spread residential buildings (field of Milot - Figure 18, 19).

The main habitats that maybe encountered in this Section are agricultural lands, limited areas of natural vegetation, riverine habitats (aquatic habitat within streams of the river) near and along Mati River and forests and shrubs areas in distance. Woodlands and fragmented shrub forests of pine and oak trees in hills lie in a distance not closer than 4 km in the east side of the corridor. Residential buildings spread along the area are denser in the lower than the upper part of this Section.

The walls of antic City of Liss (protected area) Lezhe are a cultural monument that can be noted in the wider area (2.1 km distance from the AIC - connecting point of Section 1 and Section 2).

Important protected area, crossed in its boundary zone, is the Kune Vain Managed Reserve (IUCN, Cat. IV) which encompasses the Kunë Island, the Kunë-Vain lagoon, the woodlands and several ecosystems.

Section 3 Milot - Thumane

Section 3 follows completely the alignment of the existing dual carriageway highway Sh1. The topography along the proposed AIC route in this Section is totally flat.

The terrains belong to the country's Western Lowland and lie on both sides of the existing highway Sh1, with a varying width from 8 to 10 kilometers (in east-west direction). The plains are confined by the Adriatic coast on the west and a range of mountains on the east.

The terrain quotas along Section 3 are close to the sea level, ranging from 0-1 meters asl (km 3+500 to km 6+400) to a maximum of 29 m asl at km 12+400 in Thumane (railway underpass). The terrain slopes along Section 3 are quite low and relevant figures range mostly from 0% to 1%. Slightly higher scopes (1% to 3%) are observed in three short sections of a total length of 1.0 km, which are located in km 8+700 to 9+100 (slope 1-2%), km 12+150 to 12+350 (slope 2-3%) and km 12+500 to 12+900 (slope 2-3%).

*Landscape Remarks*

Section 3 passes through urban, rural, marine, forest, river and mountain areas, including the hilly landscape on the west and east side. This landscape is also under pressure from several human activities.

This Section includes the field of Milot, Lac and Mamurras and is dominated by:

- Frequent panoramic views over smoothly undulating landscape on the east side, in the area of the mountain of Gjonëm, Skungjel and Shen Ndout Church, not closer than 2.5 km from AIC (Figure 20).
- Strong rural character with a general absence of large-scale infrastructure in the east side and low-lying fields in the west such as the field of Mamurras (Figure 21),
- Agricultural lands with spread residential buildings (Figure 22) and
- Industrial zone of Antea Cement in a distance of 4.4 km from the AIC (Figure 23).

The main habitats are agricultural lands such as the field of Bushnesh area, planted with crops, areas of natural vegetation and riverine habitats with forests and shrubs near the river of Droje. Woodlands and fragmented shrub forests in the hills of Shpërdhel, Mamurras, Boka e Kuqe as well as residential buildings lie in a distance not closer than 2.5km - 4 km.

The cultural monument that can be noted in the wider area of the AIC is the Saint Anoit's Church, Laç, which serves as a touristic and very important religious attraction in the area and lies around 5 km away from the AIC, on the km 5+500, (Figure 24).

Section 4 Thumane - Kashar

Section 4 is a completely new alignment. It starts in Thumane and ends up in Kashar at the intersection with the existing dual carriageway highway Sh2 (Tirana-Durres). The topography along the proposed AIC route in this Section is totally flat.

The terrains belong to the country's Western Lowland. The plains have a north-south orientation with a minimum width (west-east) of 6 kilometers and are confined by the hills of Preze and Ishmi on the west and Thumane, Fushe-Kruje and Tirana on the east.

The terrain quotas in Section 4 are slightly above the sea level, ranging from a minimum of 3 m asl (km 1+000) to a maximum of 57 m asl at km 20+900 in Kashar at junction with Sh2, which is also the end of Section 4. The terrain slopes along Section 4 are quite low.

*Landscape Remarks*

This Section passes by urban, rural, forest, riverine and mountainous areas. The landscape diversity ranges from natural characteristics to human developments and infrastructure. Traditional agriculture and stock farming have been developed and are the major factors, which determine the landscape physiognomy in those areas, which are characterized by autochthonous species described in detail in the biodiversity parameter. Besides this, the landscape is affected by pressure from anthropogenic activities.

This Section maybe divided in two parts according to landscape criteria.

**Table 4-9 Landscape characteristics of Section 4**

| Parts | Characteristics |
|---|---|
| 1. Landscapes of the field of Kodër Thumane, Bupq, Nikël and Bërxullë (from km 0+000 up to km 20+200) | Very structured and controlled landscape, primarily used for arable farmland (km 0+600, field of Derven - Figure 25).<br>Straight corridor with minimal roadside vegetation.<br>Small areas of trees, shrubs and grassland with two river crossings with Gjole River (km 3+400 and 8+600 - Figure 26).<br>Flat, large-scale landscape along the field of Bupq, with an open and prominent character and long-distant views to the Castle of Preza, west side of the AIC (km 11+000 - Figure 27).<br>Agricultural lands planted with crops, areas of natural vegetation and pasture, riverine habitats with forests and shrubs, woodlands and fragmented shrub. (km 10+000, east side of the AIC - Figure 28)<br>Scattered residential buildings, (field of Bilaji and in distance Arameras village and hills of Kruja and Zgërdheshi -figure 29, km 9+000-, village of Brërxullë, field of Prezë -Figure 30, km 16+000). |
| 2. Landscapes of the industrial zone, (from km 20+200 up to km 21+050) | Industrial structures surrounded by their facilities and scattered residential buildings and interstitial areas between industrial and residential district, (km 20+900 - Figure 31). |

The cultural monument that can be noted in close distance to the AIC (300 m) is the Church of Gjon Pagezorit Krujë – Derven.

The most important cultural monument is the Prezë Castle on the west side of the AIC, 2.7 km distant from the AIC and quite close to the Mother Theresa International Airport.

<u>Section 5 Kashar - Konjat</u>

Section 5 comprises of two parts, sub-section 5B (Kashar - Lekaj) and sub-section 5C (Lekaj - Konjat). More specifically:

- Section 5B, Kashar - Lekaj

Section 5B follows initially (north-south direction) the flat terrains located on the right side of Limuthi Stream until the irrigation reservoir in Kus (Purrezit) with low elevations ranging from 57 m to 75 m asl. From Kus to Allgjate village, the road corridor goes through a steep hilly terrain and then along the narrow valley of Lalmi Stream passes through moderately steep terrains.

Section 5B continues in the southern direction along the right side of the valley of Erzeni River with terrain elevations varying from 71 to 64 m asl. Then, the corridor follows the valley of Pezë Stream, where the terrain elevation is as low as 55 m asl. It continues to a north-south direction, extending over almost a flat terrain through the valley of Peze Stream (a tributary of Erzeni River) –beside the village of Maknor and in parallel to the local road to Peze, both located on the east side of AIC route. At km 16+845, Section 5B turns immediately towards the west direction, passing through steep hilly terrains, where the elevation is 318.22 m asl. From that point up to the end of Section, the corridor passes mostly through a series of hills of Mushnik, Zambish and Okshun, depressions, rugged and steep terrains with almost no inhabited settlements. Flat terrains lie between km 26+500 and 30+400 along the downstream part of Darçi River valley as well as at the ending part of Section 5B from km 31+100 to 33+573.

*Landscape Remarks*

This Section crosses a flat territory from Kashar to Pezë and then continues primarily on a hilly terrain up to Lekaj, while from there runs over agricultural areas, mostly related to crop and fruit tree production, characterized by small natural habitats in between, as well as deciduous shrub forests and woodlands mixed with meadows.

This Section maybe divided in two parts according to landscape criteria (the ones in italic are the differences of the two parts).

**Table 4-10 Landscape characteristics of Section 5B**

| Parts | Characteristics |
|---|---|
| 1. Landscapes of Kashar and Peze (from km 0+000 up to km 21+700) | A strong sense of tranquility, a high level of naturalness and a mosaic of open woodland, rough pastures, arable farmland and scattered farm buildings. Above all, the view offers distinctive panorama near Kusi Lake and Natural Park, (km 3+500 - Figure 32) and Allgjata artificial lake (partially visible from the AIC) and natural park (very close and visible from the AIC at km 7+000 - Figure 33).<br>A high degree of variation of land cover and landform with forests in the hills of Fires, Lazrit, Kuiluges<br>Vegetation dominated by groves, open woodland amongst pasture fields, roadside verge, tributaries. Forest at west and east edges along the valley of the brook Cerile until the connection point with brook of Pyllzezë (km 21+700, near Kuiluga hill).<br>*Agricultural areas, mostly related to crop and fruit tree production, characterized by small natural habitats in between, as well as deciduous shrub forests and woodlands mixed with meadows, (Peze, Çelmetaj village, km 9+000 - Figure 34).*<br>Harmonious rural character (Peze e Vogel near Erzeni River, km 13+000 - figure 35). |
| 2. Landscapes of Mushnik, Zambish, Okshun and Lekaj (from km 21+700 up to km 33+573) | A mosaic of open woodland, rough pastures, arable farmland and scattered farm buildings. Strong sense of tranquility, high level of naturalness all along this section, mostly in km 21+400 until 24+400, passing Kavaja Municipality.<br>A high degree of variation of land cover and landform contributes to enclosed views through trees.<br>Vegetation dominated by groves, open woodland amongst pasture fields, roadside verges, tributaries. Forest at western and east edges along all the section.<br>Harmonious rural character<br>*Deciduous forest shrubs covered with many types of vegetation and woodlands mixed with meadows from km 27+000 to 30+700 (Hills of Zamblishtë, south of Section 5B - Figure 37).*<br>*Character of the river valley strongly influenced by the seasons and climatic conditions visible all along the Section (km 30+700 to 32+100 - Figure 38).*<br>*Okshuni artificial lake, around 1.8 km distance from Section 5B (km 31+000 to 33+000) dominated by agriculture land and having an open view on a flat terrain before reaching the hilly terrain and rural buildings in a very open spread position. (Field of Lekajt, hills of Okshuni, Lekaj, Kerçukaj district, km 33+800 - Figure 39).* |

The only natural monument in the area is Arra e Babë Myslymit (Biomonument -Specific tree), which is at a distance of 920 m and partially visible from the AIC (km 17+400 - Figure 36).

- Section 5C Lekaj -Konjat

The topography along the proposed AIC route in this Section is totally flat. The fields of Myseqe are part of country's Western Lowlands, while are quite vast, ranging in width from about 5 km to 15 km in the west-east direction, and are confined by the Adriatic coast (west) and a range of low hills (east), along which most of the rural settlements are located (Lekaj, Gose, Cerme, Gramsh, Dushk, etc.). Myzeqe fields are intensively used for agricultural purposes (mostly crops and vegetables), while the hills are planted with olives, fruit trees and vineyards. The fields are reclaimed in the 70s through the construction of an intense network of drainage and irrigation channels. Shkumbini is the only river in the area, cutting across Section 5C at Km 6+500 (near to Rrogozhine), and then flowing in the east-west direction toward the Adriatic Sea.

On the contrary to Section 5B, which is completely a new alignment, Section 5C mostly develops along the existing double carriageway highway Sh4 that connects Durres city with other cities in Albania until the border with Greece (Kakavije). The terrain elevations in Section 5C are close to the sea level, ranging from a minimum of 9 m asl (Km 10+900) to a maximum of 25 m asl (Km 0+000). The terrain slopes along this section are quite low and relevant figures range mostly between 0% and 1%. Slightly higher scopes (1% to 2%) are observed in three short sections of a total length of about 3.0 km, which are observed in km 0+000 to 1+500 (1.5 km), km 4+400 to 4+800 (0.4 km) and km 8+500 to 9+600 (1.1 km).

*Landscape Remarks*

This Section passes mainly by a flat terrain in the west side and an upgraded to a hilly terrain in the east side of the AIC and includes the area of Lekaj, Kerçukaj, Gosë e madhe, Gosë e vogel and Konjat. It is dominated by:

- Large, rectangular fields lined by irrigation channels. These fields are accompanied by settlements which already face landscape problems (increase of linear suburban settlements) (Figure 40).
- Flat, large-scale landscape with an open and exposed character and long-distant views, (field of Lekaj and hills of Peqini closing panorama in distance, km 6+000 -Figure 41).
- Areas primarily used for farmland (Figure 41).
- Fairly open, elevated smoothly rolling plains with gentle undulations associated with watercourse near Shkumbini River, (km 6+400 to Km 6+700 - Figure 42)

The Section runs almost entirely over agricultural areas, characterized by small natural habitats in between, as well as deciduous shrub forests, while woodlands mixed with meadows in low hills nearby are very limited.

<u>Section 6+7 Konjat - Lushnje- Fier bypass</u>

Section 6+7 mostly develops along the existing double carriageway highway Sh4 that connects Durres city with other cities in Albania (Lushnje, Fier, Tepelene, Gjirokaster) until the border with Greece (Kakavije). The Section starts near to Dushk village in the north and ends up close to Mbrostar in the south, at the beginning of Fier bypass. The topography along the proposed AIC route in this Section is totally flat.

Myzeqe fields are part of country's Western Lowland. These fields are quite vast (they were also along section 5C) and confined on both sides by low rise hills oriented in the north-south direction. Myzeqe fields extend from 8 km to 15 km in width (east-west direction). The terrain elevations along Section 6+7 are close to the sea level, ranging from a minimum of 2 m asl (Km 1+600) to a maximum of 15 m asl (Km 0+000) at the beginning of this Section.

*Landscape Remarks*

Regarding both parts of this Section (6 and 7), suburban/rural developments versus natural area have a balance more in favor of natural landscape, with a mixed function area which include residential, industrial and others.

The landscape area of this Section is mainly covered by land principally occupied by agricultural land in the west side of the AIC and by areas of natural vegetation and rural building plots in the east side of the AIC.

Mostly open views are present, allowing a variety of items to be viewed within the road landscape. Hilly terrains on both sides are mostly planted with olives, fruit trees and vineyards. This creates areas with special biodiversity values. The fields are intensively used for agricultural purposes (mostly crops and vegetables) and provided with an intense network of drainage and irrigation channels.

This Section maybe divided in two parts according to landscape criteria (the ones in italic are the differences between the two parts).

**Table 4-11 Landscape characteristics of Section 6+7**

| Parts | Characteristics |
|---|---|
| 1. Landscapes of Dushk, Golem and Lushnje (from km 0+000 up to km 10+400) | Flat, large-scale landscape with an open and exposed character and long-distant views (field of Tërbufi, hills of Plena, Grabian village on the west side of the AIC, km 0+400 - Figure 43, Figure 44).<br>Very structured and controlled landscape, primarily used for arable farmland along the field of Tërbufi, Karbunarë. (Figure 43, Figure 44).<br>*Hilly terrain (near Dushku i Madh village on the east side of the AIC, km 0+000 to 2+300 - Figure 45, Figure 46) and hills of Cervegut, Malgurit. A distinguished panorama on the east side of the route with orchard and olive trees.*<br>*Very dominant element in panorama of this segment on the east side, a regional center, Lushnje City and Mountain of Harburit, 1.5 km from road corridor, and Mountain of Kasharanit 3 km distance from AIC, (km 3+000 - Figure 47).*<br>*Fairly rural character with a moderate sense of remoteness in areas away from road in Dushku i Madh village starting from km 0+000, Karbunarë e Poshtme, Lushnja Municipality, km 10+000, in distance, west side of road corridor. (Figure 48).*<br>*Agricultural lands cultivated with crops, orchard, fooder, etc, and managed habitats such as villages and settlements more affected and viewed in the east side for the entire section, and large and rectangular fields, lined by irrigation channels.* |
| 2. Landscapes of Savër, Bishqethëm, Lumth, Rrapëz fshat and Kolonje and Fier (from km 10+300 up to km 27+900) | *Small tributaries indicated by swathes of trees, shrubs and grassland (km 2+000, Savër village, field of Bishqethëm, Lushnjë Municipality, north -west side of AIC - Figure 49).*<br>*A high level of naturalness with a strong sense of remoteness, (field of Bishqethëm of Lushnjë Municipality, north - west side of the section (Figure 49, 50).*<br>Flat, large-scale landscape with an open and exposed character and long-distant views, e.g.: Field of Mbrostar, km 14+000.(Figure 51)<br>Very structured and controlled landscape, primarily used for farmland and dominated by agricultural lands cultivated with crops, orchard, fooder, etc, and by intensively managed habitats such as villages, settlements and infrastructure. (Figure 51) |

Both parts of this Section share very similar landscape characteristics. The difference is that in the first part of this Section, the hills are very close to the AIC, while unlike this, the second part is dominated by open fields/views in both sides until the AIC reaches the hills of Ardenice in the end of it.

A very important cultural monument in the area with high historical and religious value is the Saint Mary's Monastery of Ardenice, on the hills of Ardenice, in the west side of the road corridor (km 13+300, 1.8 Km from the AIC - Figure 52).

<u>Section 8 Fier bypass</u>

Apart from the first kilometer, where the alignment crosses a hill, the AIC traverses flat, low-lying land with little variation in topography. More specifically, the AIC will pass through the slopes of the hill of Petove village, will cross the railway and pass through the Fier's plain, where the relief is nearly flat. Then, the AIC will pass away from the hills of Pojani and then the Shtyllas village, still lying in the plain. At the end of the Section, the corridor will pass across Mifoli's plain.

*Landscape Remarks*

The main landscape characteristics of Section 8 (Mbrostar, Dermenas, Levan) include complex cultivation areas, transitional woodland shrubs, land principally occupied by agriculture with areas of natural vegetation and natural grasslands. The landscape character of this Section is similar to Section 6+7. Building plot versus natural landscape is balanced more in favor of natural landscape, with a mixed function: residential, industrial and others.

This Section is characterized by:

- A flat to gently rolling large-scale landscape with an open character and strong horizons.
- Very structured and controlled, primarily used for arable farmland
- Generally open and rough pastures with solitary trees and localized patches of scrub (Daullas Village, near Gjanica River, km 4+000- Figure 53).
- Isolated group of trees as a prominent feature along all section, south and west side, in a gently undulating to shelving lowland plains topography lying between 8 m -12 m asl, (Dermenas Village, km 10+100 - Figure 54).
- Agricultural lands cultivated with crops, orchard, fooder, etc, and by intensively managed habitats such as villages, spreaded settlements and local infrastructure, (fields of Mbrostar (Bishanka), before entering in Fier, km 5+000 - Figure 55).

Apollonia Archaeological Park is an important cultural monument, close but not visible from Section 8. This is an ancient city located on the right bank of Vjosa River (ancient name Aous). Its ruins are situated in the Fier Region, near the village of Pojan in a distance of 2.2 km from this Section (Figure 56).

<u>Section 9A2 Fier bypass (Levan) - Pocem (Hekal)</u>

Section 9A2 lies mostly on flat terrains that extent along the right side of Vjosa river valley. The valley has a varying width of 0.5 km to 4.0 km, along which most of rural settlements are located.

The terrain elevation around the starting point of Section 9A2 in Levan is slightly above 0.0 m asl. The AIC extends initially in the southeast direction (about 13 km) until Varibop village, reaching a maximum terrain elevation of about 10 m asl. with terrain slopes of less than 1.0 %. This first part of Section 9A-2 can be considered as almost totally flat. The terrain slopes after Varibop village slightly increase but are still less than 1.0%, reaching a maximum elevation of 34m asl, at the end of this Section in Hekal area (4 km before Pocem).

*Landscape Remarks*

The main landscape characteristics along this Section consist of complex cultivation areas, transitional woodland shrubs, land principally occupied by agriculture with areas of natural vegetation, and natural grasslands and natural areas such as forests, shrubs, pastures, meadows, and fruitless lands. Building plots versus natural is balanced more in favor of natural landscape, where building plots have a mixed function, such as residential and agricultural mix-use. This Section includes the areas of Levan, Frakull, Kafaraj, Murtezi and Varibop and is dominated by:

- Large-scale smoothly undulating plains and low hills not closer than 700 m on the north-east side of the AIC (field of Levan, Klosos near Frakull e madhe and Kafaraj village, km 0+000 to 2+000 - Figure 57).

- Strong rural character with a general absence of large-scale infrastructure (field of Bamaj, near Kafaraj village, km 5+200 - Figure 58 and km 7+000 - Figure 59).
- A flat to gently rolling large-scale landscape with an open character and strong horizons (field of Plepi, km 8+800 - Figure 60 and field of Cakrani to field of Gorishova on the west side of the Section, km 15+000 to 18+800, - Figure 61).
- Steep-sided, isolated hills and ridges in a low-lying, smoothly undulating landscape, hills of Ramësi in the north-east side of the AIC until the field of Hekal, km 19+000 until 26+900. (Figure 62).

This Section has a very important water system element, Vjosa River, which runs along the corridor and creates a distinctive landscape.

<u>Section 9B2 Pocem - Memaliaj</u>

The topography along Section 9B2 represents a variety of terrains ranging from relatively flat patches of lands to steep hills and mountains. Only a total length of about 13 km follows the existing highway Sh4 whereas the remaining length of about 24.7 km follows a new alignment, passing through steep hills and over deep depressions and water courses (including the Vjosa River) by utilizing appropriate engineering measures. This Section can be divided in five parts regarding topography. More specifically:

- The first part of Section 9B2 is about 5.5 km long (Km 0+000 to Km 5+500). The new alignment follows mostly the existing national highway Sh4 (single carriageway). The alignment follows initially the right side of Vlosa river flow for about 2.9 km, along a narrow strip of land of varying widths ranging in upstream direction from 600 m to less than 30 m, lying in between the riverbank and steep hills of northwest-southeast direction. The alignment approaches the riverbank along a section of 0.4 km (Km 2+400 to 2+800) at distances of less than 30 m. The initial area of the alignment (Km 0+000 to 1+400) extends over an almost totally flat terrain to slight high slopes. The remaining two areas along the first part of Section 9B-2 lie over much steeper terrains of varying slopes.
- The second part of Section 9B2 is about 5.1 km long (Km 5+500 to 10+600). The two motorway carriageways start separating at km 5+500 and then continue ascending on both sides of a narrow stream gorge. The carriageway on the right side of the gorge uses completely the alignment of existing highway Sh4, while the other one on the left side is completely a new alignment. Both carriageways join each other again after about 5.1 km in Km 10+600. The lowest and highest terrain elevations along the first and second part of Section 9B-2, 10.6 km in total, are 34 m asl and 264 m asl, located at the beginning of the first part and the end of second part respectively.
- The third part of Section 9B2 has a length of about 6.4 km (Km 10+600 to 17+000) and is composed of three distinct areas. The first area with a length of about 2.2 km (Km 10+600 to 12+800) lies over relatively flat terrains, following the existing national highway Sh4. The remaining 4.2 km (Km 12+800 to 17+000) includes steep terrains. The steepest part here is observed in a section of 1.5 km (Km 13+600 to 15+110), which includes a high hill followed by a deep depression. The highest terrain elevation is on top of the hill at 432.2 m asl (Km 14+000). The AIC alignment diverts from the existing national highway Sh4 in Km 13+600.
- The fourth part of Section 9B2 is about 6.9 km long (Km 17+000 to 23+900) and represents a complete new alignment, which extends over relatively flat terrains of limited width. The highest and lowest terrain elevation are 234m asl and 118 m asl, located respectively at the beginning (Km 17+000) and the end (Km 23+900) of this part.
- The fifth part of Section 9B-2 is 13.8 km (Km 23+900 to 37+700) and represents the most difficult part in terms of topographical characteristics, mostly hilly to mountainous, presenting high slopes over steep terrains that descend in perpendicular toward the AIC alignment and Vlosa river. The proposed

alignment extends over a relatively narrow strip of land located on the right side of river's flow. The highest and lowest terrain elevations are 217 m asl (Km 36+500) and 100 m asl (Km 26+700).

*Landscape Remarks*

This Section follows the existing road and is dominated by several types of landscape. Hilly and mountainous areas, the flat terrains that extend from Vjosa River as well as settlements and villages scattered all over the territory characterize this Section. This area consists of fragmented agricultural land, grassland and aquatic vegetation, natural vegetation near Vjosa River and natural woodland, Mediterranean forests, orchards as olives and vineyards in the eastern side of the hilly terrain. This Section maybe divided in five parts similarly to the topographic description above and presented below.

**Table 4-12 Landscape characteristics of Section 9B2**

| Parts | Characteristics |
|---|---|
| 1. Landscapes of Klosi (from km 0+000 up to km 5+500) | A flat to gently rolling large-scale landscape with an open character and strong horizons, sparsely settled landscape with long-distant views and strong skylines, (km 0+000 to 1+000, field of Hekali, Mallakastër - Figure 63).<br>Shallow river valley with broad sweeping meanders and steep valley sides - Vlosa river flow (km 2+000 - Figure 64).<br>Occasionally cleared areas used for native pasture grazing (near Klos village, km 4+000 - Figure 65).<br>Fairly rural character with a moderate sense of remoteness and trees along the road corridor that contribute to a strong sense of visual continuity. |
| 2. Landscapes of Kremanar and Frater (from km 5+500 up to km 10+600) | Large-scale smoothly undulating landscape and low hills in a difficult terrain on both sides of a narrow gorge stream (hills of Shullari, km 5+700 - Figure 66).<br>Sloping hillsides often open through the use of contour banks, which draw attention to the variation in landform with rural settlements, e.g.: Frater village, Hills of Dames, km 10+000, (figure 67).<br>Forest formed by mature and young trees, dead trees and shrubs. |
| 3. Landscapes of Tatoshaj, Bejar, Kute, Drizar (Km 10+600 to 17+000) | A flat to gently rolling landscape with an open character and strong horizons, e.g.: Fratar village, Hills of Dames, km 10+000, (Figure 67).<br>Occasionally cleared areas used for native pasture grazing.<br>Fairly rural character with a moderate sense of remoteness.<br>Gently sloping hillsides often open through use of contour banks, which draw attention to the variation in landform, extend on the west side. (Bejar reservoir, near Bejar village, km 13+700).<br>Forest formed by mature and young trees as well as shrubs near Zotaj village and the hill of Katamatrëng. |
| 4. Landscapes of Dames to Toç (km 17+000 to 23+900) | A relatively flat terrain, large-scale landscape with an open character and strong horizons, sparsely settled with long-distant views and strong skylines (the field of Mërtiraj, passing Zhulaj, Krahës, Lulzim, Toç village)<br>A fairly rural character with a moderate sense of remoteness and trees along road corridor that contributes to a strong sense of visual continuity.<br>Occasionally cleared areas used for native pasture grazing.<br>Large-scale smoothly undulating plains and low hills.<br>Forest formed by mature and young trees, dead trees and shrubs. |
| 5. Landscapes of Qesarat, Iliras and Memaliaj (km 23+900 to 37+700) | Occasionally cleared areas used for native pasture grazing, (near Toç to Qesarat village, mountains of Koshtina and Luftinje, km 23+000 - Figure 68 and Memaliaj, km 36+000 - Figure 71).<br>Hills and mountainous areas, presenting high slopes over steep terrains that descend toward the AIC alignment and Vlosa river (near Iliras village, km 29+000 - Figure 69). |

| Parts | Characteristics |
|---|---|
| | Sparsely settled landscape with long-distant views and strong skylines and fairly rural character with a moderate sense of remoteness (near Memaliaj village, hills of Ladova, km 34+000 - Figure 70).<br>A shallow river valley with broad sweeping meanders and steep valley sides, (in Memaliaj, km 36+000 - Figure 72).<br>Trees along the river corridor, which contribute to a strong sense of visual continuity.<br>Gently sloping hillsides which draw attention to the variation in landform, e.g.: when road corridor passes between hills of Kunjës and Graçit to Qesarat village, km 25+000 to 25+900.<br>Forest formed by mature and young trees, dead trees and shrubs, all along north-east hilly terrain, km 25+000 to 34+800. |

An important bio monument close to the Section 9B2 is Rrepet e Poçemit, at a distance of 180 m, around km 5+000, located near the water sources of the Pocem Village (Figure 73 and 74).

<u>Section 10 Memaliaj- Subashi Bridge</u>

The changing topography and high terrain slopes are typical in Section 10, which is somehow similar to the characteristics observed in few other AIC Sections, such as sections 5B and 9B2. Such characteristics, but to a much less extent, are also observed in Sections 2 (initial part) and 9A2.

Section 10 starts at the outskirt of Memaliaj town. From this point, the alignment follows completely the right side of Vlosa and Drinos river valleys. The topography along the first half of the proposed AIC route in this section develops along the right side of Vjosa river valley. This part of Section 10 start in Memaliaj town and ends up in front of Tepelene town where Vjosa and Drinos rivers join each other. The valley is quite narrow and surrounded on both sides by a range of steep hills and mountains, which become flat near the riverbanks by creating at several locations patches of relatively flat plateaus. A few rural settlements are located along the bottom part of the steep hills and mountains on the right side of these rivers, whose economic activities are primarily connected to cattle growing and livestock.

Similar terrains are also observed along the second part of Section 10, on the right side of Drinos river flow, until the end of this section at the junction with the existing highway to Gjirokaster (route Sh4). The highest and lowest terrain quotas along this Section are about 228 m asl at Km 15+800 and 114 m asl at Km 0+000 respectively. The terrain slopes in few locations are very low. These almost flat terrains (3.5 km in total) are observed in Km 0+400 to 0+900 (0.5 km), Km 1+900 to 2+700 (0.8 km) and Km 6+900 to 9+100 (2.2 km). Other terrains (4.9 km in total) with relatively low slopes, are observed in Km 9+300 to 9+900 (0.6 km), Km 10+800 to 11+400 (0.6 km), Km 11+700 to 12+600 (0.9 km), Km 16+300 to 18+800 (2.5 km) and Km 19+900 to 20+200 (0.3 km). With the exception of the terrains above, both equaling 8.1 km (3.5+4.9) and about 40% of the entire Section 10, the rest of this Section is represented by quite steeper terrains.

*Landscape remarks*

This Section, as described above, follows completely a new alignment, passing in the right side of Vlosa and Drinos river valleys to a partially flat and gradually elevated hilly terrain. This area is dominated by several types of landscape. The mountainous, hilly and flat terrains that extend from Vjosa and Drinos Rivers in one or both sides of the AIC characterize the Section while settlements and villages are scattered all over the territory, mostly far from the road corridor. Additionally, the mountains, hills, fields, valleys, rivers, waterfalls, ravines and a considerable number of caves make this area a greater touristic attraction to be explored. The huge variety of landscape characteristics from agricultural land with areas of natural vegetation and transitional pasture to natural areas such as forests in 800-1200 m altitude, shrubs in 600-800 m altitude, pastures, meadows and fruitless lands make this Section a distinctive one.

This Section maybe divided into two parts according to landscape criteria (the ones in italics indicate the differences between the two parts).

**Table 4-13 Landscape characteristics of Section 5B**

| Parts | Characteristics |
|---|---|
| 1. Landscapes of the area of Vjosa valley, (km 0+000 to km 10+180) | *A flat to gently rolling large-scale landscape with an open character and strong horizons, sparsely settled landscape with long-distant views and strong skylines (km 0+200 near Memaliaj, Vjosa river valley, near hills of Dames area - Figure 75), (Near Tepelene town, Vjosa river valley, km 5+000 - Figure 78, 79).*<br>*Occasional riverside lagoons, which contain a transitory wetland character (Vjosa river valley - Figure 78).*<br>Shallow river valley with broad sweeping meanders and steep valley sides. (Figure 79).<br>Occasionally cleared areas used for native pasture grazing and fairly rural character with a moderate sense of remoteness, (near the mountains of Shendellise - Figure 76, 77).<br>Gently sloping hillsides cut by contour banks, extending on the east side.<br>Forest formed by mature and young trees, and shrubs near Memaliaj town |
| 2. Landscapes of the area of Drinos valley (km 10+180 to km 20+200) | *Large-scale smoothly undulating plains and high hills but in a difficult terrain, on both sides of a narrow gorge stream (near Beçishti village and Maintain of Shendellise in distance, km 11+000 - Figure 80).*<br>Sloping hillsides cut by contour banks, extending on the east and west side, (field near Harmova village - Figure 82).<br>Forest formed by mature and young trees, dead trees and shrubs. (Figure 81).<br>*Fairly rural character with a moderate sense of remoteness and trees along the road corridor that contributes to a strong sense of visual continuity (Drinos river valley, near Luzati village, km 12+000 - Figure 81).*<br>Occasionally cleared areas used for native pasture grazing (Harmova village, in a distance from Çajupi Mountain, km 19+000 - Figure 82). |

This landscape is enhanced by water systems such as Vjosa River and its branches Drino-Benca-Luftinje, and subterranean waters represented by massive karstic sources such as Cold Water of Tepelene, Hormova, Lekel, Bença, Gurra in Progonat, Bambulli in Dukaj etc.

Important Bio monuments visible or partly visible from section 10 are the following:

1. Rrapi i Dervenit, bio monument, at a distance of 210 m, located near Derven village (Figure 83).
2. Uji I Ftohtë (Cold Water), at a distance 300 m from AIC, 8 km south of the city of Tepelene. It has such a name because the area is dominated by natural-rocky springs where the water always flows cold and clean on the rocks of Tepelene Mountains. (Figure 84).

<u>Section 11 Subashi Bridge - Gjirokaster Bypass</u>

The topography along this Section is almost totally flat. The AIC follows the left side of Drinos river valley (Dropull fields), which has a varying width in east-west direction ranging from 100 m to more than 1.0 km, as measured between the river's bank and bottom part of the steep hills and mountains located on the west. Section 11 has primarily a north-south direction and cuts across the valley by following completely the route of the existing national highway Sh4 (Tepelene-Gjirokaster).

A limited number of rural settlements is located on the west of the Section at the bottom part of the surrounding hills and mountains. These settlements are served by local roads, which are connected to the existing national highway (Sh4).  A few terrain irregularities are observed along a short section of about 0.7 km (Km 2+800 to 3+500), while a land depression is represented by the riverbed of Kardhiqi River. The highest and lowest terrain elevations in Section 11 are about 203.7 m asl and 166m asl at Km 6+000 and 0+100 respectively.

*Landscape remarks*

This Section is dominated by several types of landscapes such as flat terrains, hills and mountains in a distance from the road corridor and settlements and villages. The land is principally occupied by agriculture land mostly in the east side of the AIC and rural building plots in the west side of AIC, by natural vegetation and transitional pastures. This Section has a similar character and landform to Section 10.

This Section includes the area of Drinos river valley and is characterized by:

- Occasional riverside lagoons, which have a transitory wetland character (km 0+000 - Figure 85).
- A relatively flat terrain, large-scale landscape with an open character and strong horizons, sparsely settled, with long-distant views and strong skylines near mountains (village of Picari - Figure 86).
- A rural character with a moderate sense of remoteness and few trees along the road corridor that contribute to a strong sense of visual continuity all along Drinos river valley (near Picari village, km 2+150 - Figure 87).
- Creek valleys that contain a distinctive character, with typical rocky springs and valley sides full of trees , (km 5+000, Humelica village -Figure 88, 89).
- Occasionally cleared areas used for native pasture grazing or agricultural, such as the area after Kardhiqi Bridge (km 8+170), the field of Valarese, the Mashkullora village, the Mountain of Lunxhëri in distance not closer than 6 km from Section 11 and the area from km 9+070 to the end of the Section. (Figure 90).

Section 12 Gjirokaster bypass

Section 12 is a completely new alignment and represents the new Gjirokaster bypass, aiming at releasing traffic from the city's road network. The alignment follows the valley on the right side of Drinos River along the Dropull fields. The medieval city of Gjirokaster, a site protected by UNESCO, is located on the west of Section 12. A number of rural settlements are located on the east at a relatively low distance, namely Asim Zeneli, Arshi Lengo, Topullaraj and Valare, while other villages are located further away. All these villages are connected in the east-west direction with Gjirokaster city through the regional road to Valare, which crosses in a wide angle with Section 12. With few minor exceptions, the topography along Section 12 is almost flat. The flat terrains have a varying width in east-west direction ranging from 0.8 m to 1.8 km. The closest distances between the Drinos river and motorway embankment are observed along the initial 1.2 km (Km 0+000 to 1+200) and range from 50 m to 120 m. The highest and lowest terrain elevations in Section 12 are 205 m asl and 187 m asl at Km 9+700 and 0+700 respectively.

*Landscape remarks*

This Section is dominated by flat terrains, hills and mountains in some distance from the AIC and extends along the Drinos River valley, while settlements and villages are scattered all over the territory (Gjirokastër Municipality, Field of Dropulli). The area is also occupied by agriculture land in the east and west side of the alignment and rural building plots in the west side of the AIC, near the existing road.

The main types of vegetation are natural and aquatic along the riverbanks, shrubs and agricultural in flat lands. The fields are intensively used for agricultural purposes (mostly crops and vegetables) and provided with an intense network of drainage and irrigation channels. The hilly terrain on both sides is mostly planted with orchards.

This Section includes the landscapes of the area of Dropulli field and Drinos river valley, which are characterized by:

- Agricultural lands cultivated with crops, orchard, fodder and by intensively managed habitats such as villages settlements and infrastructure (Mashkullore area, near Viroi basin, km 0+500 - Figure 91).
- Occasional riverside lagoons, which have a transitory wetland character and by a wide, shallow river valley with broad sweeping meanders (Drinos River flow, km 2+000 - Figure 92).
- A relatively flat terrain, large-scale landscape with an open character and strong horizons, sparsely settled rural buildings, with long-distant views and strong skylines with mountains (field of Dropulli, hill of Bardhe, and mountains of Lunxheri, km 8+600 - Figure 93).
- Mountainous areas are more visible from the AIC such as the mountain "I Gjerë" on the west side of the AIC, the mountain Lunxherisë and the mountain Buretos from the east side of the AIC. (Figure 94).

Regarding cultural monuments, Gjirokastër Castle (UNESCO cultural heritage site) is situated at a height of 336 m in a distance of 2km from the AIC (Figure 95).

<u>Section 13A Gjirokaster bypass - Kakavije</u>

Section 13A follows mostly the existing highway Sh4 on the left side of Drinos river, since the proposed design considers the doubling and upgrading of it. The AIC alignment has a predominantly northwest-southeast direction and the topography along the entire section is almost totally flat. The flat terrains have a varying width in east-west direction ranging from 2.0 m to 4.0 km. The lowest and highest terrain quotas in Section 13A are about 200 m asl at Ch. 1+200 and 308 m asl at Ch. 23+600 respectively. Several rural settlements are located on the west side of the alignment at bottom part of a range of hills and mountains (Derviçan, Goranxi, Dhuvjan, Terihat, Gorice, Frashtan, Grapsh, Jorgucat, Zervat, Bularat, Bodrishte, Vodhime).

These settlements are provided with access roads, connecting them to the new motorway and nearly land properties through an adequate number of interchanges, underpasses and overpasses. Two national roads are connected to the AIC alignment, including the existing national roads to Sarande (Sh99) and Libohove (Sh96). The terrain slopes are mainly less than 1.0% except for two short subsections (1.5 km in total) at the start and end of Section 13A where relevant slopes reach up to 2.5%.

*Landscape remarks*

The hillsides in the south- west part of the AIC and the field of Dropulli and Drinos River in the north east, make this Section different from the other Sections. This Section goes over or near to the existing road on a flat terrain, while it passes through agricultural lands with medium to high agro-productive capacity.

Villages such as Lazarat, Derviçan, Goranxi, Vanistra, Haskovë, Dhuvjan, Sofraticë, Terihati, Gorica, Frashtani, Lugar, Grapsh and Jorgucat are in a distance less than 1 km from the AIC, while a hills range with the mountain I Gjerë and Muzinës is also noticeable.

This Section includes the landscapes of the area of Drinos valley and the field of Drropul and is dominated by:

- Agricultural lands cultivated with crops, orchard and fodder and by intensively managed habitats such as villages settlements and infrastructure. (Figure 96, 97,98).
- Fairly open, elevated smoothly rolling plains with gentle undulations associated with Drino watercourses. (Figure 99).
- Wide, shallow river valley with broad sweeping meanders and valley sides, starting from the foothills of the mountain I Gjerë
- Watercourses coming from the west – east side of the AIC, which comprise a shallow valley, fringed by open agricultural and grassland. (Figure 96, 99).

- Some remnant natural areas, including the mountain I Gjerë from the one side and the field of Dropulli i Sipërm and Dropulli i Poshtëm to the other side. Libohove village and Glina natural /mineral water source are in a distance from the AIC. (Figure 102).
- Sparsely settled landscape with long-distant views and strong skylines (Figures 101,103).
- Strong rural character with a perceived sense of remoteness and tranquility away from main road (Figures 100, 102).

The cultural monument that is close to the AIC is the ancient theatre in the Drinos river valley, near the village of Sofratikë, Hadrianopolis (590 m from AIC - Figure 104).

### 4.1.5 Geology

#### 4.1.5.1 Introduction

This analysis provides an overview of the geology, geomorphology and geotechnical characteristics of areas which seem to be affected by proposed AIC in Albania. A description of geological settings, including stratigraphy and rock type description, of the geological-engineering conditions including geotechnical rock classification and of geomorphology is prepared for each Section of the AIC. Analytical geotechnical maps are presented per Section in Annex 1 (scale 1:50.000), while also a geological map is given in the same Annex.

#### 4.1.5.2 Geological characteristics along the Sections

Section 1

Section 1 passes through the plain of Bregu i Bunes. The very low altitudes and the continuous floods of Buna River have contributed to the creation of wetlands and lagoons such as Pentar in Velipoja, Belaj, and Domni etc. The plain of Torovice (Kakariqit) was flooded in the past and has obtained material and soils from the drainage of Kakariq marsh (swamp). It is situated on a depression (Graben) through which the Drini River flows, depicted by the presence of fluvial deposits under the peat layer. The site is composed of limestone (Kakariq, Renc), flysch (hills of Bërdica, Bushat, Barbullush, Dajç) and alluvial deposits, resulting from the disposal of the solid discharge of Drini, Buna and Gjadri rivers. The alluvial deposits are coarse grained and reach a thickness up to about 100 m. Swamp deposits are also present mainly in the areas of Velipoja, Kakariqi, Zadrimë and others.

**Table 4-14 Geological characteristics of Section 1**

| Section | Rock formations | Geological-geoengineering characteristics | Geotechnical characteristics |
|---|---|---|---|
| 1 | Upper Paleogene Deposits (Lower Oligocene - Pg13)<br>Quaternary deposits – Q | The claystones dominated in flysh (weak rocks), deposits of the Lower Oligocene are situated in the hills of Muriqani, Dajçi i Bunes, Mushan and Bushat.<br>The silty clays are alluvial deposits of the pleistocene-holocene, and the alluvial deposits of the Holocene encountered in the Nenshkodra plain like Zadrima plain and in the area of Bregu i Bunes.<br>The organic silty clays are encountered in the upper part of the former swamp of Ishem-Tirane, Thumane-Mamuras, Torovice, Zadrime etc. | Section 0.0-3.2km, 3.85-8.5km, 9.2-19.45km, 22.2-40.95km<br>Section 3.2-3.85km, 8.5-9.2 km and 38.8-39.05km<br>Section 19.7-20.1 km and 21.8-22.2 km |

Regarding the geotechnical conditions, the following can be noted:

- Section 0.0-3.2km, 3.85-8.5km, 9.2-19.45km, 22.2-40.95km

This site is composed by two geotechnical units, which are:

Geotechnical unit 1:

The upper part of Section 1 of the A-I corridor is presented by vegetal soils. This geotechnical unit is 0.3-0.5m thick.

Geotechnical unit 2:

This unit is composed by gravel-sand-silts mixtures, which are in medium to dense state. This geotechnical unit has a thickness of 3.5-5.0m, which is more in some sites. According to "USCS" classification, these soils are included in "GM" group. The allowed bearing capacity of these soils is $\sigma$=2.5-3.0kg/cm$^2$ and, as such, classified into the group of construction sites of medium bearing capacity.

- Section 3.2-3.85km, 8.5-9.2km and 38.8-39.05km

The site consists of the one geotechnical unit, which is represented by gravel-sand-silt mixtures, medium to loose relative density with medium to high water content. According to "USCS" classification, these soils are included in "GM" group. This layer is found in upper part of lithological profile and has a thickness exceeds 5.0m. The allowed bearing capacity of these soils is $\sigma$=2.0-2.5kg/cm$^2$, which is classified into the group of construction sites of low bearing capacity.

- Section 19.7-20.1 km and 21.8-22.2km

These sections are composed by flysch rocks. They are weak rocks and consist of sandstone intercalated with siltstones and claystones layers.

*Potential landslide site:* These formations are subject to landslides in case of excavation works during road construction. The potential landslide sites are respectively located respectively in south west side and south east side of alignment.

Section 2

Section 2 passes over a territory that is included in Lezhe–Tirana plain. This plain is formed in the Tirana-Ishem syncline. This Section, starting from Renci mountain, passes completely over the Quaternary deposits (Holocene) that are part of the commonly called Fusha e Lezhes, which constitute one of the most important aquifers of Albania. In the northern part, the Quaternary deposits overlie the limestones of Kruja zone. The boundary of Quaternary deposits follows the Milot-Shengjin road, with the exception of the Pllana plain and Manati area where this boundary goes further to the east.  Such deposits are represented by gravels, sands, silts, clays and mixed soils. Additionally, the Quaternary deposits are included in the silty clays formations. The thickness of these deposits is up to several meters (60-65 m), while they are represented by silty clays to clayey silts, with moisture content ranging at wide limits, depending on the groundwater table.

**Table 4-15 Geological characteristics of Section 2**

| Section | Rock formations | Geological-geoengineering characteristics | Geotechnical characteristics |
|---|---|---|---|
| 2 | Upper Cretaceous deposits (Cr2).<br>The Alluvial deposits of Drini i Lezhës (Qh) (Lezhe - Lezha Island) and alluvial deposits of Mati River in Fushe Milot area.<br>The Lagoon deposits (Qh) in the areas of Rrile, Tresh and Zejmen. | Limestones of Kruja zone<br>Silty clays to clayey silts | Section 0.0-1.22 km<br>Section 1.22-2.3 km and 9.88-10.3 km<br>Section 2.3-4.22 km, 4.37-9.88 km, 10.30-13.70 km and 14.2-16.2 km<br>Section 4.22-4.37 km and 13.7-14.2 km |

Regarding the geotechnical conditions, the following can be noted:

- Section 0.0-1.22 (Tunnel)

This site is composed by strong rocks, which are represented by massive limestones. According to Bieniawski, 1989, these rocks are included in the good to very good rock of rock mass class.

- Section 1.22-2.3km and 9.88-10.3km

This site is composed by two geotechnical units, which are:

Geotechnical unit 1:

The upper part of Section 1 of the A-I corridor is presented by vegetal soils. This geotechnical unit is 0.3-0.5m thick.

Geotechnical unit 2:

This unit is consisted of marsh deposits. These soils are represented by organic silts and organic silty clays. According to "USCS" classification, these soils are included in "OL" group. It is situated below the geotechnical unit 1 and has a thickness of 2.5-4.0m. Allowed bearing capacity is $\sigma$=1.4-1.5 kg/cm$^2$, and classified into the group of construction sites of low bearing capacity.

- Section 2.3-4.22km, 4.37-9.88km, 10.30-13.70km and 14.2-16.2km

The site consists of two geotechnical units. Starting from the top, the soil's profile is represented by:

Geotechnical unit 1:

The upper part of the profile is represented by vegetal soils. This geotechnical unit is 0.3-0.5m thick.

Geotechnical unit 2:

This geotechnical unit is composed by inorganic silty and clayey sands, medium to stiff consistency with medium to high water content. According to "USCS" classification, these soils are included in "SM and SC" group. It is situated below geotechnical unit 1 and has a thickness of 3.5-5.0m. Allowed bearing capacity of soil is $\sigma$=1.6 -1.8 kg/cm$^2$ and classified into the group of construction sites of low bearing capacity.

- Section 4.22-4.37km and 13.7-14.2km

The site consists of one geotechnical unit, which is represented by silty gravel, medium to loose relative density with medium to high water content. According to "USCS" classification, these soils are included in "GM" group. This layer is found in upper part of lithological profile and has a thickness varies from 3.0-4.0m to 7.0-9.0m. The allowed bearing capacity of these soils is $\sigma$=2.0-2.2kg/cm$^2$, which is classified into the group of construction sites of low bearing capacity.

<u>Section 3</u>

Section 3 passes over the same geomorphological terrain as Section 2 does. The territory is also included in the Lezhe–Tirana plain, which is formed in the Tirana-Ishem syncline. Along Section 3, the geological formations are the same with those of Section 2. The Quaternary deposits are represented by silty clays to clayey silts, with a wide moisture content range, depending on the groundwater table. Their consistency ranges from liquid to semi-solid state. Regarding geotechnical characteristics, the following sections can be defined:

- Section 0.0-2.4km

The site consists of two geotechnical units. Starting from the top, the soil's profile is composed by:

Geotechnical unit 1:

The upper part of the profile is presented by vegetal soils and this geotechnical unit is 0.3-0.5m thick.

Geotechnical unit 2:

This geotechnical unit is composed by inorganic silty and clayey sands, medium to stiff consistency with medium to high water content. According to "USCS" classification, these soils are included in "SM and SC" group. It is situated below geotechnical unit 1 and has a thickness 3.7-5.0m. The allowed bearing capacity of this soils is $\sigma$=1.6 -1.8 kg/cm$^2$ and classified into the group of construction sites of low bearing capacity.

- Section 2.4-7.85 and 10.9-13.5km

The road site is composed by two geotechnical units, i.e.:

Geotechnical unit 1:

The upper part of the profile is presented by vegetal soils. This geotechnical unit is 0.3-0.5m thick.

Geotechnical unit 2:

It is built by sand-silt mixtures and sand-clays mixtures, medium consistency with medium to high water content. According to "USCS" classification, these soils are included in "SM and SC" group and situated below the geotechnical unit 1 with a thickness of 2.0-3.5m. The allowed bearing capacity is $\sigma$=1.2-1.5 kg/cm$^2$ and classified into the group of construction site of low bearing capacity.

- Section 7.85-10.9km

This site is composed of one geotechnical units. It consists of gravel-sand-silts mixtures, which are in medium state. This geotechnical unit is 5.0-7.0m thick. According to "USCS" classification, these soils are included in "GM" group. Allowed bearing capacity of this soils is $\sigma$=2.5-2.8kg/cm$^2$, which is classified into the group of construction site of medium bearing capacity.

Section 4

Section 4 crosses mixed hilly and flat areas, separated by stream and river valleys. From the geological point of view, the Molasses of Preze are included in the group of Sandstone-Conglomerate dominated Molasses. Due to their composition and geotechnical properties, these rocks are used as building materials at great extent.

**Table 4-16 Geological characteristics of Section 4**

| Section | Rock formations | Geological-geoengineering characteristics | Geotechnical characteristics |
|---|---|---|---|
| 4 | Clay Dominated Molasses<br>Sandstone-Conglomerate dominated Molasses<br>Quaternary deposits | Sandy silts, with a moisture content range in Koder Vore | Section 0.0-1.2km<br>Section 1.2-18.8 km<br>Section 18.8-20.0km |

In the areas without vegetation, clays are subject to intense weathering processes.

Regarding the geotechnical conditions, the following can be noted:

- Section 0.0-1.25km

The road site is composed by two geotechnical units, i.e.:

Geotechnical unit 1:

The upper part of the profile is presented by vegetal soils. This geotechnical unit is 0.3-0.5m thick.

Geotechnical unit 2:

It is built by sand-silt mixtures and sand-clays mixtures, medium consistency with medium to high water content. According to "USCS" classification, these soils are included in "SM and SC "group and situated below the geotechnical unit 1 with a thickness of 2.0-3.5m. Allowed bearing capacity is $\sigma$=1.2-1.5 kg/cm$^2$ and classified into the group of construction site of low bearing capacity.

- Section 1.25-19.0 km

The site consists of three geotechnical units. Starting from the top, the soil's profile is represented by:

Geotechnical unit 1:

The upper part of the profile is presented by vegetal soils. This unit is 0.3-0.5m thick.

Geotechnical unit 2:

This unit is composed by inorganic silty and clayey sands, medium to stiff consistency with medium water content. According to "USCS" classification, these soils are included in "SM and SC" group. It is situated below geotechnical unit 1 and has a thickness of 4.5-5.5m. Allowed bearing capacity of these soils is $\sigma$=1.6 -1.8 kg/cm$^2$ and classified into the group of construction sites of low bearing capacity.

Geotechnical unit 3:

It is situated below of geotechnical nr. 2. This geotechnical unit represents of silty gravel, medium to loose relative density with medium to high water content. According to "USCS" classification, these soils are included in "GM" group. This layer is found in upper part of lithological profile and has a thickness varies from 4.0-5.0m to 8.0m. The allowed bearing capacity of these soils is $\sigma$=2.0-2.2kg/cm$^2$, which is classified into the group of construction sites of low bearing capacity.

- Section 19.0-21.0km

The site consists of two geotechnical units. Starting from the top, the soil's profile is represented by:

Geotechnical unit 1:

Upper part of the profile is presented by vegetal soils. This unit is 0.3-0.5m thick.

Geotechnical unit 2:

It's represented by deluvial soils. They are inorganic silts and silty clays with brown-beige color, of low-medium of plasticity, intercalated with thin layer of very fines sands, medium to stiff consistency and it has medium water content. According to "USCS" classification, these soils are included in "CL and ML" group. The allowed bearing capacity of these soils is $\sigma$=1.5 -1.8 kg/cm$^2$ and classified into the group of construction sites of low bearing capacity.

Section 5

Section 5 (sub-sections 5B+5C) passes through molasses deposits of Middle Pliocene and Miocene. This molasses consists of conglomerates, claystones-siltstones and sandstones intercalation, representing a hilly and "jagged" relief affected by high intensity denudation processes. This Section runs through the lowlands separated by each other from ranges of hills in a West East direction, while several areas along the Section have suffered by soil erosion, caused by soils wash during intensive rainfalls. The seasonal streams have created a high variety of relief, creating medium to high vertical fragmentation.

From the lithological point of view, most of the Neogene deposits are composed by claystones and siltstones and conglomerates and sandstones, as well.

**Table 4-17 Geological characteristics of Section 5**

| Section | Rock formations | Geological-geoengineering characteristics | Geotechnical characteristics |
|---|---|---|---|
| 5 | Molasses deposits of Middled Pliocene and Miocene | Conglomerates, claystones-siltstones and sandstones intercalation, | Section 5B<br>Section 0.0-3.0km<br>Sections 3.0-9.3 km, 21.9-23.3 km and 30.8-32.0km<br>Section 30.8-31.3km (Tunnel)<br>Section 9.3-10.15km, 10.3-11.1km, 11.6-12.0km, 12.7-13.6km, 14.6-17.4 km, 25.0-30.8 km and 32.0-33.7km<br>Sections 10.15-10.3km, 11.1-11.6km, 12.0-12.7km, 13.6-14.6km, 17.4-21.9km and 23.3-25.0km<br>Section 18.65-20.3km (Tunnel) |
| | | | Section 5C<br>Section 0.0-6.4km and 6.67-14.2 km<br>Section 6.4-6.67 km<br>Section 9.15-10.35km, 11.2-11.55km and 12.1-12.55km |

Regarding the geotechnical conditions, the following can be noted for Section 5B:

- Section 0.0-3.0km and 31.6-33.6km

The site consists of two geotechnical units. Starting from the top, the soil's profile is represented by:

Geotechnical unit 1:

The upper part of the profile is presented by vegetal soils. This unit is 0.3-0.5m thick.

Geotechnical unit 2:

This unit is represented by deluvial soils. These are inorganic silts and silty clays with brown-beige color, of low-medium of plasticity, intercalated with thin layer of very fines sands, medium to stiff consistency and it has medium water content. According to "USCS" classification, these soils are included in "CL and ML" group. Allowed bearing capacity is $\sigma$=1.5 -1.8 kg/cm$^2$ and classified into the group of construction sites of low bearing capacity.

- Sections 3.0-9.0 km, 21.65-23.0 km and 30.65-31.60km

This site consists of premolasses rocks. These are weak rocks and are composed by marl, marls claystones, conglomerate and sandstones.

*Potential landslide site:* These formations are subject to landslides in case of excavation works during road construction. The potential landslide sites are respectively located respectively in south west side and south east side of alignment.

- Section 4.2-5.1km, 18.45-201km and 30.65-31.1 km (Tunnel)

These sections are composed by premolasses rocks, which are weak rocks. They are composed by marl, marls claystones, conglomerate and sandstones. Based to Bieniawski, 1989, these rocks are included in very poor rock of rock mass class.

- Section 10.0-11.70km, 12.45-13.50km, 14.4-15.75km, 16.25-17.20km and 24.70-30.65km

Section 5B is composed by two geotechnical units, which consist of:

Geotechnical unit 1:

The upper part of the profile is presented by vegetal soils. This unit is 0.3-0.5m thick.

Geotechnical unit 2:

This unit is built by sand-gravel-silts mixtures, which are in medium to dense state. This geotechnical unit has a thickness of 3.5-5.0m and more in some sites. According to "USCS" classification, these soils are included in "GM" group. Allowed bearing capacity of these soils is $\sigma$=2.5-3.0kg/cm$^2$ and classified into the group of construction sites of medium bearing capacity.

- Sections 9.9-10.0km, 11.7-12.45km, 13.5-14.4km, 15.75-16.25km, 17.20-21.65km and 23.0-24.70km

These are built by molasses rocks. They are very weak rocks and consist of siltstones and claystone's. These rocks are susceptible to erosion and weatherable forming a clayey horizon of residual soil.

*Potential landslide site:* These formations are subject to landslides in case of excavation works during road construction. The potential landslide sites are respectively located respectively in south west side and south east side of alignment.

Regarding the geotechnical conditions, the following can be noted for Section 5C:

- Sections 0.0-6.4km and 6.67-14.2 km

The site consists of two geotechnical units. Starting from the top, the soil's profile is represented by:

Geotechnical unit 1:

The upper part of the profile is presented by vegetal soils. This unit is 0.3-0.5m thick.

Geotechnical unit 2:

It is composed by sand-gravel-silts mixtures. These soils are in medium state and have thickness of 4.0-6.0m. According to "USCS" classification, these soils are included in "GM" group. Their allowed bearing capacity is $\sigma$=2.5-2.8 kg/cm$^2$ and, classified into the group of construction sites of medium bearing capacity.

- Section 6.4-6.67 km

This site is composed by one geotechnical unit, which consists of silty gravel, which are in medium state. This unit is 15-20.0m thick. According to "USCS" classification, these soils are included in "GM" group. Their allowed bearing capacity is $\sigma$=2.3-2.5kg/cm$^2$ and, classified into the group of construction sites of medium bearing capacity.

- Section 9.15-10.35km, 11.2-11.55km and 12.1-12.55km

It is built by molasses formations. They are weak rocks and consist of conglomerate and sandstones rocks.

*Potential landslide site:* These formations are subject to landslides in case of excavation works during road construction. Generally, the potential landslide sites are extended in east side of alignment.

<u>Section 6 and 7</u>

Section 6 goes through Quaternary deposits (Qp-h) which are represented by mixed alluvial-proluvial deposits, composed of gravels, sands and silts. These deposits overlay the bedrock and outcrop near the hills of Konjat, Dushk and Golemas as well as along the Lushnja bypass (please refer to Technical description). These deposits are also encountered at the foot of the hill of Radostima in Fier Bypass section. In the upper part, these deposits are covered by a peaty silty clay layer (St) from Konjat to about 2.5-3 km beyond the roundabout of Plugu. The common feature of these formations is the presence of peat and a rich organic material, as well as the intercalation of clays, silts and sand. The rest is composed of silty clays (SA).

Regarding the geological formations of Section 7, which passes over the existing road, Section 7 goes through the Quaternary deposits (Qp-h) which are mainly represented by mixed alluvial-proluvial deposits, composed of gravels, sands and silts. These deposits overly the bedrock and outcrop near the hills along the Lushnja bypass. More specifically, Section 7 runs over the deposits of the alluvial deposits of Holocene and the Swamp deposits. The Alluvial deposits of Holocene are composed of clays, sands, silts and gravel, formed as a result of the activity of the Seman River. Swamp deposits along the road corridor are mainly encountered in the areas of the former swamps, and are mainly represented by clay and clayey soils, with organic matter content.

**Table 4-18 Geological characteristics of Section 6 and 7**

| Section | Rock formations | Geological-geoengineering characteristics | Geotechnical characteristics |
|---|---|---|---|
| 6+7 | Quaternary deposits (Qp-h)<br>Pliocene Deposits (N2),<br>Alluvial deposits of Holocene<br>Organic soils deposits (Qh)<br>Swamp deposits | The organic soils denoted with St Symbol are encountered in the upper part of the former swamp of Terbufi.<br>The Silty Clays denoted with SA symbol include the alluvial deposits of Semani River from Lushnje to Levan. Deformations, at considerable length, are also present in the old Lushnje - Fier road.<br>Sandstone-Conglomerate dominated Molasses (Mkr) include the deposits of Neogene located in the hills of Ardenica, in the Lushnje-Fier section. | Section 0.0-10.1 km and 22.8-28.0km<br>Section 10.1-22.80km |

Regarding the geotechnical conditions, the following can be noted for Section 6 and 7:

- Section 0.0-10.1 km and 22.8-28.0km

The site consists of two geotechnical units. Starting from the top, the soil's profile is represented by:

Geotechnical unit 1:

The upper part of the profile is presented by vegetal soils. This unit is 0.3-0.5m thick.

Geotechnical unit 2:

It is composed by sand-gravel-silts mixtures. These soils are in medium state and have thickness of 4.0-6.0m. According to "USCS" classification, these soils are included in "GM" group. Their allowed bearing capacity is $\sigma$=2.5-2.8 kg/cm$^2$ and, classified into the group of construction sites of medium bearing capacity.

- Section 10.1-22.80km

This site is composed by two geotechnical units, which are given below:

Geotechnical unit 1:

The upper part of the profile is presented by vegetal soils. This unit is 0.3-0.5m thick.

Geotechnical unit 2:

This geotechnical unit is composed by the silty gravel, which are in medium to dense state. This unit is >15.0m thick. According to "USCS" classification the soils are included in "GM" group. Their allowed bearing capacity of is $\sigma$=2.8-3.8kg/cm$^2$, and classified into the group of construction sites of medium to high bearing capacity.

Section 8

Section 8 goes through Quaternary deposits (Qp-h) which are represented by deluvial, alluvial, and proluvial deposits, composed of gravels, sands and silts. These deposits overlie the bedrock and outcrop near the hills of Fieri bypass. The relief is moderate to flat, and the hills going through fields have North/West South East direction, with tendency of West-East.

Section 8 crosses the same geological formations as Section 7 does, namely Pliocene Deposits (N2), alluvial deposits of Holocene and the organic soils deposits (Qh), which are described above.

**Table 4-19 Geological characteristics of Section 8**

| Section | Rock formations | Geological-geoengineering characteristics | Geotechnical characteristics |
|---|---|---|---|
| 8 | Quaternary deposits (Qp-h)<br>Pliocene Deposits (N2),<br>Alluvial deposits of Holocene<br>Organic soils deposits (Qh) | Silty Clays (SAp) are encountered at the West of Pojan along the Fier Bypass section.<br>Sandstone-Conglomerate dominated Molasses (Mkr) are included in the deposits of Neogene located at the hills of Radostima in the Fier Bypass section. | Section 0.0-2.15km, 2.65-3.12 km, 6.0-6.7 km, 8.65-12.75km, 14.0-16.4 km and20.1-22.0 km<br>Section 2.15-2.65km<br>Section 3.12-3.25 km<br>Section 3.25-6.0 km, 6.7-8.65 km, 12.75-14.0km and 16.4-20.1 km |

Regarding the geotechnical conditions, the following can be noted for Section 6 and 7:

- Sections 0.0-2.15km, 2.65-3.12 km, 6.0-6.7 km, 8.65-12.75km, 14.0-16.4 km and 20.1-22.0 km

The site consists of two geotechnical units. Starting from the top, the soil's profile includes:

Geotechnical unit 1

The upper part of the profile is presented by vegetal soils. This unit is 0.3-0.5m thick.

Geotechnical unit 2

It is represented by sand-gravel-silts mixtures. These soils are in medium state and have a thickness of 7.0-9.0m. According to "USCS" classification, these soils are included in "GM" group. Their allowed bearing capacity is $\sigma$=1.8-2.2 kg/cm$^2$ and, are as such classified into the group of construction sites of medium bearing capacity.

- Section 2.15-2.65km

This section is composed by molasses rocks, which are weak rocks. They consist of conglomerate and sandstones.

*Potential landslide site:* These formations are subject to landslides in case of excavation works during road construction. Generally, the potential landslide site is extended on both side of alignment.

- Section 3.12-3.25 km

This site is composed by one geotechnical unit, which is composed by the silty gravel, which are in medium to dense state. The unit is >25.0m thick. According to "USCS" classification, these soils are included in "GM" group. Their allowed bearing capacity is $\sigma$=2.5-2.8kg/cm$^2$, and, are as such classified into the group of construction sites of medium bearing capacity.

- Sections 3.25-6.0 km, 6.7-8.65 km, 12.75-14.0km and 16.4-20.1 km

The site consists of two geotechnical units. Starting from the top, their soil's profile includes:

Geotechnical unit 1:

The upper part of the profile is presented by vegetal soils. This unit is 0.3-0.5m thick.

Geotechnical unit 2:

This unit is composed by inorganic silty and clayey sands, medium to stiff consistency with medium water content. According to "USCS" classification, these soils are included in "SM and SC" group. This unit is situated below geotechnical unit 1 and has a thickness of 4.2-5.7m. The allowed bearing capacity of soils is $\sigma$=1.7 -1.8 kg/cm$^2$ and, are as such classified into the group of construction sites of medium bearing capacity.

<u>Section 9A2</u>

Section 9A2 passes almost over the flat lands, characterized by low geomorphological diversity. In some areas, the subsection passes between hills.

**Table 4-20 Geological characteristics of Section 9A2**

| Section | Rock formations | Geological-geoengineering characteristics | Geotechnical characteristics |
|---|---|---|---|
| 9A2 | The Quaternary deposits<br>The Pliocene deposits | The Silty Clays (SA) - deposits overlie the alluvial-proluvial ones and are encountered from Levan to Varibob area.<br>The Sandstone-Conglomerate dominated Molasses (Mrk)-rocks include the deposits of the Pliocene (Rrogozhina N2rr formation). | Section 0.0-0.9 km, 1.4-14.2km, 14.85-20.9 km and 21.5-26.9 km<br>Section 0.9-1.4 km and 14.2-14.85 km<br>Section 20.90-21.15km |

Regarding the geotechnical conditions, the following can be noted for Section 9A2:

- Section 0.0-0.9 km, 1.4-14.2km, 14.85-20.9 km and 21.5-26.9 km

The site consists of two geotechnical units. Starting from the top, the soil's profile includes:

Geotechnical unit 1:

The upper part of the profile is presented by vegetal soils. This unit is 0.3-0.5m thick.

Geotechnical unit 2:

It is composed by sand-gravel-silts mixtures. These soils are in medium state and have thickness of 3.5-5.0m. According to "USCS" classification, these soils are included in "GM" group. Their allowed bearing capacity is $\sigma$=2.0-2.5 kg/cm$^2$ and, classified into the group of construction sites of medium bearing capacity.

- Section 0.9-1.4 km and 14.2-14.85 km

The site consists of two geotechnical units. Starting from the top, the soil's profile is represented by:

Geotechnical unit 1:

Upper part of the profile is presented by vegetal soils. This unit is 0.3-0.5m thick.

Geotechnical unit 2:

It's represented by deluvial soils. They are inorganic silts and silty clays with brown-beige color, of low-medium of plasticity, intercalated with thin layer of very fines sands, medium to stiff consistency and it has medium water content. According to "USCS" classification, these soils are included in "CL and ML" group. The allowed bearing capacity of these soils is $\sigma$=1.5 -1.8 kg/cm$^2$ and classified into the group of construction sites of low bearing capacity.

- Section 20.90-21.15km (Tunnel)

These sections are composed by molasses-siltstones and claystones rocks that are very weak rocks. Based to Bieniawski, 1989, these rocks are included in very poor rock of rock mass class.

<u>Section 9B2</u>

Section 9B2 passes over a very diverse geomorphological structure, crossing the valley of Vjosa River and going between slopes the hills.



**Table 4-21 Geological characteristics of Section 9B2**

| Section | Rock formations | Geological-geoengineering characteristics | Geotechnical characteristics |
|---|---|---|---|
| 9B2 | The Middle Jurassic deposits<br>The Lower Cretaceous deposits<br>The Upper Cretaceous deposits<br>The Paleocene deposits<br>The Eocene deposits<br>The Middle Oligocene deposits<br>The Upper Oligocene<br>The Aquitanian deposits<br>The Burdigalian deposits<br>The Langhian deposits<br>The Serravallian deposits<br>The Tortonian deposits | The colluviums (B)-deposits are encountered at the foot of the slopes consist of limestones. Slope instabilities may occur during the excavation works on this kind of rock.<br>The Flyschoidal rocks (Fl)-group includes the Aquitanian and Burdigalian deposits of the Ionian Zone, while they can be encountered in the area of Memaliaj.<br>The Siliceous limestones (Gsi) - group includes the deposits of the Middle and Upper Jurassic (J1-2) and the siliceous limestones of Lower Cretaceous (Cr1).<br>The limestones group (G)- includes the Upper Cretaceous (Cr2) and the Paleocene-Eocene (Pg1, Pg2).<br>The group with clays dominated by flysch with limestone layers intercalations (Fag) - includes the deposits of the Oligocene (Pg3). | Sections 0.0-1.2 km, 3.65-5.40km, 34.85-36.30 km, and 37.00-38.70 km<br>Section 5.4km-10.25km (Tunnel)<br>Section 10.60-12.80 km<br>Sections 13.60-14.20km, 24.4-2540 km, 27.55-27.80km and 34.35-34.85 km (Tunnel)<br>Sections 24.7-25.4 km, 28.1-29.25 km, 34.6-34.85km and 36.3-37.00 km<br>Sections 1.2-3.65 km,12.80-17.0km22.80-2340km, 26.80-28.10km and 33.8-34.6 km |

Considering the soils of this Section, there is a high risk for slides and soil erosion.

Regarding the geotechnical conditions, the following can be noted for Section 9B2:

- Sections 0.0-1.2 km, 3.65-5.40km, 34.85-36.30 km, and 37.00-38.70 km

The site consists of two geotechnical units. Starting from the top, the soil's profile includes:

Geotechnical unit 1:

The upper part of the profile is presented by vegetal soils. This unit is 0.3-0.5m thick.

Geotechnical unit 2:

This unit is composed by inorganic silty and clayey sands, medium to stiff consistency with medium water content. According to "USCS" classification, these soils are included in "SM and SC" group. It is situated below geotechnical unit.1 and has a thickness of 3.8-5.3m. The allowed bearing capacity of these soils is $\sigma$=1.7 -1.8 kg/cm$^2$, which are classified into the group of construction site with low bearing capacity.

- Section 5.4km-10.25km (Tunnel)

This site is composed by strong rocks, which are represented by massive limestones. According to Bieniawski, 1989, these rocks are included in the good to very good rock of rock mass class.

- Section 10.25km-10.60km (Tunnel)

This site is composed by strong rocks, which are represented by bedded limestones. According to Bieniawski, 1989, these rocks are included in the fair to good rock of rock mass class.

- Section 17.00-22.80 km, 23.40-24.70km, 25.40-26.80km and 28.10-33.80km

The site consists of two geotechnical units. Starting from the top, the soil's profile is represented by:

Geotechnical unit 1:

The upper part of the profile is presented by vegetal soils. This unit is 0.3-0.5m thick.

Geotechnical unit 2:

It is composed by sand-gravel-silts mixtures. These soils are in medium state and have thickness of 3.5-5.0m. According to "USCS" classification, these soils are included in "GM" group. Their allowed bearing capacity is $\sigma$=2.0-2.5 kg/cm$^2$ and, classified into the group of construction sites of medium bearing capacity.

- Section 10.60-12.80 km

The site consists of two geotechnical units. Starting from the top, the soil's profile is represented by:

Geotechnical unit 1:

Upper part of the profile is presented by vegetal soils. This unit is 0.3-0.5m thick.

Geotechnical unit 2:

It's represented by deluvial soils. They are inorganic silts and silty clays with brown-beige color, of low-medium of plasticity, intercalated with thin layer of very fines sands, medium to stiff consistency and it has medium water content. According to "USCS" classification, these soils are included in "CL and ML" group. Allowed bearing capacity of these soils is $\sigma$=1.5 -1.8 kg/cm$^2$ and classified into the group of construction sites of low bearing capacity.

- Sections 13.60-14.20km, 24.4-2540 km, 27.55-27.80km and 34.35-34.85 km (Tunnel)

It is built by flysch rocks, which are weak rocks and consist of sandstone intercalated with siltstones and claystones layers. Based to Bieniawski, 1989, these rocks are included in very poor rock of rock mass class.

- Sections 24.7-25.4 km, 28.1-29.25 km, 34.6-34.85km and 36.3-37.00 km

These sections are composed by premolasses-siltstones and claystones rocks that are very weak rocks. Based to Bieniawski, 1989, these rocks are included in very poor rock of rock mass class.

- Sections 1.2-3.65 km,12.80-17.0km22.80-2340km, 26.80-28.10km and 33.8-34.6 km

These sections are composed by flysch rocks. They are weak rocks and consist of sandstone intercalated with siltstones and claystones layers.

*Potential landslide site:* These formations are subject to landslides in case of excavation works during road construction. The potential landslide sites are respectively located respectively in south west side and south east side of alignment.

Section 10

Section 10 passes through a very diverse relief, which is composed by flat lands, river valleys and hills and mountain slopes. From Memaliaj to Lekli, the corridor passes through Vjosa valley, the slopes of which are composed by flysch deposits and are generally stable. Then, the corridor continues through the valley of Drinos.

From the geological point of view, Section 10 passes through Drinos – Memaliaj syncline, filled by Neogene deposits of Aquitanian, Burdigalian, Tortonian, Serravallian and Langhian. Both flanks of the syncline are constituted by flysch deposits of Paleogene. The formations crossed are mainly Quaternary deposits. The Quaternary deposits are represented by:

- The alluvial-proluvial deposits of Pleistocene-Holocene
- The alluvial deposit of Holocene of Vjosa and Drinos Rivers
- The nowadays proluvial deposits
- The alluvial-proluvial deposits of Pleistocene-Holocene (Qp-h) are composed of gravels, sands and silts.

The alluvial deposits of Holocene (Qh) in the Vjosa Valley are located at the actual riverbed and at its terraces. They are mostly constituted by heterogeneous gravels and sands. In the valley of Drinos, the alluvial deposits form a flat and wide plain, up to 3-5 km (Dropull plain). The nowadays proluvial deposits are related to the Drinos tributaries and other temporary streams, while they are represented by coarse grained clasts not uniformly distributed in a fine matrix composed by clay and sand.

From the geological-engineering point of view, the Quaternary deposits are included in the Gravels group as well as in the Cobbles and Boulders group. These kinds of rocks have high bearing capacity and are used as construction material. The abovementioned rocks are overlaid by the Silty Clays (SA) in the major part of the Drinos valley. They are represented by clays, silty clays, sandy silts etc, while their physical-mechanical properties depend on the moisture content and vary at wide ranges.

**Table 4-22 Geological characteristics of Section 10**

| Section | Rock formations | Geological-geoengineering characteristics | Geotechnical characteristics |
|---|---|---|---|
| 10 | Quaternary deposits | Gravels group as well as in the Cobbles and Boulders group<br>Silty Clays (SA) | Section 0.0-5.2 km, 6.15-8.12 km, 8.3-9.7 km, 10.15-10.35 km, 10.61-11.30 km, 11.75-12.3 km, 13.1-14.45 km, 14.75-15.10 km, 15.85-16.20 km, 16.70-18.82 km, |

| Section | Rock formations | Geological-geoengineering characteristics | Geotechnical characteristics |
|---|---|---|---|
| | | | 19.0-19.40 km and 19.7-21.0 km<br>Section 9.7-10.15 km and 19.4-19.70 km<br>Section 5.2-6.15 km, 10.35-10.61 km and 18.82-19.0km<br>Section 8.12-8.32km, 11.3-11.75km, 12.3-13.1 km, 14.45-14.75km, 15.1-15.85 km and 16.2-16.70km |

Regarding the geotechnical conditions, the following can be noted for Section 10:

- Sections 0.0-5.2 km, 6.15-8.12 km, 8.3-9.7 km, 10.15-10.35 km, 10.61-11.30 km, 11.75-12.3 km, 13.1-14.45 km, 14.75-15.10 km, 15.85-16.20 km, 16.70-18.82 km, 19.0-19.40 km and 19.7-21.0 km

The site consists of two geotechnical units. Starting from the top, the soil's profile includes:

Geotechnical unit 1:

The upper part of the profile is presented by vegetal soils. This unit is 0.3-0.5m thick.

Geotechnical unit 2:

This unit is composed by the sand-gravel-silt, which are in medium state. The unit is 4.0-7.0m thick. According to "USCS" classification, these soils are included in "GM" group. Allowed bearing capacity of soils is $\sigma$=2.2-2.5kg/cm$^2$, and included into construction group sites of medium bearing capacity.

- Sections 9.7-10.15 km and 19.4-19.70 km

This site consists of one geotechnical unit. This unit is composed by the silty gravel, which are in medium to dense state. The unit is 15.0-30.0m thick. According to "USCS" classification, these soils are included in "GM" group. Allowed bearing capacity of soils is $\sigma$=2.0-2.7kg/cm$^2$, and included into construction sites of medium to high bearing capacity.

- Sections 5.2-6.15 km, 10.35-10.61 km and 18.82-19.0km (Tunnel)

The tunnel section is composed by premolasses-sandstones and marls rocks that are weak rocks. After Bieniawski, 1989, these rocks are included in poor rock of rock mass class.

- Sections 8.12-8.32km, 11.3-11.75km, 12.3-13.1 km, 14.45-14.75km, 15.1-15.85 km and 16.2-16.70km

It is built by premolasses-sandstones-marls and flysch rocks. They are weak rocks and consist of sandstone intercalated with siltstones and claystones layers.

*Potential landslide site:* These formations are subject to landslides in case of excavation works during road construction. Generally, the potential landslide sites are extended on both side of alignment.

Section 11

Section 11 has similar geomorphological characteristics with Section 10. The relief is very diverse, and composed by flat lands, river valleys and hills and mountain slopes. The slopes of the valley, composed by flysch deposits, are not stable in the Memaliaj-Tepelene segment (in its left side) which is affected by massive landslides causing stability problems on the existing Tepelene-Gjirokaster national road. Regarding geotechnical characteristics, the following sections can be defined:

- Sections 0.0-2.75km, 2.95-6.35 km and 6.5-10.2km

This site is composed by two geotechnical units, which are:

Geotechnical unit 1:

The upper part of the profile is presented by vegetal soils. This unit is 0.3-0.5m thick.

Geotechnical unit 2:

This is built by sand-gravel-silts mixtures, which are in medium to dense state. The unit has a thickness of 3.5-5.0m and more in some sites. According to "USCS" classification, these soils are included in "GM" group. The allowed bearing capacity of soils is $\sigma$=2.5-3.0kg/cm$^2$ and included into construction sites of medium bearing capacity.

- Sections 6.35-6.5km

The site consists of one geotechnical unit, which is composed by the silty gravel, which are in medium to dense state. The unit is 15.0-30.0m thick. According to "USCS" classification, these soils are included in "GM" group. Allowed bearing capacity of soils is $\sigma$=2.0-2.7kg/cm$^2$, and included into construction sites of medium to high bearing capacity.

- Section 2.75-2.95km

It is built by flysch rocks. They are weak rocks and consist of sandstone intercalated with siltstones and claystones layers.

*Potential landslide site:* These formations are subject to landslides in case of excavation works during road construction. The potential landslide site is extended in south west side of alignment.

Section 12

Section 12 has similar geomorphological and geological characteristics with those related with sections 10 and 11. The topography and relief are very diverse, and the landforms are composed by flat lands, river valleys and hills and mountain slopes. This region is characterized by the alluvial-proluvial deposits of Pleistocene-Holocene (Qp-h) and the alluvial deposits of Holocene (Qp). The alluvial-proluvial deposits of Pleistocene-Holocene (Qp-h) are composed of gravels, sands and silts, while the alluvial deposits of Holocene (Qh) in the Vjosa Valley are located at the actual riverbed and at its terraces. They mostly consist of heterogeneous gravels and sands.

**Table 4-23 Geological characteristics of Section 12**

| Section | Rock formations | Geological-geoengineering characteristics | Geotechnical characteristics |
|---|---|---|---|
| 12 | Quaternary deposits | Gravels, sands and silts | Section 0.0-1.0 km, 1.2-2.3 km, 2.5-2.85 km, 3.05-6.6 km, 6.7-8.0 km, 8.2-8.7 km and 8.8-9.2km<br>Section 1.0-1.2 km, 2.3-2.5 km, 2.85-3.05 km, 6.6-6.7 km, 8.0-8.2 km and 8.7-8.8 km<br>Section 9.2-9.7 km |

Regarding the geotechnical conditions, the following can be noted for Section 12:

- Sections 0.0-1.0 km, 1.2-2.3 km, 2.5-2.85 km, 3.05-6.6 km, 6.7-8.0 km, 8.2-8.7 km and 8.8-9.2km

This site is composed by two geotechnical units, which are:

Geotechnical unit 1:

The upper part of the profile is presented by vegetal soils. This unit is 0.3-0.5m thick.

Geotechnical unit 2:

This is built by sand-gravel-silts mixtures, which are in medium to dense state. The unit has a thickness of 3.5-5.0m and more in some sites. According to "USCS" classification, these soils are included in "GM" group. Allowed bearing capacity of soils is $\sigma$=2.5-3.0kg/cm$^2$ and included into the construction sites of medium bearing capacity.

- Sections 1.0-1.2 km, 2.3-2.5 km, 2.85-3.05 km, 6.6-6.7 km, 8.0-8.2 km and 8.7-8.8 km

This site consists od one geotechnical unit, which is composed by the silty gravel, which are in medium to dense state. The unit is 15.0-30.0m thick. According to "USCS" classification, these soils are included in "GM" group. Allowed bearing capacity of soils is $\sigma$=2.0-2.7kg/cm$^2$, and included into construction sites of medium to high bearing capacity.

- Section 9.2-9.7 km

The site consists of two geotechnical units. Starting from the top, the soil's profile is represented by:

Geotechnical unit 1:

Upper part of the profile is presented by vegetal soils. This unit is 0.3-0.5m thick.

Geotechnical unit 2:

It's represented by deluvial soils. They are inorganic silts and silty clays with brown-beige color, of low-medium of plasticity, intercalated with thin layer of very fines sands, medium to stiff consistency and it has medium water content. According to "USCS" classification, these soils are included in "CL and ML" group. Allowed bearing capacity of these soils is $\sigma$=1.5 -1.8 kg/cm$^2$ and classified into the group of construction sites of low bearing capacity.

<u>Section 13A</u>

Section 13A crosses the valley of Drinos, which develops on the syncline of the same name, while it runs almost over the existing road from Gjirokaster to Kakavije in a flat terrain.

The geological formations that can be encountered along this Section are mainly formations that have been described in previous sections. The alluvial-proluvial deposits of Pleistocene-Holocene are composed of gravels, sands and silts, while their thickness fluctuates in wide ranges. The alluvial deposits of Holocene that cover the valley of Drinos form a flat and wide plain, up to 3-5 km (Dropull plain). Finally, the nowadays proluvial deposits are related to the Drinos tributaries and other temporary streams.

From the geological-engineering point of view, the Quaternary deposits are included in the Gravels group and in the Cobbles and Boulders group. The gravels are heterogeneous regarding their composition as well as their grain size distribution. The cobbles and boulders represent proluvial fans. These kinds of rocks represent high bearing capacity and are used as construction material. The abovementioned rocks are overlaid by the silty Clays (SA) in the major part of the Drinos valley.

**Table 4-24 Geological characteristics of Section 13A**

| Section | Rock formations | Geological-geoengineering characteristics | Geotechnical characteristics |
|---|---|---|---|
| 13A | Quaternary deposits | Silty Clays (SA) | Section 0.0-0.25 km<br>Section 0.25-23.0 km<br>Section 23.0-23.2km<br>Section 23.2-23.8 km |

Regarding the geotechnical conditions, the following can be noted for Section 13A:

- Section 0.0-0.25km

This section consists of two geotechnical units. Starting from the top, the soil's profile includes:

Geotechnical unit 1:

The upper part of the profile is represented by vegetal soils. This unit is 0.3-0.5m thick.

Geotechnical unit 2:

The soils of this unit are composed by inorganic silts and silty clays, intercalated with layer of sands and gravels, stiff consistency. They have a medium water content. According to "USCS" classification, these soils are included in "CL and ML" group and have a thickness of 2.5-5.5m. The allowed bearing capacity of soils is $\sigma$=1.8-2.0 kg/cm$^2$ and included into the construction sites of low to medium bearing capacity.

- Sections 0.25-23.0km

This site is composed by two geotechnical units, which are:

Geotechnical unit 1:

The upper part of the profile is presented by vegetal soils. This unit is 0.3-0.5m thick.

Geotechnical unit 2:

This is built by sand-gravel-silts mixtures, which are in medium to dense state. The unit has a thickness of 3.5-5.0m and more in some sites. According to "USCS" classification, these soils are included in "GM" group. The allowed bearing capacity of soils is $\sigma$=2.5-3.0kg/cm$^2$, and included into the group of construction sites with medium bearing capacity.

- Section 23.0-23.2km

This site is composed of one geotechnical unit, which consists of gravel-sand-silts mixtures, which are in medium state. This geotechnical unit is 5.0-7.0m thick. According to "USCS" classification, these soils are included in "GM" group. The allowed bearing capacity of this soils is $\sigma$=2.5-2.8kg/cm$^2$, which is classified into the group of construction site of medium bearing capacity.

- Section 23.2-23.8 km

It is built by flysch rocks, which are weak rocks and consist of sandstone intercalated with siltstones and claystones layers. They are weak rocks and consist of sandstone intercalated with siltstones and claystones layers.

*Potential landslide site:* These formations are subject to landslides in case of excavation works during road construction. The potential landslide site is extended in south side of alignment.

### 4.1.6 Soils

#### 4.1.6.1 Introduction

The AIC passes from North to South of the country starting in Murriqan of Shkodra Region and ending in Kakavije of Gjirokaster Region. The corridor route mainly covers plain and hilly areas. These zones are characterized by heterogeneity in geological units, varying climate characteristics, different forms of natural vegetation and changes of relief in small distances. This diversity of pedogenic factors together with the human impact have resulted in a high variability of soils in small distances.

#### 4.1.6.2 Soil classification and description

Eight different soil groups according to the World Reference Base for Soil Resources (WRB) are encountered in the Albanian areas through which the AIC passes. More specifically, these are the groups of Fluvisols and Cambisols and the subgroups of Vertisols, Arenosols, Gleysols, Luvisols, Phaeozems, Regosols. This subsection will refer to the main soil types encountered along the corridor and their main characteristics. More specifically:

- **Fluvisol** is a genetically young soil group in alluvial deposits. They are found in alluvial plains, sides of the rivers, valleys and tidal marshes. Fluvisols are technically defined by a weak or nonexistent surface horizon (uppermost layer) and by parent material which is formed by river, lake, or marine sediments that have been deposited at regular intervals or in the recent past. These soils exhibit a stratified profile that reflects their depositional history or an irregular layering of humus and mineral sediments in which the content of organic carbon decreases with depth. Wide variations in texture and mineral composition are observed. Regarding their properties, Fluvisols are young and therefore show little horizon differentiation. Chemically, Fluvisols usually are rich, with a nearly neutral pH, however soil salinity and high sodium levels may be a problem in coastal sediments. Physically, Fluvisols are wet in most cases due to stagnating groundwater or floodwater. Humus content ranges from 0.62-3.6%, N-total from 0.063-0.21%, Phosphorus ($P_2O_5$) from 1.08-18.72 ppm and Potassium ($K_2O$) 3.5-31.6mg/100 gr of soil.

- **Cambisol** is a soil with a beginning of soil formation, while the horizon differentiation is weak. This is evident from the weak, mostly brownish discoloration and/or structure formation in the soil profile. Cambisols are developed on medium and fine-textured materials which are formed by a wide range of rocks, mostly in alluvial, colluvial and aeolian deposits. Most of these soils form good agricultural land and are intensively used. Regarding their properties, most Cambisols contain minerals in the silt and sand fractions. They occur in regions with a precipitation surplus but in terrain positions that allow surface discharge of excess water. Cambisols are medium textured and have good structural stability, high porosity, and good water holding capacity and good internal drainage. In most cases, Cambisols have a neutral to weakly acid soil reaction, a satisfactory chemical fertility and an active soil fauna.

According to the study "Land Information System of the Republic of Albania" (Interreg II Italy-Albania Project) the two main aforementioned clusters (fluvisols and cambisols) are distinguished geographically in the following subgroups:

- Vertisols are deep clayey soils (>30 % clay) dominated by clay minerals such as smectite that expands upon wetting and shrinks upon drying. They form large cracks down to 50 cm from the soil surface when drying out. The upper part of the soil consists of strong and prism-like blocks.

Regarding their properties, Vertisols become very hard and develop deep and wide cracks during the dry season. During the rainy season the cracks disappear while the land becomes fairly inaccessible due to a very slippery surface. They become sticky and plastic (often untrafficable) when wet. The most important physical characteristics of Vertisols are the low hydraulic conductivity and stickiness when they are wet and a high flow of water through the cracks when they are dry which They become very hard when dry. Vertisols are relatively rich chemically, having a large reserve of weatherable minerals. The pH is neutral or slightly alkaline in most cases, while base saturation is usually high, since many Vertisols show accumulation of lime.

- Fundamental characteristic of Arenosols is their sandy nature, which dominates their characteristics and properties. The texture of Arenosols is loamy sand. Arenosols are very permeable and have rapid infiltration, high hydraulic conductivity and low water holding capacity. Chemically there may be quite large variations in contents of organic matter and nutrients. The pH and base saturation are very variable.

- Gleysols or soils with gleyic properties are permanently wet and reduced at shallow depth. The upper part of the soil is therefore either mottled (in case of temporary aeration) or has colors reflecting reduction. Gleyic properties are formed when the soil is completely saturated with groundwater, unless drained, for a period that allows reducing conditions to occur. This period may range from a few days in the tropics to a few weeks in other areas. Chemically Gleysols are better than the surrounding uplands, due to the fact that they normally have a finer soil texture, slower organic matter decomposition and enjoy an influx from ions from adjacent (higher) lands. Physically, Gleysols are saturated with water for long periods during the year. Repeated wetting and drying may also cause soil densification due to the weakening of interparticle bonds during saturation and contraction of soil particles upon desaturation.

- Luvisols are usually well drained. In case of a compacted argic horizon, internal permeability may be low so that water stagnation in the upper layers occurs. Water holding capacity in the argic horizon is high and ranges between 15 to 25 volume %. Luvisols in loess regions have a high silt content and are vulnerable to soil erosion. The moderate to high cation exchange capacity indicates the presence of high activity clays. Low aluminium saturation reflects a limited leaching, a fair content of plant nutrients, a medium pH and a good level of fertility. The rather favorable physical and chemical fertility status results in a relatively high status of biological activity in Luvisols, especially where fertility has been upgraded through long standing applications of organic and mineral fertilizers.

- Phaeozems are typical soils of the wetter and warmer steppe (prairie) regions. They occur in more humid environments than the other steppe soils. Consequently biomass production is higher but also weathering and leaching is more pronounced in these soils. The topsoils of Phaeozems are usually thinner than those of Chernozems and perhaps somewhat less dark. Phaeozems are porous, well-aerated soils with stable structures, relatively rich in nutrients and make excellent farmland. Many Phaeozems show a clay accumulation in the subsoil, which increases its water holding capacity. Yet Phaeozems still may be short of water in the dry season.

- Regosols are the initial state for pedogenesis representing recently deposited, or recently exposed, earthy materials at the earth surface. The central concept of a Regosol is a deep, well-drained, medium textured, non-differentiated mineral soil that has a minimal expression of diagnostic horizons, properties or materials other than an ochric horizon. Most properties of Regosols are associated with the materials themselves and the climate, not with genetically developed soil features. Chemically, Regosols may have a high or a low base status. A thin poorly decomposed humus layer occurs in cold climates, while organic matter content is low in hot and dry climates.

#### 4.1.6.3 Description of the group and subgroups for each section of road

Each section is described below per group and subgroup. A soil map has been prepared indicating all soil types that the AIC crosses and lies in the maps Annex.

*Section 1- Murriqan – Lezhe*

Section 1 passes by the villages of Muriqan, Oblik, Berdic, Melgush, Kosmaç, Bushat, Mabe, Dajç (Lezhe), Blinisht, Ishull Shengjin. According to the World Reference Base for Soil Resources (WRB), Fluvisols and Cambisols are the groups of soils that dominate along Section 1. According to the study "Land Information System of the Republic of Albania" (Interreg II Italy-Albania Project), the two main aforementioned clusters (fluvisols and cambisols), are divided geographically in the following subgroups:

1. The subgroup of Gleyic Fluvisols dominates in the Melgush area. This subgroup of soil is characterized by the presence of water under a depth of less than 50 cm

2. The subgroup of Eutric Fluvisols dominates in Kosmaç, in Ishull Shengjin area and in Dajc (Lezhe). This subgroup of soil is characterized by saturation 50% or more with bases in layers of 20-100 cm

3. The subgroup of Calcaric Fluvisols dominated in Bushat and Ranxa areas. This subgroup of soil is characterized calcareous, at least 20 - 50 cm below the surface.

4. The subgroup of Gleyic Cambisols dominates in Gjader area. This subgroup is characterized by the presence of water under 50 cm deep.

*Section 2- Lezhe-Milot*

Section 2 passes by the villages of Ishull Shengjin, Ishull Lezhe, Manati, Tresh, Spiten, Ril, Zejmen and Tale dhe Shenkoll. According to the World Reference Base for Soil Resources (WRB), Fluvisols Cambisols and Vertisols are the groups of soils that dominate along Section 2. Section 2 is represented by four profiles and according to the study "Land Information System of the Republic of Albania" (Interreg II Italy-Albania Project) the three main aforementioned clusters (Fluvisols, Cambisols and Vertisols) are divided geographically in the following subgroups:

1. The subgroup of Eutric Fluvisols dominates in Ishull Shengjin area.

2. The subgroup of Salic Fluvisols dominates in Tale area. This subgroup of soil is characterized by soluble salts dissolved as NaCl, $Na_2SO_4$, $CaCl_2$, $NaHCO_3$. Thus, this kind of soil commonly associated with high content of Na causes imbalance of water and nutrients and worsening soil physical properties. Therefore, the development and growth of plants are weaker. Also, due to the high content of Na, this kind of soil generally has neutral pH and tends to be slightly alkaline.

3. The subgroup of Gleyic Cambisols dominates in Ril area.

4. The subgroup of Eutric Vertisols dominates in Zejmen area. This subgroup of soil is characterized by fine clay in which the proportion of smectites is greater than in coarse clay, is transported laterally through the surface and subsurface layers and drainage and leaching of soluble compounds decrease from high to low terrain positions.

*Section 3- Milot-Thumane*

Section 3 passes by the villages of Gures, Fush Milot, Patok, Sanxhak, Adriatik, Zheje etc. According to the World Reference Base for Soil Resources (WRB), Fluvisols Cambisols and Arenosols are the groups of soils that dominate along Section 3. Section 3 is represented by four profiles and according to the study "Land Information System of the Republic of Albania" (Interreg II Italy-Albania Project) the three main aforementioned clusters (Fluvisols and Cambisols and Arenosols) are divided geographically into the following subgroups:

1. The subgroup of Haplic Arenosols dominates in Patok area. This subgroup represents deep, leached and nutrient-poor soils. These soils comprise of an ochric A-horizon and a B-horizon of pure sand showing no signs of structure development.

2. The subgroup of Fluvic Cambisols dominates in Gures area. This subgroup of soil is characterized by fluvic material of fluviatile, marine or lacustrine origin that shows stratification in at least 25 percent of the soil volume over a specified depth; stratification may also be evident from an organic carbon content decreasing irregularly with depth, or remaining above 0.2 percent to a depth of 100 cm from the mineral soil surface. Thin strata of sand may have less organic carbon if the finer sediments below meet the latter requirement.

3. The subgroup of Calcaric Fluvisols dominates in Fush Milot area. This subgroup of soil is characterized by the presence of calcium carbonate, has high natural fertility but with a potential for alkalinity.

4. The subgroup of Gleyic Fluvisols dominates in the Adriatic area. This subgroup of soil is characterized by the presence of water under a depth of less than 50 cm

*Section 4- Thumane-Kashar*

Section 4 passes through the villages of Borizan, Bubq, Preze, Nikel etc According to the World Reference Base for Soil Resources (WRB), Fluvisols Cambisols and Gleysols are the groups of soils that dominate along Section 4. Section 4 is represented by four profiles and according to the study "Land Information System of the Republic of Albania" (Interreg II Italy-Albania Project) the three main aforementioned clusters (Fluvisols and Cambisols and Gleysols) are divided geographically into the following subgroups:

*Section 5 (5B + 5C) – Kashar-Lekaj-Konjat*

Section 5 passes by the villages of Kashar, Gropaj, Menik, Pez Helmes, Pez, Lekaj, Gos, Dushk, Grabian etc. According to the World Reference Base for Soil Resources (WRB), Gleysols, Cambisols and Phaeozems are the groups of soils that dominate along Section 5. Section 5 is represented by six profiles and according to the study "Land Information System of the Republic of Albania" (Interreg II Italy-Albania Project) the three main aforementioned clusters (Cambisols, Gleysols and Phaeozems) are divided geographically into the following subgroups:

1. The subgroup of Calcaric Gleysols dominates in Kashar area.
2. The subgroup of Haplic Cambisols dominates in Ndroq area.
3. The subgroup of Mollic Cambisols dominates in Lekaj area. Mollic epipedons result from the long-term addition of organic materials derived from plant roots, and typically have soft, granular, soil structure and are dark colored.
4. The subgroup of Luvic Phaeozems dominates in Gos area. The characteristics used to define this subgroup are the textural differentiation (presence of an argic horizon), the cation exchange capacity of the clay and the aluminium saturation.
5. The subgroup of Eutric Cambisols dominates in Dushk area. These Cambisols, commonly have a plinthic or petroplinthic character and can be either eutric or dystric. Most of them are solodic due to the high Na percentage of the cation exchange capacity (CEC)
6. The subgroup of Gleyic Phaeozems dominates in Grabian area. These Phaeozems have textural differentiation (presence of an argic horizon), high cation exchange capacity and aluminium saturation.

*Section 6 and 7 –Konjat-Lushnje -Fier*

Section 6 passes by the villages of Konjat, Ullishte, Plug. According to the World Reference Base for Soil Resources (WRB), Phaeozems is the group of soils that dominates along Section 6. Section 6 is represented by one profile and according to the study "Land Information System of the Republic of Albania" (Interreg II Italy-Albania Project) is distinguished geographically by the subgroup of Gleyic Phaeozems which dominates in Grabian-Plug area.

Section 7 passes by the villages of Saver, Kemishtaj, Krutje, Gore, Bubullime, Kolonje etc. According to the World Reference Base for Soil Resources (WRB), Fluvisols and Cambisols are the groups of soils that dominate along Section 7. Section 7 is represented by four profiles, three of which are the same, and according to the study "Land Information System of the Republic of Albania" (Interreg II Italy-Albania Project) the two main aforementioned clusters (Cambisols, Fluvisols, Gleysols) are distinguished geographically in the following subgroups:

1. The subgroup of Gleyic Fluvisols dominates in the Krutje, Bubullime and Kolonje areas.
2. The subgroup of Eutric Cambisols dominates in Kemishtaj area.

*Section 8 – By Pass Fier.*

Section 8 passes by the villages of Daullas, Baltez, Dermenas, Pojan, Fushe, Shtyllas, Bacove etc. According to the World Reference Base for Soil Resources (WRB), Phaeozems and Cambisols are the groups of soils that dominate along Section 8. Section 8 is represented by three profiles and according to the study "Land

Information System of the Republic of Albania" (Interreg II Italy-Albania Project) is distinguished geographically in the following subgroup:

1. **1.** Gleyic Phaeozems The subgroup of Gleyic Phaeozems dominates in Pojan, Fushr and Dernenas area.
2. **2.** Gleyic Cambisols The subgroup of Gleyic Cambisols dominates in Shtyllas, Bocove area. This subgroup is characterized by the presence of water under 50 cm deep.

*Section 9A2 –Levan-Poçem*

Section 9A2 passes by the villages of Frakull, Kafaraj, Kashisht, Varibob, Gorishove, Poçem etc. According to the World Reference Base for Soil Resources (WRB), Fluvisols and Cambisols are the groups of soils that dominate along Section 9A2. Section 9A2 is represented by one profile and according to the study "Land Information System of the Republic of Albania" (Interreg II Italy-Albania Project) is distinguished geographically by the subgroup of Gleyic Cambisols.

*Section 9B2 – Poçem-Memaliaj*

Section 9B2 passes by the villages of Bregas, Krahes, Lulzim, Qesarat, Iliras, Vasjar, Memaliaj. According to the World Reference Base for Soil Resources (WRB), Fluvisols and Regosols are the groups of soils that dominate along Section 9B2. Section 9B2 is represented by two profiles and according to the study "Land Information System of the Republic of Albania" (Interreg II Italy-Albania Project) the two main aforementioned clusters (Fluvisols and Regosols) are distinguished geographically in the following subgroups:

1. The subgroup of Calcaric Fluvisols dominates in the Qesarat area. It is formed by unconsolidated water-borne materials and is highly variable, but much evaluated for intensive agriculture. Calcaric means presence of calcium carbonate. They have high natural fertility but the FCC (Fertility Capacity Classification) modifier indicates potential alkalinity.
2. The subgroup of Calcaric Regosols dominates in the Memaliaj area. These soils are Regosols which are calcareous at least between 20 and 50 cm from the surface.

*Section 10 –Memaliaj-Subashi bridge*

Section 10 passes by the villages of Beçisht, Dragot, Lekaj, Hormove etc. According to the World Reference Base for Soil Resources (WRB), Regosols are the group of soils that dominate along Section 10. Section 10 is represented by one profile and according to the study "Land Information System of the Republic of Albania" (Interreg II Italy-Albania Project) is distinguished geographically by the subgroup of Calcaric Regosols, which is calcareous at least between 20 and 50 cm from the surface.

*Section 11 –Subashi bridge – Gjirokaster bypass*

Section 11 passes by the villages of Hundekuq, Andon Poçi, Humelice, Palokaster, Mashkullore etc. According to the World Reference Base for Soil Resources (WRB) Cambisols are the group of soils that dominate along Section 11 and according to the study "Land Information System of the Republic of Albania" (Interreg II Italy-Albania Project) is distinguished geographically by the subgroup of Dystric Cambisols which dominates in Palokaster area. This subgroup represents deep, leached and nutrient-poor soils. These soils comprise of an ochric A-horizon and a B-horizon of pure sand showing no signs of structure development.

*Section 12 –Bypass Gjirokaster*

Section 12 passes by the village of Arshi Lengo on the left side of the river. The soils of this area are similar to the soils of Section 10. Therefore, according to the World Reference Base for Soil Resources (WRB), Regosols are the group of soils that dominate along Section 12 and according to the study "Land Information System of the Republic of Albania" (Interreg II Italy-Albania Project) is distinguished geographically by the subgroup of Calcaric Regosols. They have high natural fertility but the FCC (Fertility Capacity Classification) modifier indicates potential alkalinity. These Regosols are calcareous at least between 20 and 50 cm from the surface.

*Section 13A—Ghirokaster bypass-Kakavije*

Section 13A passes by the villages of Dropulli area and more specifically by the villages of Derviçan, Goranxi, Terihat, Frashtan, Grapsh, Jorgucat, Zervat, Kakavie. According to the World Reference Base for Soil Resources (WRB), Fluvisols and Cambisols are the groups of soils that dominate along Section 13A. Section 13A is represented by two profiles and according to the study "Land Information System of the Republic of Albania" (Interreg II Italy-Albania Project) the two main aforementioned clusters (Fluvisols and Cambisols) are distinguished geographically in the following subgroups:

1. The subgroup of Calcaric Cambisols dominates in the Grapsharea. Calcaric Cambisols in (irrigated) alluvial plains in the dry zone are intensively used for production of food and oil crops.

2. The subgroup of Calcaric Fluvisols dominates in the Goranxi area and is formed by unconsolidated water-borne materials. It is highly variable, but much evaluated for intensive agriculture.

The soils that characterize each Section are given in the following table.

**Table 4-25 Main groups and sub-groups per Section**

| Section | Main settlements | Group of soils according to the World Reference Base for Soil Resources (WRB) | Subgroups of soils according to the study "Land Information System of the Republic of Albania" (Interreg II Italy-Albania Project) |
|---|---|---|---|
| 1 (Murriqan – Lezhe) | Muriqan, Oblik, Berdic, Melgush, Kosmaç, Bushat, Mabe, Dajç (Lezhe), Blinisht, Ishull Shengjin | Fluvisols and Cambisols | Gleyic Fluvisols (Melgush area)<br>Eutric Fluvisols (Kosmaç, in Ishull Shengjin area and in Dajc (Lezhe))<br>Calcaric Fluvisols (Bushat and Ranxa areas)<br>Gleyic Cambisols (Gjader area) |
| 2 (Lezhe-Milot) | Ishull Shengjin, Ishull Lezhe, Manati, Tresh, Spiten, Ril, Zejmen and Tale dhe Shenkoll | Fluvisols Cambisols and Vertisols | Eutric Fluvisols (Ishull Shengjin area).<br>Salic Fluvisols (Tale area).<br>Gleyic Cambisols (Ril area).<br>Eutric Vertisols (Zejmen area). |
| 3 (Milot-Thumane) | Gures, Fush Milot, Patok, Sanxhak, Adriatik, Zheje | Fluvisols and Cambisols and Arenosols | Haplic Arenosols (Patok area)<br>Fluvic Cambisols (Gures area)<br>Calcaric Fluvisols (Fush Milot area)<br>Gleyic Fluvisols (Adriatik area) |
| 4 (Thumane-Kashar) | Borizan, Bubq, Preze, Nikel | Fluvisols Cambisols and Gleysols | Dystric Cambisols (Borizan area)<br>Calcaric Gleysols (Bilaj area)<br>Leptic Luvisols (Nikel area)<br>Eutric Fluvisols (Preze area) |

| Section | Main settlements | Group of soils according to the World Reference Base for Soil Resources (WRB) | Subgroups of soils according to the study "Land Information System of the Republic of Albania" (Interreg II Italy-Albania Project) |
|---|---|---|---|
| 5B + 5C (Kashar-Lekaj-Konjat) | Kashar, Gropaj, Menik, Pez Helmes, Pez, Lekaj, Gos, Dushk, Grabian | Gleysols, Cambisols and Phaeozems | Calcaric Gleysols (Kashar area)<br>Haplic Cambisols (Ndroq area)<br>Mollic Cambisols (Lekaj area)<br>Luvic Phaeozems (Gos area)<br>Eutric Cambisols (Dushk area)<br>Gleyic Phaeozems (Grabian area) |
| 6+7 (Konjat – Lushnje-Fier) | Konjat, Ullishte, Plug, Saver, Kemishtaj, Krutje, Gore, Bubullime, Kolonje | Phaeozems, Fluvisols and Cambisols | Gleyic Phaeozems (Grabian-Plug area).<br>Gleyic Fluvisols (Krutje, Bubullime and Kolonje areas)<br>Eutric Cambisols (Kemishtaj area) |
| 8 (Bypass Fier) | Daullas, Baltez, Dermenas, Pojan, Fushe, Shtyllas, Bacove | Phaeozems and Cambisols | Gleyic Phaeozems (Pojan, Fushr and Dernenas area)<br>Gleyic Cambisols (Shtyllas, Bocove area) |
| 9A2 (Levan-Poçem) | Frakull, Kafaraj, Kashisht, Varibob, Gorishove, Poçem | Fluvisols and Cambisols | Gleyic Cambisols |
| 9B2 (Poçem-Memaliaj) | Bregas, Krahes, Lulzim, Qesarat, Iliras, Vasjar, Memaliaj | Fluvisols and Regosols | Calcaric Fluvisols (Qesarat area)<br>Calcaric Regosols (Memaliaj area) |
| 10 (Memaliaj-Subash) | Beçisht, Dragot, Lekaj, Hormove | Regosols | Calcaric Regosols |
| 11 (Subash-Gjirokaster Bypass) | Hundekuq, Andon Poçi, Humelice, Palokaster, Mashkullore | Cambisols | Dystric Cambisols (Palokaster area) |
| 12 (Bypass Gjirokaster-Kordhose) | Arshi Lengo on the left side of the river(direction Gjirokaster-Kordhose). | Regosols | Calcaric Regosols |
| 13A (Kordhose-Kakavije) | Derviçan, Goranxi, Terihat, Frashtan, Grapsh, Jorgucat, Zervat, Kakavije | Fluvisols and Cambisols | Calcaric Cambisols (Grapsharea)<br>Calcaric Fluvisols (Goranxi area) |

#### 4.1.6.4 Soil Monitoring

An annual environmental monitoring program has been implemented for several years, part of which is land monitoring, which aims, among other things, at identifying the chemical qualities and the content of hazardous substances and harmful to the ground, in order to further define the measures for the protection, use and sustainable improvement. This monitoring program is carried out under the responsibility of the NEA and follows the "Law on Environmental Protection" (Law No. 10 431, dated 9.6.2011) and DCM No.1189, dated 18.11.2009 "On the Rules and Procedures for the Design and the implementation of the national environmental monitoring program".

Each year, the NEA in cooperation with other institutions, develops and implements a soil monitoring program. Land monitoring data are available for the period 2009-2017, while land monitoring is carried out at 26 monitoring points (across the country's territory) by the Laboratory of Land Department in Agricultural University.

The indicators that are monitored are pH, organic matter, nutrients for plants (N, P, K) and heavy metals. Chemical analyzes are performed by the NEA and the results are published each year in the "Environmental Statement" report.

Out of the 26 monitoring points, only Tepelena monitoring point is close to the AIC (sections 9 and 10).

It should be noted that land monitoring was carried out before 2009 by the Institute of Soil Research. Some of the conclusions regarding land monitoring referring to this period for the areas which the AIC crosses are as follows.[13]

**Table 4-26 Land monitoring per Section**

| Sections | Description |
|---|---|
| 1 | Alternated lands with high agro productivity capacity up to the middle lie in this area. The humus content ranges from 0.62-3.6%, N-total from 0.063-0.21%, assimilable Phosphorus (P2O5) from 1.08-18.72 ppm and Potassium ($K_2O$) 3.5-31.6mg/100 gr of soil. |
| 2 | The lands of this Section are characterized by high fertility. The soils have medium to high productive capacity. Among soil chemical indicators, humus content ranges from 1.03 to 3.73%, N-total from 0.09-0.18%, assimilable Phosphorus ($P_2O_5$) from 8.25 to 24.84 ppm and Potassium ($K_2O$) from 6.33 to 52.50 mg/100 gr soil toke. |
| 3 | The lands of this Section are characterized by high fertility. This area has adaptable climatic conditions for the development of agriculture. Mainly cereals, forage and vegetables are grown. The soil chemical indicators are similar to Section 2. |
| 4 | This area is characterized by soils with low to medium content of humus, poor in nitrogen (N), poor to medium in assimilable Phosphorus ($P_2O_5$) and medium in Potassium ($K_2O$). |
| 5B + 5C | This Section passes by a hilly area and ends in Lekaj. Then, it follows the existing route to Konjat. 56.3% of the road passes to the plain and 43.7% to the hilly area, while it is characterized by a humus-rich surface layer covered by abundant grass or deciduous forest vegetation. There are highly arable soils and are used for growing wheat, soybeans, and pasture for cattle, as well as for wood and fuel production. |
| 6+7 | The lands of this Section are characterized by high fertility and are considered among the most developed agricultural areas in the country. Mainly cereals, forage and vegetables are grown. Among soil chemical indicators, humus content varies from 0.78 to 2.1% with an average of 1.46%, N-total from 0.07-0.14% with an average of 0.107%, assimilable Phosphorus from 7.14-37.69 ppm with an average of 15.24 ppm and potassium ($K_2O$) of 8-31 mg / 100 gr of soil with an average of 14.72 mg / 100 gr of soil. |
| 8 | The lands of this Section are characterized by high fertility. Mainly, cereals, forage and vegetables are grown. The organic matter content of the surface layer of Phaeozems is typically around 5 percent; the C/N-ratio of the organic matter is 10-12; pH-values are between 5 and 7 and increase towards the C-horizon. The Cation Exchange Capacity of Phaeozems is 25-30 cmol(+) per kg dry soil or somewhat less; |

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| Sections | Description |
|---|---|
| | the base saturation percentage lies between 65 and 100 percent, with the higher values in the deeper subsoil. |
| 9A2 | The soils of this Section are characterized by a medium to high fertility and are considered as the most developed agricultural areas of the Fier District. Mainly cereals, forage and vegetables are grown. The chemical parameters are similar to those of Section 6+7. |
| 9B2 | The area is mainly characterized by low fertile soils. The humus content ranges from 0.78-1.2% with an average 0.9%, N-total of 0.07-0.1% with an average 0.8%, assayable phosphorus from 7.14-20 ppm with an average of 12.3 ppm and Potassium ($K_2O$) from 8-24.5 mg / 100 gr of soil with an average of 12.72 mg / 100 gr of soil. |
| 10 | The surfaces of this Section are mainly medium and poor in humus content, medium and rich in Nitrogen, medium in Assimilable Phosphorus and rich in Potassium. |
| 11 | This Section is characterized by soils of medium to high level of fertility. Humus has an average value of 2.04%, Nitrogen 0.138%, Assimilable Phosphorus 12.54 Ppm and Potassium 14.69 mg / 100 gr of soil. |
| 12 | These lands are characterized by medium to high fertility. Humus has an average value of 2.04%, Nitrogen 0.138%, Assimilable Phosphorus 12.54 ppm and Potassium 14.69 mg / 100 gr of soil. |
| 13A | This section is characterized by agricultural lands with medium to high agro-productive capacity, while the most fertile alluvial soils of the Gjirokaster district lie in this area. Humus content ranges from 0.68-3.41%, Nitrogen 0.1-0.195%, Assimilable Phosphorus 3.91-19.26 ppm and Potassium 7.3-40 Mg/100 gr of soil. |

#### 4.1.6.5 Soil erosion

The mountainous and hilly terrain in over 60% of Albania, the amount of rainfall of 1400-1600 mm per year (mainly in the autumn and spring with high intensity) as well as the presence of a number of rivers and streams, are the main reasons that favor erosion. In recent years, the phenomenon of erosion has been more evident throughout the country due to serious damage of highwater channels, forest cutting, demolition of drainage and irrigation systems, massive urbanization without planning, exploitation without protection measures of riverbeds etc. The above reasons have caused the disorientation of surface waters, affecting the formation of demolition spots of about 115,000 ha. Also, physical damage, deposit and transportation of solid materials, as well as soil depletion in nutritional elements have been identified.

Erosion has been addressed in Albania in the framework of the environmental protection strategy. The Ministry of Tourism and the Environment, the National Environment Agency, the General Directorate of Forests, the Ministry of Agriculture, Rural Development and Water Management, the Drainage Boards, the Institute of Hydrometeorology etc are responsible for identifying and taking measures to minimize erosion.

Studies conducted by the Soil Research Institute, the Institute of Hydrometeorology and Agrarian University have classified Albania's lands erosion resistance in three categories, namely:

- Resistant soils to erosion. These lands occupy approximately 10% of the total area and are mainly found in the high altitude areas.
- Moderately resistant soils to erosion, which account for about 35% of the country's lands and are generally heavy textured soil.
- Less erosion-resistant soils. These lands occupy about 55% of the area of the country. The area through which the AIC passes is generally included in the third category.

The aforementioned institutions have also carried out studies to determine the erosion values, considering the climatic and terrestrial conditions of Albania. The studies are based on the application of the Universal Soil Loss Equation (USLE) and consider the precipitation (erosion index), soil (erodibility coefficient), slope length, soil fertility, plant cover and agricultural practices). These studies conclude that the territory of Albania is divided into three zones according to the erosion index, i.e.:

Zone A 55 ton / ha per year

Zone B 14.8 ton / ha per year

Zone C 37.1 ton / ha per year

From the calculations, it appears that the average annual losses at country level are 26.8 tons / ha / year (Institute of Soil Research (ISR)). Erosion is monitored by the ISR and the Hydrometeorological Institute in six stations, while only Kallmet station is located near the area where the AIC passes, namely close to the first section, Muriqan-Lezhe and to the second section, Lezhe Milot. The experimental station Kallmet (Lezhë) characterizes the problematic area of Lezha and the northern part of Albania. Regardless of the role of the vegetation and the type of land, the precipitation and the geological nature of the soil layers are the decisive factors for the erosion values at the monitoring point of Kallmet.

**Table 4-27. Geographical position of experimental stations and their areas and sub-areas**

| No | Station | The altitude above sea level, m. | Watersheed | Climate zone and subzone |
|---|---|---|---|---|
| 1 | Lezhë (Kallmet) | 55 | Drini | Central hilly Mediterranean |

**Table 4-28 Experimental and study results during 4-year erosion monitoring in Kallmet, Lezhe**

| No | Plant cover | Weathering of land ton/ha/year | | | | |
|---|---|---|---|---|---|---|
| | | 2001 | 2002 | 2003 | 2004 | Overage |
| 1 | Perennial meadow | 9.1 | 12.4 | 15.7 | 12 | 12.3 |
| 2 | Plowing plants | 21 | 24 | 26.4 | 25.8 | 24.4 |
| 3 | Without plant | 26 | 26.6 | 31.6 | 32.8 | 29.2 |

In the recent years, another direction of erosion assessment has been based on measurements and observations in riverbeds. Damages of the land on the banks of the rivers have come, besides others, as a result of the use of beds for collection of inert. In certain areas, as a result of this phenomenon, there have been losses of significant surfaces of agricultural land. Below, some descriptions are presented for the effect of different rivers weathering in the areas where the sections of the AIC pass. More precisely:[14]

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- Section 1, Muriqan-Lezhe. Erosion on the banks of the Drin River can be estimated at low and medium levels. Erosion is in moderate levels and with visible depths inside the land that go up to 10 m near the village of Stajke, in the place called Zalli i Ganjollit, on the left side of the water flow.
- Section 2, Lezhe-Milot. The continuous deepening of the riverbed through the use of inert materials has affected the soil's weathering, especially on its shores. The most damaged areas are in the vicinity of the village of Shenkoll on the right side of the river and in Fush-Milot on the left-hand side of the river.
- Section 3, Milot-Thumane. The most damaged areas along this Section are in Fush-Milot and in the Gurz area along the entire right bank.
- Section 4, Thumane-Kashar. The three rivers, Terkuza, Zeza and Tirana River, which join and form the Ishem River, have an impact on the increase of the erosion rate in the area around this Section of the AIC. The phenomenon of erosion becomes more visible when they descend into the lower part of the area. The most problematic areas are the lands near the former Shperdhet barrier and near Mamuras.
- Section 5 (5B and 5C), Kashar-Lekaj-Konjat. This area is partially covered by the Erzen River. Referring to the footprint of the corridor, the weathering in the overage level was found in the Beshiri Bridge area.

The areas, where Sections 8, 9A2 and 9B2, 10, 11, 12 and 13A pass, are under the influence of the Drino and Vjosa rivers. The middle flow of the Vjosa River extends from Dragoti to Pocem (Section Pocem-Memaliaj and Memaliaj-Subashi bridge). The riverbed in this area is wide and the thickness of alluviums reaches 60-80 m. In the area of Pocem - Memaliaj section, erosion is of erosive-accumulative type. More precisely:

- Section 8, Fier Bypass is affected by the downhill flow of the River Vjosa. Weathering problems start near villages of Ferras and Bocove.
- Section 9A2, Levan-Pocem is affected by the downhill flow of the River Vjosa. Weathering problems start to emerge after the River Shushica discharge in the River Vjose, near the villages of Varibob and Frakull.
- Sections 11, 12 and 13A (Subashi bridge-Bypass Gjirokaster-Kakavije) are under the influence of the Drino River. The weathering in these areas has been favored by the damage of the river defensive embankments. The water flow in this area is disoriented and the adverse effects added by the increased use of the riverbed for inert have been apparent. The largest weathering has been observed in the area near the villages of Lazarat, Virua and Palokaster.

## 4.1.7 Seismicity and tectonics

### 4.1.7.1 Tectonics

Albania is located at the Alpine Mediterranean seismic belt and accommodates part of the deformation due to the collision of the Adriatic microplate with the Eurasian plate (Mazzoli and Helman, 1994). The main reason of seismicity in Albania is the collision of the Adriatic microplate forming the Albanian orogen. The Albanian orogen lies on the south-westernmost part of the Eurasian plate, and is a convergent zone due to northeastward movement of the Adriatic plate (= Adria microplate). The orogen is divided into two domains of the present-day tectonic regime: a coastal domain of compression dominated by northwest to north-northwest striking thrusts and folds (Outer Albanides), and an interior domain of extension dominated by north-striking normal faults (Inner Albanides). Two offshore regions, the South Adriatic Basin and the Periadriatic Foredeep, have not been further considered because the first has few earthquakes and the activity rate of the second is too low to make a significant contribution to the hazard. The Pliocene-Quaternary embraced strong and progressive uplift in the Mediterranean region, particularly in Albania. The commencement in the Pliocene was distinguished by extensional tectonics, which affected the interior domain of the country and created its horst-graben structures.

This continental collision directly influences the inner part of the country, along longitudinal and transverse faults cutting across the eastern and the north-eastern part of Albania (Aliaj et al., 2001; Ormeni et al., 2013).

The main tectonic units of the Albanian region are the Albanides, which are part of the Dinaric-Albanid-Hellenic arc of the Alpine orogen. They are located between the Hellenides to the south and the Dinarides to the north, which together form the Dinaric branch of the Mediterranean Alpine Belt. To the west, they are limited by the Apulia-Gargano foreland. The Albanides are composed of magmatic and sedimentary rocks of Ordovician to Quaternary age. The Albanian orogenic front is thrusted over the Adria microplate, partly over the Apulian platform and partly over the Albanian basin.

For simplicity the Albanides are separated into two major structural domains, the external part of which (in compression) is called the Outer Abanides, and the internal one (extensional) is called the Inner Albanides. The Outer Albanides are divided into two parts; 1) the western part includes the Sazani, Ionian and Kruja zones and the Periadriatic Depression, and 2) the eastern zone includes the Krasta – Cukali zone, the Albanian Alps, and the units of Ostreni and Vermoshi. The succession characterizing this domain, affected by the post-Eocene orogenesis, consists of Triassic evaporites, carbonates and Oligocene-Miocene flysch. The Inner Albanides consist of the Korabi, Mirdita and Gashi zones, which are characterized by the presence of ophiolitic units (Triassic–Jurassic) and continental deposits involved in the Middle Jurassic to Tertiary tectonism, which was accompanied by intense metamorphism. In the external domain, the average direction of compression is NE-SW (average azimuth N 225°), while in the internal domain, the average direction of extension is NNW-SSE (average azimuth N 340°).

The recent tectonics of the area consists of a middle Miocene phase and of a more recent neotectonic activity that began during the Pliocene and still continues today. The latter have controlled the development of the present day relief, which is characterized by mountain belts (up to 2000 m high) and lowlands that are the result of the formation of anticlines, synclines and of horst-graben structures bounded by active faults.

The characteristic plain surfaces and steep slopes separating the mountain belts, as well as the formation of marine terraces and of depressed areas in the Albanides and in the periadriatic lowland are all related to the Miocene to recent tectonic activity. Many of the active faults affect the coastline, producing a jagged landscape.

The interior of the country shows a horst-graben structural motif due to Pliocene-Quaternary normal faulting, whereas the external zones are mountainous, except for the Periadriatic Depression.

A large variety of rock formations ranging in age from Paleozoic to Quaternary are encountered in the Albanides. The Paleozoic formations are represented by metamorphic, terrigenous, effusive and rare carbonate rocks and are encountered in the Internal Albanides (Korabi Zone). The evaporites, dated as Permian–Triassic, are mainly encountered in the Korabi and Ionian tectonic zones. The ophiolites, corresponding to Middle-Upper Jurassic age are widely spread in the Internal Albanides, especially in the Mirdita tectonic zone. The carbonates represented by limestones, dolomitized limestones and dolomites correspond to the period from the Upper Triassic up to Oligocene. In the Ionian zone the carbonates are represented by pelagic thin layered limestones.

The flysch formation took place during the Upper Jurassic to Lower Cretaceous in Krasta-Cukali and Mirdita zones, while in the Krasta-Cukali and Albanian Alps the flysch formations are related to Mastrichtian–Eocene periods. The Oligocene flysch formations are encountered in the External Albanides (Kruja and Ionian zones) outcropping in large areas. During the Miocene marls and clayey marls, sandstones and bioclastic limestones are encountered. Molasses characterize the middle Miocene up to Pliocene age. The molasses are composed of intercalations of conglomerates, sandstones, siltstones and shales. Evaporites are also present.

Based on the seismic activity, the AIC lies in three main seismic sources as follows:

- Lezha-Ulqini (LU) – Section 1 and 2 of the AIC - a coastal zone containing pre-Pliocene W-NW-striking pure-compression thrust faults that are parallel to the Dalmatian coastline. The thrust faults are cut by ENE-trending strike-slip faults. Its zone area is 5140 km2, earthquakes used 39 and the maximum expected magnitude is 7.2. Other parameters are beta =1,52, alpha =293 and rate density 5.3.
- Periadriatic Lowland (PL) – Sections 3, 4, 5, 6, 7, 8, 9 of the AIC - a coastal and hilly zone containing post-Pliocene oblique-compression thrust faults, N- to NNW-striking, which are cut by E-NE-trending strike-slip faults. Its zone area is 7460 km2, earthquakes used 75 and the maximum expected magnitude is 7.0. Other parameters are beta =1,61, alpha =914 and rate density 6.1.
- Ionian Coast (IC) – Sections 10, 11, 12 and 13 of the AIC a coastal and hilly zone containing pre-Pliocene N-W-striking pure-compression thrust faults, which are cut by strike-slip faults. Its zone area is 16600 km2, earthquakes used 151 and the maximum expected magnitude is 7.0. Other parameters are beta =1,40, alpha =692 and rate density 6.9.

The following figure indicates the aforementioned seismic source zones (faults).

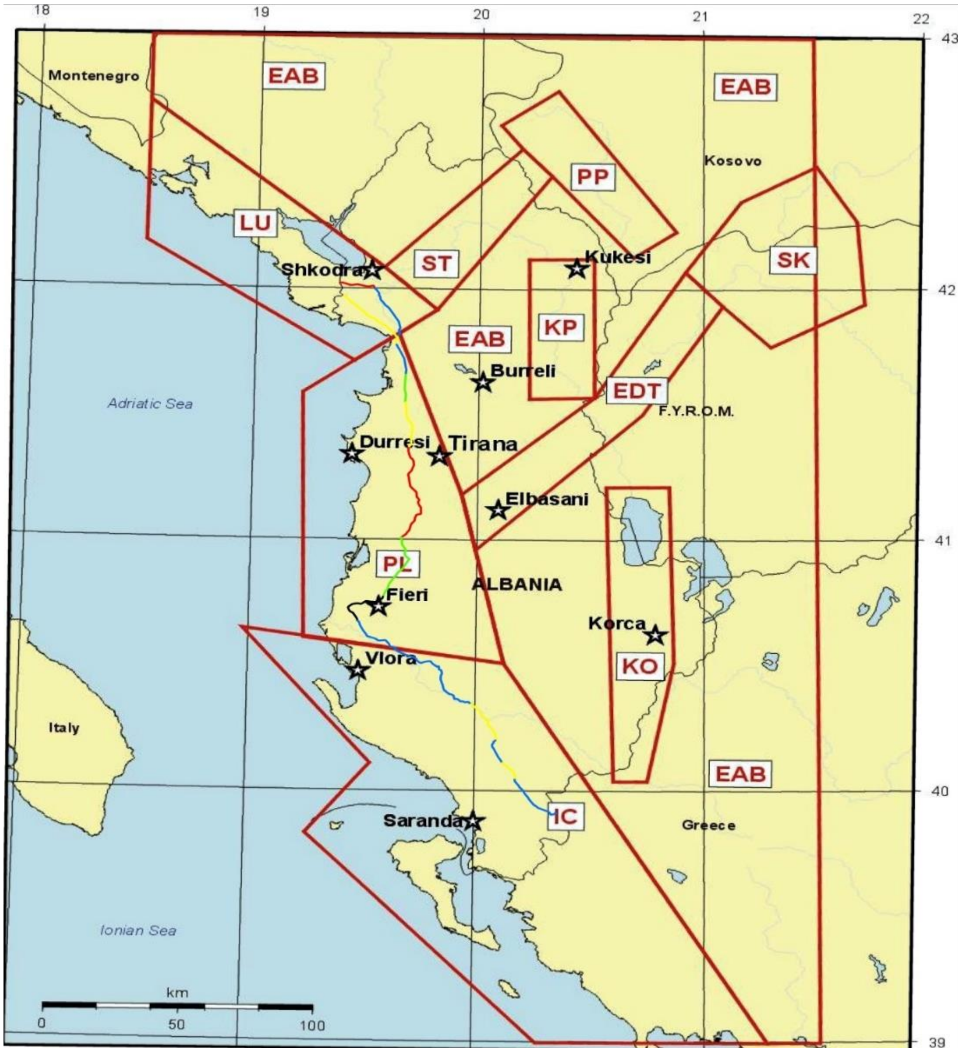



**Figure 4-6-Map of the seismic sources in Albania**

A tectonic map can be found in Annex 1.

#### 4.1.7.2 Seismicity

Albania is geologically and seismotectonically a rather complicated region. The seismicity of Albania is represented by a significant micro-seismicity (a high number of small earthquakes), sparse medium-sized events (magnitude M 5.5 - 5.9) and a few large earthquakes (magnitude M>6.5) as given by the occurrence of six main shocks with Ms magnitudes exceeding 6.0 throughout the last century (Kociaj, 1986):

- June 1, 1905 Shkodra earthquakes (Ms=6.6),
- February 18, 1911 Ohrid Lake earthquake (Ms=6.7),
- November 26, 1920 Tepelena earthquake (Ms=6.4),
- December 17, 1926 Durres earthquake (Ms=6.2),
- November 30, 1967 Dibra earthquake (Ms=6.6) and
- April 15, 1979 Montenegro earthquake (known as Shkodra earthquake) (Ms=6.9).

The latter represents the most recent event in the northwestern region of Albania, causing extensive damages along the Adriatic coastline in Montenegro and Albania in a radius of 100km. The Figure below shows the seismicity in Albania with the tectonic faults and the AIC corridor.

A regional seismic hazard map of Albania in terms of expected earthquake magnitudes and annual exceedance probability has been presented in 2004 by the Albanian seismologists L. Duni and N. Kuka. The main aim of this research study was to estimate the potential seismic hazard of the regions of Albania. The study was carried out by using the data collected from several earthquakes, occurred in the past within the Albanian territory, which then allowed to estimate the values of Peak Ground Acceleration (PGA), using the computer coded OHAZ attenuation relationship. This information also serves as a basis for the preparation in the future of detailed micro-zoning seismic studies.

Based on PGA values, the territory of Albania has been divided into several zones. The PGA's hazard maps were computed for a 10% exceedance probability in 50 years, corresponding to a return period of 475 years. This is a standard practice in seismic design. Considering the most favorable scenario of seismic hazard for Albania, as presented in the map in the following figure (authors: L. Duni and N. Kuka, 2004) it could be observed that very few areas of the country can be considered safe in terms of potential earthquakes, except for a small part in North-Northeast Albania, where PGA values less than 0.15g are expected. The northwest and southern parts of the country represent the areas with the highest seismic hazard according to all research and analysis carried out. Lushnje-Elbasan-Diber transversal axis (southwest-northeast direction) also reveals a high level of seismic hazard. In general, the PGA values are from 0.20g, approximately in all the territory, up to 0.30g in northwest and southwest parts of the country. As it can be observed in the figure below, the A-I corridor alternatives pass through several areas where the PGA values range from high to highest in terms of seismic hazard. These values are usually considered in more detail during the preparation of preliminary/detailed designs.

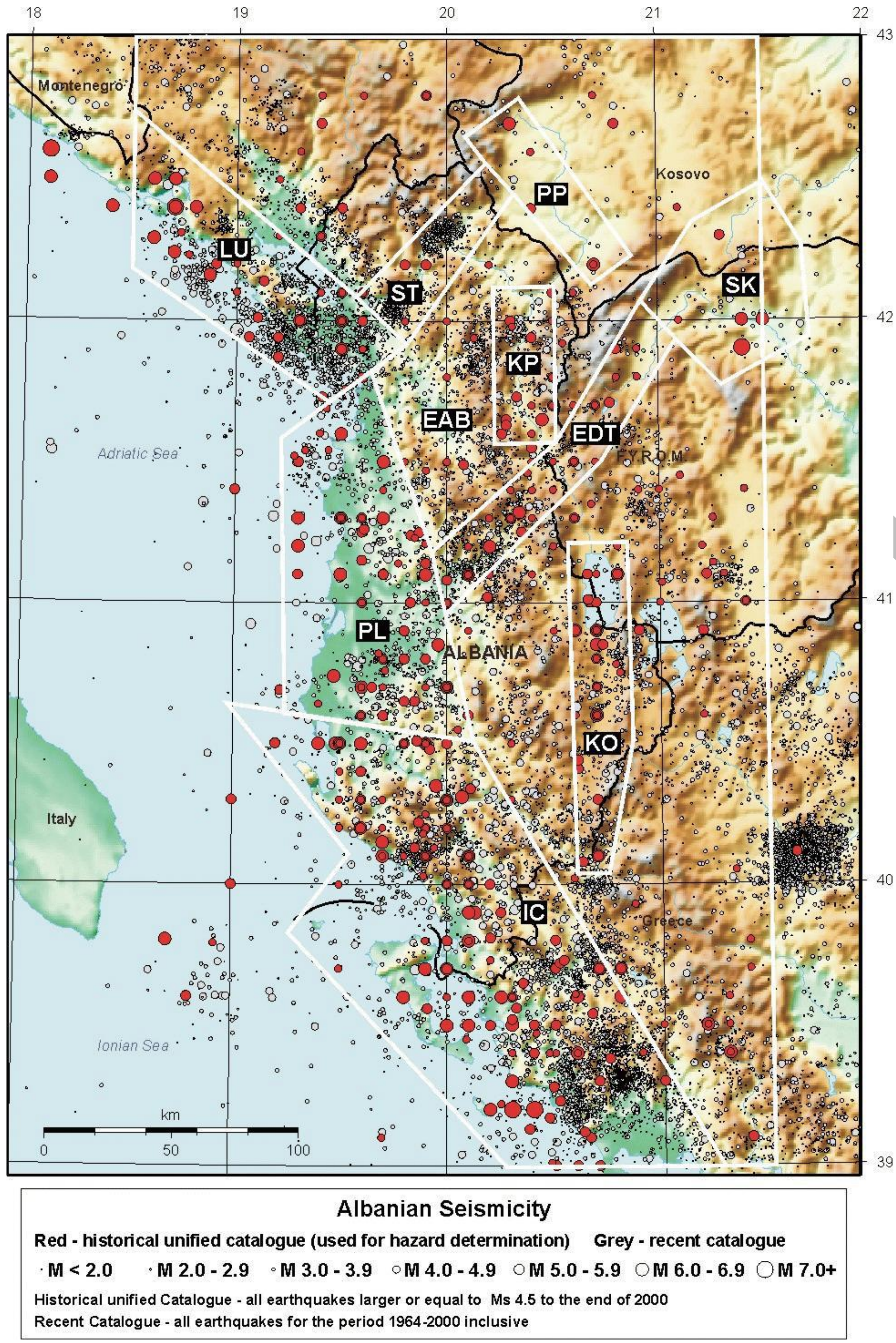



**Figure 4-7 Seismicity of Albania.**

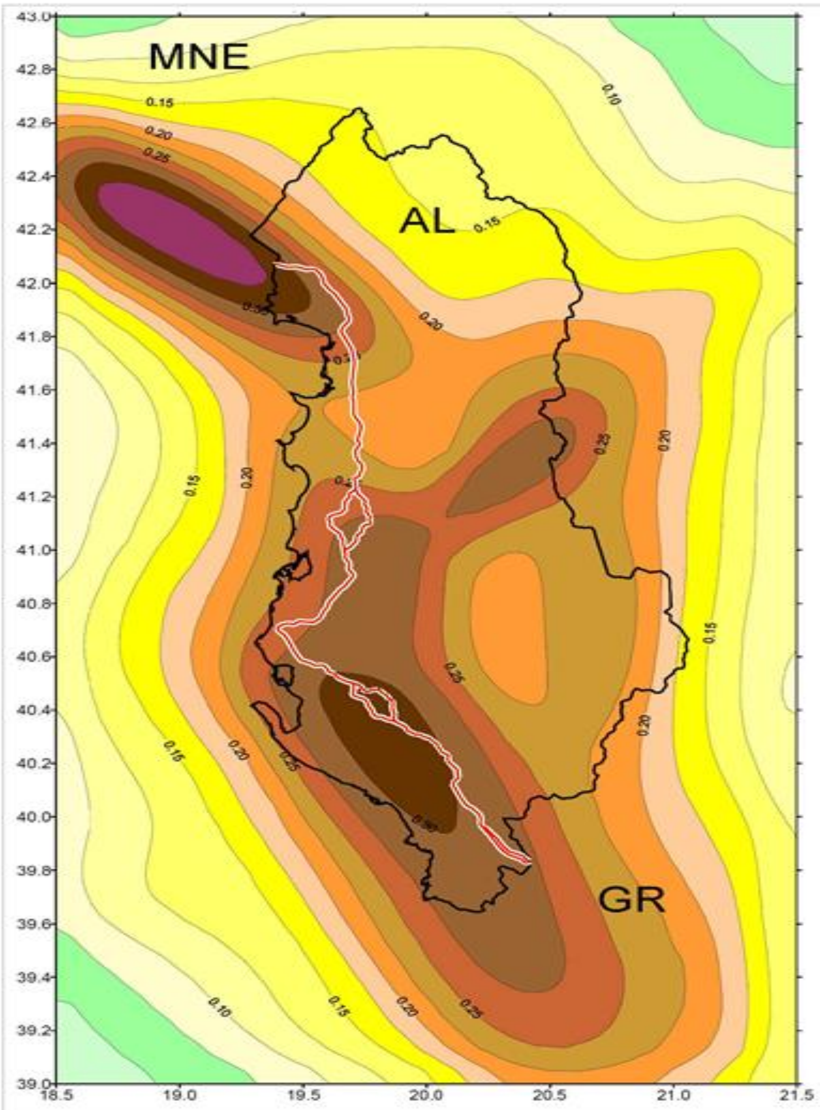



**Figure 4-8 Seismic hazard of Albania (authors: L. Duni and N. Kuka, 2004)**

### 4.1.8 Air quality

In general, data on air quality in Albania is very limited. The DCM no 352, dated in 29.4.2015, on "Assessment of Air Quality and related pollutants", sets the national air pollution limits which are presented below.

**Table 4-29 National standards for air**

| Sulfur Dioxide | | |
|---|---|---|
| Threshold assessment | Protection of health | Protection of Vegetation |

| | | | |
|---|---|---|---|
| The upper assessment threshold | 60% of the 24-hour limit value (75 µg/m³, not to be exceeded more than three times during a calendar year) | | 60 % of winter critical level (12 µg/m³) |
| The lower assessment threshold | 40 % of the 24-hour limit value (50 µg/m³, not to be exceeded more than three times during a calendar year) | | 40 % of winter critical level (8 µg/m³) |
| **Nitrogen dioxide and Nitrogen oxides** | | | |
| Threshold assessment | The $NO_2$ hourly limit value for the protection of human health | The $NO_2$ annual limit value for the protection of human health | The $NO_x$ annual critical level for vegetation and natural ecosystems protection |
| The upper assessment threshold | 70 % of the limit value (140 µg/m not to be exceeded more than 18 times during a calendar year) | 80 % of the limit value (32 µg/ m³) | 80 % of the critical level (24 µg/ m³) |
| The lower assessment threshold | 50 % of the limit value (100 µg/ m not to be exceeded more than 18 times during a calendar year) | 65 % of the limit value (26 µg/ m³) | 65 % of the critical level (19,5 µg/ m³) |
| **Particle matters ($PM_{10}$/ $PM_{2,5}$)** | | | |
| Threshold assessment | The 24-hour average of $PM_{10}$ | Annual average of $PM_{10}$ | Annual average of $PM_{2,5}$ (1) |
| The upper assessment threshold | 70 % of the limit value (35 µg/ m³, not to be exceeded more than 35 times during a calendar year) | 70 % of the limit value of (28 µg/ m³) | 70 % of the limit value of (17 µg/ m³) |
| The lower assessment threshold | 50 % of the limit value (25 µg/ m not to be exceeded more than 35 times during a calendar year) | 50 % of the limit value (20 µg/ m³) | 50 % of the limit value (12 µg/ m³) |
| (1) The upper and lower assessment thresholds for $PM_{2,5}$ are not applied for measurements made to assess compliance with the aim of reducing exposure to $PM_{2.5}$, for public health protection. | | | |
| **Lead (Pb)** | | | |
| Threshold assessment | Annual Average | | |
| The upper assessment threshold | 70 % of limit value (0,35 µg/ m³) | | |
| The lower assessment threshold | 50 % of limit value (0,25 µg/ m³) | | |
| **Benzene** | | | |
| Threshold assessment | Annual Average | | |
| The upper assessment threshold | 70 % of limit value (3,5 µg/ m³) | | |
| The lower assessment threshold | 40 % of limit value (2 µg/ m³) | | |
| **Carbon Monoxide (CO)** | | | |
| Threshold assessment | Daily 8 hours mean | | |
| The upper assessment threshold | 70 % of limit value (7 mg/ m³) | | |
| The lower assessment threshold | 50 % of limit value (5 mg/ m³) | | |

The EU air quality standards for annual average values of air quality parameters are presented in the following table.

**Table 4-30 EU Air Quality Standards EU.**

| Air Quality EU Standards | |
|---|---|
| PM10 average value for 1 year | 40 µg/ $m^3$ |
| Fine particles ($PM_{2.5}$) average value for 1 year | 25 µg/ $m^3$ |
| Sulphur dioxide ($SO_2$) average value for 24 hours | 125 µg/ $m^3$ |
| Nitrogen dioxide ($NO_2$), average value for 1 year | 40 µg/ $m^3$ |
| Benzene average value for 1 year | 5 µg/$m^3$ |
| Ozone $O_3$ (Maximum daily 8 hour mean) | 120 µg/$m^3$ |
| Carbone Monoxide (CO) (Maximum daily 8 hour mean) | 10 mg/$m^3$ |

Monitoring of the air quality indicators is carried out by the National Environmental Agency for PM10, $PM_{2.5}$, $NO_2$, $SO_2$, $O_3$, CO and BTEX indicators for the stations in the main cities of Albania such as Tirana, Elbasan, Durres, Shkoder, Vlore and Korce cities. $PM_{2.5}$ is also monitored in three other stations, in the cities of Gjirokaster, Kukes and Berat. The Public Health Institution carries out monitoring of the $PM_{2.5}$ indicator and the content of toxic metals content of Pb, Cd, Zn and Cu in the cities of Kukes, Fier, Gjirokaster and Berat. Additionally, the Albanian Institute of Nuclear Physics conducts monitoring for the parameter of $PM_{10}$ and the toxic metal content of Pb, As, Mn, Ni, Cu, Zn, Cd in the stations located in Tirana and Elbasan. While there are no monitoring stations for air quality indicators along the Adriatic Ionian Corridor, the main air quality monitoring stations in Albania are presented in the following figure.

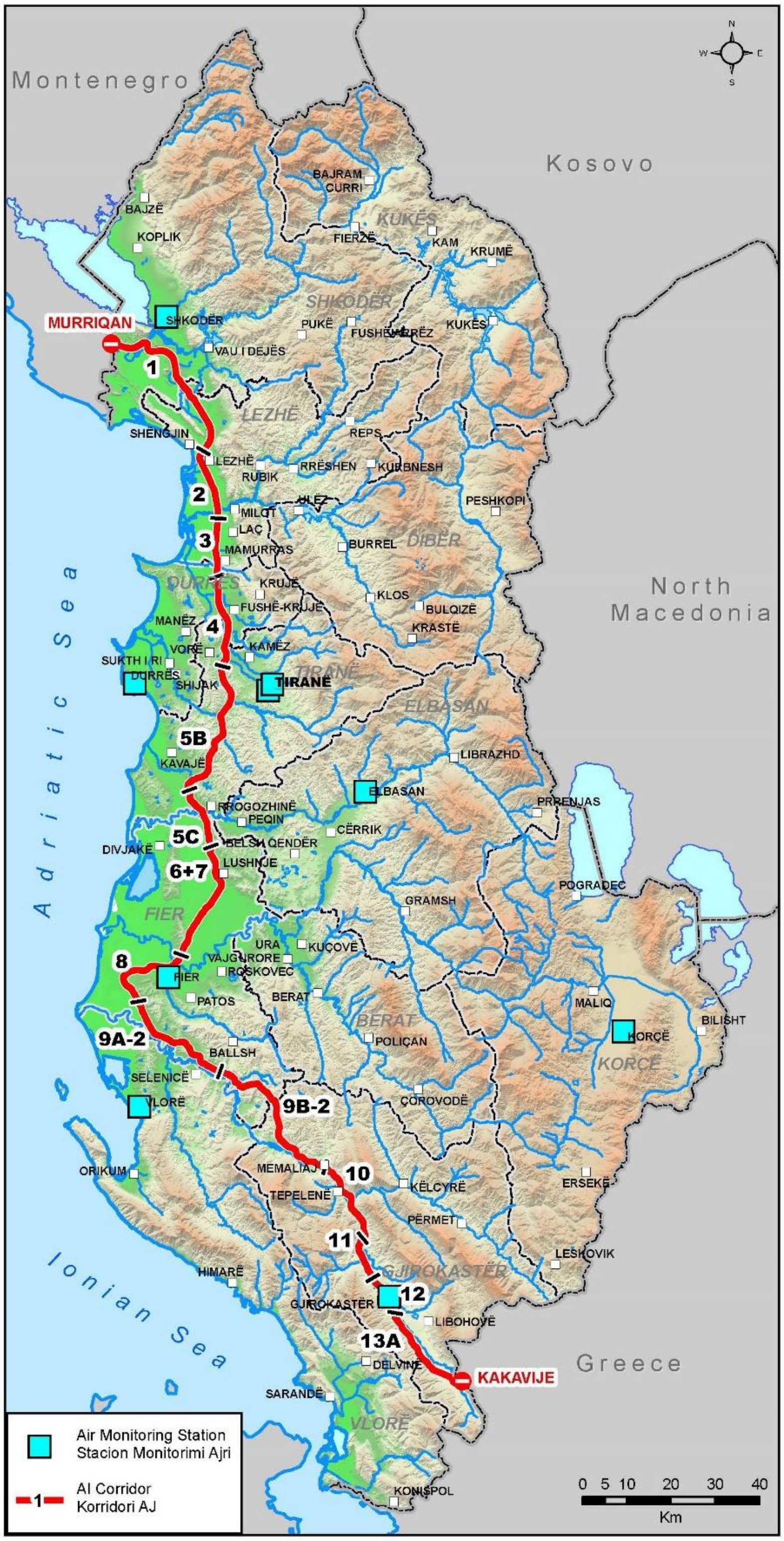

Montenegro
Kosovo
North Macedonia
Greece
Adriatic Sea
Ionian Sea
MURRIQAN
KAKAVIJE
SHKODËR
TIRANË
DURRËS
ELBASAN
FIER
VLORË
KORÇË
GJIROKASTËR
1
2
3
4
5B
5C
6+7
8
9A-2
9B-2
10
11
12
13A
Air Monitoring Station
Stacion Monitorimi Ajri
AI Corridor
Korridori AJ
0 5 10 20 30 40
Km

**Figure 4-9 Air monitoring stations in Albania**

The air monitoring stations that, although relatively distant from the AIC, are in the wider region, are mentioned below. More specifically, regarding:

- Section 1, there is only one monitoring station in the city of Shkodra, which is 7km far from the AIC.
- Sections 2, 3 and 4, there is no available data as far as air quality levels are concerned, since there are no monitoring stations close to the AIC.
- Section 5 (5B and 5C), the AIC passes 9km far from the monitoring stations, which are located in the city of Tirana. The air quality monitored in Tirana cannot represent the air quality in this AIC part due to the aforementioned distance. In the table below, five measurement points are presented which are located in the main roads of Tirana urban centre.
- Section 6 and 7, there are no monitoring points close to the AIC and therefore the air quality levels cannot be assessed.
- Section 8, the air quality status is monitored by one monitoring point, which is located 2.5km far from the AIC in the city of Fier.
- Sections 9 (A2 and B2), 10 and 11, there are no monitoring points close to the road corridor, so the air quality levels cannot be assessed.
- Section 12, the air quality status is monitored by one monitoring point which is 1,5km far from the AIC (Gjirokaster city).
- Section 13A, there is no available data on air quality, apart from the first part of the Section, in Gjirokaster city (already mentioned in Section 12)

The following table presents air quality parameters monitored for the year 2017 in the main cities that AIC is relatively close to.

**Table 4-31 Air quality parameters at the main city stations located near the road corridor**

| Alignments | Monitoring points | GASES | | | | PM | |
|---|---|---|---|---|---|---|---|
| | | CO | $NO_2$ | $SO_2$ | $O_3$ | $PM_{2.5}$ | $PM_{10}$ |
| Section 1 | Health Center in Shkoder city | X | X | X | X | X | X |
| Section 5 (5B and 5C) | Close to NEA building | | | | | | X |
| | Tirane Institute of nuclear physics | | | | | | X |
| | PHI (Public Health Institute) Tirana | X | X | X | X | | |
| | Tirana Municipality building | | | | | | |

| Alignments | Monitoring points | GASES | | | | PM | |
|---|---|---|---|---|---|---|---|
| | | CO | $NO_2$ | $SO_2$ | $O_3$ | $PM_{2.5}$ | $PM_{10}$ |
| | Tirana centre | X | X | X | X | | |
| Section 8 | PHI in Fier | | | | | X | |
| Section 12<br>Section 13A | PHI Gjirokaster | | | | | X | |

*Source: Environmental Statement Report, National Environmental Agency, 2018.*

Based on the data on urban air quality for the year 2017 (National Environmental Agency, Environmental State Report of 2018), it is noticed that:

- Air quality in Tirana is not very good regarding $PM_{10}$ as it can be seen in the following figures. PM10 exceeds the annual average EU standard only in the stations of Tirana (section 5), while PM10 levels for the other cities are lower than the EU limit.

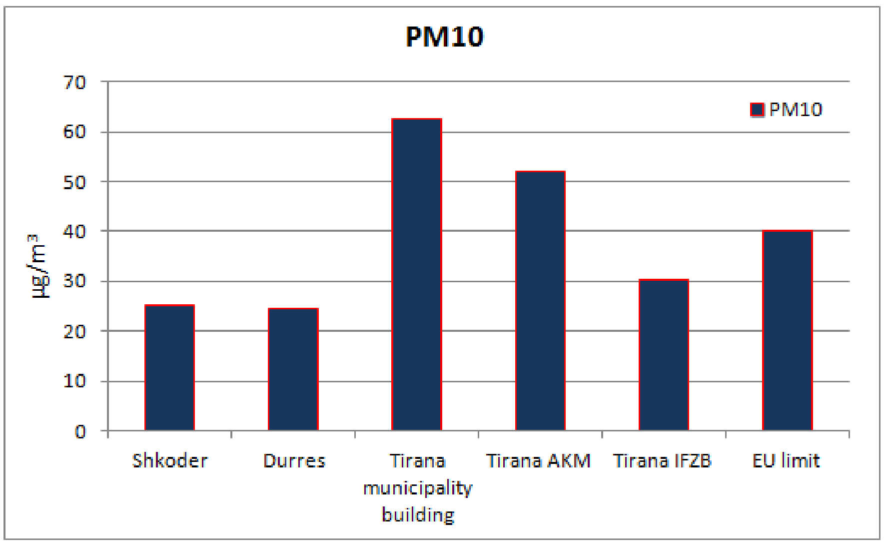



**Figure 4-10 Annual average values of PM10 (µg/m3) for the stations in the main cities of Albania which are relatively close to the AIC.**

- Annual $PM_{2.5}$ EU limit is exceeded only in the station of Fier (Section 8), since the limit is 25µg/m$^3$ and the value is 32,71 µg/m$^3$.

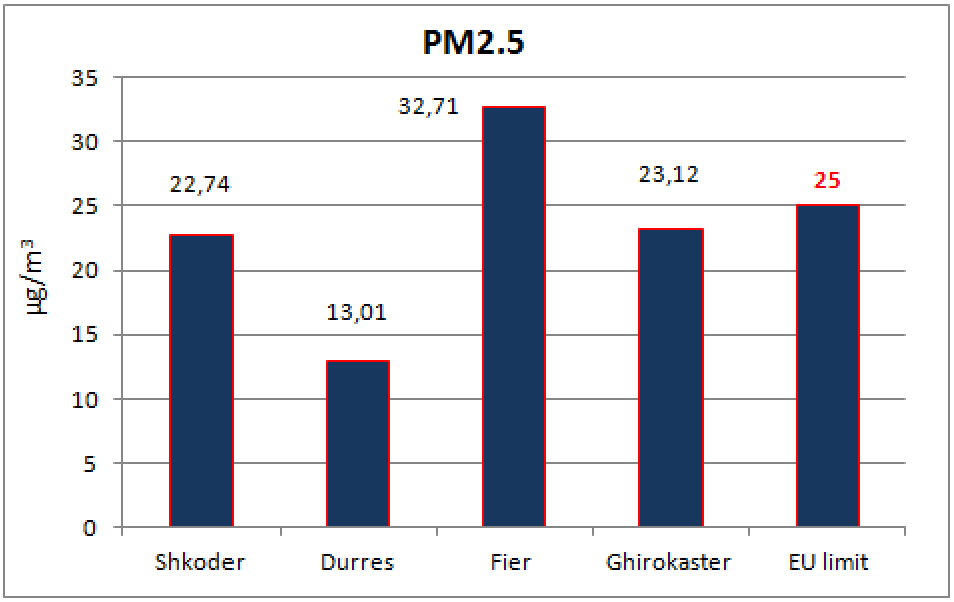



**Figure 4-11 Annual average of PM2.5 (µg/m³) for the stations of the major cities of Albania that are relatively close to the AIC.**

- Regarding $NO_2$, the values for the Tirana stations are generally higher than the annual EU limit (relevant and not close to Section 4 and partially Section 5), which is 40 µg / m³ (relevant and not close to Section 4 and partially Section 5). The values of $NO_2$ in Tirana vary from 38,25 µg/m³ to 86,42 µg/m³.

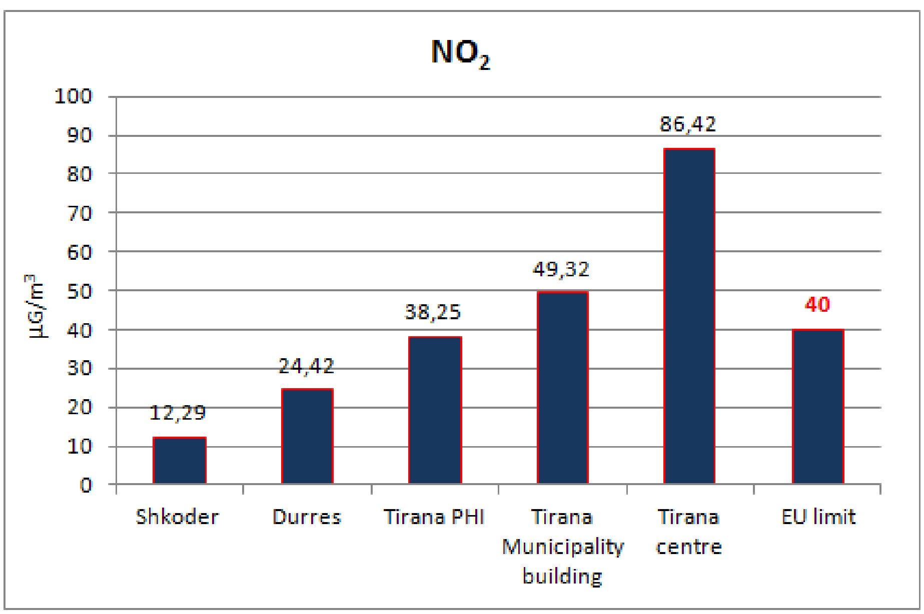



**Figure 4-12 Annual average values of NO2 (µg/m³ ) for the stations in the main Albanian cities which relatively close to the AIC.**

- The other air quality parameters ($SO_2$, $O_3$ and CO) are within the EU standards for the cities considered. Tirana city has the highest value of CO among the main cities along the AIC (2,56 mg/m$^3$), which is however lower than existing Albanian limits.

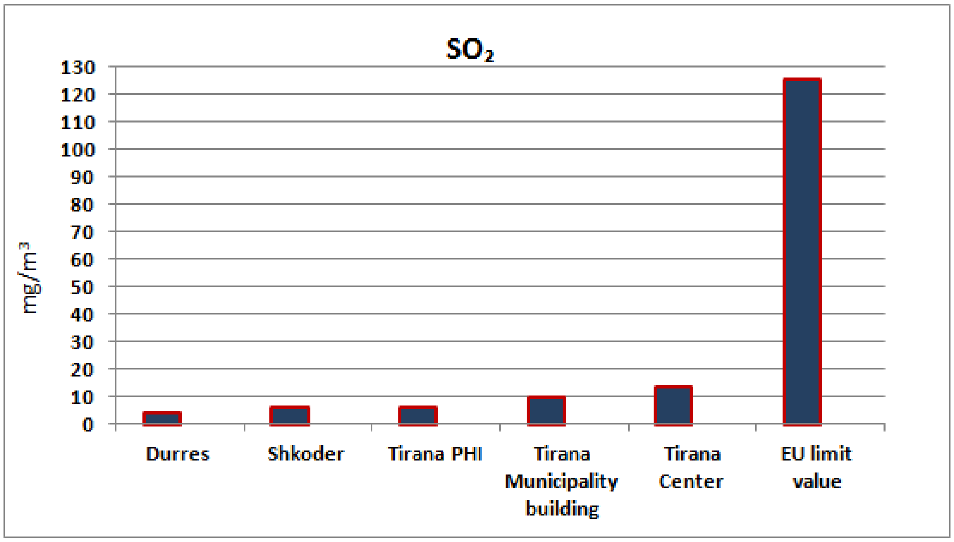



**Figure 4-13 Annual average values of SO2, (µg/m3) for the stations in the main cities of Albania that are close to the AIC.**

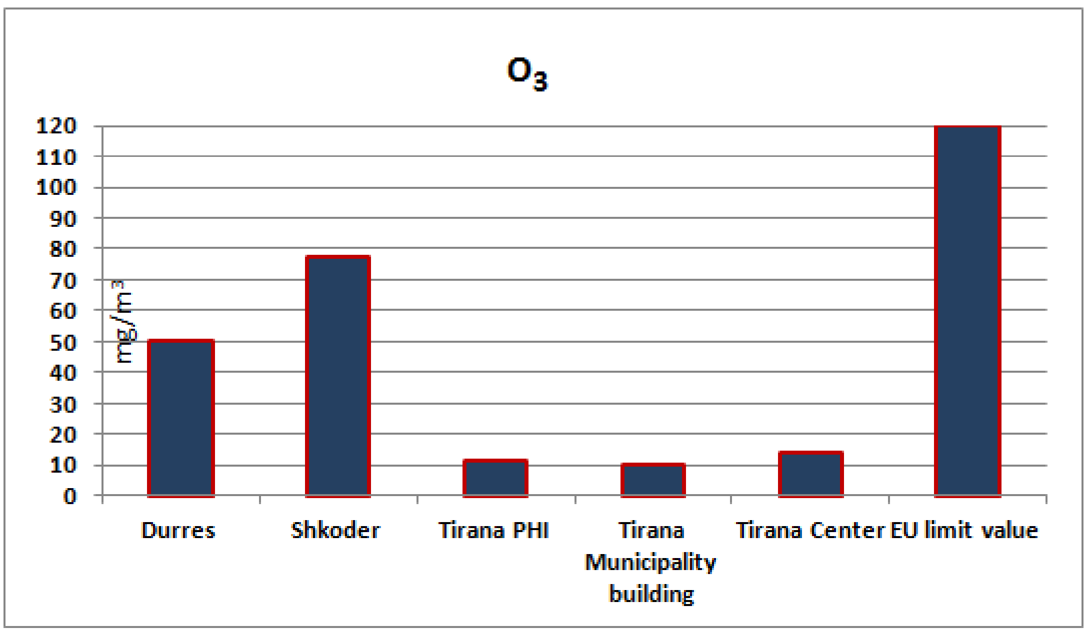



**Figure 4-14 Annual average values of O3 for the stations in the main cities of Albania that are close to the AIC.**

Tirana city has the highest value of CO among the main cities along the AIC (2,56 mg/m$^3$), which is however lower than the existing Albanian norms.

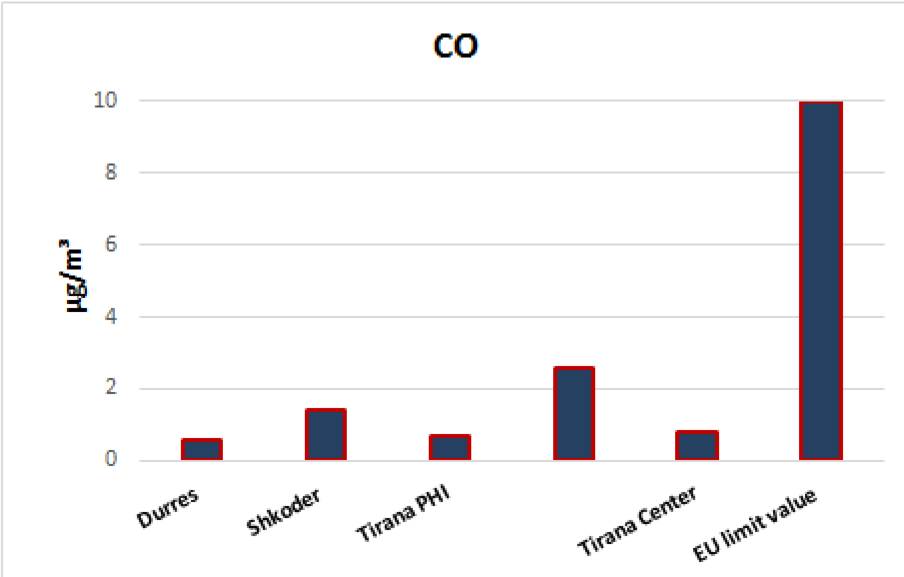



**Figure 4-15 Annual average values of CO (mg/m3), in the main cities of Albania.**

The highest level of Benzene among the cities along the cities close to the AIC is registered in Shkodra city, (Section 1) with 5.11 µg/m³ in January and 7.66 mg/m³ in February, when the annual EU limit is 5 mg/m³. The same report mentioned that for the other months, Benzene content in the air is lower than the annual EU limit value.

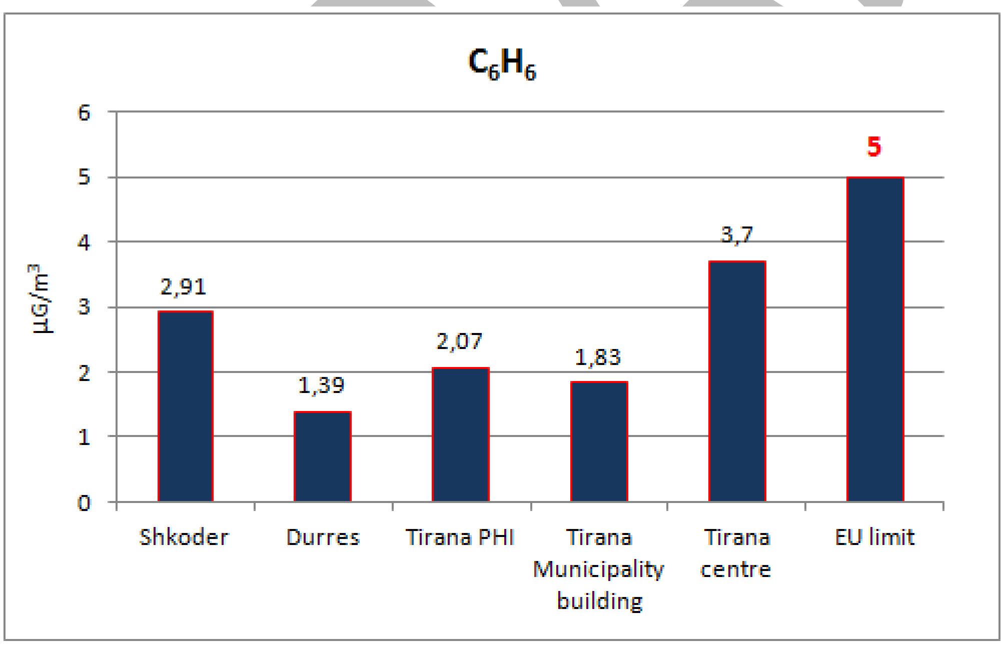



**Figure 4-16 Annual average of values of Benzene, C6H6 (µg/m3) for stations in the main cities of Albania that are close to the AIC.**

The toxic metal contamination at the aforementioned monitoring stations is not problematic, as the concentrations of all metals are much lower than the limit values.

The highest level of Benzene among the cities along the cities close to the AIC is registered in Shkodra city, (Section 1) Referring to ES report of NEA 2018, the toxic metal contamination at the aforementioned monitoring stations is not problematic, as the concentrations of all metals are much lower than the limit values.

The existing air pollution levels, since the aforementioned air monitoring points of the national monitoring system are far away from the AIC (no air measurements have been carried out) will be assessed empirically, classifying the areas affected by the AIC into four main groups:

- Existing roads

Vehicles of all types create air pollution along the existing roads. The peak of air pollution can be noted during the summer and the touristic period and includes gas emissions and dust. Considering the AIC and the four aforementioned groups of areas, air pollution along the existing roads can be considered as the most severe among the other groups.

- Urban and industrial areas

Construction activities are the main sources of air pollution in the industrial and urban sites, close to the AIC sections. One of the most significant industries along the AIC is the cement factory in Fush Kruje, (Section 4), which is a major source for air pollution regarding gases and dust. The level of air pollution in several industrial and urban areas can be considered as medium considering the industry types encountered in the vicinity of the AIC.

**Figure 4-17 Air pollution by cement Factory in Fushe Kruje, Section 4.**

- Agricultural sites

Agricultural activities and vehicles for such types of works can be considered as air pollutant sources in agricultural areas. Because of the seasonal agricultural works, the annual level of air pollution in such areas may be considered as Low.

- Natural sites

They are considered as areas of clean air. Air pollution levels can be considered as insignificant to negligible in these areas. The AIC sections pass partially through such areas and there is no section that is covered exclusively by such sites.

The table below includes a summary of the existing air pollution status per each AIC section, using the "comparison methodology", based on the land uses. The assessment ranges from high, medium to low quality.

**Table 4-32 Summary of air pollution status (level of air quality currently) per each AIC section**

| AIC Section | Environments affected | Level of air quality | AIC Section | Environments affected | Level of air quality |
|---|---|---|---|---|---|
| **Section 1** | Almost natural sites, villages and existing road | Medium | **Section 8** | Fier Bypass | Under construction |
| **Section 2** | Existing road | Low | **Section 9A2** | Existing road | Low |
| **Section 3** | Existing road | Low | **Section 9B2** | Natural sites, agricultural lands | High |
| **Section 4** | Villages, agricultural land, crossroads | Medium | **Section 10** | Natural sites, agricultural lands | High |
| **Section 5 (5B+5C)** | Crossroads, agricultural lands, natural sites, existing roads | Medium | **Section 11** | Existing Road | Low |
| | Crossroads, agricultural lands, existing roads natural sites, | Medium to high | **Section 12** | Gjirokaster bypass | The section already approved Existing environment Low |
| **Section 6+7** | Existing roads | Low | **Section 13A** | Existing road | Low |

To sum up, the main cause of air pollution along the AIC is the transport sector, followed by the uncontrolled burning of waste, extraction and oil refining (city of Fier -Section 8), cement production (AIC Section 4, cement factory of Fushe Kruje). The air pollution caused by traffic is related to the large number of vehicles that do not meet the air emission standards, to the fuel quality used, to the quality and capacity of the motorways and to the use of non-catalytic vehicles

### 4.1.9 Climate change

#### 4.1.9.1 Introduction

The United Nations Framework Convention on Climate Change (UNFCCC); and the Intergovernmental Panel on Climate Change (IPCC) established by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) are the principal bodies to provide understanding of the risk of human-induced climate change. Within the context of the UNFCCC, Albania is required to submit "National Communications" that outline the country's contribution to climate change and their response to the challenges it poses. The initial National Communication was submitted in 2002 and the Second National Communication in 2009. The third National Communication is the latest and was submitted in 2016 providing an updated inventory of GHG, both direct and indirect, and key sources. The study for the Third National Communication concentrated on the climate zone around the capital, Tirana, and the coastal zone "the Mediterranean field zone".

In September 2015, Albania submitted to the UNFCCC Secretariat its Intended Nationally Determined Contribution (INDC), adopted by the DCM No. 762 dated 16.09.2015. The GoA committed to reduce $CO_2$ emissions in the period 2016–2030 by 11.5 % compared with the baseline scenario (2015). The reduction of $CO_2$ emissions is also identified under the NSDI-II strategic objective on reaction towards climate change.

More specifically, regarding Albania and model simulations:

- Temperature is expected to increase during all seasons. What is significant is that the largest increases are expected in the summer, which has an important consequence for added demand for irrigation water. A second consequence will be an increase in the frequency and intensity of summer/spring thunderstorms. The temperate increases in spring will have an impact on flooding, as many floods are combination of rainfall and snowmelt.

- By 2050, the range of annual precipitation total is expected to vary between 570mm (in the South-East of the country) and 2100mm (in the South-West area). The maximum value is estimated at about 2650-2850mm over the alpine zones. Due to the predicted higher average temperature in winter, more precipitation is likely to fall in the form of rain rather than snow, which will increase soil moisture together with soil erosion and run-off. Episodes of intensive rain are also predicted to increase. The number of days with heavy precipitation (24 hours maximum) compared to the 1961-1990 average is likely to increase by 1-2 days by 2027 and by 2-3 days by 2050.
- Cloudiness is expected to decrease by 2.6% by 2050 as compared to 1990. Due to the close relationship to radiation, the number of sunshine hours and global radiation are supposed to increase;
- Higher wind speed is expected to occur especially in summer;
- Rising temperature will be expected to contribute to an increased number of hailstorm days in summer;
- Higher temperatures will also affect the frequency and intensity of hot days and heat waves. The number of days with a temperature higher than 35°C is likely to rise by 2-4 days by 2050 compared to the 1961-1990 average.
- The number of frost days (with temperatures below -5°C) in high altitudes is expected to decrease by 4-5 days by 2027, and by 9 days in 2050.
- The annual mean sea level is expected to increase with 70 cm by 2100. The predicted sea level rise will bring higher flood risks to most of coastal urban areas and related infrastructure, as well as will increase the risks of coastal erosion. As a result of sea level rise, the level of rivers is expected to increase in the upper parts of the basins and the flow will decelerate. In total, by 2030 approximately 1082.45 km2 (32% of the coastal area or 3.76% of the country's surface) will suffer the direct consequences of flooding. A majority of existing agriculture and industrial areas will be lost due to sea level rise. Huge amounts of arable lands will be lost or become un-usable due to inundation and increased salinity.

#### 4.1.9.2 Current contribution of the traffic to GHG emissions and climate change

Albania's third GHG inventory considers five main modules such as energy, industrial processes, agriculture, waste, and Land Use Change and Forestry. The national inventory has considered three direct GHGs such as: $CO_2$, $CH_4$ and $N_2O$ and three indirect GHGs such as: CO, NOx, $SO_2$ and Non-methane volatile organic compounds (NMVOC). Aggregated GHG emissions and removals expressed in $CO_2$ Eq. have also been provided. The total contribution of Albania in the world in aspect of GHG is 0.02 % of the total (by the data presented in the table of EDGAR's Global Greenhouse Gas Emissions from 1970 to 2012).

Albania's emissions decreased by 34% from 1990 to 2009. More specifically, emissions decreased from 1990 to 1998 and then grew from 1998 to 2005. Since then, an increase has been noted reaching the levels of 1980.

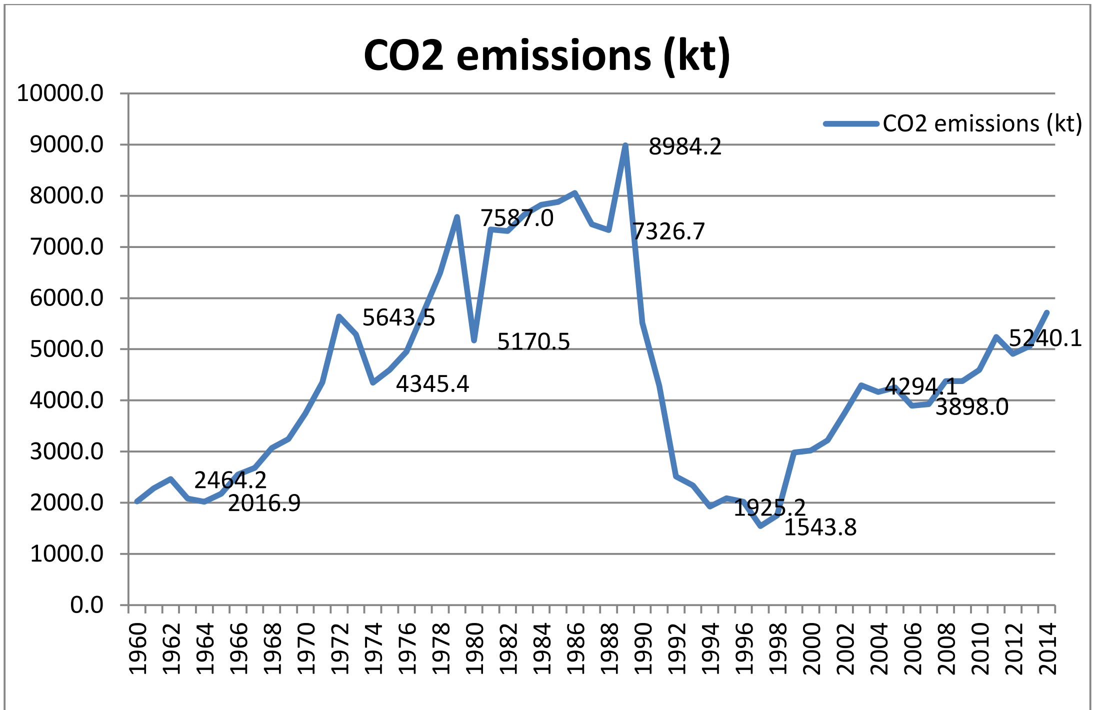



**Figure 4-18 CO2 emissions (kt)**

At the sector level, average annual change has been as follows: energy (-1%), agriculture (-1%), industrial processes (+66%), waste (+1%), and land use change and forestry (+35%).

According to the Draft Third National Communication on Climate Change (DTNCCC) (2016) the main contributor to GHG ($CO_2$ eq) emissions in 2009 is the Energy Sector (49.4%), followed by Industry (18.8%), Agriculture (14.26%), Land Use Change Forests (20.64%), and Waste (6.64%) as shown in the following figure.

The Energy sector is the main source of GHG emissions in Albania, accounting for (39 - 51%) of overall direct GHG emissions for the period. Energy production in Albania is based mainly on hydropower, domestic and imported fuels, and fuel wood used for electricity production, heat production and for transport means. Transportation accounts for 52%, manufacturing and construction 26%, other fuel combustion 18%, electricity and heat 3%, and fugitive emissions 1% of energy emissions. Agriculture is responsible for nearly one-third of national emissions.

Albania's transport sector has been increasing rapidly since 2000. The number of vehicles in circulation has increased, and infrastructure been improved which leads to an increasing total traffic load.

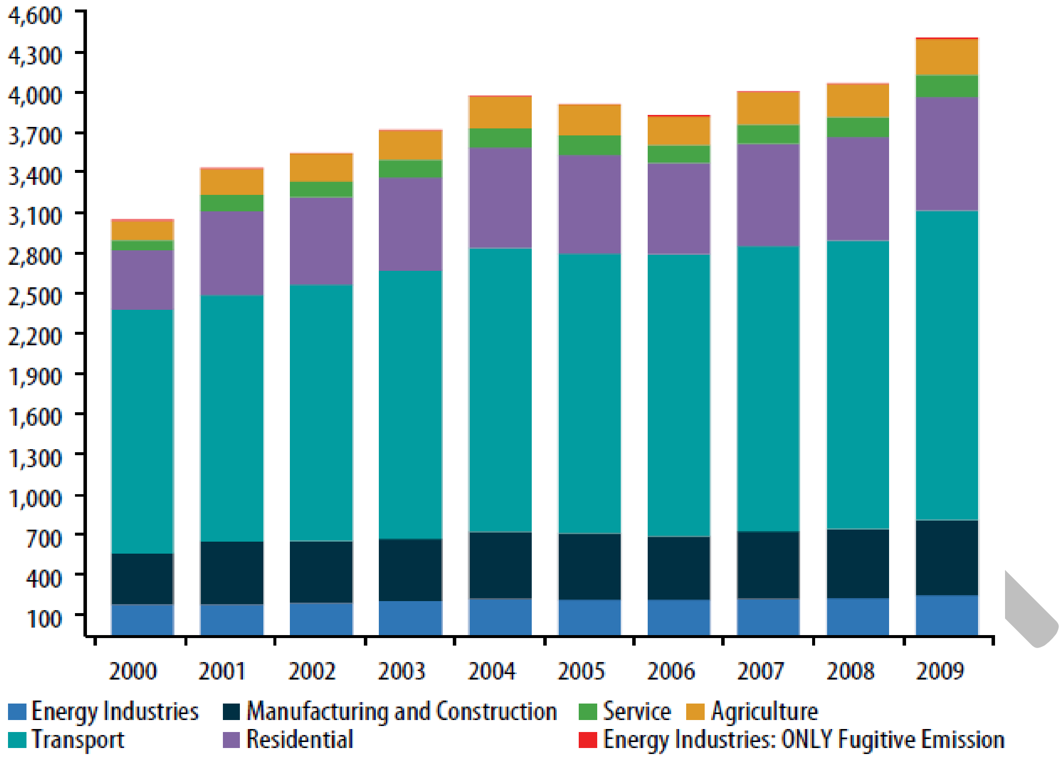



**Figure 4-19 Direct GHG emissions from each sub-sector of Energy Sector, 2000-2009 (Gg)**

The following table provides the contribution of GHGs from the Energy sector with CO2 emissions as the dominant contributor (accounting for 96.48% of the overall emissions in 2005)

**Table 4-33 Contribution of C02, CH4, N2O from the Energy subsector (Gg)**

| Subsector | Gases | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Transport | CO2 | 1815,93 | 1830,58 | 1901,29 | 1991,93 | 2110,10 | 2080,96 | 2098,12 | 2119,58 | 2145,31 | 2301,47 |
| | CH4 | 0,08 | 0,08 | 0,08 | 0,08 | 0,09 | 0,09 | 0,09 | 0,09 | 0,09 | 0,09 |
| | N20 | 0,00 | 0,01 | 0,01 | 0,01 | 0,01 | 0,01 | 0,01 | 0,01 | 0,01 | 0,01 |
| | CO2eq. | 1817,61 | 1835,36 | 1906,07 | 1996,71 | 2115,09 | 2085,95 | 2103,11 | 2124,57 | 2150,31 | 2306,46 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Transport | Road | 1774,53 | 1788,84 | 1857,95 | 1946,52 | 2061,99 | 2033,52 | 2050,29 | 2071,26 | 2096,41 | 2249,00 |

The figure below shows the GHG emissions projection form transport sector. The projections predict an approximately 1.5 times increase of transport GHG emissions from 2009 to 2030.

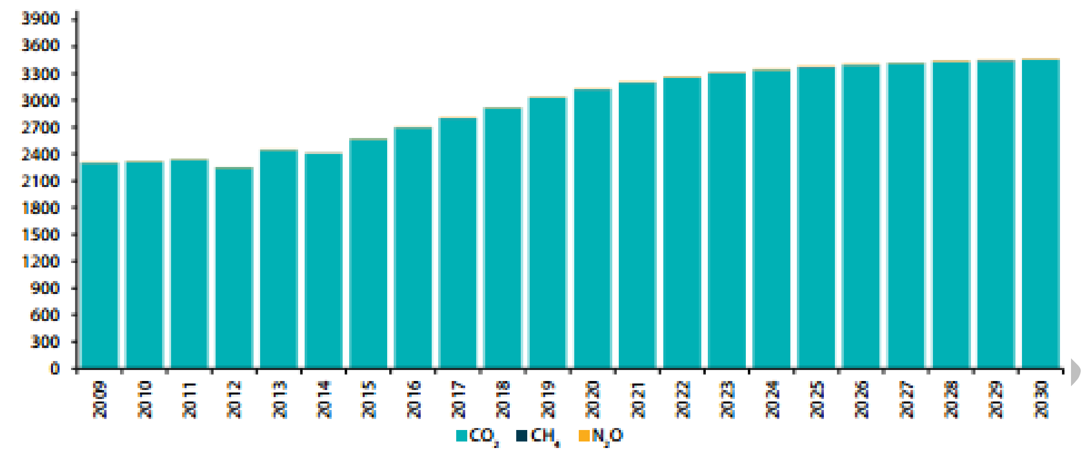



**Figure 4-20 GHG emissions from the transport Sector (in Gg of CO2 eq.)**

*Source: UNFCCC*

According to projections, the share of the transport sector will be slightly reduced from 48.08% in the year 2009 to 44.80% in the year 2030.

#### 4.1.9.3 Climate change induced risks events that have impact on the road

Air temperature, drought and precipitation

Information on projected changes in different climate variables was taken from the World Bank Climate Knowledge Portal for Albania. The portal uses CMIP5 models which were used in the latest IPCC's Fifth Assessment Report (AR5) and which are the most up-to-date Global Climate Model (GCM) projections available. Probabilistic projections of a range of climate variables are presented - for the different Representative Concentration Pathways, and for a range of time slices to the end of the 21st Century. An important source of the uncertainty in the climate projections are future emissions of the greenhouse gasses (GHGs). The Intergovernmental Panel on Climate Change (IPCC) estimates several GHGs emission scenarios that are used to force climate models. CMIP5 shows data for 4 RCPs: 2.6, 4.5, 6 and 8.5. These are four greenhouse gas concentration trajectories adopted by the IPCC and are named after the possible range of radiative forcing values In this study selected are two of IPCC's Representative Concentration Pathways (RCP) scenarios, namely the RCP4.5 and RCP8.5). The RCP4.5 is a stabilization scenario in which GHGs emission peaks around 2040 and declines afterwards. Oppositely, the RCP8.5 is a scenario with a constant increase of GHGs concentration by the end of the 21st century (IPCC, 2013). More specifically, CMIP5 projections are given for four time periods, 2020-2039, 2040-2059, 2060-79 and 2080-2099.

*Temperature*

The following chart represents the observed mean historical monthly temperature or rainfall for Albania during the time period 1986-2005. The dataset was produced by the Climatic Research Unit (CRU) of University of East Anglia (UEA).

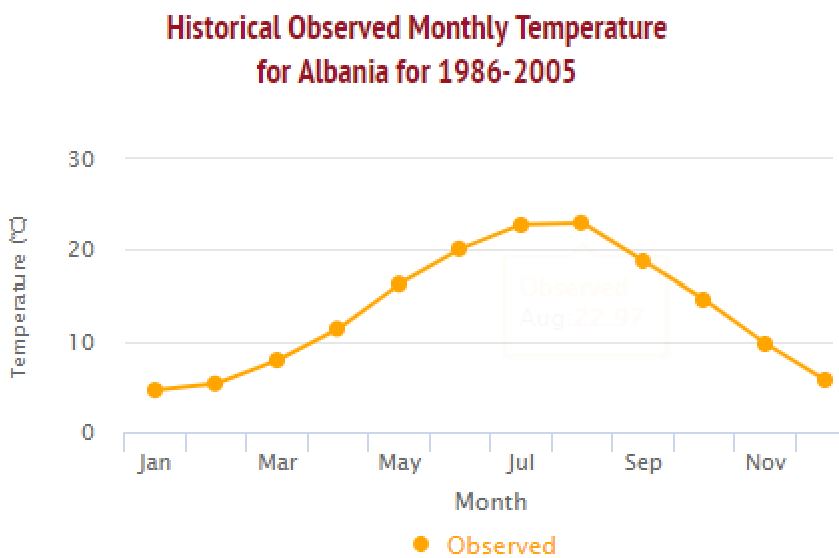



**Figure 4-21 Historical observed monthly temperature for Albania 1986-2005**

Projected changes in monthly temperatures for the four reference periods with respect to the referent period (1986-2005) under the scenarios RCP4.5 and RCP8.5. All climate simulations show an increase of mean temperatures for both future periods, under both IPCC scenarios, for all months and periods as indicated in the following tables.

**Table 4-34 Projected changes of normal monthly temperature (°C) in Albania for the periods 2020-2039, 2040-2059, 2060-2079 and 2080-2099 with respect to the referent period 1986-2005, ensemble median, Scenario RCP 4.5**

| | Winter | | | Spring | | | Summer | | | Autumn | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov |
| 2020-2039 | 0,30 | 0,45 | 0,91 | 0,12 | 0,90 | 0,13 | 0,32 | 1,49 | 1,78 | 1,20 | 1,26 | 1,27 |
| 2040-2059 | 1,24 | 0,86 | 1,11 | 0,57 | 1,59 | 1,00 | 1,81 | 1,79 | 2,56 | 1,78 | 1,85 | 1,48 |
| 2060-2079 | 1,57 | 1,30 | 1,17 | 0,92 | 1,25 | 1,31 | 1,74 | 2,47 | 2,62 | 2,43 | 2,26 | 1,95 |
| 2080-2099 | 1,97 | 1,50 | 1,63 | 1,46 | 1,96 | 1,18 | 2,29 | 3,36 | 3,36 | 2,24 | 2,72 | 2,48 |

**Table 4-35 Projected changes of normal monthly temperature (°C) in Albania for the periods 2020-2039, 2040-2059, 2060-2079 and 2080-2099 with respect to the referent period 1986-2005, ensemble median, Scenario RCP 8.5**

| | Winter | | | Spring | | | Summer | | | Autumn | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov |
| 2020-2039 | 0,84 | 0,89 | 1,39 | 0,63 | 0,81 | 0,93 | 1,56 | 1,75 | 2,37 | 2,01 | 2,04 | 0,90 |
| 2040-2059 | 1,88 | 0,94 | 1,52 | 0,81 | 1,89 | 1,83 | 1,98 | 3,30 | 3,44 | 2,67 | 2,07 | 2,18 |
| 2060-2079 | 2,55 | 2,63 | 2,24 | 1,95 | 2,69 | 2,49 | 3,94 | 4,90 | 4,91 | 4,36 | 3,82 | 3,22 |
| 2080-2099 | 3,44 | 2,96 | 3,30 | 2,90 | 3,41 | 4,10 | 4,94 | 6,34 | 6,32 | 5,14 | 4,69 | 3,59 |

For projected climate, the worst-case approach has been mainly assessed (period 2080-2099), where under scenario RCP 4.5, there is going to be an increase of 3,00 ºC during summer and of 1,70 ºC during winter. Under the scenario RCP 8.5, there is going to be an increase of 5,87 ºC during summer and of 3,23 ºC during winter. Under the scenario RCP 8.5, the highest seasonal increase, comparing decades, is in the summer. More specifically, in the period 2020-2039 there is an increase during the summer months (June, July, August - average) of 1,89 ºC, while in the period 2080-2099 the increase is 5,87ºC.

The tables below present the changes of summer days, tropical nights, frost and icy days as well as hot days for the two scenarios, where the high temperatures frequency at a day level increase going to the end of the century, while low temperatures at a day level decrease.

**Table 4-36 Projected changes of summer days, tropical nights, frost and icy days and hot day in Albania for the periods 2020-2039, 2040-2059, 2060-2079 and 2080-2099 with respect to the referent period 1986-2005, ensemble median, Scenario RCP 4.5**

| | Summer days (Tmax>25ºC) | Tropical nights (Tmin > 20 ºC) | Frost days (Tmin<0 ºC) | Icy days (Tmax<0 ºC) | Hot days (Tmax>35 ºC) |
|---|---|---|---|---|---|
| 2020-2039 | 20,34 | 7,20 | -11,24 | -2,27 | 5,15 |
| 2040-2059 | 26,92 | 12,08 | -15,75 | -2,52 | 8,52 |
| 2060-2079 | 34,71 | 16,72 | -21,25 | -3,28 | 11,64 |
| 2080-2099 | 37,59 | 19,11 | -22,67 | -3,83 | 13,81 |

**Table 4-37 Projected changes of summer days, tropical nights, frost and icy days and hot day in Albania for the periods 2020-2039, 2040-2059, 2060-2079 and 2080-2099 with respect to the referent period 1986-2005, ensemble median, Scenario RCP 8.5**

| | Summer days (Tmax>25ºC) | Tropical nights (Tmin > 20 ºC) | Frost days (Tmin<0 ºC) | Icy days (Tmax<0 ºC) | Hot days (Tmax>35 ºC) |
|---|---|---|---|---|---|
| 2020-2039 | 20,59 | 7,98 | -12,20 | -2,03 | 4,77 |
| 2040-2059 | 35,54 | 18,55 | -22,10 | -3,52 | 10,38 |
| 2060-2079 | 52,02 | 38,69 | -31,58 | -4,58 | 25,10 |
| 2080-2099 | 64,25 | 58,61 | -39,19 | -5,09 | 42,52 |

Projected changes of the ensemble median of mean annual number of frost and icing days for the period 2020-2039 are 11.24 and 2,27 days less under the RCP4.5 scenario respectively and 12.2 and 2 days less under the RCP8.5. Changes for the period 2080-2099 are greater, namely from 22,7 frost days and 3,8 icing days less under the RCP4.5 and 39,2 frost days and 5.1 icing days less under the RCP8.5.

Median change of mean number of summer days for the period 2020-2039 is 20,3 for the scenario RCP4.5 and 20,6 days for the scenario RCP 8.5, while in the period 2080-2099 is 37,6 more under the RCP4.5 and 64,2 more under the RCP8.5. Median change of mean number of days with tropical nights for the period 2020-2039 is 7,2 day more under the RCP4.5 and 8 more under the RCP8.5, while for the period 2080-2099 is 19,1 days more under the RCP4.5 and 58,6 days more under the RCP8.5. Finally, median change of mean number of days with hot days (Tmax>35ºC) for the period 2020-2039 is 5,15 days more under the RCP4.5 and 4,77 more under the RCP8.5, while for the period 2080-2099 is 13,8 days more under the RCP4.5 and 42,52 days more under the RCP8.5.

*Precipitation*

Projected changes in monthly precipitation for the four reference periods with respect to the referent period (1986-2005) under the scenarios RCP4.5 and RCP8.5.

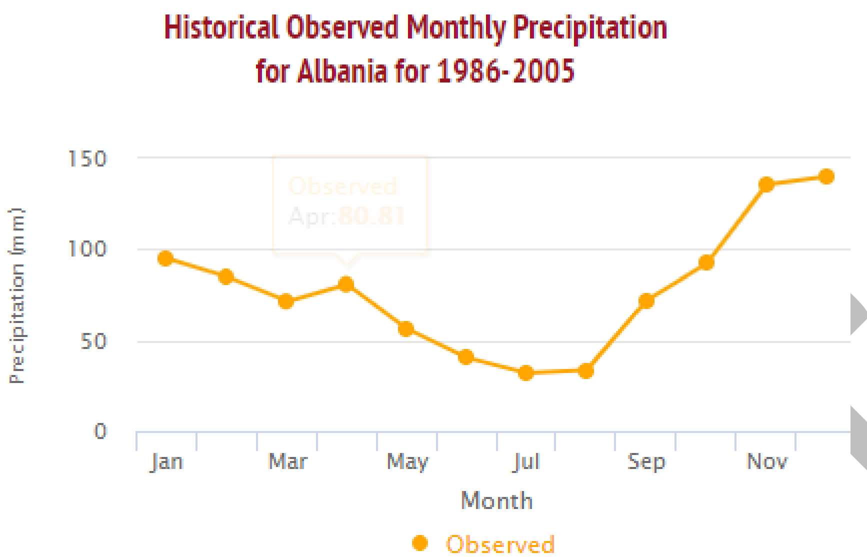



**Figure 4-22 Historical Observed Monthly Precipitation for Albania for 1986-2005**

Unlike the temperature change projections, precipitation changes are not uniform both in size and in sign.

**Table 4-38 Projected changes in monthly precipitation (mm) in Albania for the periods 2020-2039, 2040-2059, 2060-2079 and 2080-2099 with respect to the referent period 1986-2005, ensemble median, Scenario RCP 4.5**

| | Winter | | Spring | | | Summer | | | Autumn | | | Win |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| 2020-2039 | 13,89 | 4,11 | 5,00 | -4,84 | 5,60 | -0,32 | -3,90 | -4,23 | 2,64 | -2,34 | 23,11 | 2,32 |
| 2040-2059 | 9,42 | -8,10 | 2,74 | -14,94 | 4,39 | -5,58 | -7,27 | -4,18 | 2,80 | -3,80 | -2,49 | 8,31 |
| 2060-2079 | 6,74 | -12,06 | 4,19 | -7,15 | -0,57 | -1,72 | -6,49 | -4,70 | 1,02 | 7,80 | 28,00 | 6,78 |
| 2080-2099 | 9,77 | -1,64 | 2,74 | -7,02 | 14,66 | -1,31 | -6,66 | -5,81 | 1,08 | 1,68 | 14,23 | 12,49 |

**Table 4-39 Projected changes in monthly precipitation (mm) in Albania for the periods 2020-2039, 2040-2059, 2060-2079 and 2080-2099 with respect to the referent period 1986-2005, ensemble median, Scenario RCP 8.5**

| | WInter | | Spring | | | Summer | | | Autumn | | | Win |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| 2020-2039 | 11,64 | -8,07 | 5,71 | -3,52 | -2,90 | 0,80 | -4,50 | -4,80 | -8,05 | 8,09 | 4,94 | -4,70 |
| 2040-2059 | 13,33 | 4,78 | 8,02 | -9,69 | -1,58 | -5,34 | -3,32 | -6,02 | 6,60 | -3,34 | 8,10 | 0,34 |
| 2060-2079 | 9,95 | -1,34 | -7,26 | -1,25 | -3,76 | -8,50 | -10,38 | -9,40 | -11,94 | -9,34 | 2,61 | 12,24 |
| 2080-2099- | -4,94 | 1,82 | -5,52 | -5,89 | -12,98 | -5,67 | -12,12 | -7,67 | -11,86 | -8,60 | -1,75 | 10,20 |

Under the scenario RCP 8.5, the largest precipitation deficit is identified in the period 2080-2099, while on the contrary, this is not uniform under the scenario RCP 4.5, where depending on the month, different periods may have higher or lower values. Additionally, there is an increase in precipitation for all periods under RCP 4.5, apart from the period of 2040-2059.

The following tables present the project changes of days with rainfall and the maximum daily rainfall (mm) for the two scenarios.

**Table 4-40 Projected changes of days with rainfall and maximum daily rainfall (mm) in Albania for the periods 2020-2039, 2040-2059, 2060-2079 and 2080-2099 with respect to the referent period 1986-2005, ensemble median, Scenario RCP 4.5**

| | Days with rainfall > 20mm | Days with rainfall > 50mm | Maximum daily rainfall (10yr RL) | Maximum daily rainfall (25yr RL) |
|---|---|---|---|---|
| 2020-2039 | -0,33 | 0,02 | 0,92 | 1,29 |
| 2040-2059 | 0,28 | 0,00 | 2,37 | 2,87 |
| 2060-2079 | 0,14 | 0,02 | 2,65 | 3,24 |
| 2080-2099 | 0,06 | 0,02 | 2,24 | 2,68 |

**Table 4-41 Projected changes of days with rainfall, maximum monthly rainfall and maximum daily (mm) rainfall in Albania for the periods 2020-2039, 2040-2059, 2060-2079 and 2080-2099 with respect to the referent period 1986-2005, ensemble median, Scenario RCP 4.5**

| | Days with rainfall > 20mm | Days with rainfall > 50mm | Maximum daily rainfall (10yr RL) | Maximum daily rainfall (25yr RL) |
|---|---|---|---|---|
| 2020-2039 | 0,15 | 0,00 | 1,83 | 2,10 |
| 2040-2059 | 0,23 | 0,00 | 3,36 | 4,09 |
| 2060-2079 | 0,43 | 0,06 | 6,71 | 8,86 |
| 2080-2099 | 0,45 | 0,04 | 7,41 | 9,64 |

Regarding annual days with rainfall > 20mm, scenario RCP 8.5 shows higher values with a steady increase compared to the scenario RCP 4.5. However, there is a peak in the period 2040-2059 under the scenario RCP4.5 and then there is a decrease. Regarding annual days with rainfall > 50 mm, both scenarios show that there is an almost zero probability of such a precipitation. Regarding the annual maximum monthly rainfall in a 10 year RL, there is a steady increase in the values along the time under the scenario RCP 8.5. Under the scenario RCP 4.5, there is a major increase in mm up to 2060-2079 and then a slight decrease. Finally, regarding the annual maximum monthly rainfall in a 25 year RL, there is an increase up to 2060-2079 and then a decrease under the scenario RCP 4.5, while there is a steady increase in values under the scenario RCP 8.5.

*Drought indicators*

Regarding drought to the reference period, there are given below the relevant figures, presenting the trend of these indicators in the periods 2020-2039, 2040-2059, 2060-2079, 2080-2099 under the scenarios of RCP 4.5 and RCP 8.5. As far as projected change in annual severe drought is concerned, under the scenario RCP 4.5, there is a mild increase among the time periods, starting from a probability of 0,15 during the period 2020-2039 and reaching the probability of 0,4 change during the period 2080-2099. Under the scenario RCP 8.5, this probability starts from 0,2 in the period 2020-2039 and reaches the probability of 0,84 in the period 2080-2099, as it is shown in the following two figures.

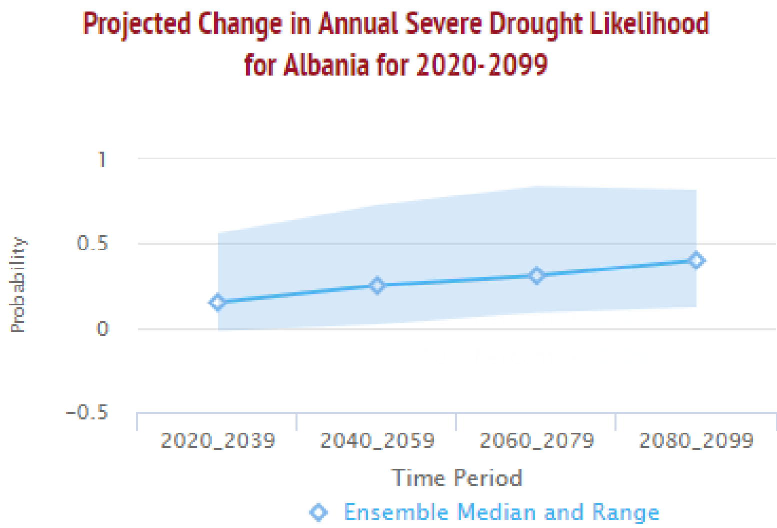



**Figure 4-23 Projected change in annual severe drought likelihood for Albania for 2020-2099 (under scenario RCP 4.5)**

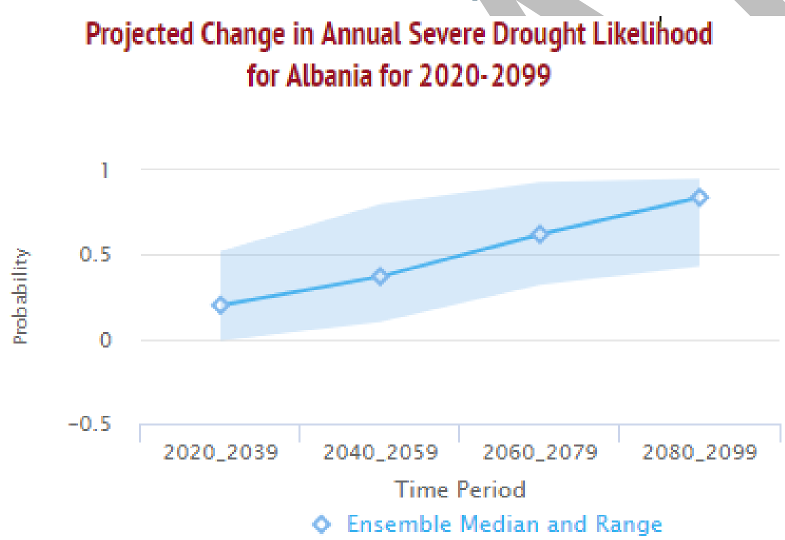



**Figure 4-24: Projected change in annual severe drought likelihood for Albania for 2020-2099 (under scenario RCP 8.5)**

<u>Flooding risk</u>

During catastrophic flooding, water inundates mainly the west Albanian plain, downstream of the catchment area, where more than 50% of Albania's population lives. The damage caused by such inundations is especially severe for the agricultural sector. According to the more recent observation records, the largest floods during the last 150 years occurred in 1854, 1905, 1937, 1962-1963, 1970-1971. However, complete data on peak discharge, inundated areas etc. exist only for the floods of 1962-1963 and 1970- 1971.

The major flood events of the past five years are summarized in the following table and figure. The impact of floods and torrents has been classified, according to colour, as extreme, severe and moderate, based on the area and population affected. It can be concluded that plains and relatively narrow valleys in the hilly and mountainous regions are those areas most exposed to flooding. The impact of the floods through damage caused to human health and the economy is greater on the floodplains and at lower river sections, where towns, industrial areas and farmlands are concentrated.




**Figure 4-25 Location of floods in 2010-2015 in the Western Balkans**

**Table 4-42 Summary of major flood events in the project region for the period 2010-2018**

| Date | Affected areas, municipalities | Extent of damage | Flood impact rating |
|---|---|---|---|
| Jan. 2010 | Shkodra, Lezhe and Durres | 10,000 hectares flooded, over 5,000 people evacuated, 2,200 houses damaged | Severe |
| Nov-Dec. 2010 | Drini and Mati River Deltas, Ulza and Shkopeti reservoirs | 15,000 evacuated, 6,000km2 land flooded, 4,800 houses flooded | Severe |
| Nov. 2014 | Tirana, Lezhe, Shkoder and Fier | 11,000 people evacuated, 3 people died, 7500 houses damaged | Severe |
| Feb. 2015 | Vlora and Fier, Berat, Elbasan and Ghirokaster, Rivers Vjosa, Devoll, Osu, Seman | 42,000 people affected | Severe |
| Nov. 2015 | Kukes, Diber, Durres, Shkoder, the southern county of Gjorokaster and around the capital in Tirana district, in central Albania | 1 death, 30,000 were left without power and many without drinking water includins residents in the Tirana area | |
| Jan. 2016 | Tirana, Diber, Durres, Shkoder and Lezhe | 700 people evacuated, roads blocked after several minor landfalls, homes evacuated because of landslides | |
| Oct. 2016 | Lac, Kurbin municipality, Lezhe County, Diber, Tirana and Korce | 1 death has been reported in the north west town of Lac, Kurbin municipality, Lezhe county. 100 homes flooded. At least six families displaced as a result. Crops and livestock damaged | |
| Nov. 2016 | Diber County, Durres county, Lezhe County, Kukes County | 3 deaths, 80 families evacuated from their homes in Tirana County, several roads have been closed, including the Tirana-Durres highway, landslides bloced roads, a bridge collapsed near Ujmisht village | |
| Dec. 2017 | Marikaj and Laknas in Tirana County, Fushe Kruje in Durres County, and also in Bardhaj, Shkoder County | Over 70,000 homes left without electricity. 5,000 households have suffered flood damage, 600 families forced to evacuate. Over 100 road sections and dozens of bridges damaged, along with | |

| Date | Affected areas, municipalities | Extent of damage | Flood impact rating |
|---|---|---|---|
| | | infrastructure such as power and water supply stations. Approx. 15,000 hectares was under water. Emergency services have evacuated 200 people after they were trapped inside a flooded shopping centre in Kashar, Tirana County | |
| Mar. 2018 | Shkoder, Diber, Kukes, Durres and Elbasan Counties | 2,286 hectares of land were under water, 800 inhabitants isolated, landslides blocked roads. | |

Based on the National flood damage reduction programmes, the figure below presents a flood risk map for a 100 years return period.

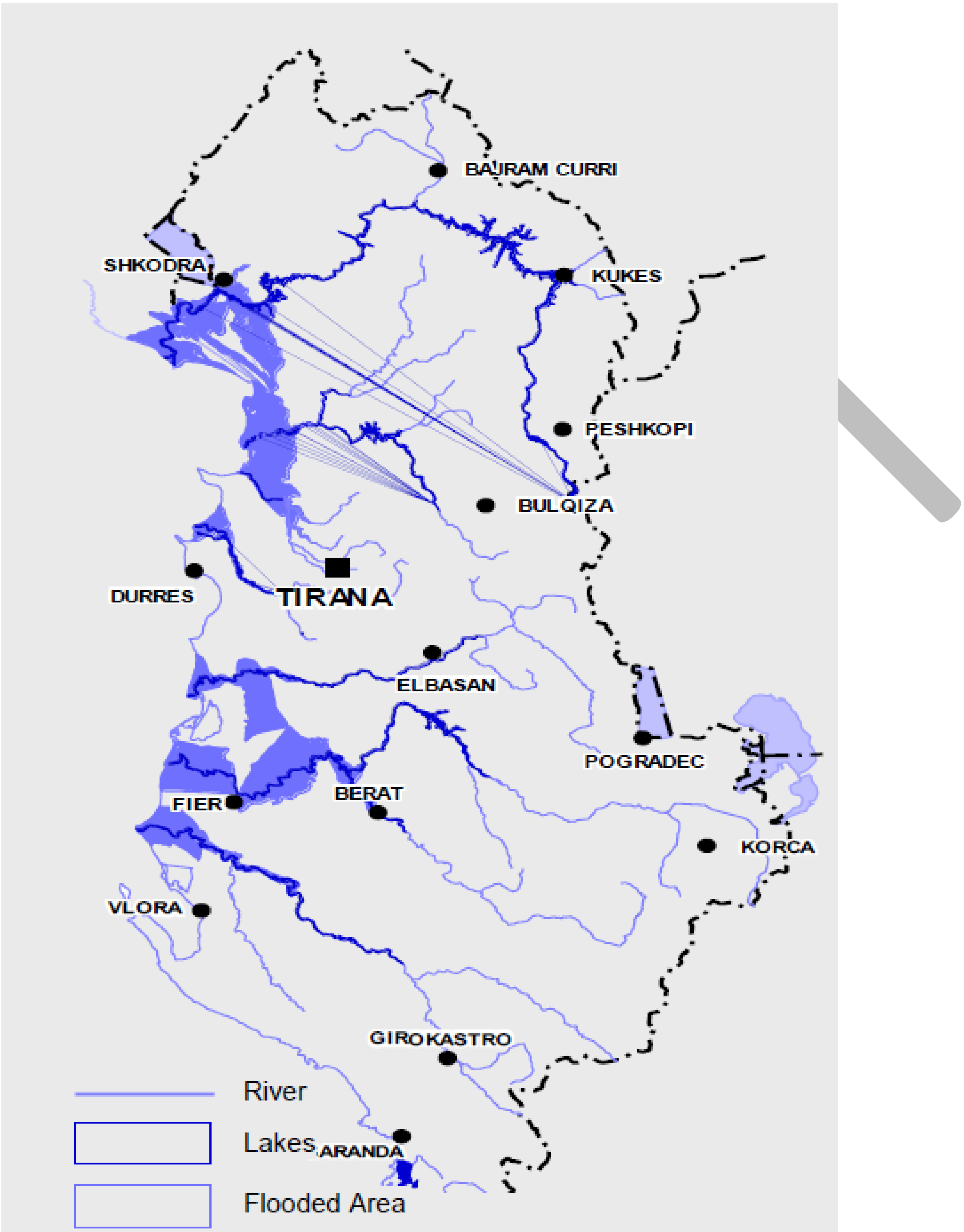



**Figure 4-26 Flood risk map 100 years return period**

The analysis below refers to each section and flood events.

<u>Section 1: Murriqan (Border with Montenegro) – beginning of Lezhe Bypass</u>

*Flooding of the winter 1962-63*

Amongst all flood events observed, the biggest and most severe event is the one in 1962-63 regarding the occupation of the territory, duration and damages caused by them. On the 13th January 1963, a big flood event was observed with almost the same magnitude as that of November 1962, but inundating a wider region of the country. The rivers Buna, Drini and Mat reached higher water levels and overpassed the riverbanks. Major parts of the fields of Shkodra and Zadrima were inundated by the flood of Drini and Buna. Because of the limited capacity of the river bed of the Buna after the confluence with Drini, a part of the waters of Drini and Buna overspilled both right and left dikes and inundated the fields of Prushi, Velipoja and Berdica, penetrating in the swamp of Kakarriqi and Myrteniza.

The maximum water level observed on the 13th January 1963 in Drini River at Vau Dejes was 673 cm, which at the same time was the highest water level ever observed at this station. Waters of this flood inundated the fields of Zadrima, the zone between the fields Stajke, Kozmac, Ashte, Plezhe, Bushat, Shkjeze and Beltoje until the hills of Mabjes se Dajçit of Zadrima, Kodhelit and Bagjelit.

Waters of Drini inundated the field of Zadrima in the vicinity of Lezha, while these waters, by joining with the waters of Buna River and those of the Drini coming from the swamps of Kakarriqi, inundated the city of Lezha and caused a lot of damages in residences and administrative buildings. At the same time, Ishull-Lezhe, the zone between the villages Gajushe, Rille and Trush was inundated up to the joint point with the waters of Mati River in the south. Big inundations were observed also in the zone of Velipoja and Myrteniza.

The waters of Drini inundated also the zone of Jubani, Vukatana and Bahçalleku, creating a big danger for the dikes of the Torrent of Gjadri.

Analysis of these data indicate that the flood of 1962-1963 is ranked as third on the list of the largest inundations. Some characteristics of the catastrophic inundations of the 1962-1963 winter appear in the following table. During this flood, the existing embankment was breached in numerous places resulting in the flooding of nearly 100 000 ha of agricultural land. Severe erosion also occurred on slopes throughout the basin.

**Table 4-43 Characteristics of the inundation of winter 1962-1963**

| No. | River | Inundation area (ha) | Duration (days) | Peak discharge (m3/s) |
|---|---|---|---|---|
| 1 | Drini | 20.000 | 22 | 9500 |
| 2 | Mati | 8.000 | 10 | 3000 |
| 3 | Ishmi | 5.000 | 8 | 1500 |
| 4 | Erzeni | 4.500 | 7 | 1400 |
| 5 | Shkumbini | 10.000 | 7 | 2000 |
| 6 | Semani | 30.000 | 35 | 3000 |
| 7 | Vjosa | 22.000 | 20 | 5500 |

*The Flood Phenomenon in January and November/December 2010*

The severe flood of Nov.-Dec. 2010 was the consequence of a combination of human and natural factors. As causes of major floods in the Drin-Buna Lowland several studies therefore list different aspects which in combination may lead to a crisis situation. These are as natural factors:

- heavy and long lasting rainfalls in the winter season often in combination with
- snowmelt in late winter / early spring causing overflow in the rivers of Buna, Drin, Kir and the lake of Shkodër, as human factors:
- the sudden release of huge amounts of water from the hydropower reservoirs and

- the not properly working drainage system in the lowland.

Due to reasons mentioned above, the Drini River flows increased, which consequently increased the water levels in the three Hydroelectric Power Plants (HPPs) of Fierza, Koman and Vau I Dejes which are built on this river. During the flood event in December 2010 most parts of the roads within the flooded area were not usable or only to a limited extent.

As a result of this situation, even though water is mainly used to produce electricity in order to keep the level of water under control in the lakes, the relevant authorities were obliged to open the emergency doors to release water from the artificial lakes.

The natural flow parameters grew to 2480 $m^3/s$ and discharges were 2009 $m^3/s$, taking into account the registered data of KESH (Albanian Power Corporation). These high discharges together with heavy rainfalls caused flooding on the flat area of the Shkodra prefecture.

The Albanian authorities declared a natural disaster on the 5th January in Shkodra and Lezha prefectures, where floodwaters forced the evacuation of thousands of people. The situation in Shkodra district became increasingly critical. The Buna River overflowed and inundated the city of Shkodra. The water level on the main road entering to Shkodra, close to Bërdica reached one meter, while in the village of Bërdica, the water level reached two meters. The Sub-Shkodra area remained in a critical situation. The water isolated the city of Shkodra blocking the national road axis and cutting communication within the town.

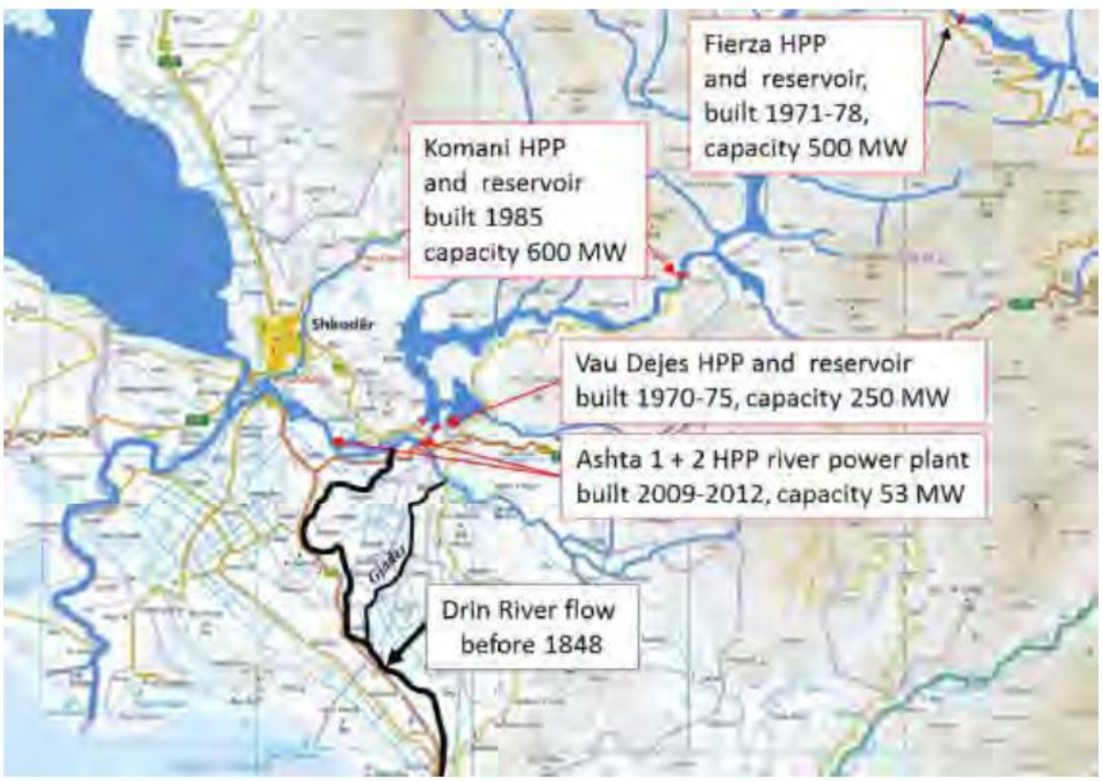



**Figure 4-27 Flow of Drin and Gjadër River before diversion in 1848 and the Drin hydropower cascade including the new river power plant Ashta**

Generally, the dike system has been improved in the last years but is still under risk in many stretches. The interventions in the rivers for embankments and dikes are done on ad-hoc basis. There is no detailed modelling for the rivers which would indicate the obsolete areas. After the flood in January 2010, the government took immediate measures and constructed embankments along Buna and Drin River, reinforced the Selmanaj dike and dikes along Buna River in Dajç. These interventions were quick reactions on the flood event and therefore partly again damaged during the extreme flood event in December 2010 and later in 2013. To protect Shkodër city, a by-pass for the city and at the same time a flood protection barrier, was started to be constructed in the western part. However, its construction is not completed and is not clear if the solution will have the considered impacts on risk reduction and possibly other consequences.

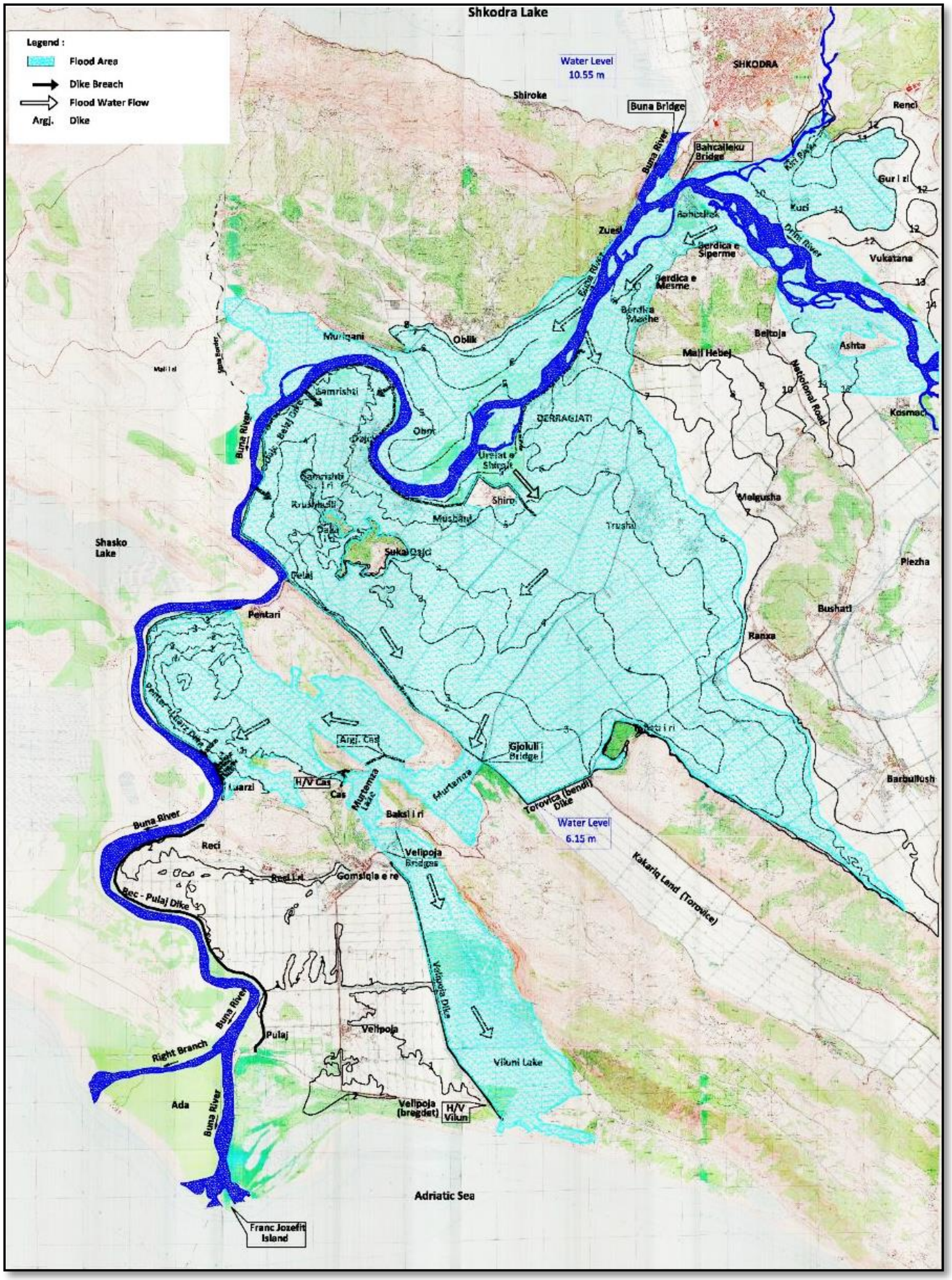



**Figure 4-28 Inundation Map of Shkodra in November/December 2010**

*The Flood of March 2018*

On the 2nd March 2018, Shkodra prefecture has been affected by extensive flooding caused initially by the snow melting due to warm winds and the gradual temperature increase. Intense rainfall over subsequent days combined with the increase in the discharges from the hydroelectric power plants (HPP) in the Drin cascade have worsened the flooding situation. The floods have been spread, covering 4,800 ha of agricultural land, cutting off 160 houses and fully flooding fourty houses. The villages of Obot and Shirq located in the Ana e Malit and Dajç administrative units, respectively, were the most severely affected areas. The situation worsened on 19th March, affecting even the suburban areas of the city of Shkodra, where twenty five people were evacuated by military and police, and accommodated in a high school dormitory. The worsening of the situation was caused by the discharges of HPPs (Hydroelectric Power Plants) in Fierzë, Koman and Vau Deja, as well as the high amount of precipitation in the Shkodra area, particularly in its northeast. Authorities increased the amount of compulsory discharges in order to reduce the pressure on the dams, since water levels were at an almost critical level. The villages of Velipoja and Trushi and most of the villages of Dajç were facing drinking water shortages due to the absence of the water pumping system.

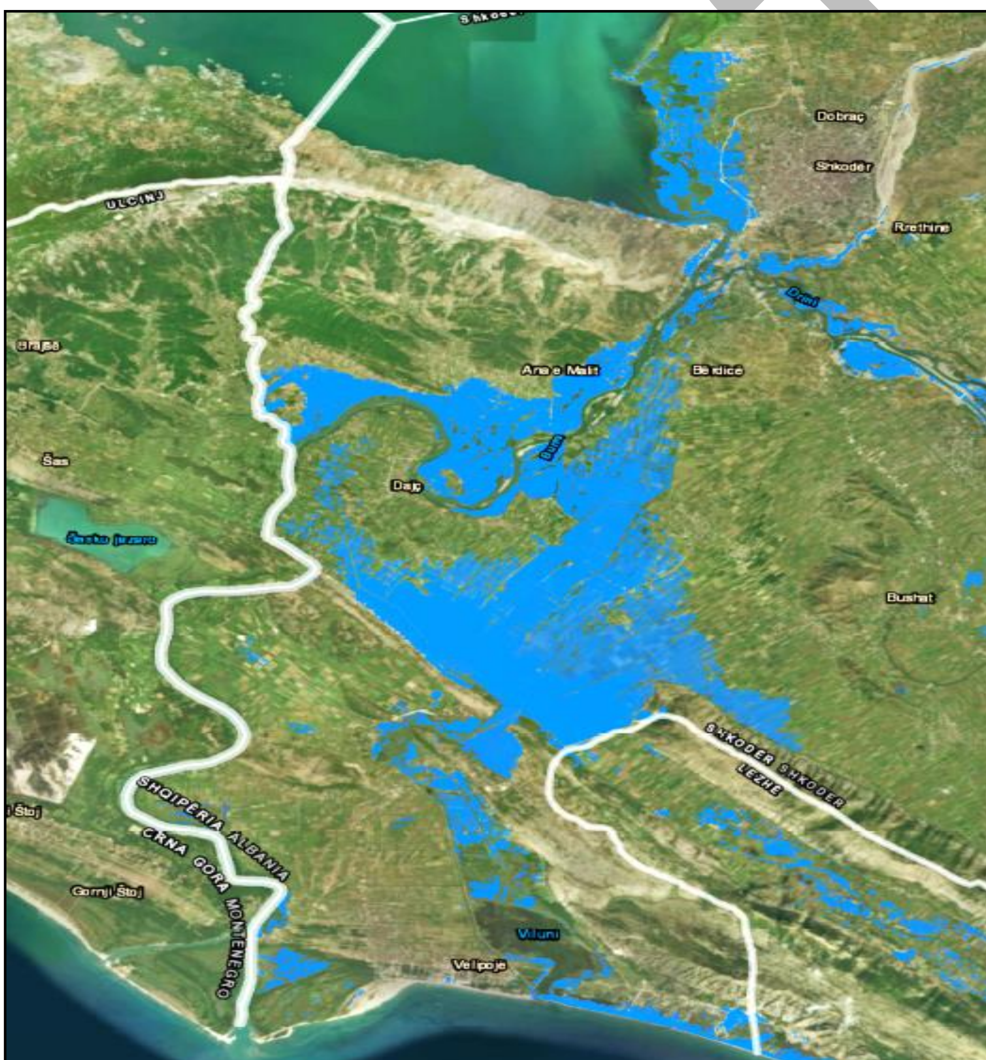



**Figure 4-29 Inundation Map of Shkodra in March 2018**

The Preliminary Flood Risk Assessment for the Drin/Drim – Buna/Bojana River Basin (November 2018) has examined the river section below Shkodra city to Adria (mouth) / & Vau Dejes (river km 170-220) for potential risk. The area affected covers the Shkodra city and administrative units of Vau Dejes, Guri i Zi, Bërdicë, Dajç, Ana e Malit, Velipojë, Rrethina, and Bushat, while specific areas/villages within this area are Livadhe, Bahçallëk, Persash, Bahçja e Cakajve, Ajasëm, Kuç, Rrenc, Guri i Zi, Trush, Bërdicë e Sipërme, Bërdicë e Mesme, Bërdicë e Madhe, Beltoje, Belaj, Rrushkull, Shirq, Mushan, Samrish,Suka, Pentar, Obot, Oblikë, Muriqan, Baks-Rrjoll, Cas, Luarz, Pulaj, Fshat i Ri (Trush i Poshtëm), Mali i Jushit, Rranxa, Konaj, Hoten. The following figures and and tables present the potential risks/assets in the risk area, the risk assessment of potential risks as well as the high risk flood area of Buna River.

### Table 4-44 Potential risks/assets in the risk area

| Potential risks / assets in risk area | |
|---|---|
| Risk area (in ha) | > 12.000 |
| Houses | > 7.000 |
| Persons | > 15.000 |
| Families | > 3.000 |
| Companies at risk | business buildings |
| Industry (objects) | |
| Infrastructure (objects) | > 400 (see below) |
| Agriculture [ha] / objects | Large agricult. area, vulnerable crops and large no. of animals |
| Protected areas | Buna river protected area |
| Other objects at risk | Public services (water supply, hospi-tals, schools, religious buildings, energy supply) |

### Table 4-45 Risk assessment of potential risks

| Risk assessment / significance of potential risks | | | |
|---|---|---|---|
| *Significance criteria* | *value* | *limit* | |
| **A) Human health, economic values** | | | |
| no. of houses | 7.000 | ≥ 10 | |
| Settlement area (in ha) | >5.000 | ≥0,5 | |
| Industrial objects | >5 | ≥ 1 | |
| Industrial area (in ha) | >2 | ≥ 0,5 | |
| Critical agriculture aspects | X | | |
| **B) Environmental risks** | | | |
| **B1) Water polluting substances / sites** | | | |
| Contaminated sites | 0 | ≥ 1 | |
| Locations with dangerous substances | 0 | ≥ 1 | |
| **B2) Protected areas (according to WRRL)** | | | |
| Protected areas (e.g. Natura 2000 etc.) | 1 | ≥ 1 | |
| Drinking Water supply areas | 3 | ≥ 1 | |
| Bathing waters | 0 | ≥ 1 | |
| **C) Risk for cultural heritage sites** | | | |
| UNESCO heritage sites | 0 | ≥ 1 | |
| Other relevant cultural heritage sites | 3 | ≥ 1 | |

Limit exceeded    No information / uncertain    Limit not exceeded

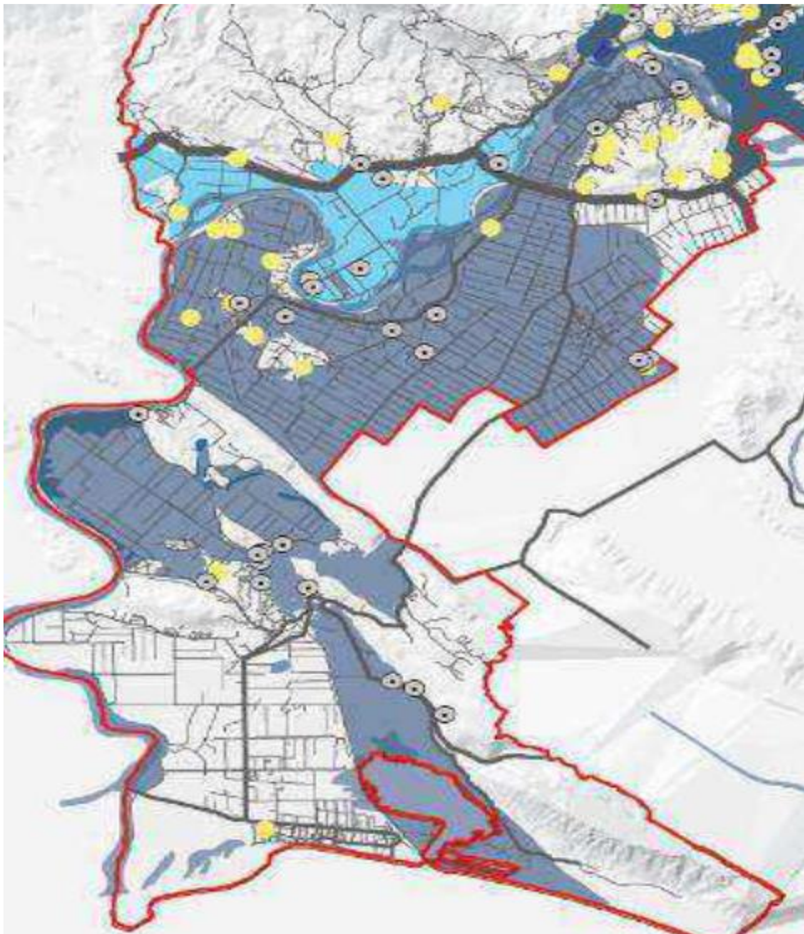


**Figure 4-30Map of the high risk flood area of Buna River. The color dark blue indicates the flood extend as presented in the Shkodra Local Territory Plan.**

Section 2: Beginning of Lezhe Bypass - Milot

The area where section 2 passes by has a medium flooding risk regarding Drini i Lezhes River and Mati River. Amongst all flood events observed, the most severe ones are considered those that occurred in 1962-63 in relation to the occupation of the territory, duration and damages caused by them. In this period Mati and Drini i Lezhes River have inundated all the area around in downstream part. Other flood events have occurred during the years but they are not documented so the information about them is missing.

The dykes in the Mati River are built downward URA e Milotit until the rivermouth. In general, these dykes protect the fields from the inundation, except of a part close to the rivermouth, where river waters recharge the swamp of Potoku.

The Preliminary Flood Risk Assessment for the Drin/Drim – Buna/Bojana River Basin (November 2018) has examined the river section that affects the area extends of Lezha city; the villages of Blinisht; Mabe; Zojz; Gocaj; Trorovice; and Ishull Shengjin. Barbullonje, Tresh, Zejmen, Kolsh. Lezha area is at high risk from many sources: sea, river, torrential streams, inundation, land degradation, drainage system. The risk in Lezha is coming from both sides. The river and drainage system and the sea level rise which has been advancing very much in the last years increasing the severity of the events. In 2010 the sea rise blocked the waters to drain.

The city of Lezha is a hotspot as one of the neighborhoods is frequently affected. The Barbulloja village is an area at high risk indicated by a rectangle on the map.

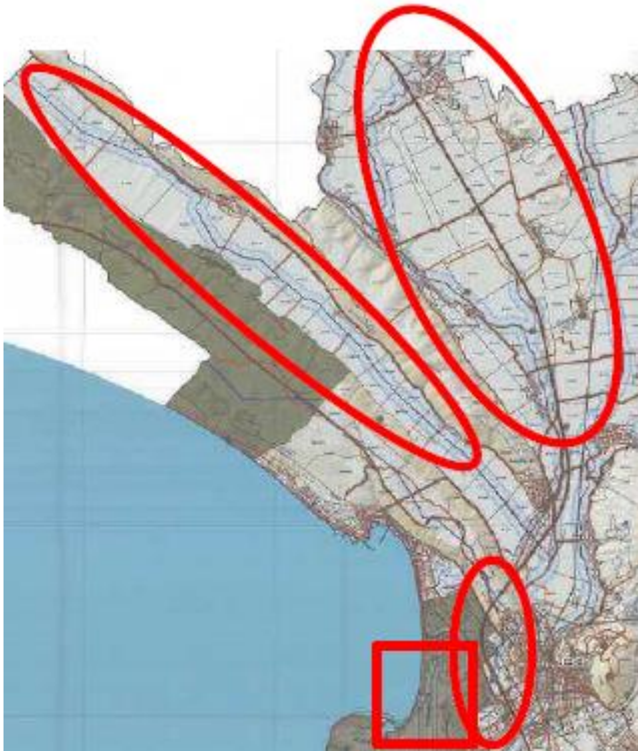


**Figure 4-31 Indicated flood extend (Google maps) from the Lezha Local Territory Plan**



**Table 4-46 Potential risks/assets in risk area**

| **Potential risks / assets in risk area** | |
|---|---|
| Risk area (in ha) | 9.500 ha |
| Houses | >100 |
| Persons | >2.000 |
| Families | >400 |
| Companies at risk | |
| Industry (objects) | |
| Infrastructure (objects) | >1 |
| Agriculture [ha] / objects | ca. 8.500 ha |
| Protected areas | 1 |
| Other objects at risk | Housing area, public services including water supply, hospitals, schools, religious buildings, energy supply systems, business buildings, |

**Table 4-47 Risk assessment/significance of potential risks**

| Risk assessment / significance of potential risks | | | |
|---|---|---|---|
| *Significance criteria* | *value* | *limit* | |
| **A) Human health, economic values** | | | |
| no. of houses | >100 | ≥ 10 | |
| Settlement area (in ha) | <u>*860*</u> | ≥ 0,5 | |
| Industrial objects | 0 | ≥ 1 | |
| Industrial area (in ha) | <u>*80*</u> | ≥ 0,5 | |
| Critical agriculture aspects | x | | |
| **B) Environmental risks** | | | |
| **B1) Water polluting substances / sites** | | | |
| Contaminated sites | 0 | ≥ 1 | |
| Locations with dangerous substances | 0 | ≥ 1 | |
| **B2) Protected areas (according to WRRL)** | | | |
| Protected areas (e.g. Natura 2000 etc.) | >2 | ≥ 1 | |
| Drinking Water supply areas | 0 | ≥ 1 | |
| Bathing waters | >1 | ≥ 1 | |
| **C) Risk for cultural heritage sites** | | | |
| UNESCO heritage sites | 0 | ≥ 1 | |
| Other relevant cultural heritage sites | >1 | ≥ 1 | |

Limit exceeded    No information / uncertain    Limit not exceeded

<u>Section 3: Milot - Thumane</u>

Thumana field where Droja river passes by has been flooded several times such as in 1946, 1963, 1971 and also during the last years 2015, 2016 and 2017. The last flood registered was in December 2017, during which a bridge over Droja River was destroyed. In the figure below is presented the flood registered from Copernicus satellite in December 2017.

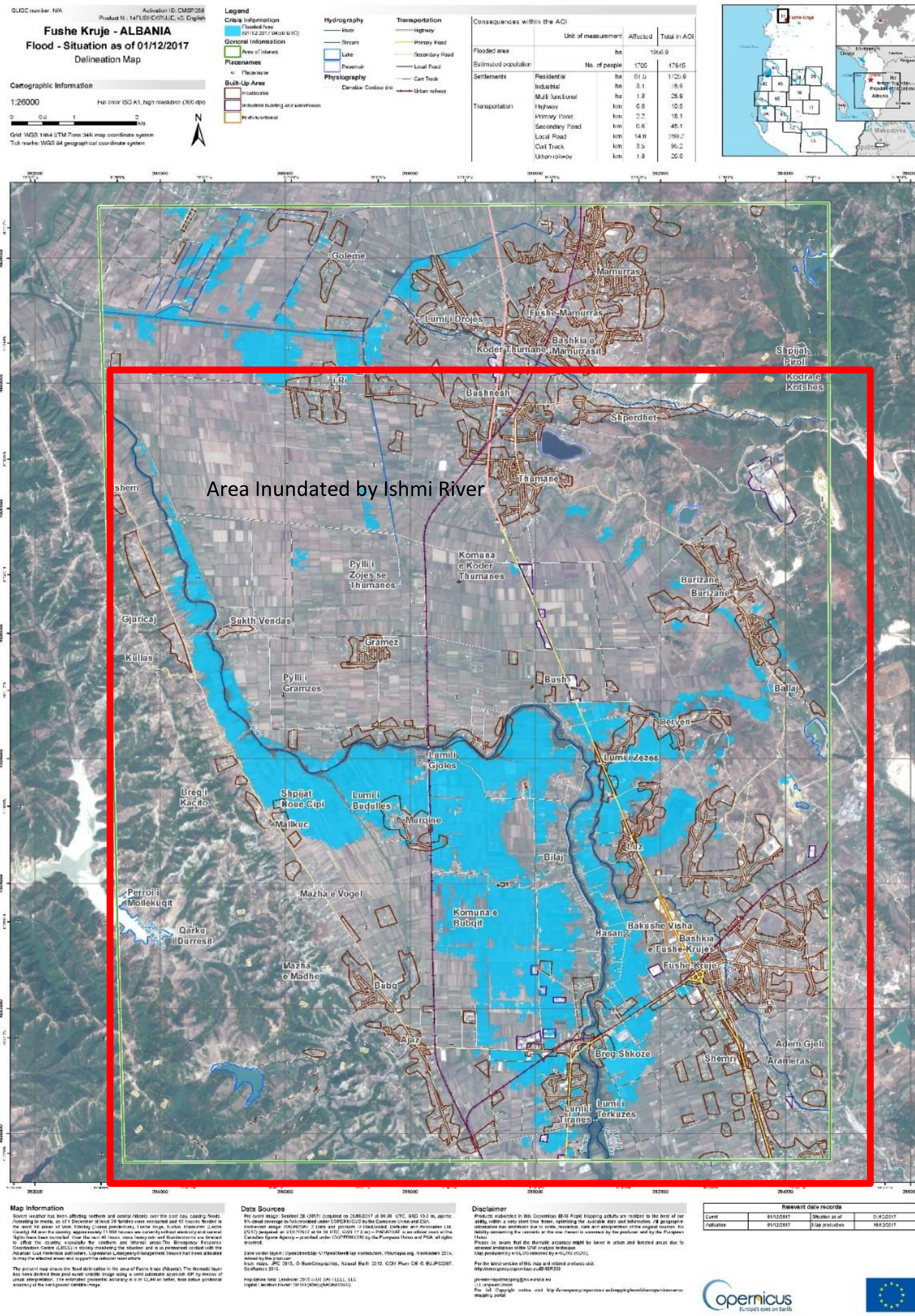

GLIDE number: N/A
Activation ID: EMSR258
Product N.: 14FUSHEKRUJE, v2, English
Fushe Kruje - ALBANIA
Flood - Situation as of 01/12/2017
Delineation Map
Cartographic Information
1:26000
Full color ISO A1, high resolution (300 dpi)
Grid: WGS 1984 UTM Zone 34N map coordinate system
Tick marks: WGS 84 geographical coordinate system
Legend
Crisis Information
Flooded Area
General Information
Area of Interest
Placenames
Placename
Built-Up Area
Residential
Industrial building and warehouse
Multi-functional
Hydrography
River
Stream
Lake
Reservoir
Physiography
Elevation Contour (m)
Transportation
Highway
Primary Road
Secondary Road
Local Road
Cart Track
Urban railway
Area Inundated by Ishmi River
Goleme
Mamurras
Fushe-Mamurras
Lumi i Droja
Koder-Thumane
Bashkia e Mamurrasit
Bushnesh
Shpiperdhet
Thumane
Komuna e Koder Thumanes
Pylli i Zojes se Thumanes
Burizane
Sukth Vendas
Gramez
Pylli i Gramzes
Bush
Ballaj
Derven
Lumi i Zezes
Lumi i Gjoles
Shpijat Noue Cipi
Lumi i Budulles
Murqine
Breg i Kacito
Mallkuc
Bilaj
Luz
Mazha e Vogel
Komuna e Bubqit
Hasan
Bakushe Visha
Bashkia e Fushe-Krujes
Fushe-Kruje
Perroi i Mollekuqit
Qarku i Durresit
Mazha e Madhe
Bubq
Ajaz
Breg Shkoze
Shemri
Adem Gjeli
Arameras
Lumi i Tiranes
Lumi i Terkuzes
Map Information
Data Sources
Disclaimer
Relevant date records
Copernicus

**Figure 4-32 Flood registered from Copernicus satellite in December 2017**

**Figure 4-33 Image near the of Droja bridge in December 2017**

<u>Section 4: Thumane - Kashar</u>

Ishmi River has flooded the field from Gjola Bridge up to Adriatic Sea several times such as in 1946, 1963, 1971 and also during the last years 2015, 2016 and 2017. The last flood registered was in December 2017. In the figure below is presented the flood registered from Copernicus satellite in December 2017. The dykes on Ishmi River are built downward the city of Fushkruja until its rivermouth, and they are still in good conditions.

**Figure 4-34 Floods in Fushe Kruja region by Ishmi River**

*Section 5B: Kashar - Lekaj*

The area where section 5B passes by has a low flooding risk, except for the parts where the section passes by downstream of Limuthi Stream and also in the right and left bank of Erzeni River. There is no registered data about flooding events for this area and therefore, it is difficult to determine exactly the risk. To have a better evaluation for the flooding risk in the next phases, a hydraulic model will be needed. The dykes in Erzeni River exist in the lower part of the river and are also in good conditions.

*Section 5C: Lekaj - Lushnje*

The area where section 5C lies is has a low flooding risk, except for the parts where the section passes by the right and left bank of Shkumbini River. There is no registered data about flooding events for this area and, therefore it is difficult to determine exactly the risk. To have a better evaluation for the flooding risk in the next phases, a hydraulic model will be needed.

*Section 6&7: Lushnje – beginning of Fier Bypass*

The area where sections 6&7 lie in has a medium flooding risk. A major part of this area is drained by a system of channels which discharge the water into the sea with pumping stations. Flooding in this area maybe caused by malfunction of pumping stations as well as by the bed conditions of the drainage system and overflowing of Semani River. There is no registered data about flooding events for this area and therefore, it is difficult to determine exactly the risk. To have a better evaluation for the flooding risk in the next phases, a hydraulic model will be needed.

*Section 8: Fier Bypass (currently under construction)*

The area where section 8 lies in has a high flooding risk. During the winter of 1962-1963, a major part of the Myzeqe Field in Lushnja City, the Roskoveci Filed and the Hoxhara Field as well as the area between the national roads Lushnje-Fier and Lushnje-Berat area were inundated. After the inundation of 1962-1963, there are also registered other inundations in 1981, 2015 and 2017. For these inundations, there are no registered data and maps and, therefore, it is difficult to determine exactly the risk. To have a better evaluation for the flooding risk in the next phases, a hydraulic model will be needed.

*Section 9A2: End of Fier Bypass - Pocem*

The area where section 9A2 lies in has a high flooding risk. During the winter of 1962-1963. a major part of the fields from Poçem village up to the Adriatic Sea was inundated. After the inundation of 1962-1963, there are also registered inundations in 1981, 2015 and 2017. There is a publication for the inundation of February 2015, while there are no registered data and maps for the inundation of 2017 and, therefore, it is difficult to determine exactly the risk. The inundated area in February 2015 is presented in the figure below, taken from "RAPORT I SHPEJTË VLERËSIMI PAS PËRMBYTJES SË SHKAKTUAR NGA LUMI VJOSË -Shkurt 2015"

**Figure 4-35 Approximately Inundation Map Recorded in 2015**

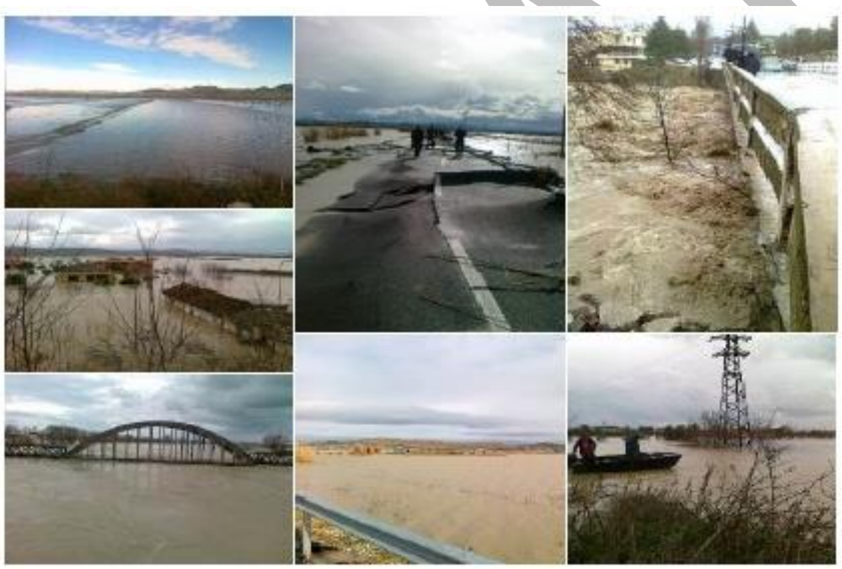


**Figure 4-36 Photos Taken for Inundation in 2015**

To have a better evaluation for the flooding risk in the next phases, a hydraulic model will be needed.

*Section 9B2: Pocem - Memaliaj*

The area where section 9B2 passes by has a low flooding risk. There is no registered data about flooding events for this area and, therefore it is difficult to determine exactly the risk. To have a better evaluation for the flooding risk in the next phases, a hydraulic model will be needed.

*Section 10: Memaliaj - Subashi bridge*

The area where section 10 passes by has a low flooding risk. There is no registered data about flooding events for this area and, therefore it is difficult to determine exactly the risk. To have a better evaluation for the flooding risk in the next phases, a hydraulic model will be needed.

*Section 11: Subashi bridge – beginning of Gjirokaster Bypass*

The area where section 11 passes by has a medium flooding risk in the area of confluence of Kardhiqi River and Drinos River. There is no registered data about flooding events for this area and, therefore it is difficult to determine exactly the risk. To have a better evaluation for the flooding risk in the next phases, a hydraulic model will be needed.

*Section 12: Gjirokaster Bypass*

The area where section 12 passes by has a high flooding risk regarding Drinos River and Suha River. There is no registered data about flooding events for this area and therefore it is difficult to determine exactly the risk. To have a better evaluation for the flooding risk in the next phases, a hydraulic model will be needed.

*Section 13A: Gjirokaster Bypass - Kakavije*

The area where section 13A passes by has a Low risk against flooding from Drinos River and Suha River. For this area, there is no registered data about flooding events and is difficult to determine the risk. To have a better evaluation for the flooding risk in the next phases, a hydraulic model will be needed.

The table below summarizes the flood events and risks per section.

**Table 4-48 Flood events per Section**

| Sections | Flood events |
|---|---|
| 1 | Amongst all flood events observed, the biggest and most severe event is the one in 1962-63 regarding the occupation of the territory, duration and damages caused by them. On the 13th January 1963, a big flood event was observed with almost the same magnitude as that of November 1962 but inundating a wider region of the country.<br>Due to the rainfall in November and December 2010, the Drini River flows increased, accompanied by the snow melting in the northern area of Albania, which consequently increased the water levels in the three Hydroelectric Power Plants (HPPs) of Fierza, Koman and Vau I Dejes which are built on this river.<br>On the 2nd March 2018, Shkodra prefecture has been affected by extensive flooding caused initially by the snow melting due to warm winds and the gradual temperature increase. Intense rainfall over subsequent days combined with the increase in the discharges from the hydroelectric power plants (HPP) in the Drin cascade have worsened the flooding situation. |
| 2 | Medium flooding risk regarding Drini i Lezhes River and Mati River. Amongst all flood events observed, the most severe ones are considered those that occurred in 1962-63 in relation to the occupation of the territory, duration and damages caused by them. |
| 3 | Thumane field where Droja river passes by has been flooded several times such as in 1946, 1963, 1971 and also during the last years 2015, 2016 and 2017. The last flood registered was in December 2017, during which a bridge over Droja River was destroyed. |
| 4 | Ishmi River has flooded the field from Gjola Bridge up to Adriatic Sea several times such as in 1946, 1963, 1971 and also during the last years 2015, 2016 and 2017. The last flood registered was in December 2017. |
| 5B | Low flooding risk, except for the parts where the section passes by downstream of Limuthi Stream and also in the right and left bank of Erzeni River. There is no registered data about flooding events for this area and therefore, it is difficult to determine exactly the risk. |
| 5C | Low flooding risk, except for the parts where the section passes by the right and left bank of Shkumbini River. There is no registered data about flooding events for this area and, therefore it is difficult to determine exactly the risk. |
| 6+7 | Medium flooding risk. A major part of this area is drained by a system of channels which discharge the water into the sea with pumping stations. Flooding in this area maybe caused by malfunction of pumping stations as well as by the bed conditions of the drainage system and overflowing of Semani River. There |

| Sections | Flood events |
|---|---|
| | is no registered data about flooding events for this area and therefore, it is difficult to determine exactly the risk. |
| 8 | High flooding risk. During the winter of 1962-1963, a major part of the Myzeqe Field in Lushnje, the Roskoveci Filed and the Hoxhara Field as well as the area between the national roads Lushnje-Fier and Lushnje-Berat area were inundated. After the inundation of 1962-1963, there are also registered other inundations in 1981, 2015 and 2017. For these inundations, there are no registered data and maps and, therefore, it is difficult to determine exactly the risk. |
| 9A2 | High flooding risk. During the winter of 1962-1963. a major part of the fields from Poçem village up to the Adriatic Sea was inundated. After the inundation of 1962-1963, there are also registered inundations in 1981, 2015 and 2017. There is a publication for the inundation of February 2015, while there are no registered data and maps for the inundation of 2017 and, therefore, it is difficult to determine exactly the risk. |
| 9B2 | Low flooding risk. There is no registered data about flooding events for this area and, therefore it is difficult to determine exactly the risk. |
| 10 | Low flooding risk. There is no registered data about flooding events for this area and, therefore it is difficult to determine exactly the risk. |
| 11 | Medium flooding risk in the area of confluence of Kardhiqi River and Drinos River. There is no registered data about flooding events for this area and, therefore it is difficult to determine exactly the risk. |
| 12 | High flooding risk regarding Drinos River and Suha River. There is no registered data about flooding events for this area and therefore it is difficult to determine exactly the risk. |
| 13A | Low risk against flooding from Drinos River and Suha River. For this area, there is no registered data about flooding events and is difficult to determine the risk. |

Flooding and landslides represent significant threats to man's activities and together with climate changes represents a particular challenge. The most landslide susceptible areas are cliffs and steep slopes of the mountain and hilly areas, unprotected river banks and the coast line from Durres to Velipoja. Flooding is increasingly becoming a problem especially in the northwestern part of the country. The same scenario is realistic for the many other lower part areas. Total estimated area under the threat of flooding is more than 40,000 ha of land. The regions of Shkodra, Lezha, Fushkruja and Fier are more affected from the process of soil flooding.

There is a chain reaction from overgrazing, deforestation and erosion culminating in the flooding, which is also accelerated by the poor maintenance of drainage canals and pumping stations. Waterlogging is reducing yields in those areas and the reverse phenomena of swamp and marsh formation is becoming evident.

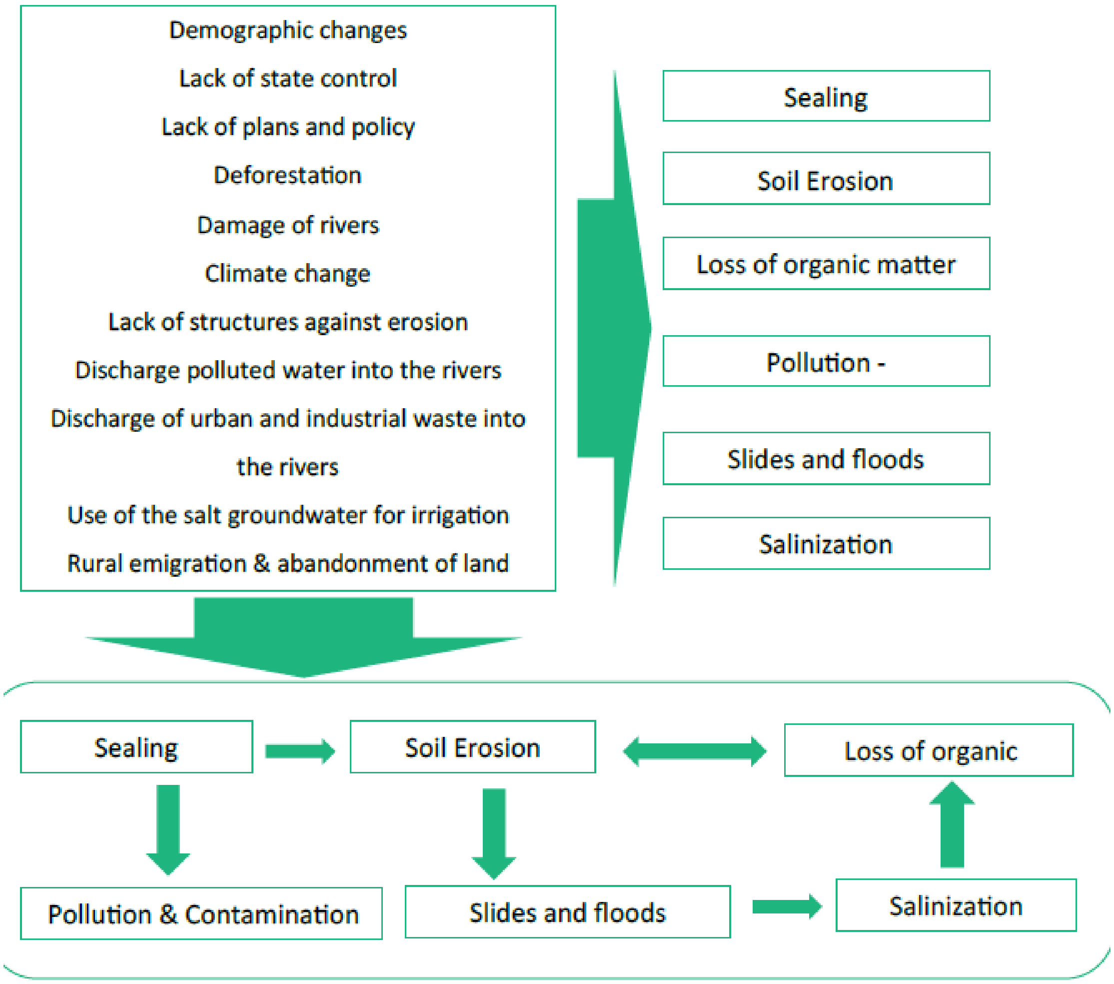
Floods may lead to a decline in soil biodiversity if anaerobic conditions cause the death of plant vegetation due to oxygen depletion in the rooting zone and the loss of plant-available soil nitrogen due to leaching or volatilization. Flood related water logging may potentially lead to local salinization in the coastal area.

<u>Soil degradation and desertification</u>

In Albania, soil degradation and desertification are two of the main problems, as result of existing natural conditions and increasing demands from economic sectors. The topography of territory, heavy rainfalls, deforest, overgrazing and non suitable cultivation systems simulate soil erosion. Beside soil erosion, soil contamination by organic and inorganic pollutants, soil sealing, salinisation, acidification, drought and other degrading phenomenon are current issues for resolution.

The main pressures dring land degradation and soil threats in Albania are listed below.

**Table 4-49 Pressures driving land degradation and soil threats in Albania**




Source: Land degradation neutrality target for Albania and soil erosion measurement norms and standards, UNDP, 2019

The table below is a summery of pressures driving land degradation in Albania, soil degradation and regions where this phenomenon is present

**Table 4-50 Pressures driving land degradation in Albania (* low level - ***** highest level of significance)**

| Anthropogenic pressures driving land degradation | Soil degradation process | Region and level of significance effect |
|---|---|---|
| The emigration of the rural population towards the capital and the other cities in the coastal lowland | Lack of plans for integrated use of land<br>Uncontrolled urbanization<br>Sealing<br>Unsustainable use of land | Tirana *****<br>Fier ***<br>Shkodra **<br>Lezha ** |

| Anthropogenic pressures driving land degradation | Soil degradation process | Region and level of significance effect |
|---|---|---|
| The transition period and lack of state control over the country's territory | Sealing<br>Deforestation<br>Erosion<br>Contamination<br>Uncontrolled urbanization<br>Land pollution (urban and industrial)<br>Unsustainable use of land | Tirana *****<br>Fier ***<br>Shkodra **<br>Lezha *** |
| Uncontrolled constructions in the absence of territorial development plans | Soil erosion and disaggregation<br>Sealing<br>Contamination<br>Compaction<br>Uncontrolled urbanization | Tirana *****<br>Fier ***<br>Shkodra **<br>Lezha *** |
| Massive deforestation for several years | Soil erosion and disaggregation<br>Slides and floods<br>Loss of organic material<br>Biodiodiversity loss | Tirana *** |
| Unfavorable use of the river for raw materials | Soil erosion<br>Slides and floods<br>Loss of organic material<br>Biodiverity Loss | Shkodra*****<br>Lezha*****<br>Lusnje***<br>Fier*** |
| Climate change and increased risk of flooding and forest fires | Soil erosion<br>Slides and floods<br>Forest fires<br>Loss of organic material<br>Biodiversity loss | Shkodra****<br>Lezha*****<br>Lusnje***<br>Fier*** |
| Degradation of protective structures against erosion and not their renewal | Soil erosion and disaggregation<br>Slides and floods<br>Loss of organic material | Hilly and mountainous<br>area *****<br>Coastal area ***<br>The slides of the rivers *** |
| Discharge polluted water and urban waste into the country's rivers | Contamination<br>Biodiversity Loss<br>Soil Degradation | Shkodra****<br>Lezha****<br>Tirana***<br>Fier ***** |

| Anthropogenic pressures driving land degradation | Soil degradation process | Region and level of significance effect |
|---|---|---|
| Discharde of industrial waste in the open environment and the country's rivers | Contamination<br>Biodiversity loss | Shkodra****<br>Lezha ****<br>Tirana***<br>Fier ***** |
| Use of the salt groundwater for irrigation | Salnisation<br>Biodiversity Loss<br>Desertification | Shkodra***<br>Lezha ****<br>Fier ****<br>Lusnje***** |

Source: Land degradation neutrality target for Albania and soil erosion measurement norms and standards, UNDP, 2019

#### 4.1.10 Noise

Regarding noise, it has to be noted that before 1993, the traffic was very limited, while since then it has been gradually increased. The national noise standards are subject of the Instruction No. 8 "Allowed noise norms in the environment", dated 27.11.2007 (Udhezim Nr. 8, date 27.11.2007, Nivelet kufi te zhurmave ne mjedise te cakturara). The noise limits in this Instruction are listed in the table below and are aligned with the noise limits set out by the WHO.

**Table 4-51 Guideline values for community noise according to Albanian legislation**

| Environment | Effects on health | LAeq (dBA) | Basic time (hour) | LAmax Fast (dB) |
|---|---|---|---|---|
| Inhabited areas | | | | |
| Outside buildings | Serious disturbance during the day and evening | 55 | 16 | - |
| | Moderate disturbance during the day and evening | 50 | 16 | - |
| Outside bedroom | Dissolution of sleep, open window (outside norms) | 45 | 8 | 60 |

Noise monitoring is carried out by the National Environmental Agency (NEA) in the main cities at an annual level and at a 24-hour time period. More specifically, monitoring includes two time periods: Lday (06:00 – 23:00) and Lnight (23:00 – 06:00), while it depends on the local meteorological conditions and the time period. Noise monitoring in Albania, was carried out in 43 monitoring points in 2017 in the urban areas of the cities of Tirana, Vlora, Fier, Saranda, Korca, Berat, Kukës, Pogradec, Shkodra and Gjirokaster. There are no noise data regarding the main national or international roads or existing areas close to AIC

In order to identify and present the existing noise levels, the location of the monitoring points of the national noise monitoring system had to be compared with the vicinity towards the AIC sections. More specifically, regarding:

- Section 1, there are two monitoring points in the city of Shkodra, which are not very close to the AIC (7km far).

- Sections 2, 3 and 4, there is no data available related to noise level, since there are no monitoring points close to the road corridor.
- Section 5 (5B and 5C), there are fifteen monitoring points located in the city of Tirana, which are presented in the table that follows and cover the urban centre of Tirana and its main roads. However, Tirana is not considered as representative for the particular section, because the closest distance from the nearest monitoring point in Tirana to Section 5 is about 8km.
- Section 6 and 7, there are no monitoring points close to the road corridor, so the data on noise values is missing.
- Section 8, there are four monitoring points in the city of Fier, which are located 2.5 km far from the AIC.
- Sections 9A2+9B2, 10 and 11, there are no monitoring points close to the road corridor, so the data on average noise value is missing.
- Section 12, there are two monitoring points in the city of Gjirokaster, which are 1.5km far from the AIC.
- Section 13A, there is no data available on noise levels.

The map below shows the noise monitoring points in Albania, prepared by NEA in 2017, while the following table presents the monitoring stations, the average noise values as well as the exceedances (in percentage form) compared to WHO standards of the noise limits, for the four main cities (twenty three stations) that are located relatively close to the road corridor, namely Shkoder (section 1), Tirana (Section 5 (5B and 5C)), Fier (section 8) and Gjirokaster (Section 12).

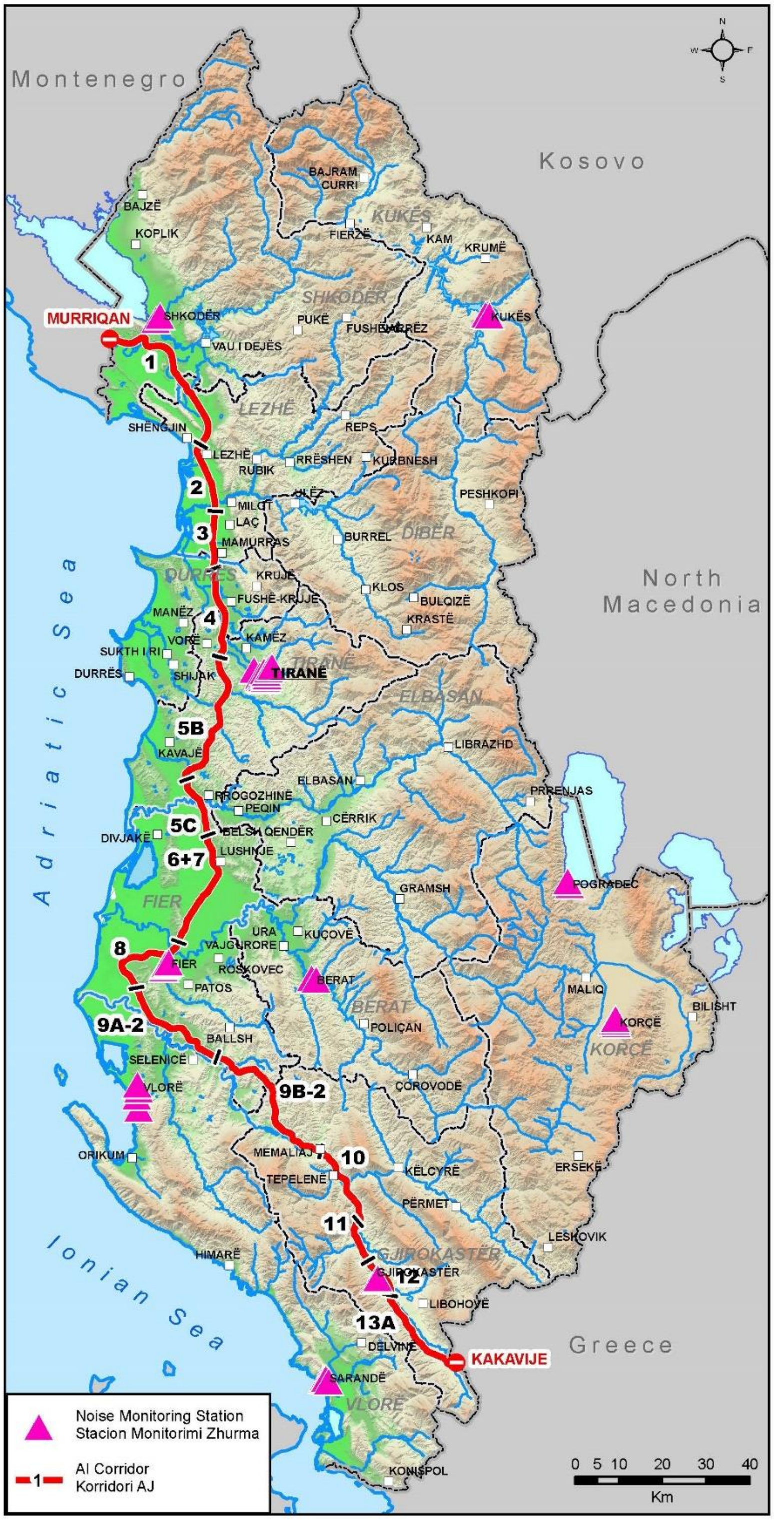



**Figure 4-37 Map of noise monitoring points, year 2017**

**Table 4-52 The average noise level value at 23 monitoring points in the four main cities, grouped under the respective section (based on the proximity of the urban area with the road corridor).**

| Alignments | Monitoring stations | LAeq/Day (dBA) | | LAeq/Night (dBA) | |
|---|---|---|---|---|---|
| | | Average noise value | Exceedance of WHO (%) day | Average Noise value | Exceedance of WHO (%) night |
| Section 1 | The entrance of the city of Shkoder | 64.82 | 17.85 % | 53.92 | 19.82 % |
| Section 5 (5B and 5C) | Shkolla e bashkuar, Tirana | 65.86 | 19.94 % | 55.40 | 23.11 % |
| | Pharmacy No.10, Tirana | 62.70 | 14.00 % | 56.81 | 26.24 % |
| | Train Station, Tirana | 66.27 | 20.49 % | 51.69 | 14.91% |
| | 'Dinamo' Stadium, Tirana | 62.86 | 14.29 % | 54.43 | 19.26 % |
| | 'Edit Durham' School, Tirana | 61.52 | 11.85 % | 59.95 | 31.48 % |
| | Former American Bank, Tirana | 63.10 | 14.73 % | 56.54 | 38.06 % |
| | "Vasil Shanto" Junction, Tirana | 66.30 | 20.54 % | 55.07 | 19.68 % |
| | "21 Dhjetori" Junction, Tirana | 64.19 | 16.70 % | 60.30 | 34.00 % |
| | "Drejtoria e Policise" Junction, Tirana | 64.07 | 16.49 % | 53.86 | 22.37 % |
| | Laprake, Tirana | 66.02 | 20.04 % | 62.13 | 25.64 % |
| | Palace of Congresses, Tirana | 66.94 | 21.71% | 59.16 | 33.22 % |
| | Ushtari I Panjohur, Tirana | 70.14 | 27.53% | 53.67 | 20.95 % |
| | "Selvia" Junction, Tirana | 69.55 | 28.45 % | 51.71 | 14.85 % |
| | Elbasani Street, Tirana | 73.80 | 34.18 % | 55.99 | 26.24 % |
| | Skanderbeg square, Tirana | 70.29 | 27.80 % | 55.06 | 23.11 % |
| Section 8 | Junction at the entrance to ring road | 45.39 | - | 37.95 | - |
| | Junction at the road to Vlora | 58.57 | 6.49 % | - | - |
| | The opposite of the bank (Market) | 54.12 | - | 41.41 | - |
| | The opposite of the Prefecture | - | | 51.17 | 13.71 % |
| Section 12 | Junction at the entrance of the city of Gjirokaster | 59.23 | 7.69 % | 50.3 | 11.77 % |
| | The roundabout at the Stadium | 57.48 | 4.50 % | 49.93 | 10.95 % |
| **WHO standards** | | **55** | | **45** | |

*Note:*
*Boxes coloured in red indicate the monitoring points where the average noise value exceeds WHO standards,*
*Boxes coloured in yellow indicate the average noise value within the WHO standards.*

The aforementioned monitoring results indicate that Albania shows many noise level exceedances in the urban centres and is characterized by high urban noise pollution. In some interurban roads, (Section 5, Rruga e Elbasanit monitoring station), the noises levels pass over 70 dB, which is the maximum level permitted of LAeq / Day, according to the national standards (Lday for industrial sites, commercial zones traffic (inside and outside)). Both day and night values exceed the standards of WHO/EU and Albanian legislation (LAeq / Day 55 dB (A) and LAeq / Night 45 dB (A)) in the inhabited areas (Environmental Status, NEA 2017).

According to the values presented in the table above, it is concluded that the highest average noise value exceedance of WHO standards as well as of the Albanian Legislation for the year 2017 has been recorded for the city of Tirana, followed by the city of Shkodra and Gjirokaster. Regarding the city of Fier and based on its two out of the four monitoring points (mentioned in the table above under Section 8), the average noise value is within the WHO standards and Albanian Legislation. The low noise levels in the city of Fier can be justified by the fact that the Municipal Authorities banned the entrance of cars in the city during the noise monitoring period. Noise level exceedances for all stations and compared to WHO standards, range from 4.50% to 34.18% for the Lday and from 10.95% to 38.06% for the Lnight.

Factors contributing to the high levels of noise are the large number of vehicles in the roads, the use of old type of vehicles with non-environmentally friendly catalysts, construction works, the lack of protective green belt between residential areas and main roads, the lack of parking lots in the cities and the lack of secondary roads which would significantly reduce traffic at the main intersections.

Since the AIC sections are far from the monitoring points located in the cities, , the existing noise level at these areas, can be calculated only empirically , using the "comparative methodology". This can be done by the classification of the sites that will be affected by the AIC, into four main groups:

- Existing roads and airport

The existing roads can be considered as of high level of noise. The main source of noise in such areas are motor vehicles of all types. This high level is influenced by a number of factors such as the types of traffic streams, the traffic speed and intensity, the road surface type and condition, the type of car tyres and the type of car engines. Noise from airplanes constitutes an increasing serious problem in Tirana (Rinas Airport). Rinas Airport is situated in the vicinity of Vora town, close to the AIC section 4, while the airplanes pass over residential areas.

- Settlements and other infrastructure (cities and urban areas)

Automobile repair shops, construction works, blasting, bulldozing, stone crushing activities are the main sources of noise pollution in such sites. Textile mills, printing presses, engineering establishments and metal works etc. contribute heavily towards noise pollution. In industrial cities such as Elbasan and Fier etc., the industrial zones are often not separated from the residential zones of the city especially in the case of small scale activities industries.

- Agricultural sites

Vehicles and machinery used for agricultural activities are also generating noise pollution. Because of the seasonal agricultural works, the noise levels in such areas may be considered as medium to low.

- Natural sites

They are considered as "no noise" areas. The only sounds in such areas are produced by the wildlife, wind, running waters etc, which are not classified as noise.

The table below presents a summary of existing noise conditions per each AIC Section, using the "comparison methodology", with the following noise levels:

- High noise level,

- High to Medium
- Medium to High level,
- Medium level,
- Medium to Low level
- Low

**Table 4-53 Summary of current noise pollution per section, using "Comparative Methodology".**

| AIC Section | Environments affected | Level of noise | AIC Section | Environments affected | Level of noise |
|---|---|---|---|---|---|
| **Section 1** | Almost natural sites, villages and existing road | Medium to High | **Section 9A2** | Existing road | High |
| **Section 2** | Existing road | High | **Section 9B2** | Natural sites, agricultural lands | Low |
| **Section 3** | Existing road | High | | Existing roads, agricultural lands | Medium to High |
| **Section 4** | Villages, agricultural land, crossroads | High to medium | **Section 10** | Natural sites, agricultural lands | Medium to Low |
| **Section 5 (5B and 5C)** | Crossroads, agricultural lands, natural sites, existing roads | Medium | **Section 11** | Existing Road | Medium |
| | Crossroads, agricultural lands, existing roads natural sites, | Medium | **Section 12** | Gjirokastra bypass<br>Already approved | Low under existing conditions<br>High after construction of bypass |
| **Section 6& 7** | Existing roads | High | **Section 13A** | Existing road | High |
| **Section 8** | Fier Bypass<br>Under construction | High | | | |

To sum up, the main cause of noise pollution along the AIC is the traffic from the existing roads, since a major part of the AIC follows the current road and is surrounded by a network of secondary roads.

### 4.1.11 Surface waters

#### 4.1.11.1 Physical description and water quantity

The AIC passes over all the Albanian country from the North (Murriqan) to the South (Kakavije), crossing the six major river basins of Albania (Drin Buna, Mati, Erzeni Ishmi, Shkumbini, Semani and Vjosa River Basins) and several rivers, streams and irrigation and draining channels etc.

More than 152 torrents and small rivers form the six large rivers, i.e. Drin Buna, Mati, Erzeni-Ishmi, Shkumbini, Semani, and Vjosa, which run from southeast to northwest towards the Adriatic coast. In the eastern and mountainous part, the rivers exhibit a torrential and erosive regime, forming large and undulated beds in the western coastal lowland.

Te rivers are fed mainly by precipitation (69%), showing a typical Mediterranean regime, with a seasonal variation in the flow rate (high flow during October to May, which amounts to 73% of the total annual water in Bistrica up to 93% in Drino).

The following description is based on existing data, river basin management plans, local management plans of related municipalities etc. After defining the data gaps, consultation with national and local/regional experts, stakeholders were carried out.

A water basin map with the AIC can be found in Annex 1. The rivers, streams and channels that may be affected by the AIC construction/operation and maintenance are described per AIC Section and are presented in figures/maps in Annex 1 (Annex 1.1-Annex 1.14).

Section 1: Murriqan (Border with Montenegro) – beginning of Lezhe Bypass

Starting from the Border with Montenegro at km 0+000 up to km 40+837, Section 1 crosses several drainage channels, irrigation channels, rivers and streams. The river sheds that are crossed by Section 1 are presented in Annex 1.1.

More specifically, Section 1 crosses the drainage and irrigation channels in Oboti field, Oblika Stream, Drin Buna River (Buna River part), the drainage and irrigation channels of Zhabiak field and Dushkes field, the Dushkes drainage channel, the irrigation and drainage channels in Ranishta field and Kolgjini field, the Kolgjini drainage channel, the irrigation and drainage channels in Ashta field, the Varishtes field, the Lumes field, the Drini i Lezhes river, the Gjadri river branch and the irrigation and drainage channels in Gramshi field.

The main rivers that lie in Section 1 are described below.

*Transboundaty River Buna (in Albanian and Bojana in Montenegrin)*

Buna River is composed of two branches, one is Buna River coming from Lake Shkodra and the other is Drini River. Both branches join after Bahcalleku Bridge.

Lake Shkodra/Skadar is the largest lake in the Balkan Peninsula in terms of water surface area (between approximately 350 and 530 km²). The lake is a shared waterbody between Albania (about 35 % of the water surface area) and Montenegro (about 65 % of the water surface area). It has a catchment area of about 5,500 km². The biggest inflow contributors into the Lake are the Morača river (MQ of about 200 m³/s, equals 66% of the inflows), followed by the inflows of Malo Blato (about 12 m³/s), of Karuč Bay and River Crnojevića. Several minor additional surface inflows (among others: Rivers Rjolska and Vraka in Albania) are accompanied by high subterranean inflows of roughly 55 m³/s as annual average (M. Radulovic et al., 2015).

The Buna/Bojana drains the lake into the Adriatic Sea with a MQ of approximately 340 m³/s at the lake outflow. The Drini River joins the Buna/Bojana 3.5 km downstream of Lake Skadar (MQ of 345 m³/s). The total catchment area of the Buna/Bojana River is about 19,580 km².

**Figure 4-38 View of Buna River**

The catchment of the Drini River is an international basin that is shared by Albania, Macedonia, Serbia, Kosovo and Montenegro. The catchment area is estimated to be 14,170 km$^2$ with a length of 285 km. The river originates from Lake Ohrid and Lake Prespa e Madhe in North Macedonia where it is called Drini I Zi. The upper catchment of Drini I Zi drains areas in Greece, Albania and North Macedonia.

Black Drin River leaves Lake Ohrid and enters Albania between Dibra and Peshkopia. Further downstream, White Drin River, which originates from Kosovo, converges with the Drini River on the west of Prizren. It has a length of about 136 km which drains a karstic region of nearly 4,960 km$^2$ within Albania and 4,360 km$^2$ in Kosovo with a mean elevation of 862 m.

The Gjadri and Kiri rivers join to the Drini downstream of Vau i Dejes Hydroelectric Power Station and have catchment areas of 200 km$^2$ and 264 km$^2$ respectively.

About 160 years ago, the paths of Buna River and Drini River differed. The original channel of the Drini, leading south to the city of Lezha, now carries only a relative small discharge. Instead, the Drini now joins the Buna just downstream of Shkodra and continues as a single river along the border with Montenegro until it enters the Adriatic Sea.

*Drini i Lezhes River.*

Drini i Lezhes River is composed of two rivers Drini and Gjadri. Drini i Lezhes River starts from the Shelqet village and ends to Adriatic Sea at Kune Vain Marsh. Gjadri River starts from the Kovac village and joins with the Drini i lezhes at Gjadri village. Both rivers drain the fields in between villages Kovac, Narac, Shelqet, Stajke, Kosmac, Melgushe, Bushat, Rranxe, Barbullush, Torrovice, Kakariq, Hajmel, Krajne, Fishte, Troshan, KAllmet I vogel, Raboshte, Patalej, and at the end Lezha City. The length of Drini i Lezhes river is about 43 km and its watershed area is 312 km$^2$.

The tables below present the maximal flows with different return periods for Buna River and Drini i Lezhes River and the maximal flow for river intersection points with Section 1.

### Table 4-54 Maximal Flows for Buna River and Drini i Lezhes River

| Maximal Flow With Different Return Period | | | | | |
|---|---|---|---|---|---|
| Station | River | Area (km$^2$) | Q (1/100 years) (m$^3$/s) | Q (1/50 years) (m$^3$/s) | Q (1/20 years) (m$^3$/s) |
| Vau I Dejes | Drini | 13650 | 6530 | 5870 | 4850 |
| Shkoder | Buna | 5179 | 3930 | 3660 | 3280 |

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### Table 4-55 Maximal Flows For River intersection points with Section 1

| Maximal Flow With Different Return Period | | | | | |
|---|---|---|---|---|---|
| **Km Position Section 1** | **River/Stream** | **Area (km$^2$)** | **Q (1/100 years) (m$^3$/s)** | **Q (1/50 years) (m$^3$/s)** | **Q (1/20 years) (m$^3$/s)** |
| 0+719 | Muriqan | 1 | 8 | 6 | 4 |
| 3+910 | Carrines | 20 | 69 | 56 | 38 |
| 6+310 | Oblika | 6 | 26 | 21 | 14 |
| 8+450 | Buna | 19354 | 7780 | 6405 | 5066 |
| 25+930 | Gjadri Branch | 48 | 140 | 112 | 77 |
| 38+830 | Drini i Lezhes | 312 | 626 | 502 | 343 |

Section 2: Beginning of Lezhe Bypass - Milot

Starting from Lezha city at km up to km 16+190, Section 2 crosses several drainage channels, irrigation channels, rivers and streams. More specifically, Section 2 crosses the drainage and irrigation channels in Ishull Shengjin field, the Drini I Lezhes River, the drainage and irrigation channels in Barbulloja field, the Spitenit field, the Rilles field, Mati River, and the irrigation and drainage channels in Miloti field. The main rivers that lie in Section 2 are Drini i Lezhes and Mati. Drini i Lezhes has been described in Section 1. Therefore, only Mati river is described below. The riversheds that are crossed by Section 2 are presented in Annex 1.2.

*Mati River.*

Mati River is located in the north-central Albania. Its overall length is 115 km, while its catchment surface is 2,441 km$^2$. The main tributary is Fani, flowing from the northeast, while the Mat flows from the southwest down to the confluence with Fani and then towards the Adriatic Sea. The table below indicates the maximal flows with different return periods for Mati River and Drini i Lezhes River.

The figure below indicates the relation between watershed area and the maximal flow with return period 1 in 50 years and 1 in 100 years for Mari River. This relation will be used for determining the maximal flow at the intersecting points of Mati River with A-I corridor route in Section 2.

The table below presents the maximal flows with different return periods for Mati River and Drini i Lezhes River as well as the for intersection of Section 2 with the main rivers.

**Table 4-56 Maximal Flows for Mati River**

| Station | River | Area (km$^2$) | Q (1/100 years) (m$^3$/s) | Q (1/50 years) (m$^3$/s) | Q (1/20 years) (m$^3$/s) |
|---|---|---|---|---|---|
| Rubik | Fani | 646 | 750 | 685 | 564 |
| Shoshaj | Mati | 1014 | 1833 | 1677 | 1463 |

**Table 4-57 Maximal Flows for Intersections of Section 2 with Main Rivers**

| Maximal Flow With Different Return Period | | | | | |
|---|---|---|---|---|---|
| Km Position Section 2 | River | Area (km$^2$) | Q (1/100 years) (m$^3$/s) | Q (1/50 years) (m$^3$/s) | Q 1/20 years) (m$^3$/s) |
| 4+245 | Drini i Lezhes | 312 | 626 | 502 | 343 |
| 14+000 | Mat | 2485 | 3433 | 2295 | 1711 |

Section 3: Milot - Thumane

Section 3 starts near the left bank of Mati River at km 0+000 up to km 13+455 near Thumane village. Section 3 crosses several drainage channels and irrigation channels and one river.

More specifically, Section 3 crosses the drainage and irrigation channels in Miloti field, the drainage and irrigation channels in Thumana field and Droja River. The riversheds that are crossed by Section 3 are presented in the Annex 1.3.

*Droja River*

Droja is the smallest River in Albania and is located in central Albania. Its overall length is 30 km, while its catchment surface is 67.2 km$^2$. During 1959-1965, irrigation and drainage channel systems were established in Thumana field. Droja River which discharges in Ishmi River is rehabilitated and ends up directly to the Adriatic Sea.

The table below presents the maximal flows with different return periods for Droja River.

**Table 4-58 Maximal Flows for Intersections of Section 3 with Main Rivers**

| Km position Section 3 | River | Area ($km^2$) | Q (1/100 years) | Q (1/50 years) | Q (1/20 years) |
|---|---|---|---|---|---|
| 10+900 | Droja | 60.6 | 434 | 393 | 371 |

Section 4: Thumane - Kashar

Section 4 passes over the Erzeni-Ishmi River Basin. The Erzeni-Ishmi basin is composed of the catchments of the Erzeni and Ishmi rivers and other minor ones, with a total surface of 1439 $km^2$. This basin is characterized by a mean altitude lower than in adjacent catchment areas.

Starting from Thumana Village at km 0+000 up to km 20+881 near City Park, Section 4 crosses several drainage channels, irrigation channels, rivers and streams.

More specifically, Section 4 crosses the drainage and irrigation channels in Thumana field, the Thunana Drainage Channel, the drainage and irrigation channels in Marqina field, the drainage and irrigation channels in Larushk field, Ishmi River, Gjola River, Terkuza River, Braka Stream, Tirana River, drainage and irrigation channels in Berxulli field and Lana River. The riversheds that are crossed by Section 4 are presented in Annex 1.4.

*Ishmi River*

Ishmi River (or Ishmi) is a river in western Albania. Ishmi river is formed at the confluence of the rivers Gjola and Zeza, a few km northwest of Fushë-Kruja city. It flows into the Adriatic Sea near the town Ishëm. The length of the watercourse is recorded in different sources as between 74 and 79 km.

Ishmi River is formed from several rivers which arise to the northeast of Tirana in the Skanderbegg Mountains beyond the Krujë range, the most important of which are:

- The Tiranë (Lumi i Tiranës), which has its source in the northeast of the Mountain Dajt, is the main tributary of the Ishëm. It crosses the mountain range to the north of Mountain Dajt, through a narrow canyon called Shkalla Tujanit. It then flows westerlies all the way across theTirana plain. The city of Tirana stretches along the southern edge of its broad flood plain. At the western edge of the plain, the river meets its most important tributary, the Lanë, which rises on the western slopes of the Mountain Dajt. Then, it flows through the city centre of Tirana to the south of the Tiranë river in a western direction until it meets it. After this, the river continues in a northerly direction.
- The Tërkuza meets the Tiranë a little further in the north. It also has its source to the east of the mountain range and crosses it via a canyon, called Shkalle e Bovillës. This canyon has been dammed in order to create the Bovilla Reservoir, which has a volume of around 8,000,000 $m^3$ and has provided drinking water to the city of Tirana since December 1998. The Tërkuza crosses the Tirana Plain in a northwesterly direction, passing close to the Tirana Airport, before it meets the Tiranë river. Once these two rivers join, the river is renamed as Gjole.

- The Zeze (Black river) arises easterlies of Krujë. It also runs through a canyon, called Shkalla e Kryemadhës, and then crosses Tirana plain in a northwesternly direction, passing through Fushë-Krujë. It meets the Gjole a few kilometers after the Tërkuza.

From the point where the Zeze joins the Gjoa, the river is known as Ishmi River. It flows in a westerly direction until it reaches the edge of the Tirana Plain, then turns to the northwest and heads for the Adriatic. In this part of its journey it passes through a town with the same name. Ishmi River discharges into the Adriatic to the southwest in the Rodoni Bay, which is bound on the western edge by the Cape of Rodon.

The drainage basin of the Ishëm covers a total area of 673 $km^2$. The average discharge at the mouth of the river is 20.9 $m^3/s$.

**Figure 4-39 Photo of Ishmi River and pollution by plastic litter.**

The table below presents the maximal flows with different return periods for Ishmi River and its tributaries as well as for the river intersection points with Section 4.

**Table 4-59 Maximal Flows for Ishmi River and Tributaries**

| Station | River | Area ($km^2$) | Q (1/100 years) ($m^3/s$) | Q (1/50 years) ($m^3/s$) | Q (1/20 years) ($m^3/s$) |
|---|---|---|---|---|---|
| Sukth Vendas | Ishmi | 651 | 1980 | 1740 | 1420 |
| Ura e Gjoles | Gjola | 468 | 1620 | 1390 | 1080 |
| Shupal | Tirana | 70.8 | 329 | 298 | 255 |
| Larushk | Terkuza | 180 | 748 | 629 | 604 |

**Table 4-60 Maximal Flows for River Intersection Points with Section 4**

| Maximal Flow With Different Return Period | | | | | |
|---|---|---|---|---|---|
| Km Position Section 4 | River | Area ($km^2$) | Q (1/100 years) ($m^3/s$) | Q (1/50 years) ($m^3/s$) | Q (1/20 years) ($m^3/s$) |
| 3+300 | Ishmi | 620 | 1932 | 1698 | 1386 |
| 8+675 | Gjola | 468 | 1620 | 1390 | 1080 |
| 12+400 | Terkuza | 200 | 788 | 663 | 637 |

| | | | | | |
|---|---|---|---|---|---|
| 15+450 | Tirana | 245 | 612 | 554 | 474 |
| 16+900 | Tirana | 216 | 575 | 521 | 445 |

Section 5

Section 5 comprises of the subsections 5B and 5C that cross the Erzeni River basin (part of Erzeni Ishmi Basin) and Shkumbini River.

- Section 5B: Kashar - Lekaj

Starting from City Park at km 0+000 up to km 33+814 near Lekaj Village. Section 5B crosses several drainage channels, irrigation channels, rivers and streams.

More specifically, Section 5B crosses the drainage and irrigation channels in Limuthi field, Limuthi Stream, Gryka e Kroit Stream, Dardha Stream, Lugu i Rrushkullit Stream, Lalmit Stream, Gryka e Shelgut Stream, Erzeni River, Ravaxheshit Stream, Isufit Stream, Xhelali Stream, Peza River, Lapraka Stream, Baltes Stream, Mehmetit Stream, Xunges Stream, Cerilë Stream, Darçi River, Channel Peqin-Kavaje. All this surface waters are part of the Erzeni Ishmi Basin. The riversheds that are crossed by Section 5 are presented in Annex 1.5.

*Erzeni River*

Erzeni River originates close to Gurakuqi mountain at an altitude of 1,300 m above sea level, but it collects water even from higher altitudes. The area of drainage basin of Erzeni River is 760 km² and it has a length of 109 km. The main branches of this river are Zalli stream, Zhullima stream and Peza stream, which have drainage basin areas of 79.8 km², 132 km² and 74.3 km² respectively. The main contributor to Erzeni River is precipitation.

The table below presents the maximal flows with different return periods for Erzeni River and its main streams which intersect Section 5B.

**Table 4-61 Maximal Flows for Erzeni River**

| Station | River | Area (km²) | Q (1/100 years) (m³/s) | Q (1/50 years) (m³/s) | Q (1/20 years) (m³/s) |
|---|---|---|---|---|---|
| Ndroq | Erzeni | 663 | 1390 | 1180 | 906 |

**Table 4-62 Maximal Flows for Streams Intersecting Section 5B**

| Km Position Section 5B | River/Stream | Area (km²) | Q(1/100 years) (m³/s) | Q(1/50 years) (m³/s) | Q (1/20 years) (m³/s) |
|---|---|---|---|---|---|
| ....0+330 | Limuthi | 29 | 203 | 152 | 118 |
| 7+500 | Lalmi | 10.2 | 49 | 42 | 32 |
| 10+100 | Erzeni River | 663 | 1390 | 1180 | 906 |
| 11+300 | Ravaxheshi | 6 | 32 | 27 | 21 |
| 16+700 | Peza | 76.2 | 419 | 314 | 243 |
| 30+700 | Darci | 64.5 | 387 | 290 | 224 |
| 32+700-33+200 | Channel Peqin-Kavaje | 2.8 | 20 | 15 | 11 |

- Section 5C: Lekaj - Lushnje

Starting from Lekaj at km 0+000 up to km 14+168 near Konjat Village. Section 5C crosses several drainage channels, irrigation channels, rivers and streams.

More specifically, Section 5C crosses the drainage and irrigation channels in Luzi i Madh field, the Peqin Kavaje Channel, Gosa e Madhe Stream, Gosa e Vogel Stream, Aliaj Stream, Zhuri Stream, Zhames Stream, Vidhasi Stream, Curgje Stream, Gramshi Stream, Kemba e Dushkut Stream, Dushku Stream and Shkumbini River. The riversheds that are crossed by Section 6 are presented in Annex 1.6.

*Shkumbini River*

Shkumbini River is located in the central part of the country, flowing from East to West, and is one of the most important rivers in Albania, while its entire watershed is included within the Albanian territory. The upstream part of the river lies in the Central Mountain Zone (close to the border with North Macedonia), while the downstream part lies in the Western Lowlands. Shkumbini River has a watershed area of about 2,445 km$^2$, an average altitude of the basin of 753 m a.s.l., and a basin length of 181 km.

The table below presents the maximal flows with different return periods for Shkumbini River and its main streams which intersect Section 5C.

**Table 4-63 Maximal Flows for Shkumbini River**

| Station | River | Area (km$^2$) | Q (1/100 years) (m$^3$/s) | Q (1/50 years) (m$^3$/s) | Q (1/20 years) (m$^3$/s) |
|---|---|---|---|---|---|
| Rrogozhine | Shkumbini | 2351 | 2600 | 2270 | 1700 |

**Table 4-64 Maximal Flows for Streams Which Intersect Section 5C**

| Maximal Flow With Different Return Period | | | | | |
|---|---|---|---|---|---|
| Km Position Section 5C | River/Stream | Area (km$^2$) | Q (1/100 years) (m$^3$/s) | Q (1/50 years) (m$^3$/s) | Q (1/20 years) (m$^3$/s) |
| 0+085 | Channel Peqin Kavaje | 2.8 | 20 | 15 | 11 |
| 2+400 | Gosa e Madhe | 4.2 | 37 | 32 | 24 |
| 4+430 | Gosa e Vogel | 3.9 | 35 | 30 | 23 |
| 5+180 | Aliaj | 4.4 | 38 | 33 | 25 |
| 6+500 | Shkumbini | 2351 | 2600 | 2270 | 1700 |
| 8+350 | Zhuri | 1.1 | 13 | 11 | 8 |
| 8+880 | Zhames | 1.5 | 16 | 14 | 11 |
| 9+980 | Vidhasit | 1.3 | 14 | 13 | 9 |
| 10+250 | Curgjes | 1.25 | 14 | 12 | 9 |
| 11+980 | Gramshit | 6.1 | 50 | 43 | 32 |
| 12+950 | Kembes se Dushkut | 2.3 | 23 | 20 | 15 |

<u>Section 6&7: Lushnje – beginning of Fier Bypass</u>

Starting from Konjat Village at km 0+000 up to km 28+037 near Mbrostar Village, Section 6&7 cross several drainage channels, irrigation channels, rivers and streams.

More specifically, Section 6&7 crosses the drainage and irrigation channels in Mezule field, the Myzeqe irrigation channel, the Dushkut Stream, Lushjna Stream, Lunja Stream, drainage and irrigation channels in Bishqethmit field and drainage and irrigation channels in Moçalit field. The riversheds that are crossed by Section 6&7 are presented in Annex 1.7.

The main streams crossed by Section 6&7 are Lushjna Stream with an area 59 km$^2$ and length up to junction with Lunja stream 13 km, and Lunja Stream with an area 40.3 km$^2$ and length 17 km. After the union of these two streams, a new stream is formed, named Myzeqe which discharges into Karavasta Lagoon.

There are no monitoring stations in this part. The design flows are calculated from rainfall or from flow transposition. The table below presents the maximal flows with different return periods for the main streams which intersect Section 6&7.

**Table 4-65 Maximal Flows for Streams Which Intersect Section 6&7**

| Km Position Section 6&7 | Maximal Flow With Different Return Period | | | | |
|---|---|---|---|---|---|
| | Stream | Area (km$^2$) | Q (1/100 years) (m$^3$/s) | Q (1/50 years) (m$^3$/s) | Q (1/20 years) (m$^3$/s) |
| 0+020 | Dushkut | 7.19 | 50 | 38 | 29 |
| 6+650 | Lushnja | 59 | 295 | 221 | 171 |
| 8+450 | Lunja | 40.3 | 242 | 181 | 140 |

<u>Section 8: Fier Bypass which is currently under construction</u>

Starting from Mbrostar Village at km 0+000 up to km 21+185 near Levan Village. Section 8 crosses several: drainage channels, irrigation channels, rivers and streams. More specifically, Section 8 crosses, drainage and irrigation channels in Luzi i Madh field, Semani River, Hoxhara Drainage Channel, drainage and irrigation channels in Dermenas field, drainage and irrigation channels in Hoxhares field, drainage and irrigation channels in Shtyllasit field, drainage and irrigation channels in Levan field. The riversheds that are crossed by Section 8 are presented in Annex 1.8.

*Semani River*

Semani River is formed from the joining of the two tributaries Devolli River and Osumi River at the beginning of Myzeqe field. Semani River has a meandering and irregular bed all the way from junction of Devolli and Osumi in a length of 100 km. It has a basin area of 5649 km$^2$ and a length of 281 km. The average height of the basin is 863 m a.s.l, something that shows that this river collects water from mountainous territory.

**Figure 4-40 Semani River**

The table below presents the maximal flows with different return periods for the Semani River which intersects Sections 8.

**Table 4-66 Maximal Flows for Semani River**

| Station | River | Area (km2) | Q (1/100 years) ($m^3/s$) | Q (1/50 years) ($m^3/s$) | Q (1/20 years) ($m^3/s$) |
|---|---|---|---|---|---|
| Mbrostar | Semani | 5389 | 2760 | 2410 | 1960 |

**Table 4-67 Maximal Flows for Section 8**

| Maximal Flow With Different Return Period | | | | | |
|---|---|---|---|---|---|
| Km Position Section 8 | River | Area ($km^2$) | Q (1/100 years) ($m^3/s$) | Q (1/50 years) ($m^3/s$) | Q (1/20 years) ($m^3/s$) |
| 3+000 | Semani | 6000 | 2912 | 2543 | 2068 |

<u>Section 9A2: End of Fier Bypass - Pocem</u>

Starting from Levan Village at km 0+000 up to km 26+901 close to the right bank of Vjosa River, Section 9A2 crosses several drainage channels, irrigation channels, rivers and streams. More specifically, Section 9A2 crosses the drainage and irrigation channels in Levan field, the drainage and irrigation channels in Bamaj field, the Fikut Stream, the Kafaraj Stream, the Kalinore Stream, the drainage and irrigation channels in Dheu I Zi field, the Fragu Stream, the Kreshpanj Stream, the Turbull Stream, the drainage and irrigation channels in Buzemadhi field, the I Thelle Stream, the Shkoze Stream, the drainage and irrigation channels in Geges field and the Shehajt dhe Perroi Madh Stream. The riversheds that are crossed by Section 9 are presented in Annex 1.9. The Section goes in parallel and close to the Vjosa River.

*Vjosa River*

Vjosa River, with a total surface area of 6710 km$^2$ (water catchment area) and length 272 km is the largest river in southern Albania and one of the largest rivers in the country.

Vjosa River begins outside of the territory of Albania, on the southern slope of the mountains Voljakal, which lie to the south of Pindi Mountains in Greece. Vjosa, before entering in Albania, receives the waters of Vojvodina (from the left) and, shortly after entering the Albanian territory, the main branch of Sarandaporos flows in from the Greek territory. Outside the territory of Albania, the surface of the watershed of Vjosa is 2085 km$^2$, which represents 31.1% of the total area of the Vjosa watershed, and the length in the Greek territory is 85.6 km.

In the Albanian territory, Vjosa River passes through the low part of the Nemrcka mountain range from the northwest and the Leskovik and Grabova Mountains from the northeast. Once entering the Albanian territory up to the Drago River, the Vjosa River forms a valley coupled with terraces on both sides. The valley is in a "V" form and is generally symmetrical. The characteristic of this part is the fact that the limestone massif of Anticlinal Nemrcкë-Dhëmbel, as well as that of Trebeshinė and Shendelli, drain their waters in the Këlcyra Gorge directly into Vjosa.

The hydrographic area of Vjosa river, after Dragot and the joining point to Drinos River with the estuary is characterized by a wide valley. In places where limestone is interrupted, Vjosa has created narrow gorges, such as Dorëz-Kalivaç, which is about 4 km long and about 150 m wide. Below the Poçemi Gorge, Vjosa 's bed is expanded and its slope decreases, creating opportunities for gravel and sand deposits. After the joining point with River Shushica up to the sea, the riverbed gradually narrows with deep meanderings and deep shores.

Vjosa River is composed of several tributaries, the main of which are Drinos and Shushica. There are also a number of streams with a surface of up to 300 km$^2$, flowing in Vjosa trunk. Thus, from entering the Albanian territory up to the Dragot, the streams of Çarshova (90.8 km$^2$), Langarica (337 km$^2$), Lemnica (103 km$^2$), Dishnica (173 km$^2$) on the right as well as the Zagori stream (171.6 km$^2$) on the left flow into Vjosa river.

The table below presents the maximal flow with return periods for Vjosa River.

**Table 4-68 Maximal Flows for Vjosa River**

| Station | River | Area (km$^2$) | Q (1/100 years) (m$^3$/s) | Q (1/50 years) (m$^3$/s) | Q (1/20 years) (m$^3$/s) |
|---|---|---|---|---|---|
| Pocem | Vjosa | 5570 | 4440 | 3970 | 3330 |
| Dorez | Vjosa | 5420 | 4640 | 4100 | 3400 |
| Dragot | Vjosa | 3470 | 2230 | 2000 | 1670 |

The main streams which intersect Section 9A2 are also presented in the table below with their maximal flow and different return periods.

**Table 4-69 Maximal Flows for Streams Which Intersect Section 9A2**

| Maximal Flow With Different Return Period | | | | | |
|---|---|---|---|---|---|
| Km Position Section 9A2 | Stream | Area (km$^2$) | Q (1/100 years) (m$^3$/s) | Q(1/50 years) (m$^3$/s) | Q(1/20 years) (m$^3$/s) |
| 4+600 | Fiku | 3 | 24 | 18 | 14 |
| 5+720 | Kafaraj | 3.4 | 26 | 20 | 15 |
| 7+030 | Kalinores | 16.17 | 92 | 69 | 53 |

| | | | | | |
|---|---|---|---|---|---|
| 9+575 | Fragus | 9.4 | 59 | 44 | 34 |
| 12+010 | Kreshpanj | 7.8 | 51 | 38 | 30 |
| 15+350 | Turbullit | 25 | 130 | 97 | 75 |
| 20+800 | I Thelle | 18.7 | 103 | 77 | 60 |
| 21+800 | Shkozes | 14 | 82 | 61 | 47 |
| 26+620 | Shehajt& I Madh | 13.6 | 80 | 60 | 46 |

Section 9B2: Pocem - Memaliaj

Starting from the right bank of Vjosa River at km 0+000 up to km 37+694 to Memaliaj, Section 9B2 crosses several drainage channels, irrigation channels, rivers and streams and more precisely the drainage and irrigation channels in Hekalit field, Povla River, Zagoni Stream, Kasri Stream, Luftinja Stream and Vjosa River. The riversheds that are crossed by Section 9B2 are presented in Annex 1.10.

Vjosa River, with a total surface area of 6710 km$^2$ of water catchment and length 272 km, is the largest river in southern Albania and one of the largest rivers of country. Its characteristics are described in the section above. There are no monitoring stations in this Section.

The table below presents the maximal flows with different return periods for main rivers and streams which intersect Section 9B2.

### Table 4-70 Maximal Flows for Streams Which Intersect Section 9B2

| Maximal Flow With Different Return Period | | | | | |
|---|---|---|---|---|---|
| Km Position Section 9B2 | River/Stream | Area (km2) | Q(1/100 years) (m3/s) | Q (1/50 years) (m3/s) | Q (1/20 years) (m3/s) |
| 4+800 | Povla | 106.3 | 689 | 609 | 498 |
| 22+560 | Kasri | 67 | 285 | 252 | 206 |
| 28+600 | Zagoni | 20.8 | 112 | 99 | 81 |
| 35+010 | Luftinja | 140.7 | 793 | 700 | 573 |
| 35+550 | Vjosa | 4950 | 4640 | 4100 | 3400 |

Section 10: Memaliaj - Subashi bridge

Starting from Memaliaj City at km 0+000 up to km 20+143, Section 10 crosses several streams, the main of which are Perroi i madh Stream and two rivers, Vjosa river and Drinos River. The riversheds that are crossed by Section 10 are presented in Annex 1.11. Vjosa river is described in section 9A2. Therefore, a description of Drinos River is given below.

*Drinos River*

Drinos River has its starting point in Greece. On the Greek territory, the area of Drino's catchment is 256 km$^2$ representing 19.4% and a length 23 km. Drinos has a total watershed area 1324 km$^2$ and a total length 84 km. The main branches that flow into the Drinos River are the stream of Suha (264.9 km$^2$) from the right side and the river Kardhiq (181.9 km$^2$) from the left side. One of the main hydrographic features for Drino River is the fact that a part of the waters of its watershed pass through the underground, through mountain limestone massif, to supply the source of the "Blue Eye" in Bistrica River, outside the Drino River Basin.

The Drinos River has a basin height ranging from 687 to 746 m a.s.l. and a basin width that ranges from 10.1 to 15.7 km.

The table below presents the maximal flow with return periods for Drinos River.

**Table 4-71 Maximal Flows with different return period, Drinos Ura e Leklit (m3/s)**

| Station | Return period Years | | |
|---|---|---|---|
| | Q (1/100 years) ($m^3/s$) | Q (1/50 years) ($m^3/s$) | Q (1/20 years) ($m^3/s$) |
| Drinos Ura e Leklit (1300 km2) | 1630 | 1440 | 1130 |

The table below presents the maximal flows with different return periods for main streams which intersect Section 10.

**Table 4-72 Maximal Flows for Streams Which Intersect Section 10**

| Km Position Section 10 | River/Stream | Area (km2) | Q (1/100 years) ($m^3/s$) | Q (1/50 years) ($m^3/s$) | Q (1/20 years) ($m^3/s$) |
|---|---|---|---|---|---|
| 2+780 | I Madh | 18 | 100 | 88 | 72 |
| 10+000 | Vjosa | 5570 | 4440 | 3970 | 3330 |
| 19+120 | Drinos | 1224 | 1630 | 1440 | 1130 |

Section 11: Subashi Bridge – beginning of Gjirokaster Bypass

Starting from at km 0+000 up to km 10+260 up to Mashullore Village, Section 11 crosses several drainage channels, irrigation channels, rivers and streams. The riversheds that are crossed by Section 11 are presented in Annex 1.12.

More specifically, Section 11 crosses drainage and irrigation channels in Palokastra field, Zalli Stream, Kardhiqi River, while the road goes in parallel with Drinos River (it has been described in Section 10). There is no monitoring station in this Section.

The table below presents the maximal flows with different return periods for the main streams and rivers which intersect Section 11.

**Table 4-73 Maximal Flows with different return period, Kardhiqi River and Zalli Stream**

| Km Position Section 11 | River/Stream | Area (km2) | Q (1/100 years) ($m^3/s$) | Q (1/50 years) ($m^3/s$) | Q (1/20 years) ($m^3/s$) |
|---|---|---|---|---|---|
| 6+365 | Kardhiqi | 160.3 | 572 | 506 | 397 |
| 9+775 | Zalli | 7.3 | 122 | 108 | 85 |

Section 12: Gjirokaster Bypass

Starting from Mashkullore Village at km 0+000 up to km 9+700 Section 12 crosses several drainage channels, irrigation channels, rivers and streams. The riversheds that are crossed by Section 12 are presented in Annex 1.13. More specifically, Section 12 crosses the drainage and irrigation channels in Dropulli field, Levendi Stream, Gjinoshati Stream Suha Stream, Sopoti Stream and Drinos River. Characteristics of Drinos River are given in Section 10. There is no monitoring station in this Section.

The table below presents the maximal flows with different return periods for the main streams and rivers which intersect Section 12.

**Table 4-74 Maximal Flows with different return period, Suha River, Levendit and Gjinoshati Stream**

| Km Position Section 12 | River/Stream | Area (km2) | Q (1/100 years) ($m^3$/s) | Q (1/50 years) ($m^3$/s) | Q (1/20 years) ($m^3$/s) |
|---|---|---|---|---|---|
| 1+530 | Drinos | 566 | 1076 | 950 | 746 |
| 6+590 | Levendi | 8.6 | 29 | 26 | 20 |
| 7+230 | Gjinoshati | 13.8 | 43 | 38 | 30 |
| 8+200 | Suha | 267.5 | 739 | 653 | 513 |
| 8+560 | Drinos | 925 | 1375 | 1215 | 953 |

<u>Section 13A: End of Gjirokaster Bypass – Border with Greece</u>

Starting from Dervicani Village at km 0+000 up to km 23+790 in Border with Greece, Section 13A crosses several drainage channels, irrigation channels, rivers and streams. More specifically, Section 13A crosses drainage and irrigation channels in Dropulli field Kseroves Field, Dervicani Stream, Kserpotamos Stream, Frashtani Stream, Jergucati Stream, Palokastra Stream, Populit Stream and Drinos River. The riversheds that are crossed by Section 13A are presented in Annex 1.14. The characteristics of Drinos River are given in Section 10. The table below presents the maximal flows with different return periods for the main streams and rivers which intersect Section 13A.

**Table 4-75 Maximal Flows with different return period Streams which Cross Axis 13A**

| Km Position Section 13A | River/Stream | Area ($km^2$) | Q (1/100 years) ($m^3$/s) | Q (1/50 years) ($m^3$/s) | Q (1/20 years) ($m^3$/s) |
|---|---|---|---|---|---|
| 1+125 | Dervicani | 36.13 | 272 | 240 | 188 |
| 4+120 | Kserpotamos | 29.4 | 245 | 217 | 170 |
| 10+580 | Gorica | 5.8 | 24 | 21 | 16 |
| 11+100 | Frashtani | 3.4 | 13 | 10 | 8 |
| 12+650 | Grapshi | 2.6 | 11 | 6 | 4 |
| 13+600 | Palokastra | 5.9 | 24 | 21 | 17 |
| 15+450 | Jergucati | 32 | 256 | 226 | 177 |
| 20+100 | Populit | 29.8 | 88 | 78 | 61 |
| 22+550 | Drinos | 180.3 | 607 | 536 | 421 |

#### 4.1.11.2 Surface water quality

The assessment of water quality has been based on consultations, collection of data and desk work for evaluation of existing information, field visits and interviews regarding defined data gaps and issues of surface quality. Data for the assessment of surface water quality derive from the Environmental Statement Reports of Albania of the years 2015-2018, prepared by the National Environment Agency. The channels and irrigation reservoirs are not covered by the aforementioned reports, so general data on water quality of these water bodies is given via field visits, consultations and interviews. The quality of surface waters crossed by the road corridor as well as some description on waters of reservoirs and channels are presented below, while the closest monitoring stations to the corridor were considered for data of the period 2014-2017.

The assessment of the surface water quality is based on the limit values of chemical parameters according to the Albanian Legislation on water quality and the EU framework directive of Waters. Additionally, the assessment is based on the Albanian legislation (DCM no. 246 of 30.4.2014 "On the Determination of Environmental Quality Standards for Surface Waters") which refers to the classification of water quality, while it mentions the limit values for pollution which are aligned with the EU Framework Directive of Waters. Based on the Albanian legislation and the EU Directive, the water quality is classified in five classes (I to V), where class I implies the best quality of waters and class V the worst one. The limit values for the chemical parameters are given in the following table.

**Table 4-76 Limit value of chemical parameters in rivers by EU framework directive.**

| Parameters | Unit | Limit value of chemical parameters | | | | |
|---|---|---|---|---|---|---|
| | | High quality (I) | Good quality (II) | Moderate quality (III) | Poor quality (IV) | Bad quality (V) |
| Dissolved oxygen | | >7 | >6 | >5 | >4 | <3 |
| $BOD_5$ | mg/l | <2 | <3.5 | <7 | <18 | >18 |
| pH (acid) | | | >6.5 | >6 | | |
| pH (alkaline) | | | <8.5 | <9 | | |
| $NH_4$ | mg/l | <0.05 | <0.3 | <0.6 | <1.5 | >1.5 |
| $NO_2$ | mg/l | <0.01 | <0.06 | <0.12 | <0.3 | >0.3 |
| $NO_3$ | mg/l | <0.8 | <2 | <4 | <10 | >10 |
| $PO_4$ | mg/l | <0.05 | <0.10 | <0.2 | <0.5 | >0.5 |
| $P_{total}$ | mg/l | <0.1 | <0.20 | <0.4 | <1 | >1 |

The figure below represents the surface waters monitoring stations located along and close to the study area.


**Figure 4-41 Surface water monitoring stations of the main rivers along the corridor,**

*Source: Environmental Statement report (ES) 2018, NEA*

The location of the water monitoring stations is presented in the figure above, while the station codes, the river basin names and the AIC Alignments, where the stations are located, are indicated in the table below. As it is mentioned below, the AIC will affect six main river basins with their main rivers, branches and streams as well as several draining and irrigation channels.

Water quality monitoring is carried out in fifteen stations along and close to the road corridor. More specifically, regarding:

- Drin-Buna river, there are four stations, namely two stations in Buna river and two stations in Drin river
- Mat river, there is one monitoring station
- Ishem/Erzen river, there are four monitoring stations, namely two stations in Ishem river, one station in Erzen river and one station in Tirana river
- Shkumbin river, there is one monitoring station
- Seman river, there are three monitoring stations
- Vjosa river, there are two monitoring stations

The monitoring station names and codes, rivers and river basins per section are presented below.

**Table 4-77 Monitoring station names and codes, rivers and river basins per section**

| Station name | Station code | Water basin | Section of AIC | River |
|---|---|---|---|---|
| D2 | L10R_Dr30 | Drin -Buna | Section 1 | Drin |
| Bu2 | AL10R_Bu10 | Drin - Buna | Section 1 | Buna |
| Bu1 | AL10r_Bu20 | Drin - Buna | Section 1 | Buna |
| Dle | AL20R_Le40 | Drin - Buna | Section 1 and 2 | Drini of Lezha |
| Ma4 | AL20R_Ma50 | Mati | Section 2 | Mat |
| T2 | AL30R_Tr40 | Ishmi | Section 4 | Tirana |
| Ish2 | AL30R_Is10 | Ishmi | Section 4 | Ishem |
| Ish1 | Al30R_Tr60 | Ishmi | Section 4 | Tirana |
| Er2 | AL40R_Er40 | Erzen | Section 5B | Erzen |
| Sh3 | AL50R_Sh120 | Shkumbin | Section 5C | Shkumbini |
| GJ4 | AL60R_Gj40 | Seman | Section 8 | Gjanica |
| Se5 | AL60R_Se20 | Seman | Section 8 | Seman |
| Se6 | AL60R_Se30 | Seman | Section 8 | Seman |
| Vj3 | AL70R_Di60 | Vjosa | Section 11 and 12, 13A | Drino |
| VJ4 | AL70R_Vj50 | Vjosa | Section 9A2 and 9B2, 10, 11 | Vjosa |

*Source: Environmental Statement report (ES) 2018, NEA*

The monitored parameters at the aforementioned river stations are presented in the following table.

**Table 4-78 Parameters considered in sample analyses of surface waters**

| Parameters | Units of measurement | Parameters | Units of measurement |
|---|---|---|---|
| Temperature | ℃ | $BOD_5$ | mg/l |
| Ph | 1-14 unit | $NH_4$ | mg/l |
| Alkalinity | mgl/l | $NO_2$ | mg/l |
| Salinity | % | $NO_3$ | mg/l |

| Parameters | Units of measurement | Parameters | Units of measurement |
|---|---|---|---|
| Conductivity | μS/cm | $P_{total}$ | mg/l |
| Dissolved oxygen | mg/l | $PO_4$ | mg/l |
| Chemical oxygen demand | mg/l | Suspended solids | mg/l |

The analysis below focuses on the surface waters quality of each section, while more extensive analysis will be carried in the PESIA. It has to be clarified that limit value for the Albanian standards for all parameters is the upper threshold of class III.

Section 1

The main river that may be affected by Section 1 is Drin Buna River. This river has its main branches, i.e. Drin-Buna River (main branch), Kiri and Gjadri Rivers, Drin of Lezha River etc.

The water quality of the Drin Buna River lies in class II (good quality). The quality of Drini of Lezha, however, is not very good, because most of waste waters and solid wastes from Malesia e Madhe and Shkodra city and its lower region are discharged in the rivers or in the Shkodra Lake. Shkodra Lake discharges its waters to Adriatic Sea, through Buna River, so the pollution runs from the Lake to Buna and then in Adriatic Sea. The water temperature of Buna River, close to the AIC Section 1, has an average of 22.1℃ during the period February to May.

Ph values are within the limit values set by the EU Directive 2006/44 and the Albanian legislation. The waters are alkaline (PH values range from 6.95 - 8.36) and are classified as of "good quality" (Class II), except for the Station "DLe" in Drin of Lezha River, which indicate higher values than the limit values . Additionally, conductivity is within the limit values.

The Gjadri and Kiri rivers join with the Drin river downstream of Vau I Dejes HPP and have catchment areas of 200 km$^2$ and 264 km$^2$ respectively. There are no data for the water quality of these rivers, but they are supposed to be moderately polluted by discharges of waste waters and disposal of solid wastes. The waters of the agricultural channels crossed are supposed to have moderate pollution mostly caused by pesticides/herbicides that end up in them.

Based on the monitoring results, the waters of the stations Bu1, Bu2 and D2 close to Section 1 related to Drin of Shkodra and Buna rivers, regarding:

- dissolved oxygen, the results are classified as of "Very Good" quality (Class I). The dissolved oxygen content results are within the limit values (> 7). Drini of Lezha river monitoring results (Dle monitoring station) indicate that this river has the worst quality regarding dissolved oxygen among all Albanian rivers. This situation in Drini of Lezha is created by the long term discharges of waste waters from Lezha city and surrounding settlements in the river.
- $BOD_5$, the value exceeds the EU limit value, since the value is over 18mg/l and therefore the waters are classified as waters of bad quality (Class V). Although the main branch of Drini Buna river has good quality of waters, the bad quality for the total river basin comes as a result of the untreated urban waters of the city of Lezhe and its surroundings, which are discharged in the Drini of Lezha River.
- COD, there has been an increase during the last 3 years as result of urban waste waters discharges from the cities and surrounding settlements, while the highest content results are found in the Drini of Lezha station (DLe).
- $NH_4$, the waters of Drin-Buna basin are within the limit value (0.05 mg / l) of class I. Due to the types of pollution mentioned above regarding the waters of Drini of Lezha river and taking into

the results of the DLe station, there has been noticed an increase in the concentration of ammonia in the last five years.

- $NO_2$, the nitrite content is below the limit value for all stations, while the rivers that lie in the Drin Buna Basin are classified in class I with very good quality. Regarding Drin of Lezha river, there are no data related with the nitrite content.
- $NO_3$, the nitrates for Drin Buna River are much lower than the limit value and therefore the waters are classified as of very good quality (Class I). Regarding the Drini of Lezha river, there are no data available.
- $PO_4$, the concentration classifies the waters of Drin of Lezha to class IV (poor quality) with a value of 0.306 mg/l at the station Dle (Drini of Lezha), while the waters monitored in the other stations are classified in higher classes.
- $P_{total}$, the concentration does not exceed the limit value, lying in class II.

Section 2

Section 2 crosses the Drini of Lezha River, Mat River and some irrigation and draining channels. The quality of Drini of Lezha River (station Dle) is described above in Section 1.

Mati River Basin is another important river basin of Albania. Mat River waters (relevant station is MA4 - close to the part which may be affected by AIC section 2), have an average temperature of 22 o C during the period of February to May.  PH values are within the limit values and they are categorized as alkaline, ranging from 6.95 to 8.36 and being classified as of good quality (class II). Conductivity and alkalinity are within the limits values (class III).

The waters are classified of high quality regarding the content of dissolved oxygen (class I), while regarding $BOD_5$ and COD, the values within the limit values (class III). Regarding the concentration of ammonia ($NH_4$) and the content values of nitrite ($NO_2$) and nitrate ($NO_3$), the waters are classified to high class (class I). The total Phosphorus ($P_{total}$) concentration is also within the limit values (class III). The irrigation and draining channels are polluted by the discharge of waste waters and solid waste from the surrounding settlements. The waters of agricultural channels are supposed to be polluted by pesticides/herbicides.

Section 3

This Section does not cross any important river apart from one small river (Droja River) and seven channels. While there is a lack of monitoring data for the water quality, the pollution from the discharge of waste waters by surrounding settlements, the illegal disposal of solid waste and the use of pesticides/herbicides in agricultural lands are expected to impact on the surface waters quality of the aforementioned receivers.

Section 4

Section 4 crosses the Erzen-Ishmi River Basin and more specifically the Ishmi River and some agricultural channels, which are used for irrigation and draining purposes. The water quality of these channels is considered not to be good due to the contamination by pesticides/herbicides and discharges of waste waters by surrounding settlements. The Ishmi River has several branches such as Ishem, Tirana, Zeza, Terkuza, Gjole etc.

Regarding the rivers that lie close to section 4, the monitoring data that will be used refer to the Ishmi River and Tirana River and the stations Ish1 and Ish2 (Ishmi river) and Tir (Tirana River, branch of Ishmi River). Erzeni river's (branch of Erzeni Ishmi River) quality is described under Section 5.

The Ishmi River, together with its branch named Tirana River, is one of the most polluted rivers of Albania. The temperature of Ishmi River waters in the aforementioned stations (period February to May) has an average of 22 ℃. Ishmi waters are classified as alkaline, having a pH value range from 6.95 to 8.36. The conductivity exceeds the limit values in all considered stations.

Regarding:

- the dissolved oxygen content results for the stations Ish1 (Rinas) and Ish2 (Gjola bridge), the values lie in class III (limit value of> 5), classifying these waters as of moderate quality. The main cause for this classification is the pollution from waste waters discharged into the river.
- $BOD_5$ exceeds the EU limit value of over 18 mg/l, classifying the waters as of very poor quality (Class V). The high $BOD_5$ values is caused by the lack of treatment of the urban and industrial discharges that end up into the rivers.
- COD, the concentration is very high (Class V)
- $NH_4$, the waters monitored at stations Ish 1 and Ish2 are classified in Class V, with very poor quality (limit value over 1.5 mg / l).
- $NO_2$, the values are high, but within the limit value (class III) in station T2, in Tirana River, Ishmi River Branch. The concentration of nitrates ($NO_3$) for all river stations considered is within the limit value (class III).
- the phosphate ($PO_4$) and the total phosphorus ($P_{total}$) concentrations in "Ish1" station exceeds the limit value, lying in class V. The discharges of untreated urban waters that contain detergent solvents with phosphorus concentration that are used by many households and industries is the cause of the high value of Ptotal content.

Also, the irrigation and draining channels of this Section are polluted due to the discharge of waste waters and solid waste from the surrounding settlements in the streams and channels and due to pollution deriving from pesticides/herbicides.

Section 5

Section 5 crosses Erzen River, Shkumbin River and several streams and agricultural channels. Regarding Erzen River, the data derive from the monitoring station "Er2", while as for Shkumbin River, the data derive from the monitoring station "Sh3", which represent the closest monitoring points to this section of the AIC. The temperature of Erzeni River waters in the above mentioned stations, measured in the period February to May, has an average of 22 ℃. The Erzeni River waters are classified as alkaline and as of "good quality" (Class II) taking into the Albanian standards and the EU Directive 2006/44 ranging in PH from 6.95 to 8.36. The conductivity exceeds the limit values. Regarding:

- the dissolved oxygen content results are within the limit value of class III -moderate value ( > 5)
- the content of $BOD_5$ and COD is within the limits (class III), while there has been a small increase in the average values during the last years.
- the concentration of ammonia ($NH_4$), nitrite - Nitrogen Dioxide ($NO_2$), nitrate $NO_3$, $PO_4$ and total Phosphorus ($P\ t_{otal}$) are within the limit values (class III).

The second part of this Section runs over Shkumbin River. The temperature of Shkumbin River waters at the Sh3 station, measured in the period of February to May, has an average of 22 ℃. The Shkumbin river waters are classified as alkaline and as of "good quality" (class II), ranging in PH from 6.95 - 8.36. The conductivity is within the limit values of class III. The dissolved oxygen, $BOD_5$ and COD content indicate a moderate quality (Class III) in terms of their values. The concentration of ammonia ($NH_4$), nitrite - Nitrogen Dioxide ($NO_2$). nitrate $NO_3$ . $PO_4$ and total Phosphorus ($P_{\ total}$) are within the limit values (class III).

Section 6 and 7

Section 6 and 7 does not cross any of important rivers of Albania, apart from some streams. Although there is lack of monitoring data on their water quality, pollution from the discharge of waste waters from the surrounding settlements, illegal disposal of solid waste and the use of pesticides/herbicides in agricultural lands are expected to impact on their surface waters quality.

Section 8

Seman River has two main branches, Devoll and Osun. The closest monitoring stations of Seman River to the Section are Gj4 (Gjanica River as a Seman Branch), Se5 and Se6. The temperature of Seman river waters, measured in the period February to May has an average of 22.1 ℃. Seman waters are alkaline, ranging in PH from 6.95 to 8.36. Gjanica River alkalinity and conductivity results indicate higher values than the limit values. Regarding:

- dissolved oxygen, the concentration is within the limit values (class III).
- $BOD_5$, the value at the station GJ4 (Gjanica river) exceeds the limit value of 18 mg/l (class V), as a result of the discharge of untreated urban waste waters of the Fier city into the river.
- COD, the highest value in Semani River is noted at the station GJ4. This is justified by the fact that there is a high content of hydrocarbons from the oil industry and urban water discharges of the city of Fier in Gjanica river.
- $NH_4$, Station Gj4 shows an exceeding value of Ammonia (2.43 mg/l), classifying the waters of this station to Class V – very bad quality (> 1.5 mg / l) for this parameter. Regarding the ammonia concentration, the waters of the stations Se5 and Se6 are of good quality (category II).
- Nitrite (Nitrogen Dioxide ($NO_2$)) and nitrates ($NO_3$), their values are high but within the limit value in station Gj4 - Gjanica River (class III).
- $PO_4$, the concentration in Gjanica River is higher than the limit values, lying in class IV, but the results of monitoring from the other two stations of Semani river, for this indicator, are within the limit values (class III).
- $P_{total}$, at the station Gj4 - Gjanica River, the content exceeds the limit value 0.4 (class IV -poor condition). The discharges of untreated urban waste waters that contain detergent solvents with phosphorus concentration that are used by many households and industries is the main cause of the high value of the Ptotal content.

The lower part of Seman River is polluted by the discharges from the oil processing refinery in Ballsh. Also, the irrigation and draining channels of this section are polluted by the discharge of waste waters and solid waste from the surrounding settlements in the streams and channels. The waters of the agricultural draining channels are supposed to be polluted from pesticides/herbicides.

Section 9A2, 9B2, 10, 11, 12, 13A.

The monitoring stations close to the AIC 9 (A2 and B2), 10, 11, 12 and 13A Sections are those of Vj3 and Vj4, referring to the quality of Vjosa river. The temperature of Vjosa river waters, measured in the period February to May has an average of 22.1 ℃. The waters are alkaline and their PH values, ranging from 6.95 to 8.36, are within the limit values (<8.5) set by EU Directive 2006/44 and the Albanian standards, classifying the waters as of good quality (class II).

Vjosa River waters have low conductivity. Vjosa River waters are classified as of very good quality regarding the content of dissolved oxygen (Class I) and are of good quality (Class II) regarding ($BOD_5$). Additionally, considering Vj3 and Vj4 monitoring stations results, they indicate low values regarding the content of COD, lying in class I and class II.

Regarding the content of ammonia ($NH_4$) in the same stations, waters have a good quality (Class II). The concentration of nitrogen dioxide ($NO_2$) and of nitrates ($NO_3$) are below the limit value for both stations and are classified in the Class I, with a very good quality. The phosphates ($PO_4$) and total Phosphorus (P total) concentration is within the limit values (class III).

Conclusions

The classification of waters below refers to measurements carried out in 2016 and are incorporated in the national Environmental Status Report (2017), prepared by the National Environmental Agency (NEA). The main results are indicated in the table below.

**Table 4-79 Classification of waters**

| | Dissolved Oxygen | $BOD_5$ | COD | $NH_4$ | $NO_2$ | $NO_3$ | $PO_4$ | $P_{total}$ |
|---|---|---|---|---|---|---|---|---|
| D2 | Class I | Class V | Class I-II | Class I | Class I | Class I | Class II | Class II |
| Bu2 | Class I | Class V | Class I-II | Class I | Class I | Class I | Class II | Class II |
| Bu1 | Class I | Class V | Class I-II | Class I | Class I | Class I | Class II | Class II |
| Dle | Class V | Class V | No data | Class V | Class I | Class I | Class IV | Class II |
| Ma4 | Class I | Class III | Class I | Class I | Class I | Class I | Class I | Class I |
| T2 | No data | Class V | No data | Class I | Class I | Class I | Class II | Class II |
| Ish2 | Class III | Class V | Class IV | Class IV | Class I | Class I | Class IV | Class IV |
| Ish1 | Class III | Class V | Class V | Class V | Class I | Class I | Class V | Class V |
| Er2 | No data | Class III | No data | Class II | Class I | Class I | Class I | Class I |
| Sh3 | Class I | Class II | Class I | Class I | Class I | Class I | Class I | Class I |
| GJ4 | No data | Class V | No data | Class V | Class III | Class I | Class IV | Class IV |
| Se5 | Class I | Class | No data | Class II | Class I | Class I | Class II | Class IV |
| Se6 | Class I | Class | No data | Class II | Class I | Class I | Class II | Class IV |

| | Dissolved Oxygen | $BOD_5$ | COD | $NH_4$ | $NO_2$ | $NO_3$ | $PO_4$ | $P_{total}$ |
|---|---|---|---|---|---|---|---|---|
| Vj3 | Class I | Class II | Class I | Class II | Class I | Class I | Class I | Class I |
| VJ4 | Class I | Class II | Class I | Class II | Class I | Class I | Class I | Class I |

Based on the aforementioned monitoring results, Vjosa river Basin has the best water quality (Class II), while the Erzen/Ishmi basin has the worst quality (Class V) of river waters that may be affected by the AIC. The trend of the water quality for four years monitoring period (2014-2017) regarding the six rivers under study is presented in the following table.

**Table 4-80 Trend of the quality of the six rivers to be affected by the road corridor in the period of 2014-2017.**

| River | Section of AIC | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|
| Drin Buna | Section 1 | | | | |
| Drin of Lezha | Section 1 and 2 | | | | |
| Mat | Section 2 | | | | |
| Erzen/Ishem | Section 4,5 | | | | |
| Shkumbin | Section 5 (5B and 5 C) | | | | |
| Seman | Section 8 | | | | |
| Vjosa | Sections 9 (A2 and B2) ,10, 11, 12, 13A | | | | |
| High quality (Category I) | | | | | |
| Good quality (Category II ) | | | | | |
| Moderate quality (Category III | | | | | |
| Poor quality (Category IV) | | | | | |
| Bad quality (Category V)- | | | | | |

*Source: NEA Environmental Statement Reports, 2015-2018 for the period 2014-2017.*

Considering the table above, it is indicated a deterioration of the water quality in Drin – Buna river (Drini Lezha River branch) and Mati river for the last the years, while the water quality in Shkumbini river has been improved in the last two years compared with its quality of the period 2014-2015. Regarding the other rivers, the water quality has remained unchanged.

The main causes of pollution for each river of the study area are presented in the following table (except for Vjosa river that has good quality).

**Table 4-81 Causes of pollution**

| River | Cause of Pollution |
|---|---|
| Drin-Buna | The pollution comes as a result of the discharges of polluted waters from the city of Lezhe to the Drin of Lezhe river. |
| Mat | Discharges of untreated urban and industrial wastewaters located near the highway area. |
| Erzen/Ishmi | Urban waters of the city of Tirana and of the surrounded inhabited areas in the east of Tirana. |
| Seman | Gjanica river is a very polluted river that affects the quality of Seman river. Seman river can be classified among the most polluted rivers due to the impacts by the discharges of urban and industrial waste waters and remains of oil extraction/processing industry into the river |
| Shkumbin | The quality of this river is moderate, due to the urban wastewater discharges |

*Source: Environmental Statement Report 2017, NEA*

#### 4.1.11.3 Groundwater Recharge zones

Carbonate formations characterized by karst of high water bearing potential, are quite sensitive by infiltration of contamination from the soils. These formations might be affected by road track at Renci, Kakarriqi areas, depending on depth of cuttings that might change the ground water regime. Carbonate formations of Kakariqi and Renci and Mati, Erzeni, Peqin –Rrogozhina, Vjosa and Drino Aquifers are exposed to the risk of pollution from project activities. Drino Aquifer serves as a recharge zone to Mali i Gjere, along a zone approximately 7 km long. Groundwater contamination may occur especially to shallow ground waters. Kremenara massif serves as a recharge that drainage to Pocemi Springs.

**Table 4-82 Aquifers Recharge Areas "Hydrogeological windows", crossed/in vicinity of AIC sections**

| Recharge area | Site | Section |
|---|---|---|
| Carbonate formations of Kakariqi and Renci | Close to Kakariqi and Renci mountains | Section 1 |
| Mati aquifer | Close to Mati bridge | Section 2 |
| Erzeni aquifer | Peze Helmes | Section 5B |
| Peqin-Rrogozhine aquifer | Eastern of Rrogozhina | Section 5C and 6 |
| Vjosa aquifer | Along Vjosa River valley, Kremenara massif-Pocem | Section 9A2 and 9B2 |
| Drino aquifer | Along Drino Valley | Section 10, 11, 12, 13A |

#### 4.1.11.4 Groundwater quality per Section

Data on the groundwaters of the basins considered in the study area derive from the Environmental State Report analysis (2018), prepared by the National Environmental Agency (NEA). This report includes data for the last five years (2013-2017) and refers to the six main groundwater basins in Albania, which are also affected by the AIC. The findings of the aforementioned report also took into consideration the Albanian Standards for drinking waters as well as the EU standards, regarding the quality of water intended for human consumption (80/778/EEC[15]) substituted by the Water Framework Directive (Council Directive 98/83/EEC[16] on the quality of water intended for human consumption).

Additionally, this analysis does not include any data for the wider area crossed by Section 8, since there is no monitoring point in the national groundwater system. For this reason, other sources of information were used for the groundwater quality description such as the Semani River Basin Management Plan (RBMP,2019) and its Strategic Environmental Assessment as well as the Local Development Plan for Fier Municipality (2016). The parameters monitored by NEA are PH, total hardness, total mineralization, alkalinity, temperature, acidity, calcium (Ca), sodium (Na), iron (Fe), magnesium (Mg), ammonium, chlorine(Cl), nitrates and nitrites content, dry residue-suspended solids, sulphates, salinity rate, exploitation coefficient in general, annual exploitation volume. The last monitoring groundwater process was performed twice a year for chemical analysis, i.e. in May - June and October of 2017. The figure below shows the groundwater monitoring stations for the river basins in Albania that were used for the period 2013-2017.



15 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31980L0778&from=EN, Annex I, Part A, B, C, D, E and F, page 6-13

16 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31998L0083&from=EN, Annex I, part A,B and C related to Chemical and Microbiological parameters, page 10-13


**Figure 4-42 Groundwater monitoring stations.**

*Source: Environmental Statement Report, NEA 2018*

The recommended concentrations (STASH-R – Albanian Recommended Standard) and the maximum allowed concentrations (STASH- Permitted Maximum Limits (PML)) were considered for the groundwater quality assessment. In addition, monitored values were compared to the EU standards, more precisely to the recommended concentrations (EU-R) and maximum permitted concentrations (EU-PML). The monitoring stations located close to the road corridor, with the code of the station, the station name and the related Section of the AIC are presented in the following table.

**Table 4-83 The aquifers, monitoring stations, and station codes and the related AIC sections**

| AQUIFER | Station code | Station name | Related Sections of AIC |
|---|---|---|---|
| Aquifer of Shkoder (Code 100) | ALGW_101 | St.no.1 Dobraç, Shkoder | Section 1 |
| | ALGW_102 | St. no.3 Kisha e Madhe, Shkoder | |
| | ALGW_106 | St. Velipoje | |
| Aquifer of Lezhe (Code 200) | ALGW_201 | St.50 Barbulloje | Section 2 |
| | ALGW_203 | St no.46 Hoteli i Gjuetise, Lezhe | |
| | ALGW-204 | St.No.29 Ishull - Lezhe st. Shëngjin | |
| | ALGW_205 | St no.2s Rrilë, Lezhe | |
| Quaternary gravel aquifer of Fushe Kuqe, Fushe Milot (Code 200) | ALGW_202 | St.no.26 Fushe Kuqe, Laç | Section 3 |
| | ALGW_206 | St no.176 Milot | |
| | ALGW_207 | St no.197 Gurrez | |
| Quaternary gravel of Fushe Kruje (Code 400) | ALGW_401 | St.no.327 Fushe – Kruje | Section 4 and first part of the Section 5 (5B) |
| | ALGW_403 | St no.160 Thumane | |
| | ALGW_404 | St no.1N Gramez | |
| | ALGW_405 | St no.2/97 Rinas | |
| Quaternary gravel of Tirane (Code 400) | ALGW_406 | St no.47 Berxull, Tirane | |
| | ALGW_402 | St.no.6 Laknas, Tirane | |
| Quaternary gravel aquifer of Lushnje (Code 300) | ALGW_302 | St.no.286 Çerme | Second part of the Section 5 (5C) and Sections 6 and 7 |
| | ALGW_306 | St. no.3 Konjat, Lushnje | |
| Semani Basin (Code 500) | NA | NA | Section 8 |
| Vjosa Basin (Code 600) | ALGW_601 | St Kafaraj, Fier | Section 9 |
| | ALGW_607 | St Water Source Uji i Ftohte Tepelene | Section 10 |
| | ALGW_602 | St Buduk, st.Gjirokaster | Section 11, 12, 13 |
| | ALGW_605 | St Budrishte, Gjirokaster | Section 11, 12, 13 |

*Source: Environment Statement Report NEA, 2018.*

There is going to be an analysis per Section regarding the groundwater quality, considering the aforementioned stations.

Section 1.

Regarding Section 1, groundwaters lie in the **Drini Basin**. Monitoring of the Shkoder quaternary aquifer close to the road corridor is carried out in three drilling wells of the aquifer, two of which are located near Shkoder town (Dobraç and Kisha e Madhe stations) and one in Velipoje (more than 5 km away the section). The closest groundwater monitoring stations with the section 1, are shown in the following figure.

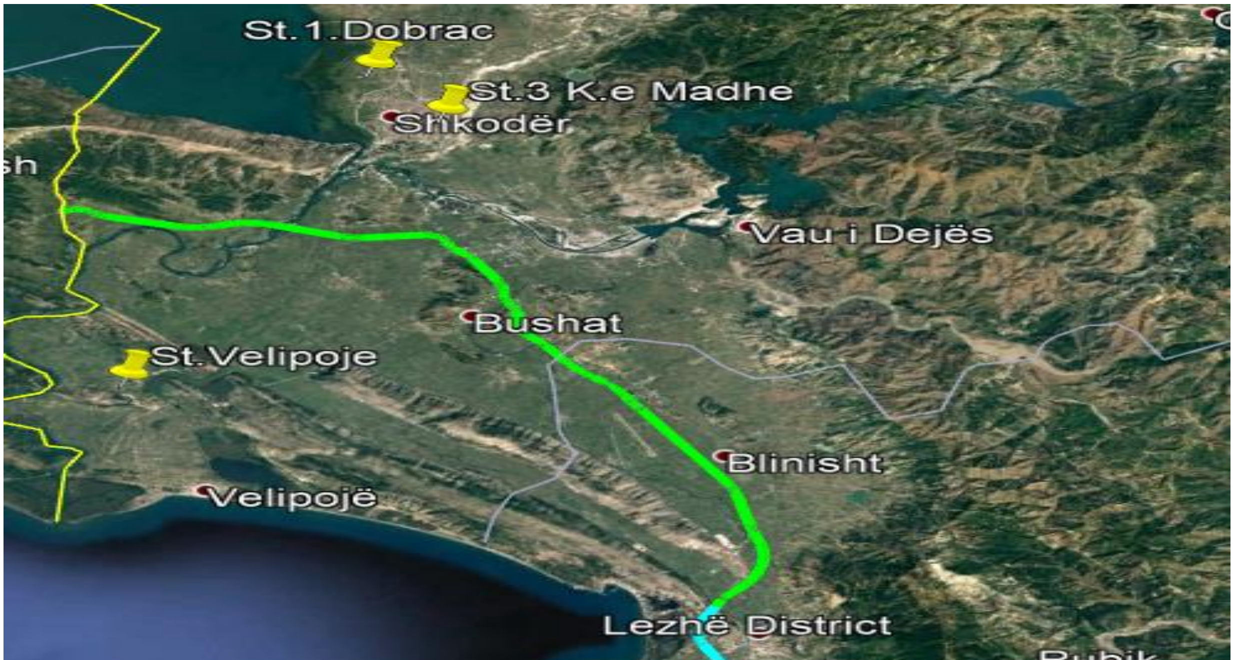


**Figure 4-43 Groundwater monitoring stations in aquifer of Shkoder.**

The results for each parameter monitored are presented below. More specifically:

- The water temperature varies from 9 to 13,7 °C in the water sources of the basin to 11,9 – 16,9 ° in the quaternary aquifer, being below the Albanian standards of 20 °C
- The Ph value for the three stations varies between 7 and 8, i.e. the waters of this aquifer are neutral.
- General hardness (GH) for all stations and for the whole period is below or equal to the EU and STASH recommended value of 10 German degrees.
- Total Mineralization for all stations and for both monitoring phases of the whole period of 2013-2017 is far below the STASH recommended of 750 mg/l, since Velipoje station's average value which is the highest among the stations lies at 400mg/l.
- Na content for all stations and for both monitoring phases of the whole period of 2013-2017 is below the EU and STASH recommended value of 20 mg/l
- Ca content for all stations and for both monitoring phases of the whole period of 2013-2017 is below the STASH recommended and PML value of 75 -200 mg/l and EU standard (100 mg/l).
- The content of magnesium in the station Velipoje is slightly over the recommended standard of EU (30mg/l). Regarding the other stations, the Mg content is within the recommended value of EU (30mg/l) and STASH (20mg/) standards with only small seasonal fluctuations.
- The content of Fe had a peak in the station of Dobrac in 2013-2014 with a value of 0,7 mg/l, exceeding the EU PML value of 0,2 mg/l and the STASH PML value of 0,3 mg/l, however since then the values fell below the EU and STASH recommended value of 0,05 mg/l. The values of the other stations were far below the EU and STASH recommended value.
- The content of Ammonia is over the recommended value of EU (0,05 mg/l) and over the STASH PML value of 0,05mg/l in the drilling in Velipoje during the year 2015-2016. Regarding the other years of the monitoring period (2013-2017) as well as the other stations, the content of ammonia is below the STASH PML value and EU recommended value.
- Cl content for all stations and for both monitoring phases of the whole period of 2013-2017 is below the EU and STASH recommended value of 25 mg/l

- $SO_4$ content for all stations and for both monitoring phases of the whole period of 2013-2017 is below the EU and STASH recommended value of 25 mg/l
- The average content of $NO_3$ for the last 5 years for all stations varies from 0.56 to 11.01 mg/l, being below the EU and STASH recommended value of 25 mg/l.
- The content of $NO_2$ for the last 5 years (2013 - 2017) varies from 0.0025 to 0.01 mg/l. It was noticed an increasing tendency in the station of Velipoje between the second phase of 2016 and first phase of 2017, which was stabilized in the second phase of 2017. The content of nitrites is above the STASH recommended value of 0 mg/l but below the STASH PML of 0,5 mg/l and EU PML of 0,1 mg/l.
- The analysis for microelements (Ni, Mn, Zn, Pb, Cu, Co, Cr, Cd) is carried out only in station 1 (in Dobrac) and the results are within the STASH and EU standards.

Taking into account the analysis of the groundwater at the three stations close to the area under study, the results show very good physical – chemical characteristics. The following table presents a summary of the parameters monitored in the stations of the aquifer of Shkoder.

**Table 4-84 Results of groundwater monitoring process in the Drin-Bune basin**

| Indicators | No. of well and location | | |
|---|---|---|---|
| | Well.no.1, st.Dobrac | Well.36. st Velipoje | Well.3 Kisha e Madhe |
| PH | VWS* | VWS | VWS |
| Na | VWS | VWS | VWS |
| Ca | VWS | VWS | VWS |
| Mg | VWS | VWS | VWS |
| Fe | VWS | VWS | VWS |
| NH4 | VWS | VWS | VWS |
| Cl | VWS | VWS | VWS |
| SO4 | VWS | VWS | VWS |
| NO3 | VWS | VWS | VWS |
| NO2 | VWS | VWS | VWS |
| TM | VWS | VWS | VWS |
| DR | VWS | VWS | VWS |
| GH | VWS | VWS | VWS |

| Indicators | No. of well and location | | |
|---|---|---|---|
| | Well.no.1, st.Dobrac | Well.36. st Velipoje | Well.3 Kisha e Madhe |
| Results | Very good physical-chemical quality | Very good physical chemical quality | Very good physical chemical quality |

*VWS = Value within the standard

Section 2

Section 2 lies in Mati Basin. Groundwater quality is measured in 4 stations of Lezha aquifer (Part of Fushe Kuqe aquifer). The closest monitoring stations to this AIC part are four drilling wells, which are located in the quaternary gravel aquifer of Lezhe and are presented in the figure below.

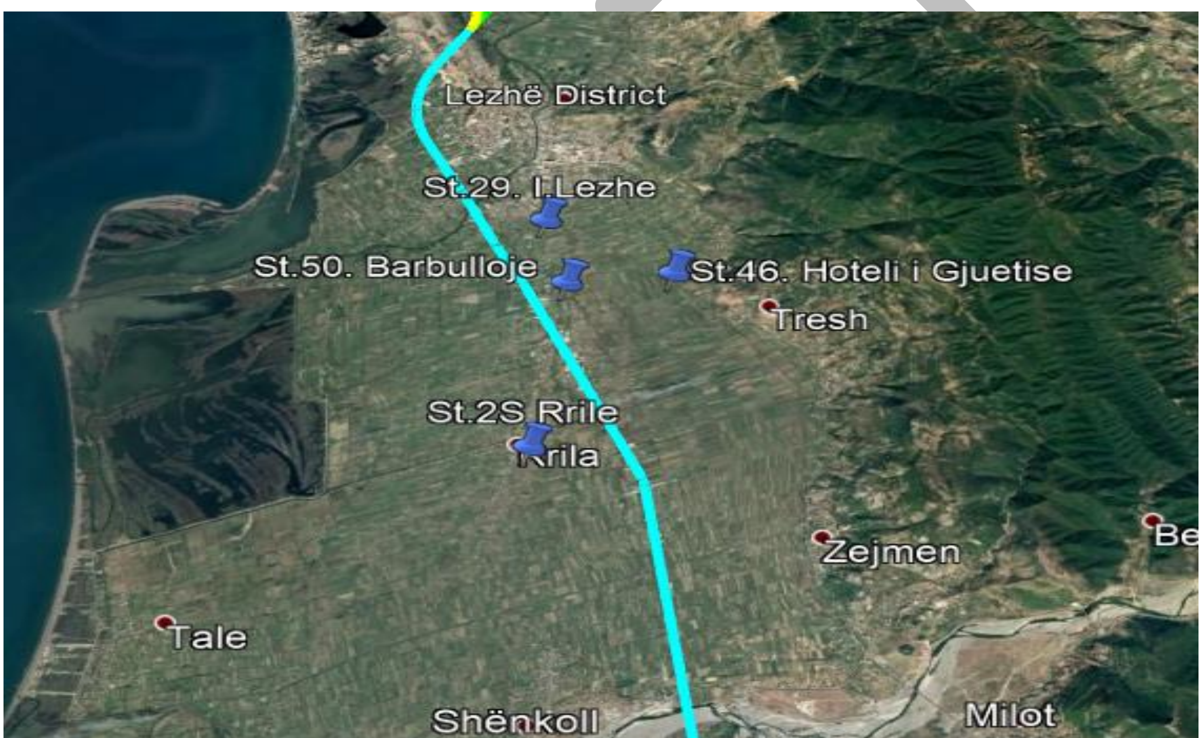


**Figure 4-44 Groundwater monitoring stations in the aquifer of Lezhe (Code AL 200)**

The results for each parameter monitored are presented below. More specifically:

- The average water temperature in the basin varies from 15.4 to 17.4 °C, where the STASH PML is 20 °C
- The PH values are within the STASH and EU standards. The trend over the last five years shows a stability on PH content, while only small seasonal fluctuations are noticed.
- General Hardness (GH) is within the STASH-R (10 German degrees) for all stations, except for the station 2S close to Rrile, where the general hardness value exceeds the allowed limit (STASH PML) of 25 German degrees. EU minimum required concentration is >60 mg/l Ca.

- Total Mineralization (TM) is over the STASH -R (700 mg/l) and STASH -PML (1200 mg/l),only in the station 2s in Rrile during the whole period 2013-2017.
- Dried residue (Dr) regarding the two monitoring phases varies from 336.71 to 679.75 mg/l for the Stations no.29 I.Lezhe, no.50 Barbulloje and no.46 I.Lezhe and is within STASH-R and PML (500 - 1000 mg/l) and EU PML (1500 mg/l). As for the station no.2s (Rrile), the values vary from 2673.7 to 2708.3 mg/l, which are over the STASH and EU standards.
- Na content has a stable tendency for the period 2013-2017 for the stations no.50 Barbulloje, no.46 H.Gjuetise, no.29 I.Lezhe and no.2s Rrile. Taking into account the STASH (R, PML) and EU (R,PML) standard (20-100; 20-150), the Na content is over all standard values for the station 2S Rrile (around 800 mg/l), while for the other stations, the values are over the STASH and EU R, but below the STASH PML.
- The Ca content is compared with the STASHR, PMLvalue of 75 -200 mg/l and EU standard-100 mg/lrespectively). Ca values at all stations are below the STASH PML, while the values for the stations in Lezhe and Barbulloje are below the STASH and EU R value of 75mg/l. The values for the other two stations are close to the EU PML limit value.
- Magnesium – Mg content varies from 2.69 to 10.58 mg/l for the stations no. 46 H.Gjuetise, no.50 Barbulloje and no.29 I.Lezhe, with some small seasonal fluctuations. These values are below the STASH-R and EU-R limit values (20,30 mg/l respectively). Regarding the station no.2s Rrile, the average content of Mg is 68.09 mg/l, which is over the STASH and EU PML ( 50 mg/l).
- Fe content for all stations is compared to the STASH and EU standards (R, PML) (0.05 - 0.3, 0.05 - 0.2 mg/l respectively). All Fe values for the relevant stations are below the STASH and EU PML limit values, apart from the station in Lezhe and the period 2014-2015, when PML values are exceeded. The STASH and EU-R limit value is in general exceeded at all stations.
- The average values of ammonium vary from 0.035 to 0.15mg/l. Ammonium content for all stations is compared with the STASH and EU standards (0 - 0.1, 0,05 - 0.5 mg/l). All values are below the EU PML limit value, while ammonium value in Rrile is even below the STASH PML. The values of the rest of the stations exceed for several years the STASH PML value.
- The Cl content is compared with the STASH and EU Recommended Limit-25 mg/l and STASH PML and EU PML (200;250 mg/l). The content of Cl is above the recommended STASH and EU value for all stations, but under the maximum allowed content, while Cl content in the station no. 2s Rrile is over the STASH PML.
- The content of $SO_4$ for the last five years is compared with STASH (R, PML) and EU (R, PML) standard (25 - 250 mg/l accordingly). Regarding the station no.2S in Rrile, the $SO_4$ content is over the standard and maximum allowed content, while for the other stations, the values are below the standards.
- The content of $NO_3$ is low for all stations below both STASH (R, PML) and EU (R, PML) standards (which for both STASH and EU R is 25mg/l and STASH PML and EU PML is 50mg/l) varies from 1.07 to 4.64 mg/l.
- The content of $NO_2$ in general is within the limits for EU-R (0) and STASH-R (0), except for the station in Barbulloje where the relevant value exceeds the EU PML (0.1 mg/l), but under the STASH PML (0.05).

The water of Lezhe aquifer is used for drinking water supply of the town of Lezhe, Shengjin and surrounding villages. In general, the monitoring analyses has shown that the water has not good chemical characteristics.

The following table presents a summary of the parameters monitored in the stations of the aquifer of Lezhe.

**Table 4-85 Results of groundwater monitoring process in the quaternary sub-aquifer of Lezhe**

| Indicators | No. of well and location | | | |
|---|---|---|---|---|
| | St.50, Barbulloje | Well-station no.46, Hoteli i Gjuetisë, Lezhë | Well-station, Nr.29, Ishull - Lezhë st. Shëngjin | Well-station nr.2s, Rrile |
| PH | VWS* | VWS | VWS | VWS |
| Na | HVOS | HVOS*** | VWS | VHVOS |
| Ca | VWS | VWS | VWS | VWS |
| Mg | VWS | VWS | VWS | HVOS |
| Fe | VWS | VWS | VWS | VWS |
| NH4 | VWS | VWS | VWS | VWS |
| Cl | HVOS | HVOS | VWS | VHVOS**** |
| SO4 | VWS | VWSIT | VWS | VHVOS |
| NO3 | VWS | VWS | VWS | VWS |
| NO2 | VWSIT** | VBN | VWSIT | VWS |
| TM | VWS | VWS | VWS | VHVOS |
| DR | VWS | VWS | VWS | VHVOS |
| GH | VWS | VWS | VWS | VHVOS |
| Water Quality results | Not good chemical characteristics. The content of Na, Cl is over the standard. NO2 content with increasing tendency | Not good chemical characteristics. The content of Na, Cl and SO4 is over the standard | Very good physical-chemical characteristics. | Not good chemical characteristics. The content of Na, Cl, Mg, SO4 GH, TM, Dr in the upper layer of aquifer is over the standard, the water is not drinkable |

*VWS = Value within the standard

**VWSIT = Value within the standard, with increasing tendency

***HVOS= High Value over the standard

****VHVOS = Very high values over the standard

Regarding the monitoring station in Rrile, most of the parameters monitored are over the normal values. The lower layers of the aquifer are not used for drinking water, but only for irrigation.

<u>Section 3</u>

The ground waters of this section lie in the Mati basin and more specifically in the quaternary gravel aquifer of Fushe Kuqe. The monitoring process in this aquifer is carried out in five drilling wells, three of which are located close to the study area, namely drilling no.176 Milot, no.26 Fushe - Kuqe and no.197 Gurrez as they are indicated in the following figure.


**Figure 4-45 Groundwater monitoring station in the aquifer of Fushe Kuqe**

The results for each parameter monitored are presented below. More specifically:

- The water Temperature varies from 15.1 to19.7 °C, with an average temperature of 17.1° C, which is below the STASH maximum allowed value
- The PH value varies from 7.59 to 8.18, indicating that the waters of this aquifer are weakly alkaline.
- General hardness measured in Fushe kuqe and Gurrez stations indicate results far below STASH R (10 German degrees) and the STASH PML (25 German degrees), while Milot's results are close or above the STASH R. Fluctuations are noticed in the drilling 176 Milot due to the increase of Mg content, decrease of piezometric level and intensive exploitation of groundwater. EU minimum required concentration is >60 mg/l Ca.
- Regarding total Mineralization (TM), the values of all stations are far beyond the STASH R value of 700 mg/l) and STASH -PML (1200 mg/l).
- Dry residue for the three stations varies from 153.19 to 234.27 mg/l, being within the Albanian limits (500 - 1000 mg/l) and EU PML (1500 mg/l).
- The Na content for the last 5 years is compared to the STASH-R and STASH-PML (20 – 100mg/l) and EU-R and EU-PML (20 – 150 mg/l). At all stations, Na content is within the recommended value and the within the maximum allowed limit of both STASH and EU standards. -
- The Ca content is within the STASH-R (75mg/l) and STASH PML (200mg/l), and EU-R standard (100mg/l) at all stations for the last five years.
- Mg content of the aforementioned stations lies within the recommended value of the EU standards (30 mg/l), while it exceeds the recommended value of the STASH standards (20 mg/l) for the whole period 2013-2017, but is within the STASH PML and EU PML of 50 mg/l.

- The average content of Fe varies from 0.02 to 0.04 mg/l for all the stations, which is beyond the EU and STASH recommended value of 0,05 mg/l, with some seasonal fluctuations that sometimes exceed this recommended value.
- The average content of Ammonium $NH_4$ varies from 0.014 to 0.026 mg/l during the last five years for all stations, which is below the recommended STASH and EU value of 00,05 mg/l.
- The average content of Cl varies from 4.66 to 22.75 mg/l for all stations, being below the recommended standards of EU and STASH (25 m/l).
- The average content of $SO_4$ varies from 19.65 to 71.1 mg/l, being over the STASH and EU recommended values of 25 mg/l but below the STASH and EU PML of 250 mg/l.
- The content of $NO_3$ varies from 1.06 to 4.34 mg/l, being far below the EU and STASH recommended standards of 25 mg/l.
- The content of $NO_2$ varies from 0.007 to 0.016 mg/l, being far below from the EU and STASH PML value of 0.05-0,1 mg/l.
- The content of $O_2$ varies from 1.51 to 8.66 mg/l.

As it is indicated in the table below, the groundwaters in the three stations close to the study area are of good physical and chemical quality.

**Table 4-86 Results of groundwater monitoring process in the quaternary sub-aquifer of Fushe Kuqe**

| Indicators | No.of well/station and location | | |
|---|---|---|---|
| | Wellstation. No.26, Fushe Kuqe, Laç | Well/station.No.176, Milot | Well/station no.197, Gurrez |
| PH | VWS* | VWS | VWS |
| Na | VWS | VWS | VWS |
| Ca | VWS | VWS | VWS |
| Mg | VWS | VWS | VWS |
| Fe | VWS | VWS | VWS |
| NH4 | VWS | VWS | VWS |
| Cl | VWS | VWS | VWS |
| SO4 | VWS | VWS | VWS |
| NO3 | VWS | VWS | VWS |
| NO2 | VWS | VWS | VWS |
| TM | VWS | VWS | VWS |
| DR | VWS | VWS | VWS |
| GH | VWS | VWS | VWS |

| Indicators | No.of well/station and location | | |
|---|---|---|---|
| | **Wellstation. No.26, Fushe Kuqe, Laç** | **Well/station.No.176, Milot** | **Well/station no.197, Gurrez** |
| Water Quality results | Very good physical chemical quality | Very good physical chemical quality | Very good physical chemical quality |

*VWS = Value within the standard

Section 4

The groundwaters of section 4 lie in Erzen-Ishmi Basin. The waters of this basin belong to two aquifers, the quaternary gravel aquifer of Tirana and the quaternary gravel of Fushe Kruje, both parts of Erzeni Ishmi aquifer. Regarding the quaternary gravel aquifer of Tirana, it is monitored by five drilling wells, while only two of them are located close to the study area. These two stations are presented in the following figure.

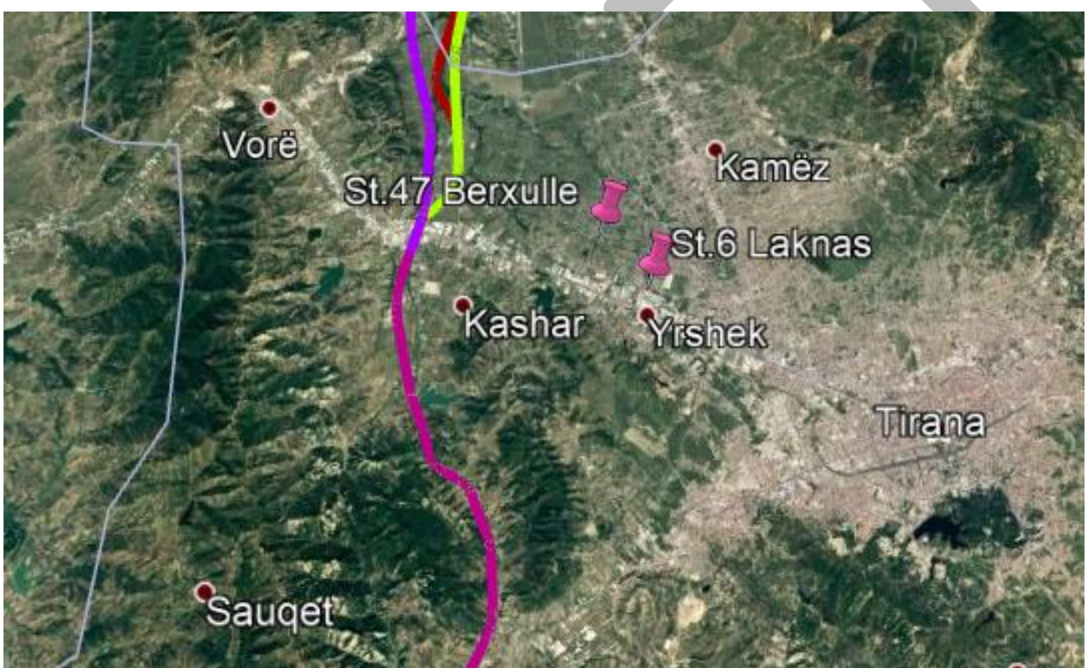


**Figure 4-46 Sampling points in the aquifer of Tirana**

*The gravel aquifer of Tirana*

The ground waters of this aquifer have in general good chemical quality, without any flavor, color and taste. The water in two monitoring stations of the aquifer of Tirana is used for drinking water supply of the town of Vora, Kamza and the surrounding villages. The water quality is relatively good, but has an increasing tendency of some parameters (Mg,Ca, $NO_3$). The main causes of the increase in the concentration of these parameters is the infiltration of polluted water of the Tirana and Lana rivers in the aquifer layers.

The results for each parameter monitored are presented below. More specifically:

- The water temperature for both monitoring phases varies from 16.7 to 19.5° C with an average temperature of 18.1 ° C, which is below the STASH standards of 20 ° C

- The PH values vary from 7,06 to 7,29 during the period 2013-2017. The waters are neutral.
- Regarding General hardness - Gh values, values at Station 6 in Laknas are just below the STASH PML value of 25 German degrees, while the results of station 47 in Berxull are over the PML Albanian standards of 25 German degrees. EU minimum required concentration is >60 mg/l Ca.
- Total Mineralization Tm values exceed the STASH recommended value of 700 mg/l for both stations, however they are far below the STASH PML of 1200 mg/l.
- The average content of Dry residue for the last five years varies from 24.14 to 67.08 mg/l for all monitoring stations and is within the STASH-R and STASH PML (500-1000 mg/l) and EU PML (1500 mg/l).
- The content of Na for both stations was far below the STASH PML (100mg/l) and the EU PML (150 mg/l) and very close to the recommended STASH and EU value of 20 mg/l.
- The average content of Ca for both stations is over the EU (100 mg/l) and STASH (75 mg/l) recommended values and far below the STASH PML value of 200 mg/l.
- Regarding the station 47 in Berxulle, the content of Mg in 2015 and 2017 was over EU recommended value of 30mg/l, while it was below the STASH PML and EU PMLvalue of 50mg/l . As far as Station 6 in Laknas is concerned, the values are above the STASH recommended value (20mg/l), but below the STASH PML and EU PML (50mg/l).
- The content of Fe was over the PML of EU and STASH (0,2 and 0,3 accordingly) in Berxulle station for the year 2015, while for the rest of the years for this station as well as for the station 6 in Laknas, the values were close to the EU and STASH recommended value of 0,05 mg/l.
- The content of ammonium NH4 for the year 2017 is over the STASH recommended value (0) and below the EU recommended value (0.05) for both stations and below the STASH PML and EU PML respectively (0.1 and 0.5).
- The content of Cl is also given for the last 5 years and is compared to the STASH-R and EU-R Limit of 25 mg/l and STASH PML and EU PML respectively (200;250 mg/l). Regarding the station in Berxull, the content of Cl shows only seasonal fluctuations, while station no.6 in Laknas shows an increasing tendency for the years 2016-2017. In all station the content of Cl is under the STASH and EU PML values.
- The content of $SO_4$ for both stations was above the EU and STASH recommended value of 25 mg/l, having an average of 50 mg/l but far below the EU and STASH PML value of 250 mg/l.
- The content of $NO_3$ for station 6 in Laknas is below the EU and STASH recommended value of 25 mg/l, while for the station in Berxulle, it exceeds the aforementioned value only in 2016.
- The content of $NO_2$ for both stations was within the recommended and maximum allowed standards, since the content of $NO_2$ for the last five years varies from 0 to 0.05 mg/l.
- The content of $O_2$ at both monitoring phases of varies from 4 to 8.5 mg/l
- The analyses for microelements showed that the content for heavy metals was within the recommended standards.

*The gravel aquifer of Fushe Kruje*

This aquifer is monitored by four drilling wells, namely the drillings no. 2/98 in Rinas, no.160 in Thumane, no.327 in Fushe - Kruje and no. 1N in Gramez. The groundwater monitoring stations in the aquifer of Fushe Kruje, located close to the road corridor are presented in the following figure.


**Figure 4-47 Groundwater monitoring stations in the aquifer of Fushe Kruje**

The water in the aquifer of Fushe kruje is used for drinking water supply of Kruje, Fushe Kruje and other urban centers. The water quality in Thumane and Rinas is relatively good, while in Fushe Kruje and Gramez, the water has not good chemical characteristics, (high concentration of Mg, Ca). The waters in Gramez show increased values of $NO_2$. The main causes of water pollution are the use of pesticides, use of gravel layers in the river bed, etc.

The results for each parameter monitored are presented below. More specifically:

- The water temperature for the two monitoring phases varies from 16.1 to 19ºC, being below the STASH maximum value of 20 ºC.
- Regarding the General hardness, all values of the stations are over the STASH recommended value of 10 German degrees. They have some seasonal fluctuations with some decreasing tendency for the station of Thumane and Gramez and stability for Rinas, while for the station in Fushe Kruje, it is noticed an increase in the years 2015, 2016 and first half of 2017, passing over the STASH PML value of 25 German degrees. The General hardness is over the STASH PML standards (25 Gd) for the Gramez station. EU minimum required concentration is >60 mg/l Ca.
- The total mineralization results show that all values are below the STASH PML (1200 mg/l). The values for the station in Thumane and Rinas are below the STASH R, while the values for the stations of Gramez are for the whole period over the STASH R values of 700 mg/l. Finally, the values of F. Kruje are below the STASH R value apart from the period 2015-2017.
- Dry residue during both monitoring phases in 2017 varies from 232.59 to 578.97 mg/l for the aforementioned stations. The STASH-R and STASH PML value are 500-1000 mg/l and EU PML is 1500 mg/l.
- The content of Na is for alls stations below the EU and STASH recommended value of 20 mg/l.
- The content of Mg is over the STASH recommended value (20mg/l) for all stations. Rinas' station values are close to the EU recommended value of 30mg/l, while Thumane station's values are over

the STASH R. The other two stations (Gramez and Fushe Kruje), the values are over the EU and STASH PML of 50 mg/l.

- The content of Fe is within the STASH R and EU-R value of 0,05 mg/l for all stations.
- The content of ammonium is for all stations over the STASH R value (0) but below the STASH PML value of 0,1 mg/l apart from the station in F. Kruje in the period mid 2014 to mid 2015. The EU recommended value of 0,05 mg/l is temporarily passed by the values of the stations Gramez and F. Kruje, while the EU PML (0,5 mg/l) is far above all values that are identified in the aforementioned stations.
- The content of Cl is under the recommended STASH and EU standard for all drillings (25 mg/l). The average content varies from 8.71 to 20.39 mg/l.
- The content of $SO_4$ is over the EU and STASH recommended value of 25 mg/l, but under the STASH and EU PML (250 mg/l)....
- The content of $NO_3$ for all stations is below the STASH and EU recommended value of 25 mg/l.
- The values of the content of $NO_2$ are below the EU PML value of 0,1 mg/ and over the STASH PML value of 0,05 mg/l in the station Gramez. For the last five years, the average values vary from 0.005 to 0.053 mg/l.
- The content of $O_2$ at both monitoring phases is 0.03 - 9.18 mg/l.
- Analyses for microelements; Ni, Mn, Zn, Pb, Cu, Co, Cr is within the recommended content.

The following table summarizes the results for the two aquifers.

**Table 4-87 Results of monitoring process in the basin of Erzen Ishem**

| Indicators | No.of well and location | | | | | |
|---|---|---|---|---|---|---|
| | Well. No 6, St Laknas | Well no.47, st Berxulle | Well 160, st.Thumane | Well.1N, St Gramez | Well.327 St.Fushe kruje | Well.2/97, st. Rinas |
| PH | VWS* | VWS | VWS | VWS | VWS | VWS |
| Na | VWS | VWS | VWS | VWS | VWS | VWS |
| Ca | VWS | VWSIT** | VWSIT | VWSIT | VWSIT | VWSIT |
| Mg | VWS | VWSIT | VWS | HVOS*** | HVOS | VWSIT |
| Fe | VWS | VWS | VWS | VWS | VWS | VWS |
| NH4 | VWSIT | VWS | VWS | VWS | VWS | VWS |
| Cl | VWS | VWS | VWS | VWS | VWS | VWS |
| SO4 | VWS | VWS | VWS | VWS | VWS | VWS |
| NO3 | VWSIT | VWSIT | VWS | VWS | VWS | VWS |
| NO2 | VWS | VWS | VWS | VWS | VWS | VWS |
| TM | VWS | VWS | VWS | VWS | VWSIT | VWS |

| Indicators | No.of well and location | | | | | |
|---|---|---|---|---|---|---|
| | **Well. No 6, St Laknas** | **Well no.47, st Berxulle** | **Well 160, st.Thumane** | **Well.1N, St Gramez** | **Well.327 St.Fushe kruje** | **Well.2/97, st. Rinas** |
| DR | VWS | VWS | VWS | VWS | VWS | VWSIT |
| GH | VWS | HVOS | VWSIT | HVOS | HVOS | VWS |
| Water Quality results | Good physical-chemical quality. Increasing tendency of Ca, Mg, NO3, GH | Good physical-chemical quality. General hardness over the standard, increasing tendency of Ca, Mg, TM. | Very good physical-chemical quality. Increasing tendency of Ca, GH | Not good chemical quality. High general hardness, content over the standard of Mg. Ca content with increasing tendency | Not good chemical quality. High general hardness, content over the standard of Ca, Mg | Very good physical-chemical quality. Increasing tendency of Ca, GH. |

*VWS = Value within the standard

**VWSIT = Value within the standard, with increasing tendency

***HVOS= High Value over the PML standard

<u>Section 5</u>

The groundwater of the northern part of the section lie in the Ishem/Erzeni basin and more specifically in the quaternary gravel aquifer of Tirana. The results from the monitoring process for this aquifer are described in the section above (section 4). The analyses of the waters regarding the well no.13 in the aquifer of Tirana show that they are of good quality and therefore are used for drinking water supply for a part of Tirana inhabited areas.

The southern (Second) part of the section 5 lies in Shkumbini basin and more specifically in the quaternary gravel aquifer of Lushnje. The water is used for the water supply of the city of Lushnje and the villages around. The waters of the quaternary gravel aquifer of Lushnje are monitored in two stations which are close to the AIC section, i.e. the drilling no. 3 in Konjat and drilling no 286 in Cerme and are presented in the following figure.

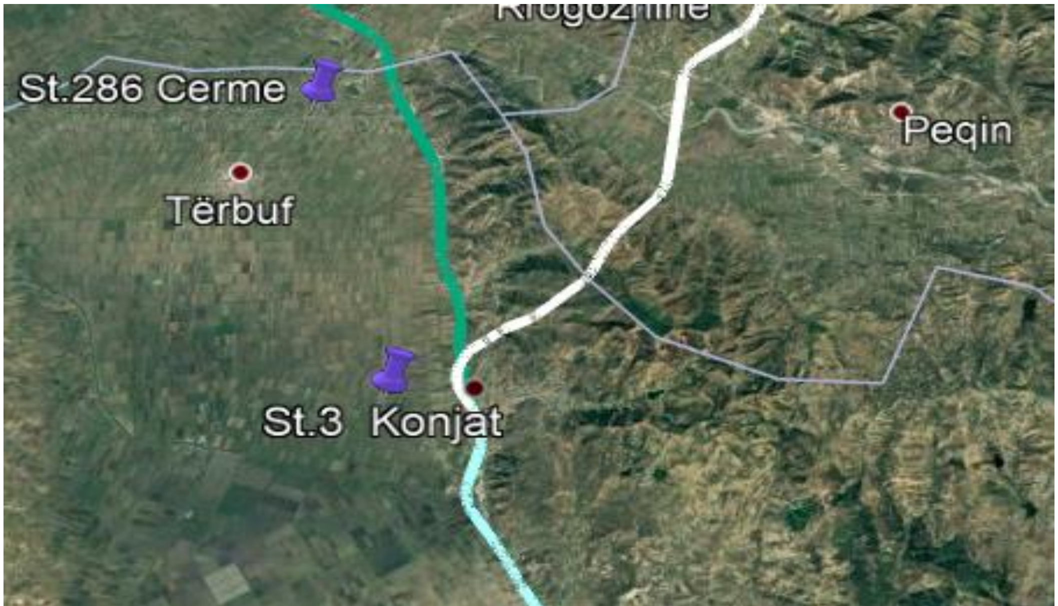


**Figure 4-48 The groundwater monitoring stations in the aquifer of Lushnje**

The monitoring results indicated that the water of the aquifer of Lushnje in station no.3 has not good physical chemical quality, since Mg content is over the standard, it is polluted with $NH_4$ and is noticed an increase tendency of Fe and Gh, while regarding the station no.286 in Cerme, the groundwater has not good physical chemical characteristics, since the content of Mg and Gh are over the standard values. The water quality in the station of Cerme of Shkumbini basin is not of good quality, the concentration of Mg is over the normal value and also general hardness. The amortization of pumping station is one of the causes of water pollution. Water pollution at this station is a result of the discharge of contaminated waters by the administrative units of Dushk and Terbuf near the pumping station, infiltration of agricultural waters, as well as the lack of sanitation areas around the wells. The water in this well is used for drinking water supply of the Lushnje municipality.

The analyses of the water in well no.13 of the aquifer of Tirana of Ishem-Erzeni basin is used for drinking water supply for a part of Tirana inhabited areas, while the water has good quality.

The results for each chemical parameter monitored is shown in the following table.

**Table 4-88 Results of monitoring process in the aquifer of Lushnje**

| Indicators | No No.of well and location | |
|---|---|---|
| | Shp. Nr.3, Konjat, Lushnjë | Shp.nr.286, Cerme |
| PH | VWS* | VWS |
| Na | VWS | VWS |
| Ca | VWS | VWS |
| Mg | VHVOS**** | VHVOS |

| Indicators | No | No.of well and location |
|---|---|---|
| | Shp. Nr.3, Konjat, Lushnjë | Shp.nr.286, Cerme |
| Fe | VWSIT** | VWS |
| NH4 | HVOS*** | VWS |
| Cl | VWS | VWS |
| SO4 | VWS | VWS |
| NO3 | VWS | VWS |
| NO2 | VWS | VWS |
| TM | VWS | VWS |
| DR | VWS | VWS |
| GH | VWSIT | HVOS |
| Water Quality results | Not good physical chemical quality, Mg content is over the standard, pollution of NH4, increase tendency of Fe and GH | Not good physical chemical quality, content over the standard of Mg and GH. |

*VWS = Value within the standard

**VWSIT = Value within the standard, with increasing tendency

***HVOS= High Value over the standard

****VHVOS = Very high values over the standard

Section 6 and 7

For this sections are considered the water monitoring parameters in the pumping station in Konjat. The quality of the Rrogozhina groundwater body is summarized. The water of Lushnja is used for drinking water supply of the town of Lushnje and the villages part of the municipality with the same name. The water quality is not very good. It has high concentration of Mg, over the norm, is found also a pollution by $NH_4$, and has increasing the tendency of general hardness and Fe.

Section 6 and 7, is related also to the Lushnja aquifer. There are no monitoring stations close to these sections. (please refer to the Section 5, Lushnje aquifer).

Section 8

The Section 8 lies in the Rrogozhina aquifer. There are no monitoring stations close to this section. Therefore, data were obtained by other literature sources such as local developments plans. Environmental pollution is caused in Semani River by the discharge of municipal waste waters and disposal of industrial wastes from the oil refining plants. Gjanica River, together with Roskovec – Hoxhar canals receive and eventually discharge waste from active oil wells, active natural gas wells, treatment plants, decanting stations, pumping stations and refining plants.

Other causes of pollution are the over- exploitation (over-withdrawal) of aquifer water, mostly in summer where demand for water increases while the aquifer's water availability is low. In addition, a long-term withdrawal of water for public supplies, industry, and agriculture has also caused pollution of several aquifers by increasing the salts concentration in the water. In many cases, the river imparts pollution with the aquifer through the areas that are called hydro-geological windows. These are the areas where the river feeds the aquifer.

Section 9 (A2+B2)

The groundwater of this section lies in Vjosa Basin and is monitored twice per year at the station of Kafaraj, which is presented in the figure below.

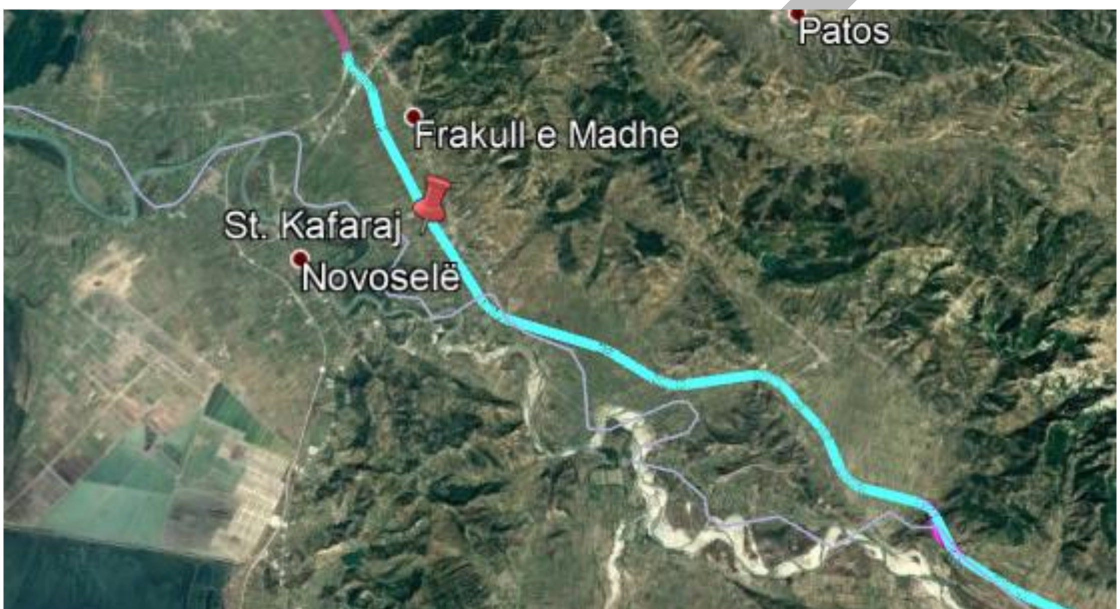


**Figure 4-49 The monitoring station in the aquifer of Kafaraj located close to the study area.**

The water in the aquifer of Kafaraj is used for drinking water supply of the town of Fier and the villages of the municipality with the same name. The physical and chemical parameters of the Pumping Station in Kafaraj are not good. The concentration of Mg and Cl is over the standard. It was notices an increasing tendency for the parameters of Na and general hardness. The water pollution of this aquifer comes as result of the discharge of contaminated waters by the residents of the administrative units close to the pumping station, infiltration of surface waters used in agriculture and oil processing industry, and the lack of hygienic and sanitary areas around wells.

The results for each parameter monitored are presented below. More specifically

- The water temperature varies from 11.8 to 17.7$^{o}$C, which is below the STASH standard of 20 $^{o}$C
- The value of PH varies from 7.42 to 8.12 and the waters of this aquifer are characterized as neutral.
- General hardness in the station of Kafaraj is on average around 29.64 German degrees. The waters of this aquifer are characterized as strong waters and the values of general hardness are over the recommended andSTASH and PML values of 10 and 25 German degrees accordingly.
- The total mineralization is at relatively high levels far above the STASH R value of 700 mg/l and slightly below as an average from the STASH PML value of 1200 mg/l.

- The content of Na is far above the STASH R and EU R value of 20 mg/l, slightly below as an average from the EU PML value of 150 mg/l and over the STASH PML value of 100 mg/l.
- The content of Ca is above the STASH recommended value of 75 mg/l, slightly below the EU R value of 100 mg/l and far below the STASH PML value of 200 mg/l.
- The content of Mg for the aforementioned period is over the recommended and permitted values of STASH (20, 50mg/l respectively) and EU standards (30,50mg/l respectively).
- The content of Fe is far below the EU and STASH recommended value of 0,05 mg/l.
- The content of ammonium is above the EUand STASH recommended value of 0 mg/l but below both the STASH (0,1mg/l) and EU (0,5mg/l) PML values.
- The content of Cl is over the STASH PML and EU PML (200;250 mg/l). having an average value of 280 mg/l during the period 2013-2017
- The content of $SO_4$ is far above the EU and STASH recommended value of 25 mg/l, but much below the EU and STASH PML value of 250 mg/l, having an average of 75 mg/l during the period 2013-2017
- The content of nitrites $NO_2$ has some fluctuations in values, being over the STASH R and EU R value of 0 mg/l, but below the EU PML value of 0,1mg/l. . The value of NO2 during 2017 are below the STASH PML value of 0,05 mg/l with increasing tendency.
- The content of $NO_3$ is below the STASH (R, PML) and EU (R, PML) standards (which for both STASH and EU R is 25mg/l and STASH PML and EU PML is 50mg/l).

The summarized table for the groundwater quality of Vjosa and Drino is at the end of Section 13.

<u>Section 10</u>

Ground waters in this section are related to Vjosa basin. The water quality is monitored in the water source 'Uji i Ftohte Tepelene', while the location of the monitoring point is presented in the following figure.

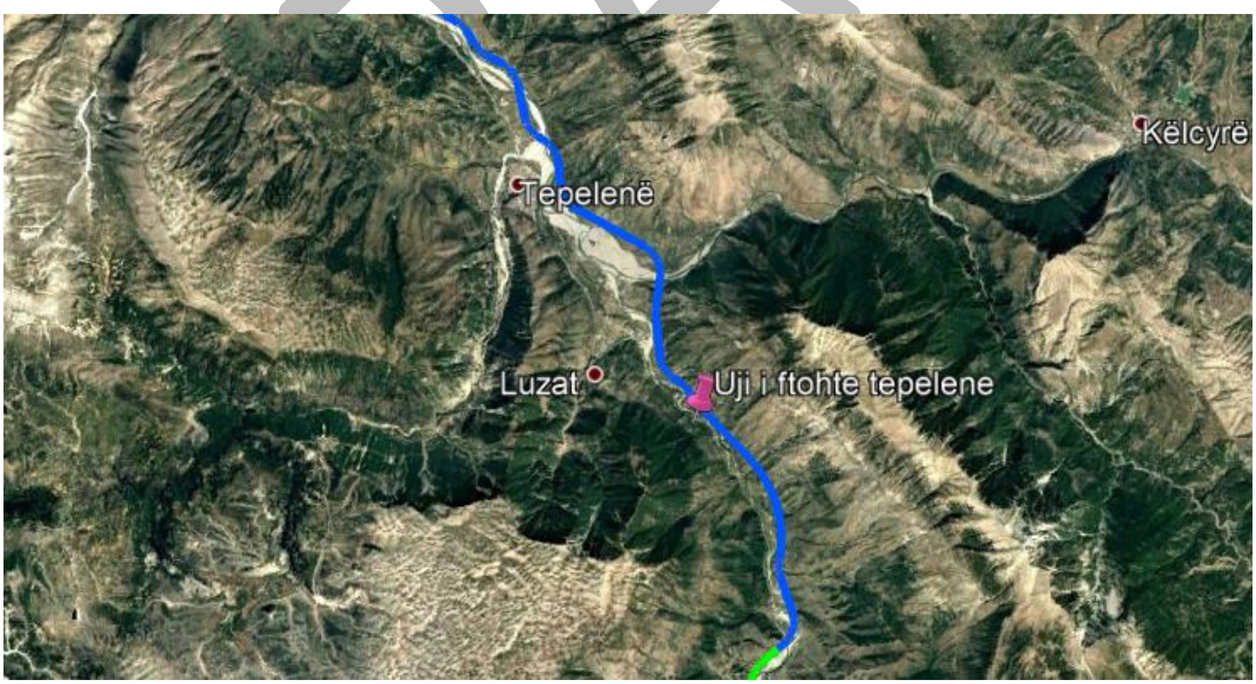


**Figure 4-50 Monitoring station 'Uji I ftohte Tepelene' along the section 10**

The analyses of these waters show very good physical and chemical characteristics of the water source 'Uji i Ftohte Tepelene' and it is presented after the description of sections 11,12 and 13.

Monitoring of the Uji I Ftohte Tepelene quality was carried out only for the period 2016-2017. The results for each parameter monitored are presented below. More specifically:

- The water temperature varies from 11.8 to 17.7 °C, being below the STASH PML OF 20°C.
- The average value of PH varies from 7.42 to 8.12. The waters are neutral.

The values for mineralization, Na, Ca, FE, ammonium, Cl, SO4, NO3 and NO2 are below/far below from the Albanian and EU standards.

Section 11, 12, 13A

The groundwater of these sections lie in the Vjosa Basin, and more specifically over Drino aquifer. This aquifer is monitored by two stations close to the AIC. The monitoring stations of Buduk and Budrishte, both are close the Section 13, but represent also the water quality of Sections 11 and 12 (Drino aquifer). The monitoring stations regarding the aquifer of Drinos are presented in the following figure.

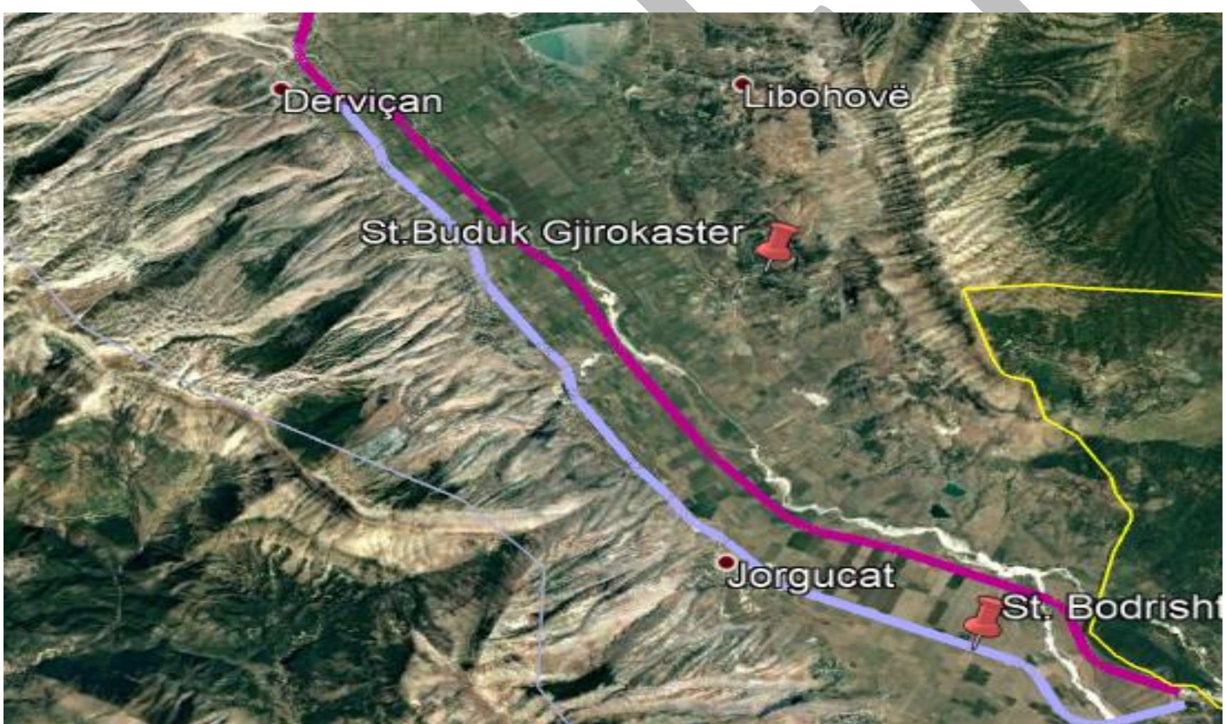


**Figure 4-51 Groundwater monitoring stations in the aquifer of Drino, section 13**

The settlement along sections 11 and 12 are supplied with drinking water from quaternary aquifer of Vjosa. Based on the analyses of water quality parameters, in the pumping station in Buduk, the water is of very good quality. The water in this station is used for drinking water supply of the town of Gjirokaster. The urban areas along section 13 are supplied with drinking water from the aquifer of Drinos. The water quality is monitored in two stations (Buduk and Bodrishte). Based on physical and chemical parameters monitored, the water is of very good quality.

The results for each parameter monitored in the aquifer of Vjosa for the four stations that lie close to sections 9, 10, 11, 12 and 13 are presented in the table below.

**Table 4-89 Results of monitoring process in the aquifer of Vjosa**

| Indicators | No. of wells and location | | | |
|---|---|---|---|---|
| | St.K St.Kafaraj | P.V Buduk | St.B Bodrishte | St. Water Source; Uji I Ftohte Tepelene |
| PH | VWS* | VWS | VWS | VWS |
| Na | HVOS *** | VWS | VWS | VWS |
| Ca | VWS | VWS | VWS | VWS |
| Mg | VHVOS**** | VWS | VWS | VWS |
| Fe | VWS | VWS | VWS | VWS |
| NH4 | VWS | VWS | VWS | VWS |
| Cl | HVOS*** | VWS | VWSIT | VWS |
| SO4 | VWS | VWS | VWS | VWS |
| NO3 | VWS | VWS | VWS | VWS |
| NO2 | VWS | VWS | VWS | VWS |
| TM | VWSIT | VWS | VWS | VWS |
| DR | VWS | VWS | VWS | VWS |
| GH | VWSIT | VWS | VWS | VWS |
| Water Quality results | Not good chemical characteristics. The content of Mg, Cl is over the standard and the content of Na, TM and GH has shown increased tendency | Very good physical-chemical characteristics | Very good physical-chemical characteristics. Cl content has shown increasing tendency | Very good physical and chemical characteristics |

*VWS = Value within the standard

**VWSIT = Value within the standard, with increasing tendency

***HVOS= High Value over the standard

****VHVOS = Very high values over the standard

*Summarize of groundwater quality and pollution sources*

The characteristics of the water basins, monitoring Stations, quality of groundwater according Albanian limits and the main sources of ground water pollution are presented below.

**Table 4-90 Summary of the characteristics of groundwaters per Section**

| Sections | Water Basin | Characteristics of the Water Basins | Monitoring Stations | Quality of Groundwater according to Albanian norms | Main causes of ground water contamination |
|---|---|---|---|---|---|
| Section 1 | Drini Water Basin | The total amount of water used in the aquifer of Shkoder is 1200-1300 l/s<br>Water exploitation coefficient is K=0.33-0.5<br>Carbonate aquifer | St. Velipoje | Very good physical and chemical characteristics | Risk of pollution by thin protective cover, especially in Dobrac aquifer<br>Infiltration of pollution from Pest/Herbicides from agricultural land<br>Intensive exploitation of groundwaters and interfering of sea waters on ground water basin |
| | | | Well no.1. Dobrac | Very good physical and chemical characteristics | |
| | | | Well no.3. Kisha e Madhe | Very good physical and chemical characteristics | |
| Section 2 | Mati Water Basin | The quaternary gravel aquifer of Lezha<br>The total amount of water used in the aquifer of Lezha is 700-900 l/s<br>Water exploitation coefficient is K=0.3-0.35 | Well no.50 Barbulloje | Not good chemical characteristics. Concentration of Na, Cl over the standard. Nitrite content show an increasing tendency. | Small protective cover, especially in Barbulloje and "Hoteli I gjuetise" areas<br>Infiltration of pollution from Pest/Herbicides from agricultural land<br>Intensive exploitation of groundwater and interfering of sea waters on ground water basin |
| | | | St. no.29 Shengjin - Ishull-Lezhe | Very good physical and chemical characteristics | |
| | | | St. no 46. Hoteli I Gjuetise | Not good chemical characteristics. Concentration of Na, Cl, $SO_4$ over the standard | |
| | | | St. no.2s. Rrile | Not good chemical characteristics. Concentration of Na, Mg, Cl, $SO_4$ over the standard. In the upper layer of aquifer, the water is not drinkable | |
| | | The quaternary gravel aquifer of Fushe Kuqe - The total amount of water used in the aquifer of Fushe Kuqe is 1250-1300 l/s<br>-Water exploitation coefficient is K=0.35-0.5 | St. no.197.Gurez | Very good physical and chemical characteristics | Risk of pollution mainly to the north of the nutritional area, due to the penetration of heavy metals of mineral origin (slams of ex ore processing industries)<br>Risk of intensive exploitation of groundwater for drinking purposes |
| | | | St. no.176. Milot | Very good physical and chemical characteristics | |

| Sections | Water Basin | Characteristics of the Water Basins | Monitoring Stations | Quality of Groundwater according to Albanian norms | Main causes of ground water contamination |
|---|---|---|---|---|---|
| Section 3 | Mati Water Basin | The quaternary gravel aquifer of Fushe Kuqe. The total amount of water used in the aquifer of Fushe Kuqe is 1250-1300 l/s<br>Water exploitation coefficient is K=0.35 -0.5 | St. no 26. Fushe Kuqe | Very good physical and chemical characteristics | |
| Section 4 | Ishem Erzeni Water Basin | The quaternary gravel aquifer of Fushe Kruje<br>The total amount of water used in the aquifer of Fushe Kruje is 600-700 l/s<br>Water exploitation coefficient is K=0.85 -0.95 | St. no.2/97. Rinas | Good physical and chemical characteristics. Increasing tendency of Ca | Infiltration of the polluted surface waters and soils by industrial remains, hospital wastes, municipal wastes and pesticides/herbicides from agricultural<br>The risk of pollution is high due to the small covering layer of the aquifer |
| | | | St. no.327. Fushe Kruje | Not good chemical characteristics. High hardness of water. Concentration of Mg, Ca over standard | |
| | | | St. no.1 N. Gramez | Not good chemical characteristics. High hardness of water, Concentration of Mg over standard. Ca content with increasing tendency | |
| | | | St. no.160.Thumane | Good physical and chemical characteristics. Increasing tendency of Ca | |

| Sections | Water Basin | Characteristics of the Water Basins | Monitoring Stations | Quality of Groundwater according to Albanian norms | Main causes of ground water contamination |
|---|---|---|---|---|---|
| | | The quaternary gravel aquifer of Tirane<br>The total amount of water used in the aquifer of Tirane is 1000-1300 l/s<br>Water exploitation coefficient is K=0.85 -0.95<br>Water is used for drinking water supply of Tirana, Kamez, Vore towns and also inhabited areas | St. no.6.Laknas | Good physical and chemical characteristics. Increasing tendency of Mg, Ca, $NO_3$ | |
| | | | St. no.47.Berxulle | Good physical and chemical characteristics. Increasing tendency of Mg, Ca<br>General hardness over the standard | |
| Section 5 (5B and 5C) | Shkumbini Water Basin | The aquifer of Lushnje<br>The total amount of water used in the aquifer is 590-600 l/s<br>Water exploitation coefficient is K=0.78 -0.9 | St. no.286. Cerme | Not good chemical characteristics. Concentration of Mg over standard. | The waters of Shkumbini basin are polluted by historical discharges of industrial water of Elbasan Metallurgic plant, and such pollution has precipitated in groundwater. This justifies the high concentration Mg and Fe.<br>The historical discharges of sewages of cities and surrounded villages in rivers, channels and stream, and precipitation of such waters in groundwater basin is the main reason of contamination of such waters by $NH_4$ |
| | | | St. no.3. Konjat | Not good chemical characteristics. Concentration of Mg over standard. Water contamination with $NH_4$, Increasing tendency of Fe | |

| Sections | Water Basin | Characteristics of the Water Basins | Monitoring Stations | Quality of Groundwater according to Albanian norms | Main causes of ground water contamination |
|---|---|---|---|---|---|
| Section 6 and 7 | Shkumbini Water Basin | The aquifer of Lushnje | St. no.3. Konjat | Not good chemical characteristics. Concentration of Mg over standard. Water contamination with $NH_4$, Increasing tendency of Fe | The contamination of groundwater has the same sources like in Section 5 |
| Section 8 | Shkumbini Water Basin | The aquifer of Rrogozhine | No monitoring station | Nevertheless, are not monitoring stations the groundwater of Rrogozhina aquifer are supposed to be polluted or not appropriate by natural chemical proprieties as drinking water. Such waters, are not anymore used as drinking water from years | Contamination sources are considered precipitation of surface waters contaminated from sewage discharges and solid waste disposal as well as remains from oil processing industry. |
| Section 9 (A2 and B2) | Vjosa Water Basin | The quaternary aquifer of Kafaraj<br>The total amount of water used in the aquifer is 700 l/s<br>Water exploitation coefficient is K=0.4 -0.5 | St.K. Kafaraj | Not good chemical characteristics. The content of Mg, Cl, Na is over the standard and the content of TM has shown increased tendency | Moderate contamination risk |
| Section 10 | Vjosa Water Basin | Quaternary aquifer of Vojsa | Water source; Uje i Ftohte Tepelene | Very good physical and chemical characteristics | The pollution risk is moderate, the natural conditions of the aquifer horizons being stretched in the depths between them with clay layers are quite favorable. The only surface contamination source can be the Vjosa River. |
| Section 11, 12 and 13A | Vjosa Water Basin | Drinos Aquifer<br>The total amount of water used in the aquifer is 90-110l/s<br>Water exploitation coefficient is K=0.4 -0.5 | St.Buduk-Gjirokaster | Very good physical and chemical characteristics | |
| | | | St.Bodrishte-Gjirokaster | Very good physical and chemical characteristics<br>Cl content has shown increasing tendency | |

### 4.1.12 Groundwaters

#### 4.1.12.1 Introduction

The hydrogeological description and the determination of the baseline conditions are carried out in compliance with the Albanian Water Law and the EU Water Directive. This baseline presentation is based on literature review and consultation with the groundwater users that will be affected by the construction and operation of the project.

The literature review is mainly based on the following data sources:

- Data/information on the hydrogeological settings has been extracted from the Hydrogeological Map of Albania, scale 1:200,000 (Puca et al, 1983) and Project of Municipality Water Resources on the project areas (AGS, 2015).-
- Data on the hydro-chemical settings has been extracted from the State of Environment Reports Albania (2014-2018).
- In case of data gaps, additional information is collected from scientific literature, consultation with ground water users (farmers etc.), local experts and institutions dealing with groundwater monitoring etc.

From the Albanian/Montenegrin border to Pocem, the proposed road corridor crosses the Western Plains and Lowlands of Albania, which are traversed by the most important Albanian rivers that run over and through the most important Quaternary gravel aquifers of the country. From Pocem to the Albanian/Greek border, the AIC crosses carbonate water bearing formation and the Quaternary gravel aquifers of the Drino and Vjosa Rivers Valleys, which are also important.

More specifically, due to the geomorphological, lithological and tectonic characteristics, the water bearing capacity of the crossed geological formations consists of four main groups of different hydrogeological characteristics, namely:

Carbonate formations affected by karst, which are of high water bearing potential;

Flysch deposits composed of clayey – silty – sandy intercalations and, at a less extent, of conglomerate ones, which are of a low to very low water bearing potential;

Neogene molasses of the Peri-Adriatic Depression. These deposits have medium to moderate water quality and quantity potential and a very limited outflow in the project area; and

Quaternary fluvial deposits of highwater bearing capacity and permeability. They are often overlaid by loose deposits of low permeability.

These aquifers serve to supply with drinking water the majority of the main Albanian urban centers that are located within the Western Lowland of the country.

#### 4.1.12.2 Hydrogeological description per Section

A description of the ground waters along the proposed road corridor alternatives, from the Albanian/Montenegrin border to the Albanian/Greek border is given below. A hydrogeological map can be found in Annex 1.5.

Section 1: AL/Mne border (Murriqan) to Lezhe

Section 1 from the AL/Mne border to Murriqan runs over the Drini Quaternary gravel aquifer which has a local importance. The alluvium plain of Buna River lies over a confined Quaternary gravel aquifer, which is 6-8 m thick. This aquifer is covered by impermeable sub-clays, the thickness of which varies from 17 to 25m. Its groundwater quality is considered as good and therefore, all the villages along the proposed road corridor are supplied with drinking water from individual water wells. The total amount of waters exploited in the aquifer of Nen-Shkoder (part of the Shkodra aquifer) is 1200 - 1300 l/sec. The water is used for the drinking supply of the city of Shkoder and of the surrounding villages.

The exploitation coefficient varies from 0.33 to 0.5. The hydro-dynamic monitoring in Drini basin was carried out twice during 2017, in June and October, only in the station of Dobrac which lies in the quaternary aquifer of Shkoder. According to the monitoring results, the maximal level of groundwater is 1.85 m below the ground and the minimal level is 3.34 m below the ground. The fluctuation of groundwater level is 1.49 m and is related to seasonal changes and changes by exploitation effect.

Section 2: Lezhe to Milot

This section traverses the dolomitized limestone of Renci Mountain which represent an anticline formation. There are numerous karst springs in the hilly foot of this mountain. The springs discharging southeast of Renci Mountain do not contain good quality waters. The marine deposits overlie the dolomitized limestone formations of the Renci Mountain and anticlines.

Section 2 continues in a flat terrain of Quaternary fluvial deposits of a high permeability. These deposits are often overlaid by loose deposits of low permeability. River Mat (near Miloti Bridge) serves as a recharge zone to Lezhe and Fushe Kuqe Quaternary Aquifers. The thickness of the top cover varies from 0.0 (at Mati River bed) to more than 50 meters towards west and north. The water quality varies from good (close to the recharge area) to relatively good (western and northern parts of the aquifer).

The aquifers of Lezha and Fushe Kuqe are of high national importance. Both of them supply with drinking water the cities of Lezha and Durres, as well as all the villages of the wider area. The ground waters are also widely used for irrigation purposes by the local population. Hydro-dynamic monitoring was carried out in 2017 only in the drilling no. 87 Shenkoll, in Lezhe. According to the monitoring results, the maximal groundwater level is 4.47 m in May below the ground in May and the minimal level observed in October is 4.58 m below the ground. The fluctuation of groundwater level is 0.11 m. Because of the pollution, the groundwater of this site is not used for drinking water in Rrile area, while only the water of the deeper layer is exploited for irrigation purposes.

The sub aquifer close to the "Zogu Bridge" at Milot, serves as a recharge area for the Fushe Kuqe and Fushe Milot quaternary aquifer, which supplies with drinking water Durres and its neighboring villages. The hydro-dynamic monitoring of the quaternary aquifer of Fushe-Kuqe is carried out only in the station Gorre (located between the existing road and Fushe Kuqe area). According to the monitoring results of 2017, the maximal groundwater level is 0.72 below the ground in November and the minimal level is 0.9 m below the ground in July. The fluctuation of groundwater level is 0.18 m and is related to seasonal changes and changes of exploitation effect. Seasonal changes are also related to climatic changes, which are expressed with an increase of the groundwater level in March and decrease of groundwater level during the summer till November. The changes due to the exploitation effect are reflected to reduction of piesometric level and the reduction of flow of the drilling wells.

Section no. 3: Milot-Thumane

The first part of this Section consists of groundwaters of the Fushe Milot (part of Fushe Kuqe aquifer) Quaternary aquifer described in Section 2. The second part part of Section 3 includes Quaternary clayey-silty-sandy deposits which overlie the Erzeni-Tirana –Ishmi (Ishmi sub-aquifer part) aquifer. The deposits of this aquifer are more than 20m thick. This aquifer serves for supplying with drinking water the majority of the villages located in the lowland between the cities of Durres, Laç, Milot, Mamurras. The amount of water exploited in this aquifer is 1250-1300 l/sec.

The hydro-dynamic monitoring was carried out twice, in May and October, during 2017, in Erzeni-Ishem river basin and regarding the specific area (the second part of the Section 3), it was carried out at one station for the quaternary aquifer of Tirane and at another station for the aquifer of Fushe Kruje. The fluctuation of the groundwater level is related to seasonal changes (related to climate conditions) as well as to changes due to the exploitation effect. Changes from the exploitation effect are reflected in the reduction of the pleizometric level and the decrease of free discharges drillings flow. The exploitation coefficient varies between 0.3 - 0.35.

Section no. 4: Thumane to Kashar

From Thumane to Kashar, the proposed section passes over the Quaternary gravel aquifer of Erzeni Ishmi and more specifically the Tirana-Ishmi sub-aquifer which is of high permeability. As it is mentioned below, this aquifer is also part of the Second part of the 3rd Section. The aquifer is of high national importance because it serves for supplying with drinking water the majority of the villages located in the lowland surrounding the cities of Tirana, Fush Kruja and Mamurras and settlements. This water is also used for irrigation purpose in agricultural lands. The overlaid Quaternary clayey-silty-sandy deposits have a thickness from 30 m in the north to approximately 10 m in the south. The ground water quality is of good to relatively good quality.

The monitoring of groundwater dynamics is carried out only in Fushe Kruje aquifer (part of Erzen Ishmi Aquifer) in the station no. 416 Bilaj. Taking into account the hydro-dynamic monitoring results of 2017, the maximal level of groundwater was 12.6 m below the ground in May and the minimal level was 15.6 m below the ground in October. The fluctuation of groundwater level was 3.0 m and was based on the seasonal changes and exploitation effects.

The total amount of water exploited in Tirana aquifer is 1200 - 1300 l/sec and is used for the water supply of the towns of Vore and Kamez and the surrounding villages as well as in industries, as technologic water. The total exploitation coefficient varies from 0,85 to 0.95.

At Kashar area, the proposed route runs over molasses deposits of low water bearing capacity and permeability. This segment does not have any importance regarding ground waters.

Section 5B+5C: Kashar to Rrogozhine (Konjat)

From Kashar to Rrogozhine, the proposed route runs over Quaternary deposits, molasses and flysch deposits. The flysch deposits have low water bearing capacity and permeability and do not have any importance regarding groundwater.

The first part of the Section (5B) runs over Tirana sub aquifer, which is part of the Erzeni Ishmi aquifer. The hydro-dynamic monitoring close to the study area is carried out only in the station no. 6 Laknas. According to the monitoring results, the maximal groundwater level is 10.9 m below the ground in May and the minimal level is 15.6 m below the ground in October. The fluctuation amplitude is 4.7 m. The changes are mostly related to seasonal changes, intensive use and also malfunction of some pumping stations temporarily or during several months.

The other part of the Section (5B) runs over the Rrogozhina formation deposits. This formation has a high water bearing potential and serves for supplying local population with drinking water. Erzeni River Quaternary deposits have a local extension close to Peze Helmesi and a medium water bearing capacity. The thickness of the overlaid top cover varies from zero to some meters. Erzeni River waters serve as a recharge area for this quaternary aquifer. The water quality is good and waters are exploited by the local population for drinking purposes via pumping stations.

Section 5C (Lekaj Konjat) crosses the Rrogozhine sub-aquifer, which is part of Shkumbini aquifer, and is covered by Quaternary clayey-silty-sandy deposits with low permeability and thickness of 5 to 8m.

The southern part of the Section runs over the groundwater of the quaternary aquifer of Lushnje. The groundwater fluctuation varies from 0.2 to 5.0 m.

Section no.6: Rrogozhine (Konjat) to Lushnje and Section 7, Lushnje-Fier

From Rrogozhine (Konjat) to Lushnje and from Lushnje to Fier, the proposed AIC runs over the eastern edge of the Rrogozhina/Lushnja sub aquifer (part of the Shkumbini aquifer) which is classified among the six most important quaternary gravel aquifers of Albania. The Sections 6 and 7 are overlying impermeable Quaternary (Q) deposits, which consist mostly of clayey-silty-sandy sediments are more than 30 m thick. The ground water quality decreases towards Lushnje city. Section 7 runs over the southern part of Lushnja Quaternary sub aquifer and quaternary sediments composed mainly of clays, silts, and sands of low water bearing capacity and poor water quality. Monitoring data of 2016 were used for the groundwater level of Shkumbini basin. The hydro-dynamic regime in Shkumbini basin (both sections), close to the study area, was monitored in May and June in two stations of the aquifer of Lushnje, and more specifically in the station no. 286 in Cerme and in Konjat. Regarding the station no.286 in Cerme, the maximal groundwater level was 7.65 m below the ground and the minimal level was 10.2 m below the ground. The fluctuation amplitude resulted in 2.55 m. As for the station in Konjat, the maximal level of groundwater was 1.8 m below the ground in May and the minimal level was 6.8 m below the ground in October. The fluctuation amplitude resulted in 5.0 m and was based on seasonal changes, intensive use and temporarily malfunctions of some pumping stations.

Section no.8: Fier by-pass (Fier to Levan)

This segment is located in the western part of Ardenica hills. The proposed Section crosses Semani ground water aquifer. This aquifer is characterized by Quaternary deposits composed mainly of clays, silts, and sands. The deposits of the Rrogozhina groundwater body occupy the main side of Fier territory and flow at the surface in the Patos-Marinza, Kraps, Ivorians, Ardenica and Frakulla structures. Deposits of this groundwater body are in the lower plains areas below the quaternary deposits. The thickness of the deposits ranges from 80 to 120m in the Patos structure, from 260 to 280m in the Zharsi structure, from 200 to 250m in the Bregasi structure and in Roskoveci-Strum area, from 300 to 350m in the Frakulla structure, from 240 to 270m in Krapsi structure and from 200 to 250m in the Ardenica structure (Roskoveci-Strum area).

Hydrogeological wells in the conglomeratic packages in the Zharsi area and sandy-conglomerates in the Vanaj area (Ardenica structure) yield between 8 to 22 l/sec. The groundwater of this aquifer is of low water bearing capacity and of poor water quality and therefore without any practical importance for the local population.

Section no. 9 (9A+9B): Levan to Memaliaj

The proposed section runs on the right of Vjosa River and crosses the quaternary river gravels, molasses and carbonate deposits. The river gravels have high filtering features and high water bearing potential. The gravel deposits have a good hydraulic connection with the river waters and the groundwaters flow direction goes in parallel to Vjosa river valley. The groundwater is of good quality and is used for drinking water purposes by the local population and the towns of Fier and Patos.

Molasses are mainly composed of conglomerate and sandstone interbedded with clay stone and siltstone. Their water bearing potential and permeability are low. The carbonate formations are affected by cracks and karst phenomena.

The Section crosses/goes close to the Kremenara Carbonate Massif that represents one of the karst reservoirs of Vjosa basin, which is recharged by the precipitations and the Vjosa River waters. The quantity exploited in this aquifer is 700 l/sec, while the exploitation coefficient varies from 0.5 to 0.7.

The water quality of these springs is good for drinking purposes and therefore, it is used for water supply by the city of Ballsh and the surrounding local population.

Regarding Vjosa basin aquifer, the hydro-dynamic monitoring was carried out in May and October of 2017, while as for the study area, one station for the aquifer of Kafaraj and two stations for the aquifer of Drinos were taken into account. The maximal level of groundwater in Kafaraj is in May 4.5 m below the ground) and the minimal level is 6.5 m below the ground in October. The fluctuation of groundwater level is 2.0 m and is related to seasonal changes and exploitation effects. The groundwater of Kafaraj supplies with drinking water the city of Fier and its surroundings.

Section no. 10: Memaliaj to Subashi Bridge

The proposed road alignment runs over flysch and gravel deposits. The flysch formations have poor waterbearing potential and low permeability. The gravel deposits, locally spread in Memaliaj and Tepelena have a good hydraulic connection with the river waters. This characteristic has conditioned both their high water bearing potential and permeability. The Section 10, is part of Vjosa groundwater basin, Drino aquifer.

Section no. 11: Subashi Bridge to Gjirokaster bypass

This road corridor section runs mainly over flysch deposits of poor waterbearing potential and low permeability. The Section 11, is part of Vjosa groundwater basin, Drino aquifer.

Section no. 12: Gjirokaster bypass

This road corridor section runs through Drino River Valley over Quaternary fluvial deposits, the thickness of which is more than 20m. The aquifer supplies with drinking water the city of Gjirokaster and the neighbouring villages. The Section 12, is part of Vjosa groundwater basin, Drino aquifer

Section no. 13A: Gjirokaster to Kakavije (border Al/Gr)

This section of the proposed road corridor runs over Quaternary fluvial deposits along the Drino River Valley. The thickness of the gravel deposits varies from 20-50m in the periphery and up to 100-150m in the central part of this valley, while the ground water flows in parallel with the river flow. This unconfined aquifer has a high waterbearing potential. The area from Goranxi to Jorgucat serves as a recharge zone for Mali i Gjere Mountain during the dry season.

The Drino aquifer supplies the city of Gjirokaster and the local population with drinking water from the hydrogeological wells of Buduk area where the water quality is good. The monitoring of groundwater level close to the study area is carried out in two stations of Drinos aquifer, the stations Buduk and Bodrishte. The maximal level of water for the station Buduk is 3.85 m below the ground in May and the minimal level is 4.72 m below the ground in October, while the fluctuation of groundwater level is 0.87 m. For the station of Bodrishte, the maximal level is 9.35m below the ground and the minimal level is 9.90 m below the ground. The fluctuation of groundwater level is 0.55 m and is related to seasonal changes and exploitation effects.

Regarding sections 11, 12 and 13A and the aquifer of Drinos, the total amount of water exploited is 90 - 110 l/sec. The total exploitation coefficient varies between 0.4 - 0.5.

# 4.2 Biodiversity

## 4.2.3 Introduction

Albania is well known for its high diversity of ecosystems and habitats. Within its territory, there are marine ecosystems, coastal areas, lakes, rivers, evergreen shrubs or deciduous shrubs, broadleaf forests and pine forests, alpine and sub-alpine pastures and meadows, as well as high mountainous ecosystems.

Albania is rich in forests and pastures. Forests account for approximately 1.041.000 ha or 33 % of the country's territory, while pastures account for approximately 400,000 ha or 15 % of the country's territory. Approximately 60% (244,000 ha) of pasture is composed of alpine and sub-alpine pastures and meadows. Forests and pastures are diverse in species, formations and communities of plants and wildlife. Along the country's coastal line many important ecosystems for the Mediterranean region are encountered such as wetlands, sand dunes, river deltas, forests and swamp weeds (hygrophilous). The coastal and infra-littoral communities of Mediterranean origin along the rock coastline are quite diverse and very well preserved. Lakes and rivers are also very important for the country's biological and landscape diversity.

Regarding plants, the list of threatened plant species at the national level is quite extensive, including 319 species. There are also about 32 endemic plant species and approximately 110 other sub-endemic species sharing their habitats between Albania, Kosovo, Montenegro, Croatia and Greece. According to the bioclimatic zones, the morphology of the territories, geo-structure, soils and exposure, presence of aquatic (stagnant and running waters) and land use, the AIC goes through or may affect several and different habitats. The study area supports large range of natural, semi-natural and artificial habitats. Semi natural and artificial or modified habitats, especially those intensively used for arable lands constitute the majority of the habitats present. The aquatic habitats include lagoon waters, rivers, dunes, streams, reservoirs and irrigation channels. Terrestrial habitats are mainly represented by Mediterranean forests, maquis and shrubs, pastures, meadows, oak belt formation, and anthropogenic vegetation (the vegetation of the environment influenced by human activity, close to settlements, agricultural land, etc). The description of flora and vegetation is presented below per each AIC Section and is incorporated in the relevant habitats. The plant species with specific status (national and international) and their distribution territories (Sections) are given in Annex 3. If the flora under conservation status is an indicator and/or abundance in a given habitat, it is also mentioned in the description below per respective Section. If not, the reference is only included in the Annex. Nevertheless, the species with specific status, in most of the cases. are not found in abundance in the territory that will be affected directly by AIC Sections. This list with the species will lead the project planners in the next project development stages to verify the presence of such species in the habitats in territory/surroundings of the AIC Sections.

According to the most recent updates (November 2013) of the International Union for the Conservation of Nature (IUCN), 109 species of fauna of different taxonomy classifications are considered as threatened. The fauna of some AIC Sections is part of the same climate zone and that is the reason that the same habitats have a similar fauna. Some exceptions and differences among fauna species or population of species in the same habitats, are related to the human presence and his disturbance to wildlife, the size or frequency of habitats, the existence of bio-corridors, level of pollution etc.

The aquatic and terrestrial fauna of the AIC is described in respect of each Section and can be found below in the relevant subsections. This separation is done to orient better the related fauna to the described habitats and flora. As ecosystem dynamics are usually not restricted to a certain type of habitat, local populations, assemblages and food web dynamics are essentially affected by the spatial flow of matter and organisms among different habitats. So, in most of cases the terrestrial fauna is strongly related to waters and vice versa. Species with a protected status are placed in Annex 3.

## 4.2.4 Methodology

The data presented in this report derive from literature background research, the stakeholder consultation process with relevant NGOs and governmental organizations as well as field visit and survey held in spring and autumn of 2018 and spring 2019. The field surveys encompassed a 2x2 km corridor in order to predict possible effect of the highway construction and operation on biodiversity. In the case of the rivers, the distance considered is longer, taking into account the natural flows as biocorridors.

Additionally, the references used were official sources such as the National Strategy and Action Plan on Biodiversity of Albania (1999), strategic Policies for Protection of Biodiversity in Albania (2015), the Red Book of Fauna and Red list of Flora respectively 1997 and 2013, several regional/municipal management plans, local and regional studies, EIAs, River Management Plans and biodiversity surveys, Protected Area Management plans etc.

For the habitat classification and analyses, certain national and international lists have been used such as:

- EUNIS
- Annex 1, of EU Habitat Directive
- Palearctic habitats
- Bern Convention, Resolution No. 4
- EU Water Framework Directive
- Red Book of Albania, 1997 and
- Albanian Red list of biodiversity, 2007.

In order to present the habitats with EUNIS classification in a zone of 2X2 km, the Vegetation and Forest Cover map of Albania prepared for the World Bank funded project ''Albanian National Forest Inventory (ANFI)'' prepared by AGROTEC was used. The technical description below, based on field studies, refers to more habitats than presented in the maps, since some of them covered very small surfaces and the scale that the abovementioned map was prepared did not allow to present habitats of such surfaces. Analytical field surveys per Section will be carried out under the ESIA preparation stage which will give the necessary input for the preparation of a habitat map per Section and for the calculations of the habitat areas affected.

### 4.2.5 Biodiversity in Section 1

This Section goes over very important habitats compared to the other AIC Sections. These habitats are related to Buna River, which is a transboundary river mainly shared by Albania and Montenegro. The Delta of Buna includes some of the most important wetlands of the eastern Mediterranean coast and occupies an area of about 19000 ha. Recognizing the importance of this ecosystem, the Albanian Government in 2005 decided to proclaim this rich area of biodiversity and its visual assets as a Protected Landscape. The Delta of Buna encompasses a diverse range of unique natural habitats that supports a wide variety of flora and fauna species. Buna River serves as an entry gate for about thirteen different species of fish. The migratory sites are situated in Buna River Delta (west of the River) and Shkodra Lake (North-East of the river). The forest vegetation is developed in the hills and mountain areas, on the river coast (almost in its mouth), the river delta, in Velipoja Lagoon, as well as in the villages of Reç, Sutjel, Shënkoll and in the island of Bahçallek.

Most of the study area, though which Section 1 runs, is composed of agricultural land, riverine habitats with their degraded deciduous forests and shrubs, woodlands and fragmentized shrub forests in hills as well as scattered residential buildings. The flora and vegetation of this Section is the most important in comparison with other Sections, including typical plants for Buna and Drini of Lezha and Gjadri rivers and river valleys, wetlands, agricultural lands and partially the plants of Kakariqi and Renci Maintain foot exposed in South East of the Section 1. However, it is not very rich with species of specific protection status. The main habitats of Section 1 are presented below.

*Contribution to International Ecological Networks.*

The Buna River, has been identified as one of the 45 Important Plant Areas (IPA); one of the 25 potential Emerald Sites; one of the 15 Important Bird Areas (IBAs); and forms part of one of the three designated Ramsar sites within Albania. It is also part of a much larger contiguous transboundary conservation area that includes the adjacent Lake Shkodra - Managed Natural Reserve (26,535 ha) in Albania and the Shkodra Lake National Park (40,000 ha) in Montenegro. Most of the study area, though which Section 1 runs, is composed of agricultural land. Riverine habitats of Buna Valley, have an international importance regarding biodiversity. Inland sites are seriously damaged by human activities and are dominated by the degraded deciduous forests and shrubs, woodlands and fragmentized shrub forests in hills as well as scattered residential buildings. About 60% of the surface area of the Buna River Protected Landscape (BRPL) has been converted to settlements and agricultural land (fields, orchards, vineyards, pastures), particularly on the floodplain portion. Natural vegetation is largely confined to the remaining 40% of the area. Within a limited area, the BRPL presents a high diversity of community types. This diversity is not related to the richness of the flora, which is not exceptional for a Mediterranean area, but to a complex mosaic of habitats related to subtle differences in the geology. Wetland and dry grassland vegetation are particularly diversified. Altogether 29 alliances and 49 associations can be described, as follows:

• Sand dunes (5 associations)

• Wetlands (26 associations)

• Alluvial forests (5 associations)

• Vegetation of carbonitic hills (13 associations)

Three of these associations are described as new: Clematido viticellae-Punicetum granatae (low woodland on the lower parts of the carbonitic hills), Medicago minimae-Aegilopetum triuncialis (low grassland on disturbed areas on the back dunes of the Rroja beach) and Periploco-Alnetum (alluvial woodland on the Buna delta). In addition, 10 series were recognized, those of the alluvial plain related to the age of deposits of Buna in relationship to the advancement of the delta in the Holocene, and those of the carbonatic range to lithological differences in relationship with altitude (and therefore geological age). The main habitats of Section 1 are presented below.

The most common mammal species within the Buna River Protected Landscape include: *Lepus capensis* (common hare), *Vulpes vulpes* (Red Fox), *Canis aureus* (Golden Jackal), *Meles meles* (European Badger), *Mustela nivalis*, (Least Weasel). Euronatur (2006), between others, record the presence of *Tursiops truncates* (Bottlenose Dolphin), and the European Otter (*lutra lutra*).

The Buna River Protected Landscape supports a rich bird community, particularly of waterbirds. Euronatur (2006) recorded the presence of 238 bird species. These included 114 breeding birds (status: breeding confirmed and probably breeding) and 16 species possibly breeding in the area. In addition 52 species are classified as regular and 51 as occasional passage migrants or winter visitors.

Together with a number of species of conservation concern, the presence of high numbers of wintering waterbirds was one of the motivations for declaring the BRPL and Lake Shkodra as a Ramsar site. 19 reptile species are found within the BRPL, all of which are included on the IUCN Red Data list of 2009: four as Near Threatened, ten as Least Concern and five as Not Evaluated. The presence of 143 freshwater fish species is noted in Lake Shkodra, Buna River, Buna mouth and Viluni Lagoon, including the Adriatic Sturgeon (*Acipenser sturio*) which is almost extinct.

This high species diversity reflects the diverse habitat mosaic of the Buna Delta. The Buna River also links and integrates the fish communities of the Adriatic Sea with those of the inland Lake Skadar and the Drin River system. Thus, the fish community is dominated by species typical of temperate freshwaters, while it also includes a number of species from colder waters that have entered the system from Lakes Ohrid and Prespa at the headwaters of the Drin River, as well as a number of marine species. Buna River is important for the migration of 13 fish species from inland waters to the Adriatic Sea, among which globally threatened species exist such as the European sea sturgeon (*Acipenser sturio*), the Adriatic sturgeon (*Acipenser naccarii*) and the Starry sturgeon (*Acipenser stellatus*).

#### 4.2.5.1 Aquatic habitats

*Large rivers*

- Reference to EUNIS Habitats: No specific reference
- Reference to Palaearctic Habitats: 24. Rivers and streams
- Reference to Water Framework Directive (EEC 60/2000): lowland medium/small river type
- Reference to EU HD Annex 1: none

Buna River is one of the main rivers of Section 1, characterized by slow-flowing water. This river is an important transboundary river, a Protected Area (Protected Landscape) while it serves as bio-corridor between the Adriatic Sea and Shkodra Lake (IBA- Important Bird Area). Three species of surgeons are listed at Critically Endangered species in IUCN Red List. A big number of fauna species has specific importance on national level. The presence of migratory birds is observed in some areas. The landscape values and richness on singing and decorative birds give to this habitat specific values for recreation and tourism development. As for plants, Buna River is characterized by high diversity of flora. Among others, water nut plants (Trapa natans) thrive in this area. This habitat has an international importance, from biodiversity point of view, for both Albania and Montenegro.

*Permanent slow flowing watercourses*

- Reference to EUNIS habitat - C2.34. Eutrophic vegetation of slow-flowing rivers
- Reference to EU HD Annex 1 – 3260: Water courses of plain to montane levels.
- Reference to Bern Convention Resolution No.4 (1998): C 2.34. Eutrophic vegetation of slow-flowing rivers

This habitat is developed along the riverbanks of Buna River, of Gjadri River and Drini of Lezha River (in both sides of the river valleys), where the water depth is not more than 60 cm and is represented by submerged hydrophytes, which is typical for riverine habitats. This habitat is dominated by the *Potamogeton denso-nodosi association*. Its abundance is justified by the low turbidity of the waters of Buna River. The association of *Potamogetonetum pectinati-Carstensen* is also widespread along the Buna river at a water depth of 1–3 m, where it forms extensive populations and close to the shore where the slope of the riverbank is steep. This floristic composition is developed also in Drini of Lezha River and Gjadri Rivers and is dominated by *Potamogeton pectinatus* sp., with low frequency of other Potamogeton sp. such as *P. crispus, P. nodosus, P. perfoliatus*. This association has a rather broad ecological range and usually occurs in mesotrophic to eutrophic waters. The bad quality of waters of Gjadri and Drini of Lezha Rivers due to pollution from wastewater and solid wastes, generated from human settlements and activities, has resulted in a poor biodiversity in this habitat.

**Figure 4-52 Potamogetonetum denso-nodosi association**

Elodea canadensis community can be also found along the Buna, Drini of Lezha and Gjadri Rivers. This community substitutes the *Potametum denso-nodosi* sp. in disturbed areas, while it is an important component of the Core Zone of Buna River Protected Landscape.

**Figure 4-53 Vegetation in Buna Riverbank**

*Water fringing reedbeds and halophytes*

- Reference to EUNIS habitat - C3.Littoral zone of inland surface waterbodies ; C3.23 - Reedmace ([Typha]) bed, C3.22 - Common clubrush ([Scirpus]) beds
- Reference to EU HD Annex 1 – None
- Reference to Bern Convention Resolution No.4 (1998); None
- Palaearctic Habitat Classification 200112 -53.12. Common clubrush beds

The habitat of *Reedmace ([Typha*]) bed is present in the wetlands surrounding the Buna River where the water depth is about 10–20 cm, in Domi marsh and other sites of alluvial plain, in reservoirs, irrigation and draining channels and also in the riverbanks with slow flowing water. The plant community dominated by Typha angustifolia forms dense swards about 2 m tall. This community is developed in seasonally flooded sites, on soils inundated in the winter, which dry out in the summer, leaving a thin veil of water on the damp ground. The *Typha angustifolia* community is frequently encountered in the Core Zone of the Buna River Protected Landscape. This community appears also in some parts of the lowlands in surrounding of the Gjadri and Drini of Lezha Rivers and grows in an intermediate belt between the *Phragmites australis and Bolboschoenus maritimus* communities. These associations in Gjadri and Drini of Lezha Rivers are quite fragmented and damaged by human intervntions.

The habitat of Common clubrush ([Scirpus]) beds is encountered in the banks of Buna, of Gjanci and Drini of Lezha Rivers, in particular where the flow is slow in the first helophytic belt at a water depth of 0.3–0.5 m, where it forms tall and dense stands. It is characterized by the dominance of *Phragmites australis*, which forms a dense reed-bed community, is 1.7–3 m tall and is accompanied by other species such as *Bolboschoenus maritimus, Iris pseudacorus and Rumex hydrolapathum*. This habitat is also dominated by the Scripus lacustris sp. in Buna and Drini of Lezha banks, while it is an important mesotrophic to slightly eutrophic habitat of the Strictly Protected Zone - Core Zone of the Buna River Protected area.

The Gjadri and Drini of Lezha Rivers, are highly polluted by discharges of wastewater from human settlements and disposal of solid wastes dumped illegally in river body. This quality status of both rivers has impacted negatively the biodiversity of those sites, conditioning the dominance of mono-type vegetation.

**Figure 4-54 Phragmites australis**

#### 4.2.5.2 Terrestrial habitats

Heathland and scrub

*Sub Mediterranean deciduous thickets and brushes*

- Reference to Eunis habitat; F3.243 Balkano-Hellenic deciduous thickets
- Reference to EU HD Annex 1 – None
- Reference to Bern Convention Resolution No.4 (1998); None
- Reference to Palaearctic Habitat; 318B3 Balkano-Hellenic deciduous thickets

Among the most important plant communities of shrub vegetation, Tamarix species dominate in wetlands such as *Tamarix dalmatica and T. hampeana*, which can reach the height of 4-5 m. This community consists of two plant floors, while the species *Vitex agnus-castus, Rubus ulmifolius*, *Juncus acutos and Arthrocnemum glaucum* maybe encountered. This community has a very strong resistance to the salinity, while it has been hardly damaged by deforestation actions. The plant community with the dominance of Salix species such as *Salix alba and Salix elaeagnos* are developed in the narrow belt of Drini River. Paliurus spina-christi sp is present at the foot of Kakariqin Mountain close to the end of Section 1, but it is usually quite fragmented by deforestation and quarries. Such habitats are very important for fauna related to wetlands (amphibians and birds).

*Maquis and thermo-Mediterranean brushes*

- Reference to Eunis habitat;-F5.213. Eastern Mediterranean high maquis
- Reference to EU HD Annex 1 – None
- Reference to Bern Convention Resolution No.4 (1998); None
- Reference to Palaearctic Habitat; 32.313 Eastern Mediterranean high maquis

This habitat is fragmented and can be found mostly near the hilly areas of the corridor. Brushes represent a degradation stage of evergreen Mediterranean forests or old forests with Quercus ilex sp. The most important species of this community are evergreen shrubs such as *Arbutus unedo, Phillyrea angustifolia, Erica arborea, Juniperus oxycedrus, Cercis siliquastrum, Paliurus spina-christi, Fraxinus ornus, Myrtus communis, Q. ilex, etc.*

Among the most important plant communities of shrub vegetation, *Tamarix*species dominate in wetlands such as *Tamarix dalmatica* and T. *hampeana,* whichcan reach the height of 4-5 m. This community has a vary strong resistance to the salinity, while it has been hardly damaged by deforestation actions. The plant community with the dominance of *Salix* species such as *Salix alba* and *Salix elaeagnos* is developed in the narrow belt of Drini of Lezha River. *Paliurus spina-christi*sp is present at the foot of Renci Mountain close to the end of Section 1, but it is usually quite fragmented by deforestation and quarries.

<u>Woodland and forests</u>

*Thermophilous woodland*

- Reference to Eunis habitat;  - G1.73 Eastern Quercus pubescens woods
- Reference to EU HD Annex  – 91AA- Eastern white oak woods
- Reference to Bern Convention Resolution No.4 (1998); G1.7 : Thermophilous deciduous woodland
- Reference to Palaearctic Habitat; 41.73 Eastern white oak woods

This habitat is dominated by oak woods characterized by the *Querco-Carpinetum orientalis* plant community. It is developed usually on rather steep slopes and mainly on the southern slope of the carbonatic rocks of Section 1 such as those on Oblika Hill foot. This plant community is characterized by the dominance of *Carpinus orientalis, Acer campestre, Celtis australis, Quercus pubescens and Fraxinus ornus* species. The herb layer is characterized mainly by Sesleria autumnalis and other species such as *Ornithogalum pyrenaicum, Viola odorata, Geum urbanum and Poa sylvicola*.  This vegetation is heavily degraded.

*Riparian willow and poplar belts*

- Reference to Eunis habitat; G1.11 Riverine [Salix] woodland - G1.112 Mediterranean tall [Salix] galleries (G1.1121 Mediterranean white willow galleries)
- Reference to EU HD Annex 1 – 92A0 Salix alba and Populus alba galleries
- Reference to Bern Convention Resolution No.4 (1998); G1.11 - Riverine Salix woodland
- Reference to Palaearctic habitat; 44.141 Mediterranean white willow galleries

The riparian woodland habitat is present along the Buna River and Drini of Lezha river, but it is heavily degraded in their river valleys. The floristic composition of the riparian woodland in these river valleys is represented by the typical mesophyll plants, as well as by species which are indicators of disturbance such as *Carduus acanthoides*. This community is highly dominated by *Amorpha fruticosa*, while it is an important habitat of the Core Zone of Buna River Protected Landscape (mainly in Buna river islands and valleys). Such woodlands are developed also in small fragments near the mouth of Buna River. The species composition is characterized by the dominance of *Carpinus betulus and Quercus robur.*

Salix alba and Populus alba associations are also important associations of the Core Zone of the Buna River Protected Landscape. They can form communities rich in species with the accompanying flora including *Salix alba, S. elaeagnos, S. purpurea, Alnus glutinosa, Populus alba, P. nigra, P. canadensis, Crataegus monogyna, Vitex agnus-castus, Rubus spp.), Rose sempervirens, Hedera helix, Ranunculus ficaria, Hypericum perforatum, Brachypodium sylvaticum, etc.* It should be mentioned that the habitat is hardly damaged by human acitivities.

<u>Inland unvegetated or sparsely vegetated habitats</u>

*Bare rock with scarce vegetation*

- Reference to Eunis Habitat; H3; Inland cliffs, rock pavements and outcrops
- Reference to EU HD Annex 1 –None
- Reference to Bern Convention Resolution No.4 (1998); None

This habitat is located in the southern part of the study area of Renci mountain, while it is fragmented, including limited species. The most common species in the limestone rocks are *Phillyrea medii L. and Juniperus sp, Crategus monogyna, Rosa sp,* etc. The botanical value of the vegetation and habitats in this area is low.

#### 4.2.5.3 Anthropogenic habitats

<u>Agricultural land</u>

*Ruderal flora and vegetation*

- Reference to Eunis habitat; - E 5.1 Antropogenic herb stans; E 5.11 Lowland habitats colonized by tall nitrophilous herbs
- Reference to EU HD Annex 1 –None
- Reference to Bern Convention Resolution No.4 (1998); None

This habitat is characteristic in areas that have been abandoned for many years and is widespread in fragmented areas along the Section. This habitat is dominated by the species of *Centaurea calcitrapa. Scolymus hispanicus and Spiny Asteraceae,* typical of nitrophile sites. The vegetation is about 90 cm tall, very dense with a relatively rich floristic composition such as *Rumex pulcher, Cichorium intybus, Bromus hordeaceus, Avena barbata* and other species which belong to the *Centaureetum calcitrapae* community.

The herb vegetation is very dense with a relatively rich floristic composition, such as: *Rumex pulcher, Cichorium intybus, Bromus hordeaceus, Avena barbata Urtica dioica, Datura stramonium, Cichorium intybus, Xantium spinosum, Onopordon sp., Cirsium spp,* etc. *Platanus orientalis, Rubus ulmifolius, Arundo donax* are also present in the side of the roads and between agricultural parcels.

**Figure 4-55 Anthropogenic herb stands in Section 1**

*Field and acres*

- Reference to Eunis habitat; I1.3. Arable land with unmixed crops grown by low-intensity agricultural methods
- Reference to EU HD Annex 1 –None
- Reference to Bern Convention Resolution No.4 (1998); None
- Reference to Palaearctic Habitat; 82.3 Extensive cultivation

Section 1 is dominated by the fields and acres habitat. There are agricultural areas along the entire Section at each side of the road corridor. Fields and acres are cultivated mostly with vegetables, vineyards and crops (corn and grain, fodder, fruit trees). Weeds vegetation is dominated by *Trifolium partense, Cynodon dactylon, Plantago coronopus, Dittrichia viscose.*

**Figure 4-56 Cultivated Agricultural land**

*Small scale cultivated garden areas*

- Reference to Eunis habitat; I2.22 Subsistence garden areas.
- Reference to EU HD Annex 1 – None
- Reference to Bern Convention Resolution No.4 (1998)-NoneReference to Palaearctic habitat; 85.32 Subsistence gardens

This habitat is widespread close to rural settlements (villages) and is characterized by cultivated land with vegetables, fruit trees or other domestic crops.

*Line of trees*

- Reference to EUNIS Habitats: G5.1; Line of trees
- Reference to EU HD Annex I: none
- Reference to Bern Convention Res. No. 4 1996: none

This habitat is present along the road and between residential areas and agricultural areas, typically used for shelter or shading. Populus species are mostly widespread in the area, while Black locust (*Robinia pseudoacacia*) is also cultivated as plant in order to control erosion. Other plant species such as *Platanus orientalis, Rubus ulmifolius, Arundo donax* are also present in both sides of the road and between agricultural parcels.

<u>Settlements, industrial and other artificial habitats</u>

*Rural Settlements*

- Reference to EUNIS Habitats: J1.2. Residential buildings of villages and urban peripheries
- Reference to EU HD Annex I: none
- Reference to Bern Convention Res. No. 4 1996: none
- Palaearctic habitat; 86.22 Villages peripheries

This habitat is characterized by residential buildings scattered in each side of the road corridor along the Section. There are small gardens in the vicinity of houses planted with vegetables and fruit trees. These gardens are sometimes surrounded by agricultural land cultivated with corn and fodder. The natural vegetation species distributed close to the settlements, roadsides and also cultivated areas is dominated by the species of *Arundo donax L, Populus alba, Robinia pesudoacacia*, etc.

*Roads*

- Reference to EUNIS Habitats: J4 Transport networks and ther constructed hard-surfaced areas J4.2 Road networks
- Reference to EU HD Annex I: none
- Reference to Bern Convention Res. No. 4 1996: none

This habitat includes the road surfaces together with the highly-disturbed environment adjacent to roads, which consists of roadside banks or verges. It is characterized by the presence of ruderal species such as *Cichorium intybus L, Datura stremonium, Punicum virgatum, Lolium perrene, Arundo donax L, Urtica dioica, Datura stramonium,etc.*

*Industrial and commercial sites still in active use*

- Reference to EUNIS Habitats: J1.4 - Urban and suburban industrial and commercial sites still in active use
- Reference to EU HD Annex I: none
- Reference to Bern Convention Res. No. 4 1996: none

This habitat includes buildings of industrial or commercial use, such as factories, industrial units, gas stations, etc., located in various areas along the entire section.

*Agricultural construction*

- Reference to EUNIS Habitat: J2.4 Agricultural constructions
- Reference to EU HD Annex I: none
- Reference to Bern Convention Res. No. 4 1996: none

This habitat includes isolated greenhouses established for the purpose of agricultural activities and is located close to Kosmac settlement. Greenhouses are used for the cultivation of vegetation, mainly tomato (*Solanum lycopersicum*) and pepper (*Capsium annuum*).

#### 4.2.5.4 Fauna

The fauna of Section 1 is one of the most important fauna of the habitats expected to be affected by AIC Sections. Buna River, together with the surrounding wetlands, is one of the most important corridors for migration of fish and birds. Although there are no frequent monitoring and inventories for fauna, there have been counted 143 species of fish of fresh waters, 11 species of amphibians, 19 reptiles, 238 birds and 22 mammals in Buna River.

The Buna River Protected Landscape (BRPL) supports a rich bird community, particularly of waterbirds. Euronatur (2006) recorded the presence of 238 bird species., which included 114 breeding birds (status: breeding confirmed and probably breeding) and 16 species possibly breeding in the area. In addition, 52 species are classified as regular and 51 as occasional passage migrants or winter visitors. Together with a number of species of conservation concern, the presence of high numbers of wintering waterbirds was one of the motivations for declaring the BRPL and Lake Shkodra as a Ramsar site. High and uncontrolled levels of hunting remain a major concern for bird populations within the BRPL. Regarding details for species with protection classification, please see Annex 3.

<u>Aquatic Fauna</u>

Several species with conservation status are encountered in the aquatic habitats of Section 1, among which one mammal, nineteen species of reptiles, eleven species of amphibians and six species of fish can be recorded. The aquatic fauna is concentrated in Buna River, its valley and surrounding wetlands. The wildlife of Gjadri and Drini of Lezha River is quite scarce due to high pollution and human presence.

*Aquatic Insects*

Insects species include the following: Mayflies (Ephemeroptera), Dragonflies and Damselflies (Odonata), Stoneflies (Plecoptera), True Bugs (Hemiptera), Caddisflies (Trichoptera), True flies (Diptera), partly, Beetles Coleoptera (partly), Ants, Bees, and Wasps (Hymenoptera), Butterflies (Lepidoptera), Lacewings (Neuroptera), Grasshoppers, Crickets, Katydids and Locusts (Orthoptera), True flies (Diptera), Beetles (Coloptera) etc.

*Fish*

Buna River is a corridor for thirteen species of fish that migrate from the Shkodra Lake to the Adriatic Sea and vice versa. Some of those are the sturgeons (*Acipenser sturio, Acipenser naccarii and Acipenser stellatus*), the Twait Shad (*Alosa fallax nilotica*), the European river lampery (*Lampetra fluviatilis*) and the Brook Lamprey (*Lampetra planeri*), the Eel (*Anguilla anguilla*), the Bass (*Dicentrarchus labrax*), the Mullet (*Mugil cephalus*), the Trinlip mullet (Liza ramada) and the Flounder (*Platichthys flesus luscus*). There are found more than fifty species of fish in Buna delta such as European anchovy (*Engraulis encrasicholus*), the Mediterrenean Killifish (*Aphanius fasciatus*), the Narrow snouted pipefish (*Syngnathus tenuirostris*), the Brown meagre or corb (*Sciaena umbra*) etc.

**Figure 4-57 Acipenser sturio, Globally Threatened Species**

*Aquatic Amphibians and Reptiles*

Five amphibian species and two hybrids are encountered, i.e. Great Crested Newt (*Triturus cristatus*), Smooth newt (*Triturus vulgaris*), Greek March Frog (*Rana balcanica*), Epirote frog (*Rana epirotica*) and Pool frog (*Rana lessonae*), which are fed and reproduced passing the winter period in the aquatic environment. After winter, they move out to a terrestrial environment. About ten types of amphibians live in the waters and wetlands, some of which are the Pool frog (*Rana Lessonae*), Balkan frog (*Rana balcanika*), Lake frog (*Pelophylax ridibundus*), Green frog (*Lithobates clamitans*), Common newt (*Lissotriton vulgaris*). Four types of reptiles live in the waters of Buna, i.e two types of water turtles (*Emys dhe Mauremys*) and two types of serpents (*Natrix sp.*).

*Aquatic Birds*

This is the richest basin in the region considering birds diversity and one of the three main migration roads of European birds. About fifty species of water birds are counted in Buna River, among which are the Little grebe (*Tachybaptus ruficollis*), Pigmy cormorant (*Phalacrocorax pygmeus*), Euroazian duck (*Anas penelope*), Country duck (*Anas platyrhynchos*) and other duck species such as the *Anas clypeata, Anas crecca, Aythya ferina, Bucephala clangula, Fulica atra and Gallinago gallinago*, which are fed in the aquatic habitats.

**Figure 4-58 Common snipe (Gallinago gallinago)**

The Small seagull (*Hydrocoleus minutus*) and Sandwich tern (Sterna sandvicensis) are birds with high importance in this area. A high number of birds such as the Common pied oystercatcher (*Haematopus ostralegus*), the Eurasian Thick-knee (*Burhinus oedicnemus*), the Black-winged Stilt (Himantopus himantopus), the Pied Avocet (*Recurvirostra avosetta*), the Collared pratincole (*Glareola pratincola*), the Kentish plover (*Charadrius alexandrinus*), the Small sea stern (*Sterna hirundo*) comes in the Albanian side from the Ulqin Saltmarsh (Ulcinh Salina in Montenegro), where these birds nest.

**Figure 4-59 Pigmy cormorant, Global Threatened Species**

*Aquatic Mammals*

There are about twenty mammals which are related to waters in Section 1, but only one of them lives and is fed in those, namely the Eurasian otter (*Lutra lutra*), which is a Globally Threatened species. Also, the Bottlenose dolphin (*Tursiops truncates*) is observed time past time in the Buna River Delta or close to it.

<u>Terrestrial Fauna</u>

*Terrestrial Insects*

Terrestrial insects are similar with those of aquatic habitats. Among insects with specific status in the territory of Section 1, the Powdered brimstone (*Gonepteryx farinose)* of Pieridae family, Scarce swallowtail *(Iphiclides podaliris*) of Papilionidae family, Nettle-tree butterfly (Libethea celtis), Peacock butterfly (*Inachis io*), Red admiral (*Vanesa atalanta*), *Cynthia cardui*, Knapweed fritillary (Melitaea phoebe), Green hairstreak (*Callophrys rubi*), Common copper (*Lycaena phlaeas*), Lesser fiery copper (*Thersamonia thersamon*), *Heodes ottomanus* and Green-underside blue (*Glaucopsyche alexis*) of the Nymphalidae family can be mentioned.

*Terrestrial Amphibians and Reptiles*

Thirteen amphibians and twenty nine reptile species are typical of terrestrial areas of Section 1. Due to marsh reclamations in Shkodra lowland during the previous years, the number of reptiles and amphibians has decreased dramatically. Sufficient amphibians, especially young generations (millions of eggs and maggots), after the water level decrease in reservoirs and canals, are under risk, as the result of the human interventions (irrigation, agricultural practices etc.). Several amphibian species such as Fire Salamander (*Salamandra salamandra*), Common toad (*Bufo bufo*), European green toad (Bufo viridis), Common tree Frog (*Hila arborea*), Common frog (*Rana temporaria*) have been reduced. Permanent deepening, cleaning and draining of irrigation and drainage canals during the winter period (hibernation period) have heavily impacted on certain frog species, particularly green fogs. Different reptiles such as Dalmatian Algyroides (*Algyroides nigropunctatus*), Balkan Green Lizard (*Lacerta viridis*), Large Whip Snake (*Coluber caspius*), Smooth Snake (*Coronella austriaca*), Aesculapian Snake (*Elaphe longissima*), Four-lined Snake (*Elaphe quatourlineata*), Grass Snake or Ringed Snake (*Natrix natrix*), Nose- horned Viper (*Vipera ammodytes*) are found in the surrounding or related territories of Section 1.

*Terrestrial Birds*

The woodlands, shrubs and abandoned agricultural lands represent an important natural environment for birds. From a variety of bird surveys, fifty species or 61.7% of the total number of species in the Section are permanently related with the forest/shrub areas, twenty two species or 27.2% are summer visitors, six species or 7.4% are winter visitors and three species or 3.7% are transitory. Hazel Grouse (B*onasia bonasia*), Blue Tit (*Parus caeruleus*) and Spotted Woodpecker (*Dendrocopos medius*) are vulnerable species.  Terrestrial species, which are related to water found in surroundings of the areas under study, are spoonbills, Glossy ibis (*Plegadis falcinellus*), Egrets (*Ardea alba*), Pygmy cormorants (*Microcarbo pygmaeus*) (already mentioned in the aquatic birds of the same Section) etc.

**Figure 4-60 European goldfinch (Carduelis carduelis)**

*Terrestrial Mammals*

Terrestrial mammals, such as Mole (Talpa sp)., Common or Brown hare (Lepus capensis), Water vole (Microtus sp.), etc. are related to the forest ecosystems, meadows and pastures. The number of large carnivores, such as the Red fox (*Vulpes vulpes*), Pine marten (*Martes martes*), Beech marten (*Martes foina*), European badger (*Meles meles*), European polecat (*Mustela putorius*), as well as trophy animals such as the common or Brown hare (*Lepus capensis*) has increased during the last years, mainly due to the reduction of the hunting activity.

### 4.2.6 Biodiversity in Section 2

The first part of the Section is characterized by the presence of the coniferous forest of Renci Mountain, and by sparsely vegetated areas, while it passes close to the inland marsh of Kenalla lagoon. Kenalla Lagoon is a wetland, mostly polluted by discharges of Lezha city waste waters. Renci Mountain, very rich with carstic waters, supplies the Kenalla Lagoon with its waters by two or more water sources. This lagoon communicates with Merzhani Lagoon, which is part of the Kune Vain Protected Area.  Section 2 goes close to the Kune Vain Tale Nature Managed Reserve (IUCN Category IV) and not touches the buffer zone of this protected area. The last part of the Section goes over the existing national road Lezhe-Milot, crossing Drini of Lezha and Mati river valleys. The banks of these rivers are covered with riparian woodland.

The main habitats along this Section are agricultural land and anthropogenic habitats, while a brief description of the habitats encountered is given below. The species with conservation status, found in surroundings of territory that will be affected by Section 2, are summarized in the relevant Annex. Considering that a major part of Section 2 goes over the existing road, it can be said that such species are related almost to the habitats which are not very close with the territory under the study.

#### 4.2.6.1 Aquatic habitats

*Large rivers*

For the classification of this habitat according to national/international lists, please refer to the habitat with the same name of Section 1. The largest rivers in Section 2 are Mati River and Drini of Lezha River, which are crossed by the road Sh1. The riverbanks of this habitat are dominated by riparian forests, mainly with the species of Salix alba and Populus alba. These rivers are characterized by slow running waters. The habitats of both Rivers are hardly damaged by human activity. Drini of Lezha river, is hardly polluted by discharges of Lezha city wastewater i, while Mati River is polluted by excavation for raw material (gravels and pits). Open querries are situated in both sides of the Section 2.

*Lagoons*

- Reference to Eunis habitat; A.5. Sublittoral sediment; A5.5 - Sublittoral macrophyte-dominated sediment; A5.533 Zostera beds in full salinity infralittoral sediments
- Reference to EU HD Annex 1 –1110. Sandbanks which are slightly covered by sea water all the time
- Reference to Bern Convention Resolution No.4 (1998); A.5 Sublittoral sediment
- Reference to Palaearctic Habitat; 11.332 Mediterranean Zostera beds

Kune Vain and Kenalla lagoons extend close to the first part of the Section 2, where the plant community of *Zosterra noltii and Ruppia cirrhosa* dominates. They create together with algae some biocenosses that can be considered as one of the most important oxygen sources for the lagoon waters. Another group which is present in small stagnant freshwater ponds is the monophytic plant community of Lemna minor. The communities represented by different Patomogeton genera are less developed than the first plant community (*Zosterra noltii and Rupia cirrhosa*). The plant community of Phragmites australis sp. is spread also in the shore of the Kenalla lagoon and is very resistant to different environmental conditions.

The shrub floor, in the surroundings of Kenalla lagoon and Drini of Lezha and Mati Rivers (habitat above) is dominated by species of *Rubus ulmifolius, Crataegus monogyna, Rosa sempervirens, Tamarix dalmatica*, *T. hampeana, Juncus acutos, Arthrocnemum glaucum*. Herbaceous floor is also very rich, mostly with species of *Lythrum salicaria, asparagus acutifolius, Agrostis stolonifera* etc.

**Figure 4-61 Kenalla Lagoon and Renci Mountain separated by Shengjini Lezha Road**

*Water fringing reedbed and halophytes*

For the classification of this habitat, please refer to the same habitat of Section 1. This habitat is characteristic in the banks of Drini of Lezha and Mati Rivers, where the flow is slow, in the shore of the lagoons (mostly in Kenalla lagoon) and in channels and other inland water bodies.

#### 4.2.6.2 Terrestrial habitats

Heathland and scrub

*Evergreen sclerophyllous shrub (Garrigues)*

- Reference to Eunis habitat; - F6.37 Illyrian Christ's thorn garrigues
- Reference to EU HD Annex 1 – None
- Reference to Bern Convention Resolution No.4 (1998); None
- Reference to Palearctic Habitat Classification 200112; 32.B7- Illyrian Christ's thorn garrigues

This habitat is widespread in the lower part of the carbonate rocks of Renci Mountain, where limestone is in contact with the alluvial plain, and more specifically where the foot of the Renci Mountain contacts the Kenalla Lagoon. It is characterized by the association of *Clematis viticellae-Punica granatum*. The dominance of Punica granatum forms a thick brush on average of 3m tall in combination with species of *Rosa sempervirens, Clematis flammula, C. viticella, Crataegus monogyna and Paliurus spina-christi* as shrubs. The herb layer is not very developed but is relatively rich with mesophilous species such as *Viola odorata and Geum urbanum*. Currently such habitats are damaged due to the un-planned urban development around the road of Lezhe-Shengjin.

**Figure 4-62 Association of Punicetum granati in horizon and meadows in top of the Renci Mountain**

*Riparian gallery and thicket*

- Reference to Eunis habitat; F9.313 Mediterraneo-Macaronesian tamarix thickets
- Reference to EU HD Annex 1– None
- Reference to Bern Convention Resolution No.4 (1998); F 9.3
- Palaearctic Habitat ; 44.813 Mediterraneo-Macaronesian tamarix thickets

This habitat is characteristic in riversides, fens and marshes and is dominated by scrub vegetation, while the main plant community is *Tamarix* spp. Tamarix species are encountered in Kune Vain and Kenalla lagoon and in Drini of Lezha and Mati river valley. The most common species are *Tamarix dalmatica and T. hampeana*, which can reach the height of 4-5 m. This community has a very strong resistance to salinity, serves as a very good habitat for nesting of little herons, while it is seriously degraded due to deforestation. Other associated plants of this community that dominate in the shrub floor are *Rubus ulmifolius, Crataegus monogyna, Rosa sempervirens Juncus acutos, Arthrocnemum glaucum sp. etc.*

**Figure 4-63 Plant community dominated with Tamarix sp In Mati River valley**

<u>Forest and woodlands</u>

*Riparian willow and poplar belts*

For the description and categorization to the lists of this habitat, please refer to the same habitat of the Section 1. Riparian willow and poplar belts are developed in the riverbanks of Drini of Lezha and Mati River. The plant community is dominated by Salix species such as *Salix alba and Salix elaeagnos*, while the plant community with *Populus alba* has remained only at small surfaces and is associated with *Alnus glutinosa* and *Fraxinus angustifolia*. This plant community is hardly affected by uncontrolled human activities.

**Figure 4-64 View of Drini of Lezha River valley riparian habitat**

*Thermophilous woodland*

- Reference to Eunis habitat;G1.78. Trojan oak woodland
- Reference to EU HD Annex 1 – 9250 –Quercus trojana wood
- Reference to Bern Convention Resolution No.4 (1998);G 1.7 Thermophilous deciduous woodland

The mountain of Renci is characterized by fragmented pastures and the steep slopes of the limestone rocks as well as by rare forest of oak trees (*Quercus trojana*) and by *Pinus halepensis* species in its southwestern part. Vegetation in this limestone rocks is dominated by the species of the *Phillyrea medii L. and Juniperus sp, Paliurus aculeatus, Crategus monogyna, Rosa sp., Rubus ulmifolius Schott* etc. In addition, several species of plants such as *Salvia officinalis, Teucrium polium, Teucrium chamaedrys L., Thymus sp., Satureja montana and Quercus ilex* are encountered in Renci mountain. The Tree of Punica granata grows in the western slopes of Renci mountain between the mountain and Kenalla Lagoon and has been identified as one of the most endangered species in the country, populating this area in the spring. This plant provides food for the animals but also is used as medicinal plant.

**Figure 4-65 Habitats characterized by Pinus sp. association in Renci Mountain**

#### 4.2.6.3 Anthropogenic habitats

<u>Agricultural land</u>

The main habitats regarding the Agricultural Land that are widespread along Section 2 are:

- *Line of Trees*
- *Ruderal flora and vegetation*
- *Field and acres*
- *Small scale cultivated garden areas*

For the description and the categorization of the aforementioned habitats please refer to the same habitats of the Section 1. The agricultural lands are cultivated with vegetables, vineyard, crops such as corn and grain, fooder, fruit trees. Weeds vegetation is dominated by *Trifolium partense, Cynodon dactylon, Plantago coronopus, Dittrichia viscose, Daturo stremonium.*

**Figure 4-66 Agricultural lands in Milot**

<u>Settlements, industrial and other atificial habitats</u>

The main habitats that are widespread along Section 2 are waste deposit sites, rural settlements, roads, industrial and commercial sites still in use. Ruderal species are encountered in both sides of the existing road of Lezhe Milot such as *Cichorium intybus L, Datura stremonium, Punicum virgatum, Lolium perrene, Arundo donax L, etc.*

**Figure 4-67 Vegetation at the eastern side of the existing road Lezhe-Milot**

Apart from the waste deposit sites, which is described below, for the other habitats, please refer to Section 1.

*Waste deposit sites*

- Reference to Eunis habitat;  J6.31 - Sewage works and sludge beds
- Reference to Annex 1 of EU Habitat Directive – None
- Reference to Bern Convention Resolution No.4 (1998);None

This habitat includes the wastewater treatment plant of Lezha city, which is situated in the vicinity of the first part of Section 2. Some of the plant species found in this habitat are *Cikoria Intidus, Ipericum perforatum, Teucrium polium, Dakuta estremonium.*

#### 4.2.6.4 Fauna

Section 2 is characterized by specific fauna of coastal hills and mountains (Renci Mountain), of lagoons (Kenalla Lagoon), surrounding wetlands, existing road and agricultural lands and settlements in both sides of the road.  Section 2 passes over Drini of Lezha and Mati rivers, which are not very rich on fauna, due to water pollution (Drini of Lezha) and exploitation of the river bottom for gravel purposes (Mati River). The agricultural areas and their surroundings are inhabited by species of wildlife such as the jackal, badger, otter and weasel etc. The sites in the surroundings of Kenalla Lagoon and Renci Mountain steeps serve for feeding and standing of different birds and mammals of the area. For the fauna species with specific status, please see Annex 3.

<u>Aquatic Fauna</u>

The aquatic fauna of the habitats along or close to Section 2 is very poor due to the intensive pollution caused during years in Drin of Lezha River and Merxhani Lagoon as well as due to the overexploitation of Mati River for gravel purposes.

*Aquatic Insects*

The Short-tailed blue (*Everes argiades*) and the Green-underside blue (*Glaucopsyche alexis*) can be mentioned among the aquatic insectivores with specific status in Section 2. An abundance of mosquitos such as *the Culex pipiens, Culex hortensis maderensis, Culex impudicus and Aedes albopictus* has been recorded every summer in the surrounding of Kenalla Lagoon.

*Fish*

Several fish species with economic importance such as the Golden grey mullet (*Mugil cephalus*), Flat heat grey mullet (*Lisa saliens*), Thin lip mullet (*Lisa auratus*) and Leaping mullet (*Lisa ramada*) have been encountered in Drini of Lezha and Mati Rivers Delta.

*Aquatic Amphibian and Reptiles*

About seven species of amphibians and twenty four reptiles have been noticed in the Kenalla Lagoon, which is far from Section 2, in Drini of Lezha River as well as Mati River. Fresh waters (in both rivers) and the slightly brackish waters of the Kenalla Lagoon are very important for water turtles such as the European pond turtle *(Emys obicularis*) and the Caspian turtle or striped-neck terrapin (*Mauremys caspica*). Both of these reptiles at present are very rare in the site under study. Other reptiles closely related to the fresh water such as the water snakes *Natrix natrix and Natrix tessellata* have been common in the draining channels which discharge in the Kenalla Lagoon and the territories of Drini of Lezha and Mati River valleys. Similarly, with Section 1, the most common species of frogs are the Pool frog (*Rana Lessonae*), Balkan frog *(Rana balcanika),* Lake frog (*Pelophylax ridibundus*), Green frog, toad, common newt etc. The Greek March Frog (*Rana balcanica*), Common Toad (Bufo bufo), Epirote frog (*Rana epeirotica*), European green toad (*Bufo viridis*) etc. have been observed in very rare cases.

*Aquatic Birds*

The most important birds species, surveyed in the area, are the Little heron (*Egretta garzeta*) and the Pigmy cormorant (*Phalacracorax pygmeus*). The Dalmatian pelecan (*Pelecanus cryspus*) feeds or stands in the Kenalla Lagoon in rare and accidental cases. The aquatic birds are very rare in these territories due to the pollution and disturbance from intensive human activities. Wild dukes and Common coot (*Fulica atra*) are fed in the Kenalla lagoon waters, but this has been gradually very rare due to the lack of food. The Common teal (*A.Crecca*) is observed in rare cases in the Kenalla Lagoon and in the Drini of Lezha and Mati Rivers slow flows and mouths. Five species of Podicepedidae and two common winter visitors, *Gallia stelata and Melanita nigra*, are also found in this Section. The most common species, but still rare in comparison with other species in the surrounding marshlands, are the Northern lapwing (*Vanellus vanellus*) and the Common redshank (*Tringa tetanus*).

**Figure 4-68 Little white Egret (Egreta garzetta), Domi marsh, Section 1 of AIC**

*Aquatic Mammals*

No mammals with specific value are observed in the aquatic habitats of Kenalla Lagoon, of Drini of Lezha and Mati river bodies. The Otter has more than twenty years that is not seen in such waters, while the Water vole (*Arvicola amphibius)* has been observed in the coasts of the channels, the shallow part of Kenalla Lagoon and the coasts of the Drini of Lezha and Mati Rivers.

<u>Terrestrial Habitats</u>

The terrestrial habitats are represented by vegetation in Renci Mountain, rivers valley, agricultural lands and other degraded shrubs, open crop fields and existing road.

*Terrestrial insects*

Most of the insects of Section 2 are also encountered in Section 1. Species with specific status such as Scarce swallowtail (*Iphiclides podaliris*), Orange tip (*Anthocaris cardamines*), Powdered Brimstone *(Gonepteryx farinose*), Nettle-tree butterfly (*Libethea celtis),* Yellow-legged tortoiseshell (*Nymphalis xanthomelas*), Peacock butterfly (*Inachis io*), Red admiral (*Vanesa atalanta),* (*Cynthia cardui*), Knapweed fritillary (*Melitaea phoebe*), Green hairstreak (*Callophrys rubi*) can be encountered among terrestrial insectivores. Such species live on the rocks of the Renci Mountain.

*Terrestrial amphibians and reptiles*

The European green toad Bufo viridis, Agile frog (*Rana dalmatica*) and other terrestrial amphibians such as the European tree frog (*Hyla arborea),* Pool frog (*Rana lessonae*) can be mentioned among terrestrial amphibians with specific status in Section 2. The Hermann's tortoise (*Testudo hermani*), the Balkan green lizard (*Lacerta trilineata*), the European green lizard (*Lacerta viridis*), the European blind snake (*Typhlops vermicularis*), Dice snake *(Natrix tessellate*) can be mentioned among reptiles.

*Terrestrial birds*

Terrestrial bird fauna is quite rich with different population of birds. The Eurasian eagle owl (*Bubo bubo*) and the Little owl (*Athene noctua*) can be mentioned among the nocturnal birds. The Honey buzzard (*Pernis apivorus*) nests and lives in the woodlands of Renci Mountain, while the Spotted eagle (*Aquila clanga. Pallas* - EU threatened sp.) visits and passes time in the Kenalla Lagoon, coming from Vaini Lagoon system (its nesting site).

**Figure 4-69 European honey buzzard**

Several birds of the Locustellidae family such as the Marsh warbler (*Acrocephalus palustris*), the Common grasshopper warbler (*Locustella naevia)*, the Eurasian river warbler (*Locustella fluviatilis)*, the Savi's warbler (*Locustella luscinioides*) are encountered in the open meadows and in the shrubs in surroundings of Kenalla Lagoon and Drini of Lezha and Mati Rivers. The other part of the Section 2 goes over the existing road.

*Terrestrial Mammals*

The Renci Mountain is the richest area of this Section regarding mammals. Carnivores such as the Red fox (*Vulpes vulpes*), the Lease weasel (*Mustela nivalis*) and the European polecat (*Mustela plutorius*) hunt in agricultural sites and settlement gardens and visit such sites. In agricultural areas, the farmers testimonies for the presence of the Badger (*Meles meles*), but none of them or their tracks have been seen by researchers.

### 4.2.7 Biodiversity in Section 3

This Section consists mainly of anthropogenic habitats, where field and acres and rural settlements occupy the largest area. The agricultural lands are characterized by irrigation/draining channels and a group of natural vegetation that thrives in agricultural parcels etc. The aquatic habitat is represented mainly by a water fringing reedbed, found in reservoirs or draining channels. The biodiversity of such areas is considered poor and under the influence of the intensive use by human activities. No plant species with specific status are found in the surrounding territories of Section 3.

#### 4.2.7.1 Aquatic habitats

*Water fringing reedbeds and halophytes*

- Reference to Eunis habitat; C3.2 - Water-fringing reedbeds and tall helophytes other than canes
- Reference to EU HD Annex 1 – None
- Reference to Bern Convention Resolution No.4 (1998); None

This habitat is found in stagnant waters, including the artificial reservoir of Thumane and the irrigation and draining channels. In some areas, aquatic plant communities are dominated by *Phragmites australis and Typha angustifolia.* Other common species around the Thumane reservoir are *Juncus effusus, Eleocharis acicularis, Scirpus setaceus, Juncus bufonius, Centaurium pulchellum.* Herbs are concentrated in the natural rivers and stream beds in the hilly zone and steep valley slopes. The herb floor is characterized by the presence of Great Horsetail (*Equisetum telmateia*) and sedges such as Hammer Sedge *(Carexhirta L.),* Winkel-Sedge (Carex*remota L.),* Soapwort (*Saponaria officinalis L*.), Water Mint (*Mentha aquatica L*.) etc.

#### 4.2.7.2 Terrestrial habitats

Woodland and forests

*Riparian willow and poplar belts*

- Reference to Eunis habitat; G1.11 Riverine [Salix] woodland - G1.112 Mediterranean tall [Salix] galleries (G1.1121 Mediterranean white willow galleries)
- Reference to EU HD Annex 1 – 92A0 Salix alba and Populus alba galleries
- Reference to Bern Convention Resolution No.4 (1998); G1.11 - Riverine Salix woodland
- Palearctic habitat; 44.141 Mediterranean white willow galleries

This habitat is widespread in the bank of a stream in Fushe Mamurras and is dominated by poplar wood (*Populus alba*), white willow (*Salix alba*) and black willow (*Salix elaeagnos*) species. Populus and Salix species form a rich community with accompanying flora which include *Alnus glutinosa, Rubus ulmifolius, Hedera helix, Tamarix parviflora, Saponaria officinalis, Arum italicum, Brachypodium sylvaticum, Rosa sempervirens, Hedera helix, Clematis vitalba, Saponaria officinalis, Hypericum perforatum, Dactylis glomerata.* This habitat is quite scarce, hardly damaged by human activities and fragmented for construction purposes or infrastructure development.

#### 4.2.7.3 Anthropogenic habitats

Agricultural land

*Field and acres*

Agricultural lands are cultivated with herbaceous plants such as *Medicago sativa L. and Zea may,* vegetables, potatoes, beans, forage, fruit trees and vineyards. The peripheries of the agricultural land are dominated by natural species or cultivated species such as *Trifolium partense, Cynodon dactylon, Plantago coronopus, Dittrichia viscose.*

**Figure 4-70 Agricultural lands in roadside of AIC Section 3**

Other habitats that belong to Agricultural Land category and are present in Section 3 are:

- *Line of Trees*
- *Ruderal flora and vegetation*
- *Small scale cultivated garden areas*
- *Fruit trees and Orchads*

For the description of this habitat category and its classification, please refer to the same habitats of the Section 1.

Settlements, industrial and other artificial habitats

The main habitats regarding this habitat category along the Section 3 are:

- *Rural Settlements*
- *Roads*
- *Industrial and commercial sites still in active use*

Flora in and around the channels surrounding the road is dominated by herbaceous vegetation of the flat terrain, developed in both sides of the existing road. This vegetation in all agricultural lands is dominated by Graminacea and Leguminacea plant species, such as *Festuca sp, Trifolium Vicia spp, Urtica dioica, Sanguisorba oficinalis, Melisa oficinalis, Papaver rhoeas, Melisa oficinalis, Cichorium intybus* etc. The substrate in the hilly zone has a sandy soil character and is characterized by the presence of the hydrophilic plant trees. The channels inside agricultural lands, which surround the existing road, are characterized by the presence of *Populus alba.*

Some small belts between arable lands and settlements are characterized by Strawberry-trees *(Arbutus unedo L.*), Briar Tree Heath (*Erica arborea L.),* Terebint-Tree (*Pistacia terebinthus L.*), Lentisk (Pistacia lentiscus L.), Common Myrtle (*Myrtus communis L.),* Laurel Common (*Laurus nobilis L.*, Grey Sun-Rose (*Cistus incanus L.),* Evergreen Rose (*Rosa sempervirens* L.), Scorpion Senna (*Coronilla emerus* L.), Bladdersenna (*Colutea arborescens L.*). Degradation in this habitat is noted via the high presence of Chamaephytes and Hemychryptophytes species as a result of fires, intensive cutting and over grazing.

Figure 4-71 Strawberry Trees

Poplar woodland with *Arundo donax and Rubus ulmifolius* species cover the borders of the existing road in some limited parts. For the description of this habitat category and its classification, please refer to the same habitats of the Section 1.

**Figure 4-72 Line of trees represented by poplar woodland with the accompanying plant species of Arundo donax, Rubus ulmifolius**

#### 4.2.7.4 Fauna

Section 3 runs over the existing road, so the only fauna habitats are those of existing roadsides, settlements and agricultural areas. For the fauna of such habitats, please refer to the Section 2 and for the fauna species of this Section with specific status, please see Annex 3.

### 4.2.8 Biodiversity in Section 4

Section 4 is dominated by agricultural lands planted with crops and fruit trees as well as riverine habitats, such as the Ishmi River, with their broad-leaved forests and shrubs, woodlands and fragmentized shrub forests in hilly areas which are widespread especially at the end of the Section.

#### 4.2.8.1 Aquatic habitats

*Large rivers*

- Reference to EUNIS Habitat: No specific reference
- Reference to Palaearctic Habitats: 24. Rivers and streams
- Reference to Water Framework Directive (EEC 60/2000): lowland medium/small river type

Ishmi river is the main river of Section 4 and is a slow flowing river. The Ishmi riverbed vegetation is characterized by the association Alno-Platanus orientalis, dominated by the presence of Oriental Plane (*Platanus orientalis* L.). Weeping Willow (*Salix amplexicaulis Bory*), Grey Willow (*Salix elaeagnos subsp. angustifolia*), Common Alder (*Alnuus glutinosa Scop*.), Small-Flowered Tamarisk (*Tamarix parviflora DC*.), Hampeanian Tamarisk (*Tamarix hampeana*) are plant representatives of the tree and shrub floor. Herbs are concentrated in the natural river and stream beds in the hilly zone and steep valley slopes. The herb floor is characterized by the presence of Great Horsetail (*Equisetum telmateia*) and sedges (*Carex sp.div.),* Hammer Sedge *(Carex hirta L.),* Winkel-Sedge (Carex *remota L.),* Soapwort (*Saponaria officinalis L*., Water Mint (*Mentha aquatica L*.) etc. The habitats of the Ishmi River valley, are seriously impacted by the human activities. Fragmentation, pollution and intensive human presence, has reduced the capacities of these habitats for the relevant wildlife.

**Figure 4-73 Ishmi river vegetation (Gjola Bridge)**

*Water fringing reedbeds and halophytes*

- Reference to Eunis habitat; C3.2 - Water-fringing reedbeds and tall helophytes other than canes
- Reference to Annex 1 of EU Habitat Directive – None
- Reference to Bern Convention Resolution No.4 (1998); None

The inland surface waters include irrigation and draining channels as well as the irrigation reservoir of Thumane, which is located at the border of Section 3 with Section 4. For the description of agricultural channels, please refer to the same habitats in Section 3. The irrigation reservoir, has poor biodiversity due to the frequent changes in its water table and the high level of trophic during the summer period.

#### 4.2.8.2 Terrestrial habitats

<u>Heathland and scrub</u>

*Maquis and Thermo-Mediteranean brush*

- Reference to Eunis habitat; F5.31 Helleno-Balkanic pseudomaquis
- Reference to EU HD Annex 1 – None
- Reference to Bern Convention Resolution No.4 (1998)-None
- Palaearctic habitat; 32.71 Helleno-Balkanic pseudomaquis

This habitat includes sclerophyllous evergreen and deciduous shrub thickets between maquis that are formed as a result of the degradation of thermophilous deciduous woodland. This habitat can be found on the lower hilly and valley slopes of the study area, up to 300m a.s.l, while it is widespread in the hilly area at the end of section 4. The soils are usually deep, overlaying sand or flishy stones and rich in nutrients. The plant community is dominated by the association of *Arbuto – Quercetum Ilicis* while it represents the second stage of degradation of *Quercetum ilicis* forest communities. This degradation comes as a result of fires, which regularly occur in this area, destroying the entire vegetation. Biodiversity studies mention the rare presence of Great Snipe (*Gallinago media*) with Global Status " Near Threatened" as a migratory bird, in the surrounding of Thumana-Kruja fields and shrubs.

<u>Grasslands and meadows</u>

*Hill Pastures*

- Reference to Eunis habitat; E1.332 - Helleno-Balkanic short grass and therophyte communities
- Reference to EU HD Annex 1 – 6220; Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea
- Reference to Bern Convention Resolution No.4 (1998) - E 1.3. Mediterranean xeric grassland
- Palaearctic habitat; 34.532 Helleno-Balkanic short grass and therophyte communities

Hill pasture habitat is characteristic in steep slope terrain with poor soils and is subject to intense erosion. This habitat is very little represented, mainly close to the south west of the hilly area at the end of the Section 4. Typical natural grasslands are present in the study area within Maquis range and indicate degradation of schlerophillous habitats. The plant community of this area is presented with species that are adapted to warm climate such as *Brachypodium distachyon, Bromus tectorum, B. hordeaceus, Alopecurus pratensis, Sanguisorba officinalis, Avena barbata, Trifolium stellatum*. This habitat and its related vegetation is hardly damaged by human activities.

<u>Forest and woodland</u>

*Mixed riparian woodland*

- Reference to Eunis habitat; G1.22324. Albanian ash-oak-alder forests
- Reference to EU HD Annex – none
- Reference to Bern Convention Resolution No.4 (1998); G 1.22 Mixed Quercus - Ulmus - Fraxinus woodland of great rivers
- Reference to Palaearctic habitat; 44.4324 Albanian ash-oak-*alder* forests

The mixed riparian woodland habitat lies on the sandy-clay alluvial soils, permanently inundated during the year, characteristic of the flat zone of Fushe - Kruja-Thumana and Preza. The alluvial forests belong to the plant community *Alno-Fraxinetum angustifoliae*, which is rare as a result of the agricultural crop cultivation in this area. Three vegetation floors are clearly distinguished in this habitat, i.e. the tree floor, scrub floor and grass floor. The tree floor consists of the following species: Common Alder (*Alnus glutinosa Scop.)*, Narrow Leaved Ash (*Fraxinus angustifolia Vahl.*), Common Elm (*Ulmus minor Miller.*), European Oak (*Quercus robur L.),* Judas Tree (*Cercis siliquastrum L.),* Thorny Smilax (*Smilax aspera L.),* White Poplar (*Populus alba* L.) etc. The scrub floor is rich in the species of Elm Leaf Blackberry (*Rubus ulmifolius*), Hawthorn (*Crataegus monogyna*), Evergreen Rose (*Rosa sempervirens L.),* Dalmatian Tamarisk (*Tamarix dalmatica*), Dogwood (*Cornus sanguinea L.*). etc, while the presence of liana species is also evident. The grass floor is rich in the species of Purple Loosestrife (*Lythrum salicaria* L.), Narrow-Leaved Asparagus (*Asparagus acutifolius L.),* Goosegrass (*Galium aparine L.),* Creeping Bent *(Agrostis stolonifera l.),* Blue Woodruff (*Asperula arvensis l.*), Villous Cranesbill (G*eranium brutium Gasparr.) etc.*

This habitat is hardly damaged by human activities. Therefore, wildlife in this habitat is not very frequent..

#### 4.2.8.3 Anthropogenic habitats

<u>Agricultural land</u>

*Recently abandoned arable land*

- Reference to Eunis habitat; I 1.53. Fallow un-inundated fields with annual and perennial weed communities
- Reference to EU HD Annex 1 – None
- Reference to Bern Convention Resolution No.4 (1998); None
- Reference to Palaearctic habitat; 87.1 Fallow fields

Abandoned fields are present close to Thumane, the field area of Fushe Kruje and the left side of Rinas airport. This habitat is represented by numerous pioneering, introduced or nitrophilous species.

*Evergreen orchards and groves*

- Reference to EUNIS Habitats: G2.91 Olive groves
- Reference to EU HD Annex I: None
- Reference to CoE BC Res. No. 4 1996: G 2 Broadleaved evergreen woodland

Olive grove habitat is widespread in the hilly terrain of the end of the section, where Olive plant (*Olea europe*a) plantation is encountered in small parcels. Where terraces are abandoned, the land is covered by vegetation dominated by *Rubus ulmifolius and Dittrichia viscosa.*

*Field and acres*

This habitat is more widespread in the study area. The most important cultures cultivated in these areas are corn and alfalfa. Horticulture in the study area is mostly represented by vineyards. Bushes and deciduous trees are planted as a separating element of agricultural plots.

**Figure 4-74 Agricultural lands close to Rinas**

Other habitats of the agricultural land category widespread along Section 4 are:

- *Ruderal and sub-ruderal herbaceous vegetation and*
- *Line of trees.*

For the description of this habitat category and its classification, please refer to the same habitats of Section 1.

<u>Settlements, industrial and other artificial habitats</u>

*Rural Settlements*

The settlements are spread along the entire section and are surrounded by agricultural land, meadows and grassland.

**Figure 4-75 Residential buildings in villages and agricultural lands in Preze area located along AIC**

*Industrial, commercial and another man-made site*

- Reference to EUNIS Habitats: J4 Transport networks and other constructed hard-surfaced areas
- J4.4 - Airport runways and aprons
- Reference to EU HD Annex I: none
- Reference to Bern Convention Res. No. 4 1996: none

This habitat is characterized by natural vegetation and some ruderal plant communities adapted to grow under anthropogenic influence such as the *Artemisia vulgaris and Urtica dioica*. It is located about 800 meters from the road corridor (Rinas airport).

#### 4.2.8.4 Fauna

Section 4 crosses some natural waters valleys (Branches of Erzeni Ishmi River) that are considered as the most polluted natural waters of Albania (Ishmi River). This is the reason why the fauna of this Section is relatively poor.

<u>Aquatic Fauna</u>

*Aquatic Insects*

The most characteristic orders of insectivores of Section 4 are Mayflies (Ephemeroptera), Dragonflies and Damselflies (Odonata), Stoneflies (Plecoptera), True Bugs (Hemiptera), Caddisflies (Trichoptera), True flies (Diptera), partly, Beetles Coleoptera (partly), Ants, Bees, and Wasps (Hymenoptera), Butterflies (Lepidoptera), Lacewings (Neuroptera), Grasshoppers, Crickets, Katydids and Locusts (Orthoptera), True flies (Diptera), Beetles (Coleoptera) etc, while only few of those have a specific status. The Adonis blue (Polyommatus (Lysandra) bellargus) and the Short-tailed blue (Everes argiades), both of which belong to the Lycaenidae family, are under conservation status from IUCN.

*Fish*

The ichthiofauna of Ishmi River and its streams is very poor due to the pollution from human activities and illegal discharges. Most of the fish of this river are found in the lower part, coming from Erzeni River, such as *Oncorhynchus mykiss, Alburnoides bipuntatus, Alburnus scoranza, Pelasgus prespensis and Barbus rebeli*.

*Aquatic Amphibians and reptiles*

The amphibians and reptiles of the area are encountered in irrigation and draining channels as well as in some small natural Ishmi river branches. Several amphibian species such as the Fire Salamander (*Salamandra salamandra*), the Common toad (*Bufo bufo*), the European green toad (*Bufo viridis*), Common Tree Frog (*Hila arborea*), the Common Frog (*Rana temporaria*), the Greek March Frog (*Rana balcanic*a) and the Pool Frog (*Rana lessonae*) (both last mentioned are considered as threatened) can be encountered in this Section. The Dalamatian Algyroides (*Algyroides nigropunctatus*) can be mentioned among the reptiles, while the European legless lizard (*Ophisaurus apodus)* and the Hermann's Tortoise (*Testudo hermanni*) are found in the natural and semi natural sites.

*Aquatic Birds*

Concerning the presence of the birds in the aquatic habitats of the Section 4, there is general lack of inventories. Therefore, the data represented below derive from consultant team studies and field surveys. The aquatic territories of the site are quite poor regarding aquatic birds due to disturbance from human activities. This status is reflected by the reduction of colonies and of the population of the species. Martin fisher lives close to the Thumane reservoir, while the Coots (*Fulica atra*) are abundant in the slow flowing waters, between canebrakes as well as in Thumana reservoir. Wagtails (*Motacilla alba, Motacilla flava* etc) visit the coasts of the natural waters, being fed with insects.

**Figure 4-76 White Wagtail (Motacilla alba)**

*Aquatic Mammals*

No significant aquatic mammals are found in the surroundings of Section 4, except for water voles which live close to agricultural channels and small channels used for sewage discharges. The Otter (*Lutra lutra*) is not seen for years in the territory of Section 4 and both rivers, Erzeni and Shkumbini.

<u>Terrestrial fauna</u>

*Terrestrial Insects*

The insects of the terrestrial habitats of Section 4 are similar to those of Section 2. The Adonis blue (*Polyommatus (Lysandra) bellargus*) and the Short-tailed blue (*Everes argiades*) can be mentioned among the insects with specific status. Regarding endemic arthropoda, the *Euscorpius beroni* (scorpion species) can be mentioned.

*Terrestrial Amphibians and reptiles*

Balkan Green Lizard (*Lacerta viridis*), Large Whip Snake (*Coluber caspius*), Smooth Snake (*Coronella austriaca*), Aesculapian Snake (*Elaphe longissima*), Four-lined Snake (*Elaphe quatourlineata*), *Lacerta trilineata,* Grass Snake or Ringed Snake (*Natrix natrix*), Nose-horned Viper (*Vipera ammodytes*) maybe encountered along the Section.

**Figure 4-77 Grass Snake or Ringed Snake (Natrix natrix)**

*Terrestrial birds*

A number of finches such as the Common chaffinch (*Fringilla coelebs*), the European greenfinch, (*Chloris chloris*) and the European goldfinch (*Carduelis carduelis*) live in terrestrial habitats and are fed in grasslands which are full of Carduus nutans and Cichorium intybus plants, which is the basic natural food for them. Such birds account for about 85% of the birds of the terrestrial ecosystems of Section 4. Phylloscopid warblers such as the Willow warbler (*Phylloscopus trochilus*), the Common chiffchaff (*Phylloscopus collybita*), the Western Bonelli's warbler (*Phylloscopus bonelli*), the Eastern Bonelli's warbler (*Phylloscopus orientalis*) and the Wood warbler (*Phylloscopus sibilatrix*) live in the woods.

*Terrestrial Mammals*

Because of the intensive management of territories in both sides of Section 4, the terrestrial fauna is quite poor. The Horseshoe bat (*Rinolophus Euryale*), which lives close to the settlements of Section 4, is considered vulnerable in Albania.

**Figure 4-78 The Horseshoe bat (Rinolophus Euryale)**

During the Last years, after prohibition of hunting in the Albanian territory, a slow increase of the presence of the carnivores such as the Red fox (*Vulpes vulpes*), the Least weasel (*Mustela nivalis*) and the European polecat (*Mustela plutorius*), has been surveyed in the surround of agricultural sites. These species also come in gardens looking for prey. Several species of rodents, both mice and voles, such as the Thomas's pine vole (*Microtus thomasi*), the Wood mouse (*Apodemus sylvaticus*), the Macedonian mouse (*Mus* *macedonicus*) and the House mouse (*Mus domesticus*) live in agricultural areas and abandoned agricultural areas. For more detail, please refer to the fauna of agricultural lands of Section 2.

### 4.2.9 Biodiversity in Section 5B + 5C

Section 5 (sub-section 5B and 5C), goes through the agricultural lands, schlerophylous vegetation and transitional woodland shrubs, based on flysch substrates, while it runs over the Erzen and Shkumbini Rivers and their branches and crosses agricultural channels etc. Sub-section 5B runs over the Erzen River valley, agricultural lands and hilly areas with natural vegetation and grassland. Sub-Section 5C runs also over existing roads between agricultural lands, settlements and over Shkumbini River. Shkumbini River has poor quality due to the pollution from industrial and municipal wastewater discharges, something which results in poor biodiversity and scarce habitats. Both Sub-Sections 5B and 5C have quite similar ecological characteristics for the same habitats, except for that natural habitats are mostly situated at Section 5B.

#### 4.2.9.1 Aquatic habitats

*Large rivers*

- Reference to EUNIS Habitat: No specific reference
- Reference to Palearctic Habitats: 24. Rivers and streams
- Reference to Water Framework Directive (EEC 60/2000): lowland medium/small river type

This habitat includes two rivers, Erzeni River in Section 5B and Shkumbini River in Section 5C. Both rivers sides, affected by this Section, are relatively polluted by discharges of sewages and unplanned solid waste disposals from surrounding settlements and uncontrolled agricultural activities (overuse of herbicides and pesticides). Therefore, their natural habitat and flora values are relatively poor. The aquatic flora is represented by *Carex sp, Schoenoplectus sp, Sparganium sp, Acorus sp, Typha sp,* etc. The plant communities are quite similar in both Erzeni and Shkumbini Rivers valleys. The tree floor is represented by *Alno-Platanus orientalis* association, dominated by the presence of Oriental Plane (*Platanus orientalis L.)*. Salix species are abundant in the natural shrub floor, while grasslands are characterized by the presence of *Avena barbata, Trifolium stellatum*, etc.

*Rooted floating vegetation*

- Reference to Eunis habitat; C1.34 – Rooted floating vegetation of eutrophic waterbodies
- Reference to Annex 1 of EU Habitat Directive – None
- Reference to Bern Convention Resolution No.4 (1998); None

This habitat type is represented by the water reservoir of Kusi and Allgjata (Section 5B). The macrophyta vegetation is rather poor and it is composed of Magno-Potamion association, typical for the eutrophic waters of Kusi Lake.

The aquatic vegetation is dominated by floating hydrophytes of Broad-leaved pondweed *Potamogeton natans* and at little extent by the Symplesten bur-reed *Sparganium erectum*, The common water-plants *Alisma plantago-aquatica* and Thread-leaved crowfoot *Ranunculus trichophyllus*. Reed-beds of *Phragmites sp*. are rather limited.

The shore of the lakes is usually covered by *Arboreous hydrophilous* formations with White Willow *Salix alba* as the dominant species. Other tree species are Black Alder *Alnus glutinosa*, Brittle Willow *Salix fragilis* and White Poplar *Populus alba*. Nevertheless the above formation does not cover large areas in the lake and neither forms continuous belts.

#### 4.2.9.2 Terrestrial habitats

<u>Grasslands and meadows</u>

*Hill Pastures*

This habitat is more widespread in Section 5B and it can be encountered close to scleropyllous vegetation. For the description of this habitat category and its classification, please refer to the same habitats of Section 4.

Heathland and scrub

*Maquis and Thermo-Mediteranean brush*

This habitat is more distributed on flishy substrates while it is more typical on the Rrogozhina's zone and Peza's Valley and less common on the other parts of this Section. For the description of this habitat category and its classification, please refer to the same habitats of the section 4.

*High Maquis*

- Reference to Eunis habitat; F5.213 Eastern Mediterranean high maquis
- Reference to Annex 1 of EU Habitat Directive – None
- Reference to Bern Convention Resolution No.4 (1998); None

This habitat is composed by Maquis and Thermo-Mediteranean brush and it is distributed especially in flishy substrates. It is more typical of the segment near Allgjate and Peze area.

The most important species which give the physiognomy to this formation are the evergreen shrubs such as Strawberry tree (*Arbutus unedo*), Narrow-leaved Phillyrea (*Phillyrea angustifolia*), Briar tree heath (*Erica arborea*), Prickly juniper (*Juniperus oxycedrus*), Lesser sea spurrey (*Spartium junceum*), Judas tree (*Cercis siliquastrum*), Christ's thorn (*Paliurus spina-christi*), Almond pear tree (*Pyrus amygdaliformis*), etc. The major part of the herbaceous plants are dried during the summer time, while among the herbaceous plants are found: Characeous spurge (*Euphorbia characias*), Narrow-leaved asparagus (*Asparagus acutifolius*), White-felted germander (*Teucrium polium*), Grey sun-rose (*Cistus incanus*), Sage-leaved sun-rose (*Cistus salviafolius*), Daisy (*Bellis perennis*), Thorny smilax (*Smilax aspera*), Cocksfoot (*Dactylis glomerata*), etc

Woodland and forest

*Thermophilous woodland*

- Reference to Eunis habitat; - G1.74 - Italo-Illyrian Ostrya carpinifolia sub-thermophilous Quercus wood
- Reference to EU HD Annex 1 – None
- Reference to Bern Convention Resolution No.4 (1998); G1.7 : Thermophilous deciduous woodland

This habitat is widespread along Section 5B till Peze area. It is located in the flishy area, on dry or mid-dry soils, mostly with moderate to high levels of soil fertility and characterized by a typical sub- Mediterranean climate. Thermophilous deciduous woodland is characterized by the *Querco-Caprinetum* association. The *Querco–Carpinetum* association could be considered as the third dynamic stage of *Quercion frainetto cerris*, as the result of intensive cutting, grazing and soil erosion on steep slopes. The tree floor is represented by Orient hornbeam, (*Carpinus orientalis Mill.*), Turkish oak (*Quercus cerris L.),* Hungarian oak (*Quercus frainetto Ten*), etc. Shrub floor is represented by Red Berried Juniper (*Juniperus oxycedrus L.*), Hirsute Dorycnium (*Dorycnium hirsutum* (L.) Ser.), Bituminosus Psoralea (*Psoralea bituminosa* L.), Calabrian Skunk (*Putoria calabrica* (L. fi.l.) DC.), Soapwort (*Saponaria calabrica Guss.*), Flowering Ash *(Fraxinus ornus L.*), Oriental hornbeam (*Carpinus orientalis Miller.*). Aleppo pine trees (*Pinus halapensis Miller.*), have been used for reforestation of degraded woodland, and have changed the soil structure and the landscape.

The medicinal species, such as Red Juniper (*Juniperus oxycedrus L.*), Hawthorn (*Crataegus monogyna Jacq.),* Wild Marjoram (*Origanum vulgare L.*) etc, are also present in hill foot habitats. The plant species with specific status are summarized in Annex 3.

**Figure 4-79 Erzeni River Valley vegetation**

The herb floor is represented by Great Horsetail (Equisetum telmateia) and sedges such as Hammer Sedge (Carex hirta L.), Winkel-Sedge (Carex remota L.), Soapwort (Saponaria officinalis L., Water Mint (Mentha aquatica L.) etc. This habitat is quite fragmented by human interventions.

*Mediteranean riparian woodland*

- Reference to Eunis habitat; - G1.381 Helleno-Balkanic riparian plane forests
- Reference to EU HD Annex 1 – 92C0 orientalis and Liquidambar orientalis woods (Platanion orientalis)
- Reference to Bern Convention Resolution No.4 (1998); G 1.3. Mediterranean riparian woodland
- Palaearctic Habitat Classification; 44.711 Helleno-Balkanic riparian plane forests

This habitat can be encountered in the riverbeds and springs of the hilly zone or on steep slopes, near the rivers and springs. The soil substrate has a sandy character. The habitat is dominated by the plant community *Alno-Platanetum orientalis* and is characterized by the presence of Oriental Plane (*Platanus orientalis L*.) with admixed *Tamarix* sp., willows sp. and fierthorn (*Pyracantha coccinea*) in the shrub layer. The herb floor is characterized by Great Horsetail (*Equisetum telmateia*) and sedges (*Carex sp.div.),* Hammer Sedge *(Carex hirta L.),* Winkel-Sedge (Carex *remota L.),* Soapwort (*Saponaria officinalis L*., Water Mint (*Mentha aquatica L*.) etc.

*Pinus Halepensis forest and wood*

- Reference to Eunis habitat; - G3.749. Illyrian Aleppo pine forests.
- Reference to EU HD Annex 1 – None
- Reference to Bern Convention Resolution No.4 (1998); G 3.7 Lowland to montane mediterranean *Pinus* woodland

It is represented by planted Mediterranean Pine Forests dominated by *Pinus halepensis*. The vegetation is dominated by common plant species typical of disturbed forest, with low plant species diversity but frequent throughout the Albanian territory.

This pine forest of (*Pinus halepensis*]) is found only near Allgjata village, while they are generally the remains of areas planted and cultivated 60 to 70 years ago to prevent erosion. The shrubby and herbaceous floor is represented by elements of degraded stages of Maquis such as Narrow-leaved mock privet (Phillyrea angustifolia), Mastic (*Pistacia lentiscus*), Tree heath (*Erica arborea*), Oriental hornbeam (*Carpinus orientalis*), Pubescent oak (*Quercus pubescens*), Eagle fern (*Pteridium aqualinum*), Prickly juniper (*Juniperus oxycedrus*), Elmleaf blackberry (*Rubus ulmifolius*), Judas tree (*Cercis siliquastrum*), Wild asparagus (*Asparagus acutifolius*), False yellowhead (*Dittrichia viscosa*), Traveller's joy (*Clematis vitalba*), Yellow bluestem (*Andropogon ischaemum*), Italian arum (*Arum italicum*), Mountain savory (*Satureja montana*) etc.

#### 4.2.9.3 Anthropogenic habitats

Agricultural land

*Field and acres*

- Reference to EUNIS: I1.3 Arable land with unmixed crops grown by low intensity agricultural methods
- Reference to EU HD Annex I: none

Field and acres are mostly widespread in the first part of Section 5B, from Kus to Allgjate and Peze and in the agricultural fields of section 5C, area which represents the largest part of this habitat. They are cultivated mostly with corn, alfalfa, weed and fruit trees.

*Bushes and Hedges on the slopes*

This habitat is characteristic in brown silicate soils developed in calcareous rock. It is distributed in fragmented parcels, along the boundary of Mediterranean shrubs and oaks. The habitat is characterized by the plant community represented by *Pruno-Crataegum* association. There can be found Blackthorn Tree *(Prunus spinosa L.)* and Prickly Juniper (*Juniperus oxycedrus L.), Phillyrea latifolia L*., Christ's Thorn (*Paliurus spina-christi Mill*.), Spring Rest- Harrow (*Ononis spinosa L*.), *Scabiosa atropurpurea L.,* Cypress Spurge (*Euphorbia cyparissias L*.), Fierthorn (*Pyracantha coccinea Roem*.), Bladdersenna (*Colutea arborescens L*.),Hawthorn (*Crataegus monogyna Jacq*.), Oriental Hornbeam (*Carpinus orientalis Mill*.), Wild Basil (*Clinopodium vulgare L.),* Odorous Hellebore (*Helleborus odorus Waldst.et Kit*), False Brome [*Brachypodium sylvaticum* (Huds),etc. From the physiognomy point of view, this community consists in shrub formations which are 1-2 m high.

The herbaceous layer of this habitat is dominated by "graminae" such as Wood Meadow-Grass (*Poa nemoralis L*.), Mountain Micromeria [*Micromeria juliana* (L.)], Cock's Foot Grass (*Dactylis glomerata L.),* [*Pteridium aquilinum*), (*Festuca heterophylla Lam*), Hungarian Knautia (*Knautia drymeia Heuffel*.), Common Agrimony (*Agrimonia eupatoria L*.), Hare's Foot (*Trifolium arvense L*.) etc.

*Fruit trees and Orchards*

- Reference to EUNIS Habitats: G1. D4 Fruit orchards and FB.31 Shrub and low-stem tree orchards
- Reference to EU HD Annex I: none
- Reference to Bern Convention Resolution No.4 1996: none

Orchards and vineyards are encountered especially in the first part of Section 5B till Peze. More specifically, there are planted fruit trees like apples (*Malus domestica*), plums (*Prunus domestica*), arra (*Juglans regia*), persimmon (*Diospyrus sp)* , mulberry tree (*Morus sp*), apricot (*Prunus armeniaca*) and vineyards, etc.

**Figure 4-80 Orchards in Peze e Vogel village**

*Evergreen orchards and groves*

- Reference to EUNIS Habitats: G2.91 Olive groves
- Reference to EU HD Annex I: None
- Reference to Bern Convention Resolution No.4 1996: G 2 Broadleaved evergreen woodland

Olive grove habitat is widespread along fragmented areas of Section 5B as well as part of Section 5C Olive (olea europea) plantation is encountered in the hilly terrain form Lekaj to Dushk. Where terraces are abandoned, the land is covered by vegetation dominated with *Rubus ulmifolius and Dittrichia viscosa* sp.

<u>Settlements, industrial and other artificial habitats</u>

*Rural settlement*

This habitat is situated in the first part of the section 5B and along the entire section 5C. For the description of this habitat category and its categorization, please refer to the same habitats of the section 4.

*Agricultural construction*

- Reference to EUNIS Habitat: J2.4 Agricultural constructions
- Reference to EU HD Annex I: none
- Reference to Bern Convention Res. No. 4 1996: none

This habitat includes isolated greenhouses and is located close to rural settlements such as Peze Pelmes settlement in Erzeni River valley. Greenhouses are used for the cultivation of vegetation, mainly tomato (*Solanum lycopersicum*), pepper (*Capsium annuum*) and lettuce (*Lactuca sativa*).

*Roads*

- Reference to EUNIS Habitats: J4 Transport networks and the constructed hard-surfaced areas J4.2 Road networks
- Reference to EU HD Annex I: none
- Reference to Bern Convention Res. No. 4 1996: none

This habitat includes the road surfaces, together with the highly-disturbed environment adjacent to roads, which consists of roadside banks or verges etc. This habitat can be found along the entire section 5B. Ruderal species are widespread in the side of the road, characterized by the presence of *Cichorium intybus L, Datura stremonium, Punicum virgatum, Lolium perrene, Arundo donax L, Urtica dioica, Datura stramonium* species.

#### 4.2.9.4 Fauna

The rivers of Erzeni and Shkumbini, are the most important aquatic habitats for the fauna of Section 5. The diversity of habitats has conditioned a diversity of fauna and wildlife. Wildlife has been reduced in the years 1993-2015 due to unplanned and intensive human activities. The part of Section 5B which passes by the natural habitats of shrubs and woodlands in hills and Erzeni river valley is a richer area for fauna compared to Section 5C. For the fauna species with specific status, please see Annex 3.

Aquatic Fauna

*Aquatic insects*

Dragonflies such as the Banded demoiselle (*Calopteryx splendens*), the Beautiful demoiselle *(Calopteryx virgo*) and the Common Spreadwing (*Lestes sponsa*) are more common in the slow flowing parts of the running waters. The presence of mosquitos is very high due to the decomposed matter in the border of the rivers and channels. Based on studies of 2018, the presence of thirteen species of coleoptera in Shkumbini waters, such as *Gyrinus marinus, Gyrinus dejeani, Hydroglyphus pusillus, Hydroporus pubescens* were verified.

*Fish*

The fish of both subsections 5B and 5C are related almost to the Erzeni and Shkumbini Rivers, which are polluted and disturbed by human presence and un-planned activities. Among the fish species of Erzeni River, *Oncorhynchus mykiss, Alburnoides bipuntatus, Alburnus scoranza, Pelasgus prespensis and Barbus rebeli* can be mentioned. The *Salmofaroides, Oncorhynchus mykiss, Alburnus scoranza, Barbus prespensis, Gobio gobio, Squalius cephalus, Carassius spp., Chondrostoma nasus, Pachichilon pictum and Pseudorasbora parva* fish are found in the upstream of Shkumbini River.

*Aquatic Amphibian and Reptiles*

Erzeni River and Shkumbini River, natural streams and irrigation and draining channels are some very important habitats for animal species linked with running freshwater habitats, such as frogs (*Rana graeca, R. dalmatina, and R. temporaria*). The Salamandridae family is also well represented by *Lissotriton vulgaris* (IUCN Red List), *Triturus macedonicus, Bombina variegate*, which use a wide range of habitats for feeding and live in woodlands and shrubs, ponds and running waters, etc. Among reptiles present in Section 5, the *Mauremys rivulataw* and *Emys orbicularis* (European pond turtle, living in/close to irrigation reservoirs) can be mentioned, both of which are however rarely found.

**Figure 4-81 European pond turtle (Emys orbicularis)**

*Aquatic Birds*

The high presence of the insects and plants, small reptiles and amphibians offers a good opportunity for feeding of both carnivorea and gramivorea birds. The human interventions and disturbance, degradation and fragmentation of natural habitats have created problems on the aquatic birds presence in the territories surrounding Section 5. King fisher is observed in the slow flows of the running waters as well as in the ponds and reservoirs. Several wagtails (green and grey wagtail), warblers, and other insect eaters, nest in the shrub areas close to the waters. Most of them are mentioned as birds of terrestrial habitats of this Section.

*Aquatic Mammals*

As it has been mentioned, the natural running waters have been highly polluted in the last thirty years. This is the reason why the presence of aquatic mammals is very low. The water vole remains the most abundant mammal in this Section, while the presence of the Otter (*Lutra lutra*) is declining throughout the years.

Terrestrial Fauna

*Terrestrial Insects*

Due to the diversity of habitats of Section 5, there have been defined species of insectivores with specific status of Nymphalidae family such as the Nettle-tree butterfly (L*ibethea celtis*), Lesser purple emperor (*Apatura Ilia*), Silver-washed fritillary (*Argynnis paphia*), Knapweed fritillary (*Melitaea phoebe*), Green hairstreak (*Callophrys rubi*), Common copper (*Lycaena phlaeas*), Heodes tityrus, Heodes ottomanus, Green-underside blue (*Glaucopsyche alexis*), Rock Grayling (*Hipparchia semele* ) and Dusky clearwing (*Paranthrene tabaniformes*).

*Terrestrial Amphibians and reptiles*

Section 5 is rich in amphibians and reptiles. The illegal fires as well as intensive human activities have reduced seriously their presence compared to previous years. *Salamandra salamandra* as well as species of Hylidae family represented by *Hyla arborea* (tree frog) live in woodlands. The presence of *Bufo bufo* and Bufo viridis from the Bufonidae family can also be mentioned. Among reptiles, the *Testudo hermanni and Pseudopus apodus* can be mentioned, which live in grasslands and open wood lands. Lacerta viridis (IUCN Red Book) and *Malpolon insignitus* can be encountered between the shrubs and woodlands, in vegetation in sides of agricultural lands and abandoned agricultural lands and in low vegetation in sides of the roads.

*Terrestrial Birds*

The mixed broadlive woodlands and shrubs offer suitable food resources and nesting ground for a high number of bird species. Characteristic species include woodpeckers (fam. Picidae), such as *Picus viridis, Dendrocopos syriacus, Dendrocopos minor* etc.), tits (*Parus major, Parus coeruleus, Parus lugubris*), Blackbird (*Turdus merula*) and Jay (*Garrulus glandarius*), *Loxiacur virostra, Coccothraustes coccothraustes,* Parusatter sp. (P*. major, P. cristatus*), etc.

**Figure 4-82 Upupa Epops**

*Terrestrial Mammals*

A range of mammals also exploit the maquis habitat and the agricultural lands and abandoned agricultural lands of Section 5 during different periods of the year. The tracks of the Weasel (*Mustela nivalis*), European polecat (Mustela putorius), Fox (*Vulpes vulpes*), different species of rats/mice (*Apodemus flavicollis,* *Apodemus sylvaticus, Microtus thomasi and Musmus culus*) as well as species such as Crocidura suaveolens and Erinaceus concolor have been frequently observed during the field survey. The habitat also supports a range of several species of bats (*Rhinolophus sp., Pipistrellus sp. and Myotis sp.*) which hunt insects over the maquis.

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**Figure 4-83 Red Fox**

### 4.2.10 Biodiversity in Section 6+7

Both Sections 6 and 7 go over the existing road. The flora and vegetation of these Sections is characterized by ruderal species, developed in both sides of the existing road. The surrounding habitats are those of agricultural land, settlements, industrial etc. Olive plantations are situated on the hills, in the eastern part of the beginning of Section 6 and the western part at the end of Section 7. The wildlife is poor in both sides of the existing road, is represented by species of agricultural land, settlements and intensive infrastructure. There no plant species with specific status.

#### 4.2.10.1 Aquatic habitats

*Littoral zone of inland surface waterbodies (Drainage channels)*

- Reference to EUNIS habitat - C3.2 : Water-fringing reedbeds and tall helophytes other than canes
- Reference to EU HD Annex 1 – None
- Reference to Bern Convention Resolution No.4 (1998); None

Sections 6 and 7 are characterized by numerous drainage and irrigation channels and some small streams. This habitat is dominated by the plant community of *Phragmito-Magnocaricetea* which is encountered usually at the sides of the streams.

Reedbed is very common in these running waters. The dominant species of this community are biennial aquatic plants such as *Phragmites australis, Typha angustifolia and Scirpus lacustris accompanied by Sparganium erectum, Alsma plantago-aquatica, Eleocharis palustris and Mentha aquatic* sp.

**Figure 4-84 Irrigation channel in Lushnje periphery**

#### 4.2.10.2 Terrestrial habitats

*Maquis and Thermo-Mediteranean brush*

- Reference to Eunis habitat; F5.31 Helleno-Balkanic pseudomaquis
- Reference to EU HD Annex 1 – None
- Reference to Bern Convention Resolution No.4 (1998)-None
- Palaearctic habitat; 32.71 Helleno-Balkanic pseudomaquis

This habitat is the same as for Sections 4 and 5B+5C and can be found on the lower hilly and valley slopes of the study area, up to 300m a.s.l, while it is widespread in the hilly area at the the first part of the section till Lushnje and at the end of section 6+7, near Vajkan settlement. The plant community is dominated by the association of *Arbuto – Quercetum Ilicis* while it represents the second stage of degradation of *Quercetum ilicis* forest communities. This degradation comes as a result of fires, which regularly occur in this area, destroying the entire vegetation.

#### 4.2.10.3 Anthropogenic habitats

<u>Agricultural land</u>

*Field and acres*

- Reference to Eunis habitat;- I1.3. Arable land with unmixed crops grown by low-intensity agricultural methods
- Reference to EU HD Annex 1 –None
- Reference to Bern Convention Resolution No.4 (1998); None
- Palaearctic Habitat; 82.3 Extensive cultivation

Fields and acres are the most widespread habitat along Sections 6 and 7. There are agricultural areas along the entire length of the Sections in both sides. Field and acres are cultivated with vegetables, vineyard, crops; mostly corn and grain, and also fooder, watermelon, vegetables, potatoes and fruit trees. Sections 6 and 7 are characterized by high agricultural activity.

*Bushes and hedges on the slopes*

The most common natural species, developed on hilly slopes, are Blackthorn Tree (*Prunus spinosa L.)* and Prickly Juniper (*Juniperus oxycedrus L*.), *Phillyrea latifolia L*., Christ's Thorn (*Paliurus spina-christi Mill*.), Spring Rest- Harrow (*Ononis spinosa L*.), Scabiosa atropurpurea L., Cypress Spurge (*Euphorbia cyparissias L*.), Fierthorn (*Pyracantha coccinea Roem*.), Bladdersenna (*Colutea arborescens L*.),Hawthorn (*Crataegus monogyna Jacq*.), Oriental Hornbeam (*Carpinus orientalis Mill*.), Wild Basil (*Clinopodium vulgare L*.), Odorous Hellebore (*Helleborus odorus Waldst.et Kit*), False Brome [*Brachypodium sylvaticum (Huds.)*, etc. Bushes are also developed on hilly slopes, represented by *Pruno-Crataegum* association species.

*Fruit trees and Orchards*

- Reference to EUNIS Habitats: G1. D4 Fruit orchards
- Reference to EU HD Annex I: none
- Reference to Bern Convention Res. No. 4 1996: none

This habitat is mostly represented in Sections 6 and 7 by olive groves, peaches, vineyards and citrus fruit.

*Evergreen orchards and groves*

- Reference to EUNIS Habitats:G2.91 Olive groves
- Reference to EU HD Annex I: None
- Reference to Bern Convention Res. No. 4 1996: G 2 Broadleaved evergreen woodland

The eastern side of the hilly terrain in the beginning of the Section is characterized by olive plantations. This habitat is also widespread in the hilly area of the end of the section. Olive plantations are an important source of income for the local population.

<u>Settlement, industrial and other artificial habitats</u>

*Rural and urban peripheries settlements*

- Reference to EUNIS Habitats: J1.2. Residential buildings of villages and urban peripheries
- Reference to EU HD Annex I: None
- Reference to CoE BC Res. No. 4 1996: None

Sections 6 and 7 passes by the periphery of the city of Lushnje and by some villages. Rural settlements are surrounded by agricultural land. Bushes and Hedges are spread near settlements, while the plant community Crataego – Prunetum spinosae dominates the area. This plant community is characterized by the species such as *Prunus spinosa, Crataegus monogyna, Ligustrum vulgare, etc.*

*Small scale cultivated garden areas*

- Reference to Eunis habitat; I2.22 Subsistence garden areas.
- Reference to EU HD Annex 1 – None
- Reference to Bern Convention Resolution No.4 (1998)-None
- Palaearctic habitat; 85.32 Subsistance gardens

This habitat is close to rural settlements and is related with the cultivation of vegetables, fruit trees or other domestic crops in the immediate vicinity of a dwelling. Houses are surrounded by small gardens and fruit trees.

*Roads*

- Reference to EUNIS Habitats: J4 Transport networks and other constructed hard-surfaced areas J4.2 Road networks
- Reference to EU HD Annex I: none
- Reference to Bern Convention Res. No. 4 1996: none

This habitat includes the road surfaces, together with the surrounding highly-disturbed environment adjacent to roads, which may consist of roadside banks or verges. This habitat is widespread along the entire Sections 6 and 7, as they go on the existing road. It is characterized by the presence of ruderal species such as *Cichorium intybus L, Datura stremonium, Punicum virgatum, Lolium perrene, Arundo donax L, Urtica dioica, Datura stramonium,etc.*

**Figure 4-85 Roadsides along Sections 6 and 7**

*Industrial and commercial sites still in active use*

- Reference to EUNIS Habitats: J1.4 - Urban and suburban industrial and commercial sites still in active use
- Reference to EU HD Annex I: none
- Reference to Bern Convention Res. No. 4 1996: none

This habitat includes buildings of industrial or commercial use, such as factories, industrial units, gas stations, etc, located in different areas along the entire section. This habitat is under constant anthropogenic pressure.

**Figure 4-86 Commercial constructions along Rrogozhine Lushnje motorway**

*Agricultural construction*

- Reference to EUNIS Habitat: J2.4 Agricultural constructions
- Reference to EU HD Annex I: none
- Reference to Bern Convention Res. No. 4 1996: none

This habitat includes isolated greenhouses established for the purpose of agricultural activities and is widespread in different location along the sections 6 and 7. Greenhouses are used for the cultivation of vegetation, mainly tomato (*Solanum lycopersicum*), pepper *(Capsium annuum*) Strawberry (*Fregaria vesca).*

#### 4.2.10.4 Fauna

The biodiversity of these sections is poor and is related almost with the agricultural lands and settlements that surround the existing roads. Some of the agricultural lands on the peripheries of the Sections have been swamps and were drained during the years 1968-75. The draining system is currently under rehabilitation but still not working in the required conditions. That is why in some sites the stagnant water presence has been increased. This phenomenon has facilitated the presence of mosquitos such as *Aedes vexans, Culex pipiens, Culex impudicus, Culiseta annulata* etc. The abundance of mosquitos disturbs the everyday life of the inhabitants, so, they use pesticides to control the mosquito presence in their settlements and surroundings. Other pesticides are used to control pests of crops and others for the agricultural production. This overuse of pests affects the presence of fauna in agricultural lands in the surrounding areas of Section 6 and 7. During summer, flocks of green grasshoppers, suborder of Caelifera, come from the south Mediterranean countries and create damages in crops in such agricultural lands. For the description of the fauna of these Sections, please refer to the agricultural land and other managed habitats, as mentioned in Section 2, while for the fauna with specific conservation status, relevant Annex will be prepared for the PESIA. No major river runs along both Sections. Therefore, the biodiversity mainly refers to the terrestrial habitats and to small natural streams, agricultural channels and reservoirs.

<u>Terrestrial fauna</u>

*Insects*

The Large Tortoiseshell (*Nymphalis polychloros*), Peacock butterfly (I*nachis io*), Red admiral (*Vanesa atalanta), Cynthia cardui,* Comma butterfly *(Polygonia C-alba),* Lesser fiery copper *(Thersamonia thersam*on) and Tree grayling (*Hipparchia statilinus*) can be mentioned among the insectivores with specific status.

*Amphibian and Reptiles*

The Common toad (*Bufo bufo*), European green toad (*Bufo viridis*) and frogs such as European tree frog (*Hyla arborea*), *Rana dalmatica, Rana balcanica* (*Pelophylax kurtmuelleri*), Rana Verde and Pool frog (Rana lessonae) can be mentioned among the amphibians with conservation status in Sections 6 and 7. The European pond turtle (*Emys orbicularis*), Caspian turtle (*Mauremys caspica*), Hermann's tortoise *(Testudo hermani*), Kotschy's gecko *(Gymnodactilus kotschije*), Mediterranean house gecko (*Hemidactylus turcicus*), Balkan green lizard (*Lacerta trilineata*), European green lizard (Lacerta viridis), Common wall lizard (*Podarcis muralis*), *Ophisarus apodus, Coluber jugularis,* Balkan whip snake (Coluber gemonensis), Aesculapian snake (*Elaphe longissima*), Four-lined snake (*Elaphe quatrolineata*), Green snake (*Natrix natrix*), Dice snake (Natrix tessellate) and European cat snake (Telescopus fallax) can be mentioned among reptiles with specific status in Section 6 and 7.

**Figure 4-87 Rana verde**

*Birds*

The birds of these Sections are characteristic for living in or surrounding agricultural land, settlements and infrastructure sites. They are represented by small passerines such as finches Erithacus rubecula, Miliaria calandra, Passer domesticus, Troglodytes troglodytes, larks (Alaudidae). Among garden birds, species with specific values regarding their visual and singing aspects are goldfinches, green finches, chaffinches and nightingale, warblers, etc. The most typical birds of shrub vegetation, found in between agricultural parcels and bordering the irrigation and draining channels, are *Sylvia atricapilla, Sylvia melanocephala, Emberiza spp, Cettiacetti* etc.

**Figure 4-88 European robin (Erithacus rubecula)**

*Mammals*

Mammals in these Sections are very rare due to the intensive human interventions. Several rats and vole are seen in the surroundings of settlements and in the agricultural areas. Weasel, polecat and European mink live in the periphery of agricultural lands and in rocks and woodlands of foothills, far away from the road corridor. However, they have been also seen, hunting into the agricultural lands and between the line of trees and shrubs of the channels and small streams.

### 4.2.11 Biodiversity in Section 8

The main habitat along Section 8 is agricultural land, followed by rural settlements. Agricultural areas and areas of natural grasslands are found mainly in the lower hilly terrain of this Section. The aquatic habitats include the Semani river and other stagnant waterbodies, irrigation and draining channels etc. The Section is already under construction, while it is described below for the holistic overview for the Project.

#### 4.2.11.1 Aquatic habitats

The aquatic vegetation and flora are very poor due to the high contamination of the river water by oil extraction and treatment industry, and discharges of waste waters from surrounding settlements in the river body. The Semani river waters have similar characteristics with other Albanian polluted rivers (please refer to the Erzeni and Shkumbini Rivers in Section 5), but the Semani waters vegetation is much less abundant, because of the effects of oil contamination in the site under study.

*Large rivers*

- Reference to EU HD: No specific reference
- Reference to Palaearctic Habitats: 24. Rivers and streams
- Reference to Water Framework Directive (EEC 60/2000): lowland medium/small river type

Semani river represents one of the main rivers along the highway corridor, while it has a slow flow and it is crossed by the road corridor in the beginning of the Section. Most of the species present in this aquatic habitat are relatively widespread in the habitats of rivers and streams of Albania. Riparian forests are mostly dominated by the deciduous trees of *Platanus orientalis*. They can form communities rich in species with accompanying species such as *Salix alba, S. elaeagnos, S. purpurea, Alnus glutinosa, Populus alba ets.*

*Littoral zone of inland surface waterbodies (Drainage and Irrigation channels)*

- Reference to EUNIS habitat - C3.2 : Water-fringing reedbeds and tall helophytes other than canes

- Reference to EU HD Annex 1 – None
- Reference to Bern Convention Resolution No.4 (1998); None

This habitat is very widespread along the entire Section 8. It is located alongside the main irrigation channel and its branches, in several drainage channels and along some parts of Semani River where the flow is slow. For the habitat description and the dominant species of this plant community in this habitat, please refer to the habitat with the same name of the Sections 6 and 7.

#### 4.2.11.2 Terrestrial habitats

Forest and woodland

*Mediterranean riparian woodland*

- Reference to Eunis habitat; - G1.381 Helleno-Balkanic riparian plane forests
- Reference to EU HD Annex 1 – 92C0 orientalis and Liquidambar orientalis woods (Platanion orientalis)
- Reference to Bern Convention Resolution No.4 (1998); G 1.3. Mediterranean riparian woodland
- Palaearctic Habitat Classification; 44.711 Helleno-Balkanic riparian plane forests

The small fragmented and less-disturbed riparian forests in Semani River valley are characterized by plane tree (Platanus orientalis), willow species (*Salix alba, Salix fragilis*) and poplar (*Populus* sp). The plant community is characterized by species such as White willow (*Salix alba*), Black willow (S. elaeagnos), (S. *purpurea*), Common alder (*Alnus glutinosa*), Juda tree (*Cercis siliquastrum*), (Celtis australis), White poplar (*Populus alba*), Black poplar ( *P. nigra*), *Fraxinus ornus, Crataegus monogyna, Cornus sanguinea, Vitex agnus-castus, Rubus spp., Rosa sempervirens, Hedera helix, Clematis vitalba, Vitis vinifera ssp. sylvestris, Ranunculus ficaria, Aristolochia rotunda, Saponaria officinalis, Hypericum perforatum, Brachypodium sylvaticum, Dactylis glomerata.*

**Figure 4-89 Riparian forest in Semani River Valley**

#### 4.2.11.3 Anthropogenic habitats

Agricultural land

*Fields and acres*

- Reference to EUNIS: I1.3 Arable land with unmixed crops grown by low intensity agricultural methods
- Reference to EU HD Annex I: none

This habitat includes field and acres cultivated mostly with traditional crops such as corn, vegetables, fooder (*Medicago sativa),* barley (*Hordeum vulgare*) fruit trees, vineyards.

Orchards and groves

The olive groves habitat is found in the hilly area of the beginning of the Section till Mbrostar and in the hilly area from Havaleas settlement to the end of the Section. Please refer for the classification as well as the description of the habitat of the olive groves to Sections 6 and 7.

*Abandoned arable land with significant areas of vegetation*

This habitat is largely widespread in the hilly zone, from the middle to the end of the Section 8. Arable land that was abandoned about 15-20 years ago, already supports a semi-natural group species. The characteristic species of this habitat are *Ditrichia viscosa, Bromus hordeaceus, Centaurea cyanus, Agrostemma githago, Ranunculus arvensis, Papaver rhoeas, Malva sylvestris, Cirsium* vulgare etc. This type of habitat is often subject to intensive grazing or heavy cutting for providing livestock forage.

<u>Settlement, industrial and other artificial habitats</u>

*Rural Settlements*

- Reference to EUNIS Habitats: J1.2. Residential buildings of villages and urban peripheries
- Reference to EU HD Annex I: none
- Reference to Bern Convention Res. No. 4 1996: none
- Reference to Palaearctic habitat; 86.22 Villages peripheries

Rural settlements are encountered along the entire section. This habitat is surrounded by agricultural land. There are small gardens in the vicinity of houses planted with vegetables, fruit trees and surrounded by agricultural land cultivated with corn and fodder. The plant species spread close to the settlements, roadsides and also cultivated areas is represented by the association of *Arundo donax L, Populus alba, Robinia pesudoacacia*, etc.

#### 4.2.11.4 Fauna

As it is mentioned before, Section 8 runs over Fier bypass and is covered by the studies done before for this motorway. Therefore, some general details for fauna are given below in order to offer an overview of the Section, by mentioning the species with specific status, defined by previous studies and field surveys along the Section.

The *Limenitis reducta, Nymphalis antiopa, Vanesa atalanta, Cynthia cardui* and from Nymphalidae family can be mentioned the *Hiparchia fagi, Hipparchia semele and Hipparchia statilinus* from the Nymphalidae family can be mentioned among insects with conservation status.

The Common newt (*Triturus vulgaris*), Yellow-bellied toad (*Bombina variegata)*, Common toad (*Bufo bufo*), European green toad (*Bufo viridis*), Agile frog (*Rana dalmatica*), Rana balcanica (*Pelophylax kurtmuelleri*) and Pool frog (*Rana lessonae*) can be mentioned among the amphibians with specific status. The abandoned agricultural lands and natural shrubs and rocks are rich with reptiles such as *Algyroides nigropunctatus, Podarcis tauricus, Pseudopus apodus, Typhlops vermicularis*, European pond turtle (*Emys orbicularis*), Caspian turtle (*Mauremys caspica*), Hermann's tortoise (*Testuda hermani*), Kotschy's gecko (*Gymnodactilus kotschije*), Balkan green lizard (*Lacerta trilineata*), European green lizard (*Lacerta viridis*), Common wall lizard (*Podarcis muralis*), *Anguis fragilis, Ophisarus apodus, Coluber jugularis*, Balkan whip snake (*Coluber gemonensis*), Aesculapian snake (*Elaphe longissima*), Four-lined snake (*Elaphe quatrolineata*), Dice snake (*Natrix tessellate*), Green snake (*Natrix natrix*) and Long-nosed viper (Vipera ammodytes).

Most of the fish of Section 8 are related to the Semani River. The pollution has conditioned a poor abundance of fish. The Devolli and Osumi Rivers, branches of the Semani River are rich in fish, while the situation changes in the point that both branches meet together and create Semani River, where pollution deriving from the remains of oil treatment factories begins. In rare and sporadic cases, the fishers and researchers inform for the presence of some species of fish in Semani River which come from the abovementioned branches. Among these fish species, the *Oncorhynchus mykiss, Alburnoides fangfangae, Alburnoides devolli, Alburnus scoranza, Gobio gobio, Carassius spp., Chondrostoma nasus, Pachichilon pictum, Pseudorasbora parva, Lepomis gibossa, Oxynoemacheilus pindus, Chelon ramada* can be mentioned.

Among birds with specific status of Section 8, the Eurasian eagle-owl (*Bubo bubo*), Common redstart (*Phoenicurus phoenicurus*), Western Orphean warber (*Sylvia hortensis*), Great Reed Warbler (*Acrocephalus arundinaceus*) can be mentioned.

Finally, among the mammals of the surrounding territory of Section 8, the European free tailed bat (*Tadarida teniotis*) and Badger (*Meles meles*) can be mentioned.

**Figure 4-90 Great Reed Warbler (Acrocephalus arundinaceus)**

### 4.2.12 Biodiversity in Section 9A2

This Section goes close to the Vjosa River, runs over the existing road and touches some hilly foot where heathland and shrub habitats are encountered. The aquatic habitats include large rivers (Vjosa River and its branches) and the littoral zone of inland surface water bodies (drainage and irrigation channels). Section 9A2 goes over scarce biological habitats (existing road), damaged during the years by human activities and related infrastructure. An exception is Vjosa River body, which is characterized by good water quality. Vjosa River, together with its branches, have natural waters, less impacted by the human activities compared to other Albanian Rivers. The terrestrial habitats include natural habitats, the Vjosa river valley, hill foot and anthropogenic habitats with agricultural and constructed land, industrial areas and other intensive managed habitats.

The Vjosa valley habitats (aquatic and terrestrial ones) are considered as very important from biodiversity point of view. Endemic species and migratory ones are found by last ivestigations in the River valley. Vjosa River is a International River Body, shared by Albania and Greece. Different types of aquatic habitats can be distinguished within the active river body. Their ecological characteristics change continuously with the expansion and contraction of the river, i.e. regarding the water table height. Even small water level fluctuations and "flow pulses" lead to continuous changes in the flowage line and habitat conditions, especially for the aquatic biota and the riparian fauna.

Moreover, the geographic position of the main arm shifts with each major flood pulse. Under such hydrologically dynamic conditions the application of the Amoros-Roux classifcation of water body types for floodplain rivers (e.g. eupotamal, parapotamal, plesiopotamal) is not easily applicable.

Regarding the main branches of the rivers and Sections 9B2, 10, 11, 13A, the beds are generally shallow, with a maximal depth of approximately 3–4 meters in erosion zones. Regarding the central runs, the compaction of sediments is generally high, however the variability in the relief causes local runs with loose gravel. Thus, micro-habitat conditions show a high variability, which is of significance for the colonisation of macrozoobenthos and fish. A characteristic aquatic habitat type within the active channel is erosion pools, especially along the borders of the elevated floodplains or behind obstacles such as eroded trees and eroded parts of the higher floodplains. Their areal extent is low. These small to medium sized (a few m2 to 1000 m2) pools partially retain water during low water phases and allow for intensive growth of algae.

Very few such aquatic backwaters were found in the whole floodplain section between Poçemi and Memaliaj wetlands along hillslope streams entering the floodplains. Such habitats characterized by low flow and fne-grained deposits were found along the outer floodplain borders at Kute and Tepelena. Along the course of such small streams, different successional stages can be identifed:

a) slowly flowing water with Typha spp., Veronica anagallis-aquatica, Bolboschoenus maritimus, Scirpoides holoschoenus, Alisma plantago-aquatica and others,

b) early succession stages with characteristic shrub vegetation Salix alba, S. triandra, Populus alba and others and

c) succession stages with small trees in ditches that are flled with water only during flooding events.

In some areas, these wetlands comprised of small shallow pools and low current running water with a rich invertebrate and fish community (e.g. Pelasgus) and *Emys orbicularis*. Terrestrial habitats on elevated bars within the active channel and the floodplains exhibit an even higher complexity, dependent on sediment sorting processes, elevation above mean water table, frequency of flooding, distance from the thalweg, etc. The main factors for differentiation within the floodplain are:

- Sediment composition (grain size diameter) as a main factor for the germination of plants (water capacity),
- Intervals and dimension of flow pulses resulting in a time span for vegetation development, The situation of the groundwater table and its connection with the fne grained sediment cover, i.e. water retention capacity,
- Transformation by human impact (gravel mining, logging, burning, grazing). Along the transects through the river-floodplain complex, an enormous range of transition zones occurs at small scale.

Terrestrial species which are characteristic of highly dynamic riverine systems are exceptionally sensitive to hydromorphological changes regarding discharge, flow regime and sediment budget. Any impacts on these parameters may lead to a decrease or extinction of these highly vulnerable taxa observed at the Vjosa. To underline the high conservation status of the Vjosa area, the spider *Liocranoeca vjosensis* is a new species for science that has never been observed anywhere else, worldwide (The Vjosa in Albanian, a Riverine Ecosystemn of European significance, 155/1, Acta ZooBot Austria, 2018).

The diversity of habitats and geo-morphology of the area has conditioned a high development of wildlife. The brown bear, wild cat, wolf, fox, martin, badger and otter can be counted among the high fauna with international significance.

#### 4.2.12.1 Aquatic habitats

*Large rivers*

- Reference to Habitat Directive: No specific reference
- Reference to Palaearctic Habitats: 24. Rivers and streams
- Reference to Water Framework Directive (EEC 60/2000): lowland medium/small river type

Vjosa river is one of the largest rivers along the AIC corridor. The lower valley of this river is characterized by mixed Oak forests (*Quercus sp.*) and Strawberry trees (*Arbutus andrachne*), while the river system is characterized by large gravel banks with pioneer vegetation, ponds and alluvial forests with *Platanus orientalis* and Willows (*Salix spp.).*

**Figure 4-91 Riverbed vegetation in Vjosa river**

*Water fringing reedbed and helophytes*

- Reference to Eunis habitat; C3.21. Common reed ([Phragmites]) beds
- Reference to EU HD Annex 1 – None
- Reference to Bern Convention Resolution No.4 (1998); None

This habitat is located in some parts of Vjosa River where the flow is low as well as in irrigation and draining channels and other small running water bodies. The vegetation type in this habitat is represented by reedbeds (*Phragmites australis*). Other dominant species of this habitat are *Typha angustifolia , Lythrum salicaria, Polygonum hydropiper, Polygonum lapathifolium, Sium latifolium, Gratiola officinalis, Cladium mariscus, Alisma plantago-aquatica, Sparganum erectum etc.*

#### 4.2.12.2 Terrestrial habitats

<u>Heathland and scrub</u>

*Garrigues*

- Reference to Eunis habitat; F6.3Illyrian garrigues
- Reference to EU HD Annex 1 – None
- Reference to Bern Convention Resolution No.4 (1998); None
- Reference to Palaearctic habitat; 32B-Illyrian garrigue

This habitat is encountered before the end of Section 9A2 and is dominated by *Quercus coccifera* sp. The habitat is fragmented due to anthropogenic influence related to agricultural practices such as olives and vineyards cultivation. Other characteristic species which are found in this habitat are *Pyrus amygdaliformis, Phlomis fruticosa, Phillyrea latifolia, Pistacia terebinthus, Euphorbia characias, Hypericum perfoliatum, Cistus incanus, etc*. In those areas, the vegetation floors are not well developed because of intensive human interventions.

<u>Forest and woodland</u>

*Thermophilous forest*

- Reference to Eunis habitat; G1.78. Trojan oak woodland

- Reference to EU HD Annex 1 – 9250 –Quercus trojana wood
- Reference to Bern Convention Resolution No.4 (1998);G 1.7 Thermophilous deciduous woodland

This habitat is developed in the hilly areas of Mallakaster and is usually situated on calcareous rocks, covered by a thin layer of clay. The plant community is dominated *by Quercetum trojanae* species and is degraded due to human activities such as tree cutting and overgrazing.

*Mixed riparian gallery*

- Reference to Eunis habitat; G1.22324. Albanian ash-oak-alder forests
- Reference to EU HD Annex 1 – none
- Reference to Bern Convention Resolution No.4 (1998); G 1.22 Mixed Quercus - Ulmus - Fraxinus woodland of great rivers Palaearctic habitat; 44.4324 Albanian ash-oak-alder forests

This habitat is widespread in the lower part of the river valley, near Frakulla e Madhe up to the river outlet, where the flow is low, and the substrate is composed mainly of sand and clay. The plant community is dominated by *Alnus glutinosa, Fraxinus angustifolia, Ulmus minor, Quercus robur (*very few and sparse individuals*), Populus alba etc.*

*Riparian willow and poplar belts*

- Reference to Eunis habitat; G1.11 Riverine [Salix] woodland - G1.112 Mediterranean tall [Salix] galleries (G1.1121 Mediterranean white willow galleries)
- Reference to EU HD Annex 1 – 92A0 Salix alba and Populus alba galleries
- Reference to Bern Convention Resolution No.4 (1998); G1.11 - Riverine Salix woodland
- Palaearctic habitat; 44.141 Mediterranean white willow galleries

Riparian willow and poplar belts are widespread near the riverbanks of Vjosa river, especially close to Pocemi village as well as in Kashishte village. Characteristic species of this habitat are *Populus alba, Populus nigra, Alnus glutinosa, Alnus incana, Platanus orientalis, Ulmus minor, Ulmus glabra, Fraxinus angustifolia,* etc. In some parts of the river, mainly in gravel substrates, the plant community is represented by *Willow species Salix* sp associated with *Platanus orientalis, Salix elaeagnos*, etc. The grassland vegetation is generally poor.

*Meadows*

- Reference to EUNIS Habitats: E2.238 Southwestern Moesian submontane hay meadows
- Reference to EU HD Annex I: 6510 Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)
- Reference to Bern Convention Res. No. 4 1996: E2.2 - Low and medium altitude hay meadows

Herbaceous vegetation is developed in the meadows of the Buzemadh and Karbunare area, dominated by Graminacea and Leguminacea plant species, such as *Festuca sp, Trifolium Vicia spp, Urtica dioica, Sanguisorba oficinalis, Melisa oficinalis, Papaver rhoeas, Melisa oficinalis, Cichorium intybus species.*

<u>Inland unvegetated or sparsely vegetated habitats</u>

*Bare rock with scarce vegetation*

- Reference to Eunis Habitat; H3; Inland cliffs, rock pavements and outcrops
- Reference to EU HD Annex 1 –None
- Reference to Bern Convention Resolution No.4 (1998); None

This habitat is located in the southern part of the study area of Kashishte and Gjonc, while it is fragmented. This habitat supports a very limited habitat vegetation. The most common species in the limestone rocks are *Phillyrea medii L. and Juniperus sp, Crategus monogyna, Rosa sp,* etc. The botanical value of the vegetation and habitats in this area is low.

#### 4.2.12.3 Anthropogenic habitats

Agricultural land

The main habitats encountered regarding agricultural land are:

- *Field and acres are the dominant habitat along this section*
- *Line of trees is encountered in the side of the road between parcel and settlements*
- *Olive groves are widespread mostly in the hilly terrain between km 13+000-21+000*
- *Orchards*

For the description and classification of the aforementioned habitats, please refer to Section 8.

Constructed, industrial and other artificial habitats

The main habitats regarding constructed, industrial and arificial habitats are:

- *Rural settlements (widespread close to existing road)*
- *Roads*
- *Agricultural construction (widespread at each side of the road from Frakull to Kashisht).*

Ruderal vegetation is developed in both sides of the existing road, over which Section 9A2 runs and is characterized by the presence of species of *Cichorium intybus L, Datura stremonium, Punicum virgatum, Lolium perrene, Arundo donax L, Urtica dioica, Datura stramonium,etc.*

#### 4.2.12.4 Fauna

The Section 9A2 is very rich on the fauna, due to the low human presence in natural sites.

Aquatic Fauna

The aquatic fauna of this Section is present in Vjosa River and its branches such as the Drinos River and their valleys. Several studies have shown that Vjosa River has a very high importance not only at a national but also at an international level. The description of the aquatic fauna of the Vjosa River Valley, is a little more detailed below, since this fauna is characteristic also for the Sections 9B2, 10, 11, 12 and 13B.

*Aquatic Insects*

Vjosa River and its surroundings, together with Buna River are the richest rivers in Albania, regarding the presence of insectivores. There have not been detailed studies and inventories on insects in these river valleys. The Ephemeroptera taxa encountered in Vjosa River maybe divided into three groups: (1) taxa endemic to the Balkans, (2) potamalic taxa, characteristic for large rivers and formerly widely distributed throughout Europe (*Choroterpes picteti, Brachycercus harrisellus, Caenis pusilla*) or the Western Palaearctic (*Heptagenia longicauda, Neoephemera maxima, Prosopistoma pennigerum*), and (3) comparatively common taxa occupying a rather wide range of habitats throughout the Western Palaearctic (*Siphlonurus lacustris, Baetis muticus, B. rhodani, Centroptilum luteolum, Procloeon bifdum, Paraleptophlebia submarginata, Torleya major*), Palaearctic (*Procloeon bifdum, Heptagenia sulphurea, Ephemerella ignita, Caenis macrura, C. pseudorivulorum, C. rivulorum*), or even Holarctic realm (*Procloeon pennulatum, Cloeon dipterum*).

*Fish*

Vjosa River and its branches is of outstanding importance for various migratory fish species, i.e. the critically endangered European eel (*Anguilla Anguilla*) as well as sub-endemic fish species such as the Ohrid loach (*Cobitis ohridana*) and the Pindus stone loach (*Oxynoemacheilus pindus*). Other fish species found in the Vjosa River and its branches are the *Petromizon marinus, Acipenser sturio, Acipenser Pelasgus thesproticus* *naccarii, Salmofaroides, Oncorhynchus mykiss, Alburnoidesaff. Prespensis, Alburnus scoranza, Barbus prespensis, Luciobarbus albanicus, Gobio skadarensis, Squalius platyceps, Carassius spp., Chondrostoma ohridana, Pachichilon pictum, Pseudorasbora parva, Chelon aurata, Chelon labrosus, Chelon labrosus, Chelon ramada, Chelon ramada, Chelon saliens* etc.

The sea lamprey (*Petromyzon marinus*) is an anadromous species, which migrates into rivers to spawn. It is a very rare species in the coastal parts of Albania, while its presence within country is poorly documented. Ichthyological surveys examine very seldom this species. *Alosa fallax* -was formerly widespread in the sea and in larger rivers, while it has declined in numbers and distribution the last years. It has been recorded in the lower course of the Vjosa (close to confluence with Narta), while as a migratory fish, it swims from the sea up to rivers to spawn during spring. *Pachychilon pictum* is endemic to the Balkan and found in large numbers in the Vjosa River and its tributaries. It inhabits slow flowing rivers, canals and backwaters.

*Aquatic amphibians and reptiles*

The knowledge about amphibians and reptiles of the Vjosa River is very scarce. The only published information is that of Oruci (2010b) on amphibians of thermal waters of Benja along the Lengarica stream (a tributary of Vjosa River), where only two species were recorded (Rana balcanica (*Pelophylax kurtmuelleri*) and Greek Stream frog (*Rana graeca*). During the last three years, some groups of researchers have done a range of surveys on amphibians and reptiles of Vjora River Valley. Among the amphibians found in the Vjosa valley and its surrounding habitats, agricultural lands and bushes of hill foots, there can be mentioned the Common toad (*Bufo bufo* - a protected species, listed in Appendix III of the Bern Convention and in the National Red List of Flora and Fauna of Albania), the European green toad (*Bufos viridis*), the Yellow-bellied toad (*Bombina variegate*), the Balkan water frog (P*elophylax kurtmueller*), the Marsh frog (*Pelophylax ridibundus*), the Albanian pool frog (*Pelophylax shqipericus* - considered as an endangered species in Albania) and the Greek stream frog (*Rana graeca* - a protected species listed in Appendix III of the Bern Convention).

Among the reptiles, the European pond turtle (*E. orbicularis*) can be mentioned, which is considered as a semi-aquatic turtle and the Dice snake (*Natrix tessellata*), which is abundant on stagnant waters and very rare in running waters and is a strictly protected species listed in Appendix II of the Bern Convention and in Annex IV of the EU Habitats Directive.

*Aquatic Birds*

The area provides breeding ground for Stone curlew (*Burhinus boedicnemus*), Little ringed plover (*Charadrius dubius*) etc. and foraging ground for the Little tern (*Sterna albifrons*), Egyptian vultures (*Neophron percnopterus*) and the Lesser Kestrel (Falco naumanni). Due to the lack of knowledge, the status of some species is unclear. For example, the Little tern (*Sterna albifrons*) is regularly seen along Section 9A, however its nesting sites have not been recorded yet.

*Aquatic mammals*

The most important aquatic mammal species found in Vjosa River and its branches is the European otter (*Lutra lutra*), which is a globally threatened species. Water voles are encountered more to ponds in the peripheral part of the running waters.

<u>Terrestrial Fauna</u>

Section 9A2 runs almost over the existing road. Therefore, due to human pressure and presence as well as frequent management of agricultural lands, the terrestrial fauna of this Section is relatively poor.

*Terrestrial insects*

The terrestrial insects of Section 9A2 are much related to aquatic habitats. Most of the insect species are nesting in waters and feeding and living in terrestrial habitats. Among the most important insects, the Red admiral (*Vanesa atalanta), Rhyacophila diakoftensis, Rhyacophila nubile, Agapetus laniger, Agapetus rectigonopoda, Cyrnus trimaculatus, Polycentropus ieraptera dirfs, Allotrichia vilnensis, Allotrichia pallicornis, Lype reducta, Psychomyia pusilla, Tinodes unicolor, Ecnomus tenellus, Tinodes waeneri, Limnephilus graecus, Stenophylax mitis, Adicella syriaca, Leptocerus interruptus, Leptocerus tineiformis, Mystacides azurea* can be mentioned. Mayflies can be considered an important group of insects in the terrestrial, shrub land and roadside vegetation. From the Phaneropteridae family, *Poecilimon gracilioides* (subendemic in Albania and Greece), Poecilimon jonicus jonicus, Poecilimon ornatus, *Poecilimon zimmeri* (subendemic in Albania and Greece), *Tylopsis lilifolia* etc. can be encountered, while arthropodas such as ants (carpenter ant, fire ant (woodlands), black garden ant and alpha ant) are found among terrestrial insects.

*Terrestrial Amphibians and reptiles*

The Hermann's tortoise (*Testudo hermanni*) and the Balkan terrapin (M*auremys rivulata*) live in aquatic surroundings with or without swamps, canals or streams. The European grass lizard (*Pseudopus apodus*), lives in grassland fields or sparsely wooded hills and is a strictly protected species listed in Appendix II of the Bern Convention, in Annex IV of the EU Habitats Directive and in the National Red List of Flora and Fauna of Albania. Additionally, the Common wall lizard (*Podarcis muralis*), the Balkan wall lizard (*Podarcis tauricus*), which is a strictly protected species listed in Appendix II of the Bern Convention, in Annex IV of the EU Habitats Directive and in the National Red List of Flora and Fauna of Albania and the Grass snake (*Natrix natrix*), which is a common snake all over Albania, can be identified.

*Terrestrial birds*

The terrestrial birds of Section 9A2 are almost related to agricultural lands, fruit trees and brushes of foothills. Among these birds, there can be mentioned those being fed with insects or seeds such as the Eurasian blue tit (*Cyanistes caeruleus*) and Warblers (*Sylvia* spp), Robin (*Erithacus rubecula*), Wren (*Troglodytes troglodytes*), Buntings (*Emberiza* spp), Goldfinch (*Carduelis carduelis*), Grey and yellow wagtail (respectively *Motacilla cinerea and Motacilla flava*), blackbird (*Turdus merula*) and Common Lark (Alauda arvensis). Flock of sparrows are fed via the agricultural crops during the springtime.  Other birds such as the European Magpie (*Pica pica*) and nocturne raptors such as the Eurasian eagle owl (*Bubo bubo*) are encountered in woodlands and are found in agricultural areas and in parcels with fruit trees. The presence of small birds, amphibians and reptiles is a good offer for food of raptors such as the Common buzzard, (*Buteo buteo*) and the Lesser kestrel.

**Figure 4-92 Eurasian blue tit [Cyanistes caeruleus] (left), European greenfinch [Chloris chloris] (right)**

*Terrestrial Mammals*

Several types of rats, field mice and voles live in agricultural areas, while the European free tailed bat (*Tadarida teniotis*) and Badger (*Meles meles*) are among the most important ones. Weasel (*Mustela nivalis*), polecat (*Mustela putorius*), and European mink (*Mustela lutreola*) live in the periphery of agricultural lands and in rocks and woodlands of foothills, far away from the road corridor.

### 4.2.13 Biodiversity in Section 9B2

This Section is composed mainly of aquatic vegetation, schlerophyllous vegetation, broad leaved forest, pastures, constructed and artificial habitat (existing road) and agricultural land with areas with natural vegetation. The main habitats of this Section are described below.

#### 4.2.13.1 Aquatic habitats

The aquatic habitats affected by the Section 9B2 is Vjosa River and its branches, as well as irrigation and draining channels operating in agricultural areas. The aquatic habitats of the Vjosa River, running close or crossed by Section 9B2 are quite undisturbed and very rich on biodiversity. For the aquatic habitats characterization and description, please refer to Section 9A2.

#### 4.2.13.2 Terrestrial habitats

<u>Grasslands and meadows</u>

*Hill Pastures*

- Reference to EUNIS Habitats: E1.332 - Helleno-Balkanic short grass and therophyte communities
- Reference to EU HD Annex I: 6220 Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea
- Reference to Bern Convention Res. No. 4 1996: E 1.3. Mediterranean xeric grassland

Pastures are widespread in the hilly terrain of Section 9B2. This habitat is characterized by short-perennial grassland often encountered in calcareous substrates. The plant community is represented by the association *Thero-Bracipodietalia.* Characteristic species of this habitat are *Bromus sp, Brachypodium distachyon sp., Aegilops sp.*, etc. This habitat is quite undisturbed and represents a great shelter and feeding area for wildlife.

*Meadows*

- Reference to EUNIS Habitats: E2.238 Southwestern Moesian submontane hay meadows
- Reference to EU HD Annex I: 6510 Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)
- Reference to Bern Convention Res. No. 4 1996: E2.2 - Low and medium altitude hay meadows

Herbaceous vegetation is developed in the meadows of the Mallakaster and Memaliaj hills, dominated by Graminacea and Leguminacea plant species, such as *Festuca sp, Trifolium Vicia spp, Urtica dioica, Sanguisorba oficinalis, Melisa oficinalis, Papaver rhoeas, Melisa oficinalis, Cichorium intybus species.* This habitat is quite undisturbed and represents a great shelter and feeding area for wildlife.

**Figure 4-93 Sub-Mediterranean meadows in the vicinity of AIC Section 9B2**

Heathland and scrub

*Garrigues*

- Reference to Eunis habitat; F6.3Illyrian garrigues
- Reference to EU HD Annex 1 – None
- Reference to Bern Convention Resolution No.4 (1998); None
- Reference to Palaearctic habitat; 32B-Illyrian garrigue

This habitat is frequently encountered along the Section 9B2, while is usually present in very eroded sites. The plant community of this habitat is dominated by Quercus coccifera species and in some cases the habitat is fragmented by agricultural practices such as olives, vineyards etc. Characteristic species of this habitat are those of *Pyrus amygdaliformis, Phlomis fruticosa, Phillyrea latifolia*, etc. The association of *Asphodelo – Paliuro Adriaticum* is widespread in the vicinity of Buzemadhi village. Species that belong to this association include *Thymus capitatus, Juniperus oxycedrus* etc. Another important association found in this habitat is *Cisto-Micromerietum*. The main characteristic species of this association are *Cistus incanus, C salviefolius and Micromeria juliana.*

Forest and woodland

*Thermophilous forest*

- Reference to Eunis habitat;  G1.78.  Trojan oak woodland
- Reference to EU HD Annex 1 –  9250 –Quercus trojana wood
- Reference to Bern Convention Resolution No.4 (1998);G 1.7 Thermophilous deciduous woodland

This habitat is developed in hilly areas between Mallakaster and Memaliaj and is usually situated in calcareous rock, covered by a thin layer of clay. The plant community is dominated *by Quercetum trojanae* species and is degraded due to human activities such as tree cutting and overgrazing. This habitat is rich on wildlife.

*Mixed riparian gallery*

- Reference to Eunis habitat; G1.22324. Albanian ash-oak-alder forests
- Reference to EU HD Annex 1 – none
- Reference to Bern Convention Resolution No.4 (1998); G 1.22 Mixed Quercus - Ulmus - Fraxinus woodland of great rivers Palaearctic habitat; 44.4324 Albanian ash-oak-alder forests

This habitat is widespread in the lower part of the river valley, near Frakulla e Madhe up to the river outlet, where the flow is low, and the substrate is composed mainly of sand and clay. The plant community is dominated by *Alnus glutinosa, Fraxinus angustifolia, Ulmus minor, Quercus robur (*very few and sparse individuals*), Populus alba etc.*

*Riparian willow and poplar belts*

- Reference to Eunis habitat; G1.11 Riverine [Salix] woodland - G1.112 Mediterranean tall [Salix] galleries (G1.1121 Mediterranean white willow galleries)
- Reference to EU HD Annex 1 – 92A0 Salix alba and Populus alba galleries
- Reference to Bern Convention Resolution No.4 (1998); G1.11 - Riverine Salix woodland
- Palaearctic habitat; 44.141 Mediterranean white willow galleries

Riparian willow and poplar belts are widespread near the riverbanks of Vjosa river, especially close to Pocemi village as well as in Kashishte village. Characteristic species of this habitat are *Populus alba, Populus nigra, Alnus glutinosa, Alnus incana, Platanus orientalis, Ulmus minor, Ulmus glabra, Fraxinus angustifolia,* etc. In some parts of the river, mainly in gravel substrates, the plant community is represented by *Willow species Salix* sp associated with *Platanus orientalis, Salix elaeagnos*, etc. The grassland vegetation is generally poor.

Inland unvegetated or sparsely vegetated habitats

*Bare rock with scarce vegetation*

- Reference to Eunis Habitat; H3; Inland cliffs, rock pavements and outcrops
- Reference to EU HD Annex 1 –None
- Reference to Bern Convention Resolution No.4 (1998); None

This habitat is located in the southern part of the study area of Karbunare, Qesarat and Iliras. and supports a very limited vegetation, while it is fragmented. The most common species in the limestone rocks are *Phillyrea medii L. and Juniperus sp, Crategus monogyna, Rosa sp,* etc. The botanical value of the vegetation and habitats in this area is low.

#### 4.2.13.3 Anthropogenic habitats

Agricultural land

*Field and acres*

- Reference to Eunis habitat; I1.3. Arable land with unmixed crops grown by low-intensity agricultural methods
- Reference to EU HD Annex 1 –None
- Reference to Bern Convention Resolution No.4 (1998); None
- Palaearctic Habitat; 82.3 Extensive cultivation

This habitat is widespread at each side of the existing road. The main species that are cultivated in this habitat are traditional crops such as corn, wheat, vegetables, fodder, olive tree. During the period that agricultural lands are not planted, they are used for grazing. This habitat has similar characteristics to the one described in Section 8.

**Figure 4-94 Agricultural lands in the Vjosa River Valley**

*Evergreen orchards and groves*

- Reference to EUNIS Habitats: G2.91 Olive groves
- Reference to EU HD Annex I: None
- Reference to Bern Convention Resolution No.4 1996: G 2 Broadleaved evergreen woodland

Olive plantation is widespread in the hilly part of the Section from Klos to Qesarat. The plantations form a characteristic landscape around the settlements in this area. This habitat has similar characteristics to the one described in Section 8.

Settlement, industrial and other artificial habitats

*Rural Settlements*

- Reference to EUNIS Habitats: J1.2. Residential buildings of villages and urban peripheries
- Reference to EU HD Annex I: none
- Reference to Bern Convention Res. No. 4 1996: none

There are settlements located at each side of the corridor, between agricultural lands, meadows and natural grassland. Houses in these villages are surrounded by small gardens and fruit trees. The herbaceous vegetation encountered close to the settlements and roadsides is represented by the associations of *Polygono – Potea annua and Artemisetea vulgaris*.

*Roads*

For the habitat categorization and description, please refer to the habitat with the same name of the Sections 6 and 7.

**Figure 4-95 View of ruderal vegetation in the side of the road of Section 9B2 and in the riverbank of Vjosa**

#### 4.2.13.4 Fauna

The habitats of Section 9B2, are rich in fauna because the natural sites are not suffering by the intense human presence or infrastructure. After the National Moratorium that has prohibited hunting for the last 7 years, different wildlife species return in their natural habitats.

Aquatic Fauna

Section 9B2 crosses or runs close to Vjosa River. For the fauna of this habitat, please refer to the Section 9A2.

Terrestrial Fauna

The habitats are very strongly related to Vjosa River basin. For the fauna of agricultural lands, settlements and infrastructure sites of Section 9B2, please refer to the fauna of the same habitats of the Section 9A2. Important continental mollusk species in this area are Cochlostomatidae (*Cochlostoma tessellatum tepelenum*), Hydrobiidae (*Orientalina lbanica*), *Radomaniola albanica* (from karstic springs), Grossuana euxina), Ellobiidae (*Myosotella myosotis*), Argnidae (*Agardhiella truncatella, Albinaria senilis inconstans, Oxychilus inopinatus*), Hygromiidae (*Monacha emigrata senitshika, Hiltrudia kusmici, Metafruticicola occidentalis*), Helicidae (*Liburnica albanograeca*) and Sphaeriidae (*Pisidium personatum*). European Otter is observed in Vjosa valley.

*Terrestrial Insects*

Taking into account the Albanian Red list (MoE 2013), the most important endangered terrestrial insects are the Dingy Skipper (*Erynnis tages*), the Inky Skipper (*Erynnis marloyi*), the Alexanor (*Papilio alexanor*), the African Monarch (*Danaus chrysippus*), the Dryad (*Minois dryas*), the Hermit (Chazara briseis), the Tree Grayling (*Hipparchia statilinus*), the Southern White Admiral (*Limenitis reducta*), the Cinnabar Moth (*Tyria jacobaeae*), etc.

*Terrestrial Amphibians and Reptiles*

From the sixteen types of Albanian amphibians, thirteen are observed in the Vjosa Valley and its surroundings. For more details, please refer to Section 9A2. Regarding reptiles, out of the thirty seven reptiles species reported in Albania, thirty two are present in the Vjosa watershed. Some of the most common reptiles are the Balkan whip snake (*Coluber gemonensis*), Leopard snake (*Elaphe situla*), Four-lined snake (*Elaphe quatuorlineata*), Hermann's tortoise (*Testudo hermanni*), European pond turtle (Emys orbicularis), Erhard's wall lizard (Podarcis erhardii), Balkan green lizard (*Lacerta trilineata*) and the

European green lizard (*Lacerta viridis*). The Vjosa catchment is also home for the Meadow viper (Vipera *ursinii ssp. graeca*, a species which was just recently found in Albania. For more data on reptiles, please refer to the Section 9A2.

*Terrestrial Birds*

Several migratory bird species are founf along the Section. More specifically, the Western capercaillie (*Tetrao urogallus*) lives in forests, while the Rock partridge (*Alectoris graeca*) and the Common quail (*Coturnix coturnix*) are found in meadows. The Rock pigeon (*Columba livia*) can be found on rocks, while the Common cuckoo (*Cuculus canorus*) and the White stork (*Ciconia ciconia*) are encountered close to settlements. These are very rare birds in Albania, which are fed mostly with amphibians, reptiles and inland fishes. The Common swift (*Apus apus*) is a migratory bird, which is very abundant close to settlements. Finally, the woodlands of this Section are rich on woodpeckers (*Dendrocopos syriacus, D. major, D. medius, D. minor*). As in Section 9A2, a rare presence of Egyptian Vulture, Black stork, European Kestrel maybe observed in the habitats of Section 9B2.

**Figure 4-96 Hawfinch (Coccothraustes coccothraustes)**

The Osprey (*P.andion haliaetus*), European honey buzzard (Pernis apivorus), Common buzzard (Buteo buteo), Eurasian kestrel (*Falco tinnunculus*), Peregrine falcon (*Falco peregrinus*) are among the predators in the natural vegetation, while the Eurasian scops owl (*Otus scops*) and Eurasian eagle owl (*Bubo bubo*) are in woodlands and forests among the nocturnal raptors.

*Terrestrial Mammals*

The European otter (*Lutra lutra*) is one of the significant elements of the Vjosa river system. Large carnivores live in the wider area of Section 9B2, such as the brown bear (*Ursus arctos*), wolf (*Canis lupus*), and European wild cat (*Felis silvestris*). Due to their mobility/movements, the large carnivores can be found in different habitats within the Vjosa River valley. The Chamois (*Rupicapra rupicapra balcanica*), the Roe deer (*Capreolus capreolus*) and the Wild boar (*Sus scrofa*) are also large mammals in the Vjosa watershed. Other characteristic mammals are the Red squirrel (*Sciurus vulgaris*), Fat dormouse (Glis glis), Hazel dormouse (*Muscardinus avellanarius*), Beech marten (*Martes foina*), Badger (*Meles meles*), Red fox (*Vulpes vulpes*) etc.

The study area is rich in bats, both cave-dwelling as well as forest bats. The most characteristic bats are *Rhinolophus euryale, R. blasii, R. hipossideros, R. ferrumequinum, Miniopterus schreibersi, Eptesicus serotinus, Myotis bechsteini, and M. capaccinii.*

### 4.2.14 Biodiversity in Section 10

All types of aquatic and terrestrial habitats described in Sections 9A2 and 9B2 are also present along Section 10. The natural forests and woodlands have the same characteristics as those of Section 9B2 but are more abundant in the hill foot and valleys. The vegetation of such habitats is very rich in wildlife. Olive groves habitat is not very widespread, but it can be found around Tepelene area. For the description of these habitats and their classification, please refer to the Section 9A2 (aquatic habitats) and Section 9B2 (other habitats).

Additionally to the aforementioned habitats, the following maybe encountered as well in terms of terrestrial habitats.

Oak-hornbeam forest

- Reference to EUNIS Habitats: G1.A1A - Illyrian Quercus - Carpinus betulus forests
- Reference to EU HD Annex I: none
- Reference to Bern Convention Res. No. 4 1996: G1.A1 Quercus - Fraxinus - Carpinus betulus woodland on eutrophic and mesotrophic soils

This habitat is encountered between Tepelene and Bence, is mostly widespread in Bence area, while it is dominated mainly by black hornbeam (*Caprinus orientalis*). This habitat is affected by human activities as a result of cutting, intensive grazing and deforestration. The main species of the habitat are *Caprinus orientalis, Paliurus spina-christi, Juniperus oxycedrus, Juniperus communis, Rubus ulmifolius, Crataegus monagina* etc. Herbaceous species are represented by *Brachypodium pinnatum, Veronica chamaedrys, Silene vulgaris, Trifolium medium, Campanula rapunculus* etc.

The fauna of this Section has the same characteristics as the one of Section 9B2 so please refer to the relevant Section.

### 4.2.15 Biodiversity in Section 11

This Section is also characterized by the same habitats as Section 9B2 does, except the olive groves habitat that is not widespread along this Section. The beginning of the Section 11 is dominated by sclerophyllous vegetation and broad-leaved forest, while the other part is characterized by natural grassland, agriculture lands and settlements. For the habitat classification, references and description, please refer to the section 9A2 for the aquatic habitats and section 9B2 for the other habitats. For the description of the fauna of Section 11, please refer to the Section 9A2.

The vegetation and flora of this sites consists on species of *Cichorium intybus L, Datura stremonium, Punicum virgatum, Lolium perrene, Arundo donax L, Urtica dioica, Datura stramonium*, etc. For the plants with specific status, please see Annex 3.

### 4.2.16 Biodiversity in Section 12

The main types of habitats in Section 12 are alluvial forests along the riverbanks, Mediterranean forests and shrubs (maquis formations) and agricultural lands. Section 12 goes over the Gjirokastra bypass, which has gone under EIA procedure and therefore has been studied. However, it is described in order to give a general overview. For the description of the fauna please refer to Section 9A2.

#### 4.2.16.1 Aquatic habitats

Section 12 goes close to the Drino River (branch of Vjosa River), so it has similar habitats as the other Sections which go over this river. Therefore, for the description and classification of the aquatic habitats, please refer to the Section 9A2/9B2.

#### 4.2.16.2 Terrestrial habitats

Forest and woodland

*Riparian willow and poplar belts*

- Reference to EUNIS Habitats: G1.11 Riverine [Salix] woodland - G1.112 Mediterranean tall [Salix] galleries (G1.1121 Mediterranean white willow galleries)
- Reference to EU HD Annex I: 92A0 Salix alba and Populus alba galleries
- Reference to Bern Convention Res. No. 4 1996: G1.11 - Riverine Salix woodland

Riparian willow and poplar belts are widespread on the banks of the Drino River. The plant community is covered with hydrophilic vegetation and the main associations of the alluvial forests are Alno-*Populetea and Salicetea purpurea* which consist of tree species such as *Platanus orientalis, Alnus incana, Populus alba, Salix alba, Salix purpurea, Salix amplexicaulis, etc.*

*Italian and Turkey oak forests*

- Reference to EUNIS Habitats: G1.76 Balkano-Anatolian thermophilous [Quercus] forests - G1.762 Helleno-Moesian [Quercus frainetto] forests
- Reference to EU HD Annex I: 9280 Quercus frainetto woods
- Reference to Bern Convention Res. No. 4 1996: G1.7 Thermophilous deciduous woodland

This Section is dominated by Italian and Turkey oak forests, which belong to the plant community *Quercetum frainetto-cerris.* The most frequent species of this community are the *Quercus frainetto, Quercus coccifera and Quercus cerris*, while the species of *Carpinus orientalis, Ostrya carpinifolia* are encountered at a considerable part of the Section at a degradation status. The grass floor is represented by the species of *Origanum vulgare, Psoralea bituminosa, Trifolium campestre, Dorycnium pentaphyllum, Brachypodium ramosum, Campanula glomerata, Dictamnus albus, Micromeria Juliana, Micromeria graeca, Bellis perennis, Dactylis glomerata.*

<u>Grasslands and meadows</u>

*Hill Pastures*

- Reference to EUNIS Habitats: E1.332 - Helleno-Balkanic short grass and therophyte communities
- Reference to EU HD Annex I: 6220 Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea
- Reference to Bern Convention Res. No. 4 1996: E 1.3. Mediterranean xeric grassland

This habitat is very little present along the study area and is encountered close to Valare. The description of this habitat is the same as for the section 92.

#### 4.2.16.3 Anthropogenic habitats

<u>Agricultural lands</u>

*Lines of trees*

- Reference to EUNIS Habitats: G5.1 Lines of trees
- Reference to EU HD Annex I: none
- Reference to Bern Convention Res. No. 4 1996: none

This habitat is widespread with Populus sp among agricultural parcels from Paleokaster to Gjirokaster. Black locust (*Robinia pseudoacacia*) with visual and aromatic values is cultivated as a plant which can control erosion. Other plant species such as *Platanus orientalis, Rubus ulmifolius and Arundo donax* are also present in the roadsides and between agricultural parcels.

*Field and acres*

- Reference to EUNIS: I1.3 Arable land with unmixed crops grown by low intensity agricultural methods
- Reference to EU HD Annex I: none
- Reference to Bern Convention Res. No. 4 1996: none

Agricultural lands are encountered along the majority of the Section. In most cases, corn, wheat, vegetable, fodder and fruit trees are cultivated.

*Recently abandoned arable land*

- Reference to Eunis habitat; I 1.55. Fallow un-inundated fields with annual and perennial weed communities
- Reference to EU HD Annex 1 – None
- Reference to Bern Convention Resolution No.4 (1998); None

Some areas with abandoned agricultural land are found near Paleokaster. The dominant species are these of arable weed and nitrophilous species such as *Artemisia vulgari, Urtica dioica, Ditrichia viscosa, Bromus hordeaceus, Centaurea cyanus, Papaver rhoeas, Cirsium vulgare.*

<u>Settlement, industrial and other artificial habitats</u>

*Rural and urban peripheries settlements*

For this habitat, please refer to the classification and description of the same habitat presented in the Sections 6, 7 and 8. This Section passes by the periphery of the city of Gjirokaster and by some settlements such as Lazarat and Arshi Lengo.

### 4.2.17 Biodiversity in Section 13A

This Section runs almost over the existing road and its plant diversity and vegetation is quite poor. The main habitats along this Section are anthropogenic. Natural grassland and sclerophyllous vegetation are widespread in the south western part of the Section. For the fauna of this Section please refer to Section 9B2.

#### 4.2.17.1 quatic habitats

Drino river branches are crossed by the AIC corridor at the end of the section 13. The riverbanks are covered with riparian poplar and willow belts. *Fragmites australis and Typha latifolia* species are found in the sites where the flow is very slow.  For the classification and description of the habitats which belong to aquatic habitats category, please refer to the section 9A2.

#### 4.2.17.2 Terrestrial habitats

<u>Heathland and scrub</u>

*Garrigues*

This habitat is the same as for the Section 9B2. Therefore, for the classification and description of this habitat, please refer to the aforementioned Section.

<u>Grasslands and meadows</u>

*Hill Pastures*

- Reference to EUNIS Habitats: E1.332 - Helleno-Balkanic short grass and therophyte communities
- Reference to EU HD Annex I: 6220 Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea
- Reference to Bern Convention Res. No. 4 1996: E 1.3. Mediterranean xeric grassland

Pastures are widespread in a large area and in the western part of this section. This habitat is characterized by short-perennial grassland often encountered in calcareous substrates. The plant community is represented by the association Thero-Brachipodietalia. Characteristic species of this habitat are Bromus sp, Brachypodium distachyon sp., Aegilops sp., etc.

<u>Inland unvegetated or sparsely vegetated habitats</u>

*Bare rock with scarce vegetation*

This habitat is the same as for section 9A2, 9B2 and 10, is located in the western part of Lazarat and Jorgucat settlement and is fragmented including limited species.

#### 4.2.17.3 Anthropogenic habitats

Agricultural land

*Field and acres*

- Reference to EUNIS habitat: I1.3 Arable land with unmixed crops grown by low-intensity agricultural methods.
- Reference to EU HD Annex 1: None

The fields and acres of section 13A are mainly represented by wheat, corn and weeds culture. Industrial crops are rarely cultivated.

*Recently abandoned arable land*

Abandoned fields are also present and colonized by nitrophilous plants. The dominant species are *Potea annua, Cicorium intybus L. Artemisia vulgaris, Lolium perrene,e*tc. For the classification of this habitat, please refer to the habitat with the same name presented in the section 12.

Settlement, industrial and other artificial habitats

The main habitats that belong to this category and are present in the Section 13A are:

- *Rural and urban peripheries settlements*
- *Rural settlement*
- *Roads (this habitat characterizes the entire section as the AIC runs through the existing road). Some of the ruderal plant communities are strictly adapted to development along roads.*

For the abovementioned habitats description, please refer to the Section 6 and 7.

The following table summarizes the habitats that are encountered per Section.

**Table 4-91 Habitats per Section**

| Sections | Habitats |
|---|---|
| 1 | Aquatic: Large rivers, Permanent slow flowing watercourses, Water fringing reedbeds and halophytes<br>Terrestrial: Sub Mediterranean deciduous thickets and brushes, Maquis and thermo-Mediterranean brushes, Thermophilous woodland, Riparian willow and poplar belts, Ruderal flora and vegetation, bare rock with scarce vegetation<br>Anthropogenic: Field and acres, Small scale cultivated garden areas, Line of trees, Roads, Industrial and commercial sites still in active use, Agricultural construction |
| 2 | Aquatic: Large rivers, Lagoons, Water fringing reedbed and halophytes<br>Terrestrial: Evergreen sclerophyllous shrub (Garrigues), Riparian gallery and thicket, Riparian willow and poplar belts, Thermophilous woodland<br>Anthropogenic: Line of Trees, ruderal floara and vegetation, Field and acres, Small scale cultivated garden areas, waste deposit sites, rural settlements, roads, industrial and commercial sites still in use. |
| 3 | Aquatic: Water fringing reedbeds and halophytes<br>Terrestrial: Riparian willow and poplar belts<br>Anthropogenic: Field and acres, Line of Trees, rufderal flora, Small scale cultivated garden areas, Fruit trees and Orchards, Rural Settlements, Roads, Industrial and commercial sites still in active use |
| 4 | Aquatic: Large rivers, Water fringing reedbeds and halophytes<br>Terrestrial: Maquis and Thermo-Mediteranean brush, Hill Pastures, Mixed riparian woodland<br>Anthropogenic: Recently abandoned arable land, Evergreen orchards and groves, Field and acres, Ruderal and sub-ruderal herbaceous vegetation, Line of trees, Rural Settlements, Industrial, commercial and another man-made site |
| 5B + 5C | Aquatic: Large rivers Rooted floating vegetation<br>Terrestrial: Hill Pastures, Maquis and Thermo-Mediteranean brush, High maquis, Thermophilous woodland, Mediteranean riparian woodland, Pinus Halepensis forest and wood |

| Sections | Habitats |
|---|---|
| | Anthropogenic: Field and acres, Bushes and Hedges on the slopes, Fruit trees and Orchards, Evergreen orchards and groves, Rural settlements, Agricultural construction, Roads |
| 6+7 | Aquatic: Littoral zone of inland surface waterbodies (Drainage channels)<br>Terrestrial: Maquis and Thermo-Mediteranean brush<br>Anthropogenic: Field and acres, Line of trees, Bushes and hedges on the slopes, Fruit trees and Orchards, Evergreen orchards and groves, Rural and urban peripheries settlements, Small scale cultivated garden areas, Roads, Industrial and commercial sites still in active use, Agricultural construction |
| 8 | Aquatic: Large rivers, Littoral zone of inland surface waterbodies (Drainage and Irrigation channels)<br>Terrestrial: Mediterranean riparian woodland, Maquis and Thermo-Mediteranean brush<br>Anthropogenic: Fields and acres, Orchards and groves, Abandoned arable land with significant areas of vegetation, Rural Settlements |
| 9A2 | Aquatic: Large rivers, Water fringing reedbed and helophytes<br>Terrestrial: Garrigues, Thermophilous forest, Mixed riparian gallery, Riparian willow and poplar belts, Meadows, Bare rock with scarce vegetation<br>Anthropogenic: Field and acres, Line of trees, Olive groves, Orchards, Rural settlements, Roads, Agricultural construction |
| 9B2 | Aquatic: Large rivers, Water fringing reedbed and helophytes<br>Terrestrial: Hill Pastures, Meadows, Garrigues, Thermophilous forest, Mixed riparian gallery, Riparian willow and poplar belts, bare rock with scarce vegetation<br>Anthropogenic: Field and acres, Evergreen orchards and groves, Rural Settlements, Roads |
| 10 | Same as 9A2 and 9B2. Additionally, oak hornbeam forest |
| 11 | Same as 9A2 and 9B2 |
| 12 | Aquatic: Large rivers, Water fringing reedbed and helophytes<br>Terrestrial: Riparian willow and poplar belts, Italian and Turkey oak forests, hill pastures<br>Anthropogenic: Lines of trees, Field and acres, Recently abandoned arable land, Rural and urban peripheries settlements |
| 13A | Aquatic: Large rivers, Water fringing reedbed and helophytes<br>Terrestrial: Garrigues, Hill pastures, bare rock vegetation<br>Anthropogenic: Field and acres, Recently abandoned arable land, Rural and urban peripheries settlements, , Rural settlement, Roads |

### 4.2.18 Protected Areas

The protected areas of Albania are distributed across the whole territory of the country. Currently, there are 798 protected areas including 15 national parks, 22 managed nature reserves, 5 protected landscapes and 750 Nature Monuments and other protected areas of various categories. Furthermore, a Biosphere reserve, three World Heritage sites, four RAMSAR sites, 45 Important Plant Areas (IPA) and 16 Important Bird Areas (IBA) are located in Albania. Meanwhile, the Albanian government has proclaimed the Coastline of Albania and the Tirana Greenbelt as areas of national importance.

A summary of the protected areas system in Albania is given in the table below.

**Table 4-92 Summary of protected areas in Albania**

| Protected Areas Categories | Description of the category | Number | Area (ha) | % |
|---|---|---|---|---|
| Strict Nature Reserve/ Scientific Reserves (IUCN Cat. I) | Territories bigger than 50 hectares, with special natural value where no intervention is allowed | 2 | 4,800.00 | 1.04 |
| National Parks (IUCN Cat. II) | Wide territories usually bigger than 1000 hectares, representing unique national and international values | 15 | 210,501.40 | 45.76 |
| Natural Monuments (IUCN Cat. III) | Natural formation (including special wood), with an area up to 50 hectares, a habitat of a rare type and in threat of extinction or with an importance scientific value | 750 | 3,470.00 | 0.75 |

| Protected Areas Categories | Description of the category | Number | Area (ha) | % |
|---|---|---|---|---|
| Managed Nature Reserve/ Natural Park (IUCN Cat. IV) | Territories that represent bio-centers and bio-corridors with regional and local importance or areas with plants, animals that are especially protected | 22 | 127,180.10 | 27.64 |
| Protected Landscape (IUCN Cat. V) | Large territories more than 1000 hectares with a well formed harmonic landscape, with a developed relief, with a variety of ecosystems, sea or land, etc. | 5 | 95,864.40 | 20.84 |
| Protected Area of Managed Natural Resources (IUCN Cat. VI) | Areas that include large territories which are relatively isolated and uninhabited | 4 | 18,245.00 | 3.97 |
| *Regional Nature Parks (IUCN Cat. IV of V) | Territories/Areas with naturals values and important to the local communities that are under the management of local government, such as forests, grasslands, reservoirs, wetlands, etc. | 4 | 51,383 | |
| Total | | 798 | 460,060.90 | 100% |

*These areas have been endorsed by the Regional Council, but their plan had to be approved Ministry of Environment, so there are not still included in the Protected Areas system

The following map presents the Protected Areas in Albania, their categorization as well as the positioning of the AIC.


**Figure 4-97 Map of Protected Areas**

The following table presents Natural Protected Areas that are crossed or are close to the AIC.

**Table 4-93 Natural Monuments and Protected areas along the AIC**

| No | Name | PA Category | Section | Region |
|---|---|---|---|---|
| 1 | Buna River - Velipoja | Protected Landscape (IUCN, Cat. V) | Section 1 | Shkoder, Velipoje |
| 2 | Kune Vain | Natural Managed Reserve (IUCN, Cat. IV) | Section 2 | Lezhe |
| 3 | Rrepet e Poçemit | Natural Monument (IUCN Cat. III) | Section 9B2 | Tepelene |
| 4 | Rrepet e Dervenit | Natural Monument (IUCN Cat. III) | Section 10 | Tepelene |

*1.Buna River Velipoja - Protected Landscape, Section 1*

The BRPL is one of the five Protected Landscapes and accounts for 5% the overall extent of protected areas in Albania. It has been identified as one of 45 Important Plant Areas (IPA); one of 25 potential Emerald Sites; one of 15 Important Bird Areas (IBAs); and forms part of one of three designated Ramsar sites within Albania. It forms part of a much larger contiguous transboundary conservation area that includes the adjacent Lake Shkodra Managed Natural Reserve (26,535 ha) in Albania and the Skadar Lake National Park (40,000 ha) of Montenegro.The BRPL will also contribute to the developing Balkan Regional Ecological Network (BREN), to the European Greenbelt and to the Pan European Ecological Network (PEEN). It also contributes to the global priority conservation areas as recognised by WWF (Global 200 Ecoregions) and CEPF (Hotspots and Key Biodiversity Areas). The Buna River Protected Landscape extends for about 20000 ha and is located between the last 15 km of the northern Albanian coast and the Buna river, which forms the border with Montenegro.

The Buna river is the outflow of the Skadar Lake and has the Drin River, the longest river in Albania, as main tributary. The sediments of Buna have an important role for the morphology of the coastline, which is subject to strong erosion. According to old descriptions (Reiser & Fuhrer 1896, Kárpáti & Kárpáti 1961, Kárpáti 1962), the Buna Landscape was an impressive wilderness area. However, likewise other Mediterranean wetland areas it has been strongly transformed during the last decades.

The main livelihood activities within the BRPL are crop and livestock production, including production of irrigated pastures for livestock. Tourism is also important to the local economy and, to a lesser extent fishing.

Regarding agriculture, the ownership of land is highly fragmented and farm sizes are very small (mean size varies among Communes from 1.0 to 1.9 ha). Big farms, defined as being larger than 10 ha in extent, or with more than 8 cattle or 150 sheep or goats, account for less than 5% of farms within the BRPL. Access to credit is limited, hampering the ability of farmers to invest in machinery and irrigation equipment. Roughly half the cropping area is used for fodder production, with a wide variety of cereals, vegetables, fruits and olives being grown on the remainder.

Regarding livestock, the livestock community is dominated by cows (about 13,000 within the BRPL), sheep (about 20,000) and goats (about 3,000), which provide transport, meat, milk and cheese. Given the small size of farm, and thus production, access to markets is limited, and most production is used for self consumption or for direct selling.

The main tourism activity is summer beach tourism, with some 80,000 to 200,000 visitors per year. The bulk of the visitors come from Kosovo, and typically stay for only a short period (from a few days to two weeks). This type of high volume – low spending tourism results in high pressures to local resources, for example in terms of demand for services and the management of wastes (solid waste and wastewater). It is also a key driver for the ongoing uncontrolled urban development. The quality of tourism services is generally low. There are also some hunting tourists, mainly from Italy.

As for fishing, Lake Shkodra is the main site of fishing within the area, but additional fishing is carried out within the BRPL in the Buna River, in the sea, and in the larger wetland areas, particularly Viluni Lagoon. Freshwater fish catches appear to be declining, probably due to unsustainable (and often illegal) methods of fishing including, for example, the use of dynamite. Local residents who fish in the sea suffer strong competition from larger fishing vessels launched from the nearby port of Shëngjin. One company previously was awarded a licence to produce mussels in Viluni Lagoon, but after the 2010 floods this was discontinued in favour of mullet and eel fishing instead. The fish catch is completely absorbed by the local market. Concerns have been raised about the possible dangers of pollution to fish quality.

The bulk of the BRPL was until recently a swampy wilderness, such that it is devoid of any such major historical features. However, the visual attractiveness of the landscape, in particular the alluvial forest of the Velipojë wetlands comprises an important tourism and thus cultural resource. In Europe, there are only a few examples where pastoralism is still practised on a scale as large as in the BRPL. Associated with this, Euronatur (2006) documented the presence of a number of primitive and indigenous breeds of domestic animals, including Siska pigs, Busha cattle and Zackel sheep, whilst noting that goat, horse and donkey populations require further investigation. The particular rural feel of this landscape comprises a considerable tourism asset, but which in the face of uncontrolled and haphazard urban development, is fast being lost.

A significant number of threatened species at a national, european and global level are registered in this wetland ecosystem, since both in Shkodra Lake and Buna River live about 45 species of fish. The area is very rich in aquatic vegetation, where there can be distinguished species mentioned in the National Red List. Important migration routes, especially for fish and birds, pass through the surrounding wetland area, which also serves as an important breeding and wintering site for water birds. This richness in biodiversity and habitats as well as their international importance, the beautiful natural landscape of the River and its valley has led the Albanian Government to declare the Buna River as a Protected Landscape, IUCN V th Category, in 2005. Buna River map with the zoning system is presented in Annex 1.15.

**Figure 4-98 Buna River**

*2. Kune Vain, Natural Managed Reserce, Section 2*

In 2010, Kune Vain Tale which is an area close to the Corridor was declared by the Albanian government as a Natural Managed Reserve (IUCN, IV Category). This site is characterized by aquatic and hydro-hydrophilic vegetation, halophile vegetation, forests and shrubs vegetation, while it has been identified as an Important Bird Area. The Kune Vain Tale Marshland is a very important area for globally threatened species such as the pigmy cormorant (Phalacracorax pygmeus) and the European otter (Lutra lutra) etc. Section 2 passes over the peripheral part of North/East Buffer Zone of Kune Vain Natural Managed Reserve/Natural Park. Kune Vain Tale map with the zoning system is presented in Annex 1.16.

**Figure 4-99 Protected area of Kune Vain**

Kune Vain Tale Lagoon System (KVTLS) is located within the Drini – Mati River Deltas in the Lezha region of Albania. It provides a wide range of valuable goods and services to nearby communities. A rapid increase in population size and widespread poverty in the area have led to an increased pressure on the lagoon for ecosystem goods and services, as well as unplanned interventions in the buffer zone surrounding the lagoon. The local communities base the majority of their income from fishing or agriculture, and therefore depend on functional and intact ecosystems in the lagoon system for their livelihoods. Unsustainable use of resources within the KVLS causes also a reduction in quality and quantity of waters in the lagoon (affecting the lagoon productivity), and also increases coastal flooding sand dunes erosion. Taking into account the vulnerability to the Climate change effects, Kune Vain Lagoon System is expected to experience more frequent and intense floods and storm surges.

There has been established a Law on Protected Areas (81/2017), which is to be intrerpreted via bylaws, guidances and more specifically via management plans. Buffer zones of protected areas of different Protection Categories are discussed in general in this Law, while it seems by current stakeholder consultations that zoning, and boundaries of this protected area are to be re-examined. There is an ongoing management plan for this protected area, the results of which may be inserted in the PESIA, depending the time that will be officially published.

*3. Rrepet e Pocemit – Natural Monument, Section 9B2*

This Natural Monument, situated close to the water source of Pocem and 180m from the AIC, is characterized by a group of plane trees, accompanied by other plants such as alders, willows, poplars, acacia etc, forming a natural forest. The plane trees are higher than 35m and their tree trunk diameter is 2.5-3.5 m. The site has also historical values, as a place of important meetings (Beslidhja e Pocemit) of Albanian partisans against the Fascism during Second World War. Rrepet e Pocemit map is presented in Annex 1.17.

Figure 4-100 Rrepet e Pocemit

*4. Rrepet e Dervenit – Natural Monument, Section 10*

Section 10 passes close to the "Rrepet e Dervenit" (210 m from the AIC), a Nature Monument of Category III (IUCN), which is represented by a group of specific trees and is located in Derven village. The average height of the trees is about 13 m, while they have a scientific (biological), didactic and touristIC value and can be easily visited by the Tepelene - Derven road. Rrepet e Dervenit map is presented in Annex 1.18.

Figure 4-101 Rrepet e Dervenit, Natural Monument

## 4.3 Socio-Economic Baseline

This chapter presents a overview of the socio-economic, cultural heritage and land use condition at national level and in affected municipalities and settlements. It describes current conditions and evaluatea how they will change during and after project development. As a result of socio-economic baseline possible impacts to the community will be identified and measures to avoid and/or reduce the negative impacts will be adriculated.

The socio- economic baseline data[17] are for the area with the length of 320 km, in a width of 1.5 km corridor, 750 meters from each side of the road and administratively is divided in 15 municipalities.

Baseline provides information about socio-economic status of population, cultural heritage, land uses, livelihoods. It examines forms and accesibility of public service in sectors of education, health, social protection, drinking water supply and sewerage, infrastructure, energy supply and telecommunication, waste collection. Baseline reflects upon the vulnerable groups as well.

The information is structured in such a way that it presents an overview for the entire country followed by presentation of the existing situation for each section of the AIC route and respective municipalities within that section. Based on available data some information is presented at settlement level.

Considering that Section 8 of AIC is under construction and toward finalization, in this chapter of PESIA report is not presented the evaluation of existing situation for the settlements affected by this Section.

### Data sources and methodology

The data for assessment of socio-economic and cultural baseline is collected collected from national statistics, relevant reports, focus group discussions, key informant interviews, and field observations.

Data is gathered in several stages described below:

- Review of Institutions' publications such as Office of Statistics, ALUIZNI and similar from April to October 2018 and November-December 2019;
- Data verification in Geospacial maps of State Authority April to October 2018 and February 2020
- Dedicated meetings with with representatives from Institute of Cultural Monuments in November 2018, May 2019 and January 2020;
- Field visits to identify locations of sites of social or cultural importance in April 2018;
- Meetings with heads of each municipalitiy/administrative unit affected by the project employees in relevant sectors in May 2018, February and March 2020;
- Meetings with head-man of affected settlement or with community representatives in February and March 2020;
- Stakeholders' response on Scoping Report of PESIA for AIC Corridor during January-February 2020.

[17]Data source is following: Secondary data are obtained from Population Census 2011, annual reports of Institute of Statistics (INSTAT), National Agency for Water Supply and Sewerage (NAWSS) , State Social Service (SSS) , Regional[17] Educational Directorates (REDs), Institute of Cultural Monuments (ICM), Agency for Legalization, Urbanization and Integration of Informal Areas and Buildings (ALUIZNI), General Local Plan of affected municipalities, etc. Data gaps are filled with primary data obtained from affected parties.

## Baseline Assumptions and Limitations

Presented social baseline data is almost sufficient considering the conceptual design stage of the project. However, there are some certain limitations and data gaps:

- Demographic data (ethnic groups, etc) in the settlements under the study area may have some flaws and inaccuracies. In this sense, data provided by Civil Registry office may be higher than the population figure from the last Census. This discrepancy is a result of population movements inside or outside the country after the years 89'. These people who moved did not necessarily changed their residence in Civil Register office and update it with current address;
- Number of people directly affected by the project and their employment status is not known as the instiutions do not collect this data at settlement level;
- The number of employed people in the businesses structures within project footprint is not known due to conceptual designed stage of the project. This should be obtained during ESIA preparation stage.
- While overall number of structures within project footprint is known, their detailed breakdown into residential, non-residential and bussinesses structures is not known. Their legal status is not known as well;
- Detailed information on level of poverty and average income of households within project area's settlements is not known. This should be obtained at ESIA preparation stage.
- Information on subsistence farming (which is likely to be higher) is not known. This is relevant considering the big portion of AIC corridor lays over agricultural land and this land need to be expropriated. Further investigation should be taken during Detailed Design and ESIA.
- The number of unemployed job seekers in the project area is not known. During the stage of preparation of ESIA the social survey should gather data on identification and qualification of these group.
- There are many archeological sites undiscovered throughout Albania, so it is quite possible that archaeological remains may be discovered during project implementation, construction works, high potenctial especially southern part of AIC Corridor. In these regard monitoring must be applied at Detailed Desing and ESIA stage.

A detailed Social Survey will have to be undertaken at the Detailed Design and ESIA stage, with the aim to provide sufficient information for the physical and/or economical resettlement purposes.

### 4.3.1 Administrative Organization

Republic of Albania is located in the southwestern part of the Balkan Peninsula, bordered with Montenegro in the northwest, Kosovo in the Northeast, North Macedonia in the east and Greece in the south. Its territory covers 28,748 square kilometers. Albania extends along the Adriatic and Ionian seas and it's coastline length is 476 km.

Since June 2015, the territory of Albania is divided into 12 Prefecture and 61 municipalities.

#### 4.3.1.1 The Territorial Administration

Municipality is the basic unit of local government. Municipalities are run by the mayor and a municipal council, elected every 4 years. There are 61 municipalities in Albania. The municipalities are further subdivided into administrative units. There are 373 administrative units. In charge of administrative unit is the administrator appointed by the mayor of municipalities. Administrative units are composed by cities and/or villages[18]. Each village has its own head and headship elected by the community members. More detailed information on administrative-territorial division of Albania can be found on law 115/2014[19]

County is the second level of local government that represents an administrative-territorial unity, composed of several municipalities with geographic, traditional, economic, social, and common interests. There are 12 Counties in Albania. County is headed by the Prefect and the County Council. The County Council is responsible for coordinating planning processes at the county level. In Albanian territory there are 3068 settleements[20] by which 71 cities and about 2997 villages[21]. For the purose of this document we are using the notion of settlements as they are administrative unit.

The Adriatic Ionian Corridor passes through the territory of 15 municipalities consisted of 56 administrative units. There are 116 settlements affected by the project, a part of them bisected, bypassed or located close to the AIC corridor. On the table below it can be seen the number of affected municipalities, administrative units and settlements affected by the project. The municipality with the highest number of affected settlements is municipality of Lushnje (16) followed by Lezhe (14), Dropull (12 settlements), and Tirane and Fier (10 and 11 each). The municipality with the lowest number of affected settlements is Tepelene (only the city of Tepelene which is not directly affected, as it is 650m far from the road), Mallakaster and Kurbin (3 and 4 settlements respectively). There are 6 urban centres in close proximity (1.5 km corridor) of the study area, the towns of Lezhe, Lushnje, Fier, Memaliaj, Tepelene and Gjirokaster. Each centre is a focus of administration, employment and commerce, and both Lezhe and Gjirokaster are important tourism centres.

### Table 4-94 Administrative organization of the municipalities crossed by the AIC corridor

| Municipality | AIC Section that affect the territory of municipality | Geographical area km2 | Non Administr-ative Units within municipality | No. Administrative Units affected by the project | Number of settlements within municipality | No.of affected settlements |
|---|---|---|---|---|---|---|
| Shkoder | Section 1 | 872.71 | 11 | 3 | 94 (one city and 93 villages) | 8 |
| VauiDejes | Section 1 | 499 | 6 | 1 | 48 (one city and 47 villages) | 6 |
| Lezhe | Section 1 and Section 2 | 508.95 | 10 | 7 | 67 (2 cities and 65 villages) | 14 |
| Kurbin | Section 3 | 125.2 | 3 | 3 | 30 (3 cities and 27 villages) | 4 |
| Kruje | Partially Section 3 + Section 4 | 339.02 | 6 | 4 | 52 (2 cities and 50 villages) | 9 |
| Vore | Section 4 | 82.72 | 3 | 2 | 19 (1 citiy and 18 villages) | 4 |
| Tirane | Section 5B | 1110.03 | 25 | 4 | 137 (2 cities and 135 villages) | 10 |
| Rrogozhine | Section 5B+Section 5C | 223.5 | 5 | 3 | 37 (1 city and 36 villages) | 6 |
| Lushnje | Section 5C+Section 6+7 | 372.72 | 11 | 6 | 86 (1 city and 85 villages) | 16 |
| Fier | Section 8 and Section 9A2 | 620 | 10 | 6 | 86 (one city and 85 villages) | 11 |
| Mallakaster | Section 9A2 and Section 9B2 | 329.19 | 9 | 2 | 42 (1 city and 41 villages) | 3 |
| Memaliaj | Section 9B2 and Section 10 | 372.07 | 6 | 4 | 54 (1 city and 53 villages) | 7 |
| Tepelene | Section 10 | 431.19 | 4 | 1 | 25 (1 city and 24 villages) | 1 |

[18]https://shtetiweb.org/wp-content/uploads/2016/03/LIGJI_139_2015_PER_VETEQEVERISJEN_VENDORE1.pdf

[19]Local government units, town, villages and administrative-territorial map, page 6365 official bulletin

http://www.qbz.gov.al/botime/fletore_zyrtare/2014/PDF-2014/137-2014.pdf

[20]The types of settlements are determined on the basis of administrative and legal criteria. According to their size and role, they are divided into villages (rural area) and cities (urban area), but here are included also human colonies or regions newley settled and not yet known formally. Villages have small size of population than towns and are established in a territritory with more than 200 inhabitants.

[21] By the law 115/2014

| Municipality | AIC Section that affect the territory of municipality | Geographical area km2 | Non Administr-ative Units within municipality | No. Administrative Units affected by the project | Number of settlements within municipality | No.of affected settlements |
|---|---|---|---|---|---|---|
| Gjirokaster | Section 11 and Section 12 | 469.25 | 7 | 6 | 39 (1 city and 38 villages) | 5 |
| Dropull | Section 13A | 466.6 | 3 | 2 | 41 villages | 12 |
| **Total** | | **7,019.94** | **126** | **56** | **908** | **116** |

Indicative maps that presents the distribution of the municipalities and settlements along the route and road network per sections of AIC are presented in the Annex 1, Social maps.

The Alignment avoids densely populated areas, bypassing the towns and most of the villages. It bisects residential buildings from the center of settlement, about 31 of them, including; southern part of Plezhe, south-western part of Mabe, south-eastern part of Balldren and Balldren I Ri, eastern part of Ishull-Shengjin and western part of Ishull-Lezhe, buildings in the eastern part near Rrile, western part of Fushe Milot, eastern part of Prozhme, western part of Fushe Mamurras, eastern part of Bushnesh, western part of Thumane, north-western part of Rinas, north-eastern part of Breg Shkoze, eastern part of Berxulle, western part of Peze Helmes, north-western part of Peze e Madhe, northern part of Lekaj, western part of Gose e Vogel, western part of Zham Fshat, western part of Dushk I Madh, western part of Saver, western part of Bishqethem, eastern part of Lumth, eastern part of Gorre, eastern part of Rrapez Fshat, Rrapez Sektor, south-eastern part of Dermenas, eastern part of Malas, northern part of Iliras and northern part of Memaliaj-Fshat.

The table in Annex XX 'Settlements affected by AIC road Corridor and their distances' provide data on the settlements affected by the project and their distance from AIC sections, distributed by municipalities/administrative units which they are under administrative organization.

### 4.3.2 Demography

The total population of Albania is 2,938,140 inhabitants[22].The breakdown of population by age is: 0-14 years old are 17.23%, 15-64 are 68.67% and over 65 years old are 14,08%. Male to female ratio represents a slight dominance of males against females. There are 100.5 males per 100 females.

Out of total population, 53.5 % of the population lives in urban areas and 46.5 % lives in rural areas. 70.9 % of households live in private houses. The size of households is 3.9 persons.

According to Population and Housing Census 2011, 82.58 % of the population are Albanian by ethnicity. Other groups in smaller percent are Greek, Aromanian, Roma. Ethnic and cultural composition of Albania is presented in the table below.

**Table 4-95 Resident population in Albania, by ethnic and cultural affiliation**

| Ethnic and cultural affiliation | Resident population | Percentage of resident population |
|---|---|---|
| Albanian | 2, 312, 356 | 82.58 |
| Greek | 24,243 | 0.87 |
| Aromanian | 8, 266 | 0.30 |
| Roma | 8, 301 | 0.30 |
| Macedonian | 5, 512 | 0.20 |
| Egyptian | 3, 368 | 0.12 |
| Montenegrin | 366 | 0.01 |
| Other | 2, 644 | 0.09 |
| Prefer not to answer | 390, 938 | 13.96 |
| Not relevant/not stated | 44, 144 | 1.58 |
| **Total** | **2, 800, 138** | **100** |

[22]As of 26. May 2019, UN Population estimation based on interpolation of World Population Prospects data.

Muslims are the most represented group regarding the religious affiliation, following by Catholics. The representation of other religious groups in Albania is presented on the table below.

**Table 4-96 Resident population by religious affiliation**

| Religious affiliation | Resident population | Percentage of resident population |
|---|---|---|
| Muslims | 1,587,608 | 56.70 |
| Catholics | 280,921 | 10.03 |
| Orthodox | 188,992 | 6.75 |
| Bektashi | 58,628 | 2.09 |
| Evangelists | 3,797 | 0.14 |
| Other Christians | 1,919 | 0.07 |
| Believers without denomination | 153,630 | 5.49 |
| Atheists | 69,995 | 2.50 |
| Others | 602 | 0.02 |
| Prefer not to answer | 386,024 | 13.79 |
| Not relevant/not stated | 68,022 | 2.43 |
| **Total** | **2,800,138** | **100** |

*Data source; Instat, Population and Housing Census, 2011.*

Albanian is the official language and it is spoken by 98.8 % of the population. Greek, Macedonian, Aromanian and Roma are native language of minorities group.

In the wider area of the project lives 1,226,027 inhabitants, representing 43.7% of the total population of the country. The population density is 189.2 inhabitants/km². There are **691,950** inhabitants living in urban area and 534,077 in rural area. Male to female ratio is 99.7. In the project area there are **323,289** households and the average number of household members is 3.8.

Presentation of demographic indicators (for municipalities affected by the project) presented in the following tables and paragraphs is done as follows:

Section 1 – includes data for; Municipality of Shkoder (which territory is crossed from km 0+000 to km 14+500 of section 1 of AIC), Municipality of Vau i Dejes (crossed from km 14+500 to km 23+500 of section 1 of AIC), and partly Lezhe crossed from section 1 of AIC starting from km 23+500 to km 40+965 (where are included data for adm.units of Dajc, Blinisht, Balldren, Kallmet and Ungrej)

Section 2 – includes data for the other part of Municipality of Lezhe (adm.units of Lezhe, Shengjin, Shenkoll, Zejmen and Kolsh). Although this section crosses the territory of Municipality of Kurbin, the demographic indicators are not included here for the reason that this Section ends just the territory of that municipality starts.

Section 3 – includes data for the municipality of Kurbin (crossed from section 3 of AIC starting from km 0+000 to km 11+500) and partly municipality of Kruje (only for adm.unit of Koder Thumane) starting from km 11+000 to km 13+455 of Section 3 of AIC.

Section 4 – includes data for municipality of Kruje (adm. Units of Kruje, Fushe-Kruje, Cudhi, Nikel and Bubq) crossed from section 4 of AIC, starting from km 0+000 to km 15+000) and municipality of Vore (crossed from section 4 of AIC, starting from km 15+000 to km 21+000),

Section 5B - includes data for the municipality of Tirane (crossed from section 5B of AIC, starting from km 0+000 to km 26+000) and partly Rrogozhine (adm.unit of Lekaj) crossed from section 5B of AIC, starting from km 26+000 to km 33+573.

Section 5C - includes data for the rest of other adm.units of municipality of Rrogozhine (crossed from Section 5C of AIC from km 0+000 to km 6+500) and partially for municipality of Lushnje (only adm unit of Dushk), which is crossed form km 5+500 to 10+085 of Section 5C of AIC.

Section 6+7 – crosses the municipality of Lushnje, starting from km 0+000 to km 25+000 of Section 6+7 of AIC and the territory of only settlement that belong to the municipality of Fier (from km 25+000 to km 28+037).

Section 8 – affect only the municipality of Fier and are included data for adm.units of Dermenas, Fier, Libofshe, Mbrostar, Qender, Portez and Topoje, part of the municipality of Fier.

Section 9A2 - includes partial data for the municipality of Fier (adm.units of Levan, Frakull and Cakran), which is crossed from km 0+000 to km 21+000 of Section 9A2 of AIC and data for Mallakaster municipality (adm.units of Hekal) which is crossed from km 21+000 to km 26+901 of Section 9A2 of AIC.

Section 9B2 - includes partial data for the municipality of Mallakaster (adm.units of Ballsh, Greshice, Kute, Fratar and Selite) crossed from Section of 9B2 of AIC starting from km 00+000 to km 16+000) and data for the municipaliy of Memaliaj which territory is crossed from this section of AIC starting from km 16+000 to km 37+694.

Section 10 – crosses in the beginning of the Section the territory of Memaliaj municipality (from km 0+000 to km 5+200), and mainly the municipality of Tepelene (from km 5+200 to km 20.143). The data for Memaliaj municipalilty will be presented in the section 9B2, and not considered for this section as it donot affect any settlement.

Section 11 - crosses partially the municipality of Gjirokaster (four administrative units; Cepo, Lunxheri, Picar and Odrie)

Section 12 – crosses partially the territory of municipality of Gjirokaster (administrative units of Gjirokaster, Lazarat and Antigone)

Section 13A - include data for the municipality of Dropull.

**Table 4-97 Demographic indicators of 15 municipalities crossed by the road track, dissaregated by AIC sections.**

| Sections | Resident population 2011 | Population density inhabitants /km$^2$ | Urban population | Rural Population | Male to Female ratio | Household | Average household size |
|---|---|---|---|---|---|---|---|
| Section 1 | 185,092 | 109.1 | 79,584 | 105,554 | 98.1 | 47,566 | 3.9 |
| Section 2 | 46,591 | 252.8 | 21,812 | 24,733 | 101.7 | 11,423 | 4.1 |
| Section 3 | 58,626 | 363.1 | 20,111 | 38,515 | 92.0 | 13,778 | 4.3 |
| Section 4 | 72,990 | 208.7 | 22,045 | 50,945 | 103.1 | 16,839 | 4.3 |
| Section 5B | 562,548 | 481.6 | 419,917 | 142,631 | 96.3 | 152,354 | 3.7 |
| Section 5C | 24,894 | 119.1 | 7,049 | 17845 | 98.8 | 6,237 | 4.0 |
| Section 6+7 | 75,787 | 229.6 | 31,105 | 44,682 | 95.0 | 15,256 | 3.7 |
| Section 8 | 93,954 | 253.9 | 55,845 | 38,109 | 100.4 | 26,178 | 3.6 |
| Section 9A2 | 38,879 | 91.71 | - | 38,879 | 104.4 | 9661 | 4.02 |
| Section 9B2 | 25,541 | 48.4 | 10,304 | 15,237 | 99.5 | 6820 | 3.74 |
| Section 10 | 8,949 | 20.75 | 4,342 | 4,607 | 104.9 | 2,564 | 3.5 |
| Section 11 | 5038 | 13.7 | - | 5,038 | 107.8 | 1493 | 3.4 |
| Section 12 | 23,635 | 229.4 | 19,836 | 3,799 | 99.9 | 6,658 | 3.5 |
| Section 13A | 3,503 | 9.55 | - | 3,503 | 94.4 | 1,314 | 2.7 |
| **Total** | **1,226,027** | **189.2** | **691,950** | **534,077** | **99.7** | **323,289** | **3.8** |

*Data source: Author calculations*

Based on the data above, most of the population is located in the half of the first part of road corridor (from Section 1-Section 8), as there are encountered the biggest urban centers along the Corridor and also in Albania.

#### 4.3.2.1 Age structure of the municipalities affected by the project

The age structure of the population by sex and group age per each municipality affected by the project is presented in the following table.

### Table 4-98 Population by sex and group age per each affected municipality

| Sex and age group | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sections** | **Total** | **Total age cohorts** | | | **Male** | | | | **Female** | | | |
| | | 0-14 | 15-64 | 65+ | Total | 0-14 | 15-64 | 65+ | Total | 0-14 | 15-64 | 65+ |
| Section 1 | 185,092 | 39,170 | 122643 | 23279 | 91738 | 20411 | 60195 | 11132 | 93354 | 18759 | 62448 | 12147 |
| Section 2 | 46,591 | 10197 | 31402 | 4992 | 23496 | 5405 | 15743 | 2348 | 23095 | 4792 | 15659 | 2644 |
| Section 3 | 58,626 | 13,713 | 38,839 | 6,074 | 29,391 | 7,283 | 19,256 | 2,852 | 29,235 | 6,430 | 19,583 | 3,222 |
| Section 4 | 72,990 | 17197 | 48921 | 6872 | 37381 | 9011 | 25086 | 3284 | 35609 | 8186 | 23835 | 3588 |
| Section 5B | 562,548 | 104368 | 398552 | 59628 | 276392 | 53411 | 194687 | 28294 | 286156 | 49957 | 204865 | 31334 |
| Section 5C | 24,894 | 5321 | 16795 | 2778 | 12521 | 2678 | 8486 | 1357 | 12373 | 2643 | 8309 | 1421 |
| Section 6+7 | 75,787 | 14047 | 52435 | 9305 | 38350 | 7417 | 26423 | 4510 | 37437 | 6630 | 26012 | 4795 |
| Section 8 | 93,954 | 17843 | 63893 | 12218 | 47086 | 9379 | 31737 | 5970 | 46868 | 8464 | 32156 | 6248 |
| Section 9A2 | 38,879 | 8430 | 25839 | 4610 | 19848 | 4415 | 13166 | 2267 | 19031 | 4015 | 12673 | 2343 |
| Section 9B2 | 25,541 | 5306 | 17023 | 3212 | 13103 | 2786 | 8766 | 1551 | 12438 | 2520 | 8257 | 1661 |
| Section 10 | 8,949 | 1696 | 5985 | 1268 | 4582 | 852 | 3125 | 605 | 4367 | 840 | 2860 | 667 |
| Section 11 | 5038 | 704 | 3316 | 1018 | 2614 | 377 | 1724 | 513 | 2424 | 327 | 1592 | 505 |
| Section 12 | 23,635 | 4104 | 16540 | 2991 | 11812 | 2124 | 8327 | 1361 | 11823 | 1980 | 8213 | 1630 |
| Section 13A | 3,503 | 269 | 2,051 | 1,183 | 1,701 | 136 | 1,026 | 539 | 1,802 | 133 | 1,025 | 644 |
| **Total** | **1,226,027** | **242,365** | **844,234** | **139,428** | **610,015** | **125,685** | **417,747** | **66,583** | **616,012** | **115,676** | **427,487** | **72,849** |

*Data Source: Population and housing Census, 2011, Instat. Author's calculations*

As it can be seen from the table above, out of 1,226,027 total affected population there are 417,747 male and 427,487 female which indicate higher number of females of about 97401 inhabitants in the wider area of the project.

### Demorgaphics of affected settlements

The total number of potentially affected population within all settlements in the study area is 213,316[23], which accounts for approximately 7.3 % of the estimated national population. The number of people directly affected by the Project is not known due to the conceptual design stage of the project.

The age profile of the population that reside in the settlements within the study area is almost similar to the national profile. The highest percentage is for the age group between 15 and 65 (67.2%), followed by young generation under 15 (20.2%), while the age group over 65 years account for 12.6%. This means that most of the population are economically active work force. In settlements that lies in the southern part of the AIC route the percentage of the group age over 65 years exceeds the nationl profile. Here can be mentioned the settlements of Dervican, Goranxi, Vanister, Haskove, Sofratike, Terihat, Gorice, Frashtan, Lugar Grapsh, Jorgucat and Kakavije (part of Municipality of Dropull), where elderly residents account from 27% to 40% of the population. High number of elderly people comes due to high levels of permanent and

[23] Data provided by Civil Registry offices in each administrative units where this settlements belong to after the new territorial division. *Note:In some cases the population figures provided by Civil Registry Offices are higher for some settlements (part of one municipality) than the population figure for the entire territory that this municipality cover (such as in Dropull). This inconsintency comes because the population movements inside or outside the country after the years 89', were not always accompanied by the registration procedures in the Civil Register of the area where they would be located.*

seasonal migration. Average household size is 4.1 members. The sex ratio among affected settlements is almost at the same level, 50.2 % females and males 49.8%.

The following table presents demographic parameters per each settlement affected by the project, divided by AIC sections.

| Section 1 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Municipality** | **Adm.unit** | **Settlements** | **Population** | **Male** | **Female** | **Household** | **Age group** | | | **Emigrants** |
| | | | | | | | **0-14** | **15-64** | **65+** | |
| Shkoder | Ana e Malit | Shtuf | 191 | 90 | 101 | 101 | 37 | 126 | 28 | 30% of the population have migrated |
| | | Muriqan | 1229 | 576 | 653 | 292 | 240 | 809 | 180 | |
| | | Obot | 672 | 332 | 340 | 195 | 131 | 442 | 99 | |
| | | Oblike | 2749 | 1364 | 1385 | 747 | 536 | 1809 | 404 | |
| | Berdice | Berdice e Madhe | 1663 | 834 | 829 | 549 | 361 | 1098 | 204 | |
| | | Mali Hebaj | 726 | 378 | 348 | 231 | 158 | 479 | 89 | |
| | | Beltoje | 775 | 410 | 365 | 244 | 168 | 512 | 95 | |
| Vau I Dejes | Bushat | Ashte | 999 | 450 | 549 | 244 | 204 | 654 | 141 | |
| | | Kosmac | 2332 | 1049 | 1283 | 594 | 476 | 1527 | 329 | |
| | | Meglush | 2533 | 1140 | 1393 | 713 | 517 | 1659 | 357 | |
| | | Bushat | 2606 | 1173 | 1433 | 677 | 532 | 1707 | 367 | |
| | | Plezhe | 743 | 334 | 409 | 169 | 152 | 487 | 104 | |
| | | Shkjeze | 1116 | 502 | 614 | 265 | 228 | 731 | 157 | |
| Lezhe | Dajc | Mabe | 1020 | 508 | 512 | 255 | 188 | 683 | 149 | About 20 % of the population have migrated |
| | | Dajc | 1677 | 841 | 836 | 432 | 309 | 1124 | 244 | |
| | | Gjader | 2150 | 1042 | 1108 | 568 | 396 | 1441 | 313 | |
| | Blinisht | Piraj | 558 | 273 | 285 | 148 | 105 | 371 | 82 | |
| | | Blinisht | 996 | 488 | 508 | 251 | 188 | 661 | 147 | |
| | Kallmet | Rraboshte | 1700 | 816 | 884 | 424 | 338 | 1108 | 254 | |
| | | Merqi | 1200 | 576 | 624 | 299 | 239 | 782 | 179 | |
| | Balldren I Ri | Balldren I Ri | 1054 | 474 | 580 | 245 | 233 | 701 | 120 | |
| | | Balldren | 2465 | 1109 | 1356 | 594 | 545 | 1639 | 281 | |
| **Tot. Section 1** | | | **31154** | **14759** | **16395** | **8237** | **6281** | **20550** | **4323** | |
| **Section 2** | | | | | | | | | | |
| Lezhe | Lezhe | Lezha city | 15510 | 7661 | 7849 | 4166 | 3319 | 10702 | 1489 | About 20 % of the population have migrated |
| | Shengjin | Ishull Shengjin | 3619 | 1822 | 1797 | 912 | 800 | 2396 | 423 | |
| | | Ishull Lezhe | 3602 | 1814 | 1788 | 907 | 796 | 2385 | 421 | |
| | Shenkoll | Rrile | 3270 | 1720 | 1550 | 743 | 732 | 2204 | 334 | |
| | | Shenkoll | 5000 | 2629 | 2371 | 1136 | 1120 | 3370 | 510 | |
| | | Gajush | 1750 | 920 | 830 | 398 | 392 | 1180 | 178 | |
| **Tot. Section 2** | | | **32751** | **16566** | **16185** | **8262** | **7159** | **22237** | **3355** | |
| **Section 3** | | | | | | | | | | |
| Kurbin | Milot | Fushe Milot | 2103 | 1013 | 1090 | 363 | 490 | 1375 | 238 | 280 |
| | | Prozhme | 182 | 102 | 80 | 52 | 42 | 119 | 21 | 57 |
| | | Shullaz | 367 | 191 | 176 | 172 | 85 | 240 | 42 | 69 |
| | Mamurras | Fushe Mamuras | 5575 | 2609 | 2966 | 1500 | 1332 | 3674 | 569 | 400 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Kruje | Thumane | Bushnesh | 1140 | 581 | 559 | 300 | 274 | 756 | 110 | About 30 % of the population have migrated |
| | | Koder-Thumane | 2410 | 1228 | 1182 | 620 | 578 | 1598 | 234 | |
| | | Fushe- Thumane | 2450 | 1248 | 1202 | 610 | 588 | 1624 | 238 | |
| **Tot. Section 3** | | | **14227** | **6972** | **7255** | **3617** | **3389** | **9386** | **1452** | |
| **Section 4** | | | | | | | | | | |
| Kruje | Thumane | Derven | 800 | 407 | 393 | 250 | 192 | 530 | 78 | About 30 % of the population have migrated |
| | Bubq | Bilaj | 1250 | 649 | 601 | 307 | 263 | 843 | 145 | 40 % of the population have migrated |
| | Fushe Kruje | Larushk 2 | 2200 | 1115 | 1085 | 400 | 537 | 1487 | 176 | About 25 % of the population are permanent emigrants |
| | | Arrameras | 3102 | 1598 | 1504 | 730 | 757 | 2097 | 248 | |
| | | Hasan | 734 | 382 | 352 | 282 | 179 | 496 | 59 | |
| | Nikel | Rinas | 850 | 436 | 414 | 177 | 230 | 553 | 68 | Over 200 inhabitants have migrated |
| Vore | Preze | Breg Shkoze | 468 | 229 | 239 | 112 | 103 | 307 | 57 | About 25 % of the population are permanent emigrants |
| | | Ndermjetes | 209 | 105 | 104 | 65 | 46 | 137 | 25 | |
| | Berxulle | Berxulle | 3860 | 1983 | 1877 | 1037 | 1015 | 2532 | 313 | |
| | | Mukaj | 1050 | 536 | 514 | 210 | 276 | 689 | 85 | |
| **Tot. Section 4** | | | **14523** | **7440** | **7083** | **3570** | **3598** | **9671** | **1254** | |
| **Section 5B** | | | | | | | | | | |
| Tirane | Kashar | Kashar 1 | 2937 | 1467 | 1470 | 746 | 631 | 2088 | 217 | About 15 % of the population are permanent emigrants |
| | | Mazrek | 816 | 408 | 408 | 221 | 175 | 580 | 60 | |
| | | Kus | 508 | 253 | 255 | 140 | 109 | 361 | 38 | |
| | Vaqarr | Allgjate | 436 | 232 | 204 | 150 | 109 | 292 | 35 | |
| | | Lalm | 1865 | 991 | 874 | 502 | 468 | 1248 | 149 | |
| | Ndroq | Menik | 528 | 269 | 259 | 131 | 102 | 358 | 68 | |
| | Peze | Peze Helmes | 1586 | 819 | 767 | 359 | 392 | 1052 | 143 | |
| | | Peze e Vogel | 1432 | 739 | 693 | 324 | 354 | 949 | 129 | |
| | | Maknor | 417 | 215 | 202 | 94 | 103 | 276 | 38 | |
| | | Peze e Madhe | 1468 | 758 | 710 | 332 | 363 | 973 | 132 | |
| Rrogozhine | Lekaj | Mushnik | 250 | 120 | 130 | 50 | 51 | 168 | 32 | 24 % of the population have migrated |
| | | Zambish | 530 | 250 | 280 | 100 | 108 | 355 | 67 | |
| | | German | 1103 | 563 | 540 | 220 | 225 | 739 | 139 | |
| | | Lekaj | 2902 | 1470 | 1432 | 700 | 592 | 1944 | 366 | |
| **Tot. Section 5B** | | | **16778** | **8554** | **8224** | **4069** | **3782** | **11383** | **1613** | |
| **Section 5C** | | | | | | | | | | |
| Lushnje | Gose | Gose e Madhe (Kercukaj) | 3200 | 1540 | 1660 | 820 | 694 | 2106 | 400 | About 30 % of the population have migrated |
| | | Gose e vogel | 1469 | 707 | 762 | 377 | 319 | 967 | 183 | |
| | Dushk | Zhame Sektor | 2059 | 1038 | 1021 | 478 | 459 | 1398 | 202 | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Zham Fshat | 556 | 280 | 276 | 120 | 124 | 378 | 54 | About 30 % of the population have migrated |
| | | Gramsh | 2083 | 1050 | 1033 | 465 | 465 | 1414 | 204 | |
| | | Konjat | 752 | 379 | 373 | 156 | 168 | 510 | 75 | |
| | | Dushk I madh | 3327 | 1677 | 1650 | 880 | 742 | 2259 | 326 | |
| **Section 5C** | | | **13446** | **6671** | **6775** | **3296** | **2971** | **9032** | **1443** | |
| **Section 6+7** | | | | | | | | | | |
| Lushnje | Golem | Golem I madh | 1358 | 697 | 661 | 375 | 285 | 926 | 147 | About 30 % of the population have migrated |
| | Lushnje | Lushnja | 29,605 | 14825 | 14780 | 8548 | 5033 | 20724 | 3849 | About 35 % of the population have migrated |
| | | Saver | 1500 | 751 | 749 | 372 | 255 | 1050 | 195 | |
| | Krutje | Krujtje e Poshtme | 1382 | 709 | 673 | 360 | 247 | 959 | 176 | |
| | Kolonje | Bishqethem | 959 | 481 | 478 | 263 | 178 | 645 | 135 | |
| | | Lumth | 580 | 291 | 289 | 159 | 108 | 390 | 82 | |
| | | Gorre | 935 | 469 | 466 | 257 | 174 | 629 | 132 | |
| | | Rrapez Fshat | 654 | 328 | 326 | 180 | 122 | 440 | 92 | |
| | | Rrapez Sektor | 498 | 250 | 248 | 137 | 93 | 335 | 70 | |
| | | Ardenice, Kolonje | 1128 | 566 | 562 | 310 | 210 | 759 | 159 | |
| | Bubullime | Pirre | 1250 | 644 | 606 | 343 | 228 | 866 | 156 | |
| Fier | Mbrostar | Vajkan | 1247 | 625 | 622 | 305 | 292 | 817 | 138 | |
| **Section 6+7** | | | **41096** | **20636** | **20460** | **11609** | **7225** | **28540** | **5331** | |
| **Section 9A2** | | | | | | | | | | |
| Fier | Levan | Levan | 7134 | 3531 | 3603 | 1250 | 1427 | 4751 | 956 | About 20 % of the population have migrated |
| | Frakull | Frakull e Madhe | 2004 | 980 | 1024 | 514 | 431 | 1355 | 218 | |
| | | Kafaraj | 1141 | 561 | 580 | 305 | 245 | 771 | 124 | |
| | | Ade | 1068 | 525 | 543 | 287 | 230 | 722 | 116 | |
| | | Sheq Musalala | 775 | 382 | 393 | 212 | 167 | 524 | 84 | |
| | | Kashisht | 600 | 285 | 315 | 168 | 129 | 406 | 65 | |
| | Cakran | Varibop | 2415 | 1205 | 1210 | 115 | 551 | 1584 | 280 | |
| | | Floq | 295 | 145 | 150 | 495 | 67 | 194 | 34 | |
| | | Buzemadh | 1915 | 895 | 1020 | 76 | 437 | 1256 | 222 | |
| | | Gjonc | 635 | 325 | 310 | 400 | 145 | 416 | 75 | |
| **Section 9A2** | | | **17982** | **8834** | **9148** | **3822** | **3829** | **11979** | **2174** | |
| **Section 9B2** | | | | | | | | | | |
| Mallakaster | Fratar | Dames | 1605 | 856 | 749 | 521 | 345 | 1040 | 220 | About 40 % of the population have migrated |
| | | Behaj | 1340 | 708 | 632 | 405 | 288 | 868 | 184 | |
| | | Malas | 335 | 182 | 153 | 87 | 72 | 217 | 46 | |
| Memaliaj | Krahes | Zhulaj | 670 | 350 | 320 | 185 | 137 | 443 | 90 | Almost 50 % of the population have migrated |
| | | Lulezim | 387 | 206 | 181 | 118 | 79 | 256 | 52 | |
| | Qesarat | Toc | 715 | 361 | 354 | 194 | 129 | 490 | 96 | About 30 % of the population have migrated |
| | | Qesarat | 445 | 225 | 220 | 121 | 81 | 304 | 60 | |
| | | Iliras | 550 | 278 | 272 | 149 | 100 | 376 | 74 | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Fshat Memaliaj | Memaliaj Fshat | 2629 | 1362 | 1267 | 730 | 463 | 1759 | 407 | |
| | Memaliaj | Memaliaj | 6325 | 3192 | 3133 | 2130 | 1075 | 4257 | 993 | |
| **Tot. Section 9B2** | | | **15001** | **7720** | **7281** | **4640** | **2769** | **10010** | **2222** | |
| **Section 10** | | | | | | | | | | |
| **Tepelene** | **Tepelene** | **Tepelene city** | **4342** | **2173** | **2169** | **1359** | **799** | **2970** | **573** | |
| **Section 11** | | | | | | | | | | |
| Gjirokaster | Cepo | Humelice | 668 | 336 | 332 | 151 | 86 | 444 | 138 | Almost 40 % of the population have migrated |
| | | Cepune | 328 | 179 | 149 | 105 | 42 | 218 | 68 | |
| | | Mashkullore | 706 | 377 | 329 | 185 | 91 | 469 | 146 | |
| **Tot. Section 11** | | | **1702** | **892** | **810** | **441** | **219** | **1131** | **352** | |
| **Section 12** | | | | | | | | | | |
| Gjirokaster | Antigone | Arshi Lengo | 677 | 347 | 330 | 193 | 115 | 436 | 126 | Almost 40 % of the population have migrated |
| | Lazarat | Kordhoce | 805 | 412 | 393 | 230 | 137 | 563 | 105 | |
| **Tot. Section 12** | | | **1482** | **759** | **723** | **423** | **252** | **999** | **231** | |
| **Section 13A** | | | | | | | | | | |
| Dropull | Dropull I Poshtem | Dervican | 2190 | 1089 | 1101 | 693 | 204 | 1395 | 591 | About 75 % of the population have migrated in the last 20 years |
| | | Goranxi | 852 | 424 | 428 | 270 | 79 | 543 | 230 | |
| | | Vanister | 360 | 179 | 181 | 114 | 33 | 229 | 98 | |
| | | Haskove | 420 | 209 | 211 | 133 | 39 | 268 | 113 | |
| | | Sofratike | 440 | 219 | 221 | 139 | 41 | 280 | 119 | |
| | | Terihat | 732 | 364 | 368 | 232 | 68 | 466 | 198 | |
| | | Gorice | 180 | 90 | 90 | 57 | 17 | 115 | 48 | |
| | | Frashtan | 672 | 334 | 338 | 213 | 62 | 428 | 181 | |
| | | Lugar | 325 | 162 | 163 | 103 | 30 | 207 | 88 | |
| | | Grapsh | 671 | 334 | 337 | 212 | 62 | 427 | 182 | |
| | Dropull I Siperm | Jorgucat | 1550 | 731 | 819 | 486 | 93 | 967 | 491 | |
| | | Kakavie | 440 | 208 | 232 | 138 | 26 | 275 | 139 | |
| **Tot. Section 13A** | | | **8832** | **4343** | **4489** | **2790** | **754** | **5560** | **2478** | |
| **TOTAL AIC SECTIONS** | | | **213,316** | **106,319** | **106,997** | **56,135** | **43,027** | **143,488** | **26,801** | |

**Table 4-99 Demographic indicators in affected settlements by sex and group age per each section of AIC Corridor, number of families and migrants.** Data Source: Civil Registry offices at each administrative units that have under jurisdiction the settlements, consultation with head of the settlement. Author's calculations

By taking into consideration the demographic data presented above, result that the largest number of the population is encounter in the settlements that will be affected by section 6+7 of the AIC route (19.3% of the total population of the study area), section 2 of AIC (15.4%), and Section 1 (14.6%).

#### 4.3.2.2 Education attainment of the population in municipalities affected by the project

Based on Census 2011 data, on average the population has completed 9.7 years of schooling. Part of the population that have completed university studies represent 14.8 %, compared to 11.8% at the national level. This is due to contributions from Tirane (Section 5B), Shkoder (Section 1) and Gjirokaster (Section 12) municipalities, since the territory of the municipalities has better coverage with primary, and secondary school facilities, and in these municipalities are located the largest number of Albanian universities. Illiteracy rate is 2.33 % which is lower than on the national level.

These data indicate that the population constituting the workforce of the municipalities is relatively qualified and have better opportunities regarding the competition in the employment market. The contractor responsible for construction works of the project can engage local workforce not only for manual work but also for more complex tasks and responsibilities.

The table below shows the population of age 10 years and over by education attendance, literacy and educational attainment, disaggregated by sections of the area under the study.

**Table 4-100 Resident population of age 10 years and over by sections of AIC Corridor, education attendance, literacy and educational attainment in municipali level.**

| Sections | Total | Never attended school | | Attending or attended school/Highest diploma obtained | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Literate | Illiterate | Without diploma* | Primary | Lower secondary | Upper secondary | University Advanced* |
| Section 1 | 162,229 | 1,603 | 4,538 | 2,014 | 27,394 | 70,147 | 42,756 | 13,777 |
| Section 2 | 40559 | 919 | 1414 | 588 | 6677 | 16805 | 11009 | 3147 |
| Section 3 | 50609 | 274 | 1712 | 572 | 9012 | 24039 | 12754 | 2246 |
| Section 4 | 62594 | 1032 | 1854 | 641 | 10136 | 29306 | 16005 | 3620 |
| Section 5B | 496890 | 7892 | 7586 | 4659 | 55176 | 126123 | 180290 | 115164 |
| Section 5C | 21786 | 542 | 905 | 284 | 4231 | 11013 | 4002 | 809 |
| Section 6+7 | 67424 | 483 | 1806 | 802 | 10158 | 29516 | 19815 | 4844 |
| Section 8 | 83347 | 692 | 2331 | 983 | 11894 | 31618 | 27105 | 8724 |
| Section 9A2 | 33961 | 420 | 1375 | 407 | 6388 | 18020 | 6394 | 957 |
| Section 9B2 | 21520 | 204 | 777 | 329 | 4360 | 9312 | 6006 | 1581 |
| Section 10 | 8,011 | 166 | 202 | 113 | 1,494 | 2,902 | 2,328 | 806 |
| Section 11 | 4642 | 79 | 219 | 74 | 831 | 1858 | 1269 | 312 |
| Section 12 | 21131 | 259 | 313 | 179 | 2320 | 6215 | 7385 | 4460 |
| Section 13A | 3,343 | 51 | 63 | 50 | 845 | 1,099 | 894 | 341 |
| Total | 1,078,046 | 14,616 | 25,095 | 11,695 | 150,916 | 377,973 | 338,012 | 160,788 |
| **%** | **100** | 1.36 | 2.33 | 1.08 | 14 | 35 | 31.4 | 14.83 |

Data Source: Census 2011, Instat.

*(Note; * without diploma – includes the population that is currently attending school but has not yet obtained a diploma; *University and advanced includes: BA, BAMA, old system of tertiary, post-university/master, PhD)*

#### 4.3.2.3 Education attainment of the population in the project area

There are approximately equal numbers of men and women in Albania regarding education attainment. The access to education for both women and men is provided at the same level. However, in rural areas only 23% of women have completed secondary education, compared to 56% of women in urban areas[24]. This is because society is patriarchal and women in rural areas focus on the household related duties, while women in urban areas increasingly participate in higher education.

[24] Gender Perspective in Albania, October 2014, Instat. Gender analysis of Census 2011

Based on expert evaluations[25], most of the population (61.07 %) has completed primary and secondary education. Post secondary education is higher for the population residing in the settlements along the Section 2, Section 5b, Section 6+7, Section 10, Section 12 and Section 13A, varing between 8.8% (in Section 2) to 16.3% (in section 10). This may be due to presence of urban centers along this section and proximity with universities institutions. In terms of gender equality within project area the situation does not defer from the country level. Roma community's education attainment is at low level with majority being illiterate or has completed only primary school.

#### 4.3.2.4 Ethnic and Cultural affiliation

Data regarding ethnic and cultural affiliation are provided from the last Census 2011. This data presents the ethnic affiliation only for 84.3 % of the total population, as 15.5 % of the total population preferred not to answer or the information provided was not relevant or stated. The table below shows that in affected municipalities ethnic Albanian population has largest share of 83 % while other ethnic groups represent only 1.3 % of the total population. Second largest is Greek population with 0.60 % and Roma population with 0.39%. Ethnic distribution is per municipality is presented below.

**Table 4-101 Resident population by ethnic and cultural affiliation in the municipalities affected by the road track**

| Section of AIC Corridor | Ethnic Structure | | | | | | |
|---|---|---|---|---|---|---|---|
| | Albanian | Roma | Greek | Aromanian | Egyptian | Montenegrin | Macedonian |
| Section 1 | 166406 | 380 | 1 | 16 | 692 | 203 | 1 |
| Section 2 | 41668 | 101 | 23 | 2 | 172 | 7 | 0 |
| Section 3 | 47583 | 74 | 10 | 5 | 28 | 0 | 0 |
| Section 4 | 57264 | 475 | 0 | 5 | 9 | 0 | 0 |
| Section 5B | 466781 | 2174 | 2564 | 780 | 725 | 0 | 446 |
| Section 5C | 20839 | 89 | 1 | 6 | 0 | 0 | 1 |
| Section 6+7 | 63797 | 28 | 15 | 164 | 62 | 0 | 0 |
| Section 8 | 66244 | 859 | 181 | 772 | 11 | 0 | 0 |
| Section 9A2 | 30283 | 501 | 18 | 15 | 1 | 0 | 3 |
| Section 9B2 | 22435 | 0 | 15 | 11 | 0 | 0 | 0 |
| Section 10 | 7335 | 0 | 46 | 0 | 0 | 0 | 0 |
| Section 11 | 3275 | 0 | 135 | 384 | 0 | 0 | 0 |
| Section 12 | 18508 | 89 | 1218 | 79 | 10 | 0 | 0 |
| Section 13A | 142 | 1 | 3,159 | 10 | 0 | 0 | 0 |
| Total | 1012560 | 4771 | 7386 | 2249 | 1710 | 210 | 451 |
| **%** | **83** | **0.39** | **0.6** | **0.18** | **0.14** | **0.02** | **0.037** |

*Data source: Generated by the expert using the data of Geo-portal Insta)*

**Ethnic affiliation in Settlements along the study area**

Based on data elaborated results that the vast majority of affected population, 81.7% are Albanian, whereas 1.69 % belong to other ethnic groups. Within this group, the highest number of representatives are with Greek background (1.26 %), followed by roma community (0.25%). Less integrated by all ethnic groups are the roma community, which encounter difficulties on accessing basic services (health centers) but also have high levels of iliteracy and unemployment.

[25] There is no official data on education level of the population in affected settlement. Evaluation of the level of education for the population in the project area is done by calculation of the expert for administrative units affected by the road corridor, where are part the settlements and using the data provided by the Census 2011,

### Summary of Ethnic groups in settlements affected by AIC

There are identified 5 minority groups in the study area;

The highest number of the population belonging to **Greek ethnic group** is located along the section 13A, in the settlements of Dervican, Goranxi, vanister, Haskove, Sofratike, Terihat, Gorice, Frashtan, Lugar, Grapsh, Jorgucat and Kakavie (part of Dropull municipality), where more than 90% of the population are declared as Greek.

**Roma population** are located in 10 settlements along the study area. The highest number of Roma population is located in Levan – section 9A2 of AIC (about 500 people based on last Census). About 115 people are located in Lezha city outskirts (section 2 of AIC). This group is more disadvantaged compared to other ethnic group in the study area. In general, the main incomes for roma families are provided by informal market, which in turn creates a high volatility. Most of roma member had completed only primary eduction. Regarding the territory and infrastructure, all roma family lives in apartment which are amortized, or in tents and warehouses.

**Egyptian community** in the study area is mostly settled in Lezhe city (section 2 of AIC) about 190 person and in Lushnje city (section 6+7 of AIC) about 62 persons. This community group is more advantaged compared to roma community. The percentage of educated persons is higher than that of the Roma community. Almost all families live in dwellings where structures are amortized. Mostly they live in tents, barracks and warehouses and are unprotected by low temperatures and precipitation.

**Aromanian (Vlach) community** in the study area is mostly settled in Lushnje city (section 6+7 of AIC), about 103 persons (based on last Census data), and in settlemnts belonging to Gjirokaster municipality (section 12 of AIC), about 79 persons. This group is very well integrated in Albanian society.

**Macedonian community** is settled in Kashar (section 5B), about 26 persons. This group is very well integrated in Albanian society.

Data regarding religious belief of affected population are provided by the last Census (2011) and this data are available only for 74.8 % of the population in affected municipalities, as the other part of the population did not give information or declared themselves as a believer. 50.1% of the population belongs to Muslim religion while smallest affected religious community are the Bektashi, consisting 2.1 % of the total population. The distribution of the population by religious affiliation is presented in the table below.

**Table 4.63 Resident population by religion affiliation.**

| Sections | Religious Affiliation | | | |
|---|---|---|---|---|
| | Muslims | Orthodox | Catholic | Bektashi |
| Section 1 | 78004 | 683 | 86529 | 136 |
| Section 2 | 5057 | 137 | 36494 | 39 |
| Section 3 | 20021 | 197 | 26510 | 141 |
| Section 4 | 56216 | 150 | 2974 | 482 |
| Section 5B | 315294 | 35675 | 30106 | 19015 |
| Section 5C | 19127 | 306 | 70 | 389 |
| Section 6+7 | 39063 | 13811 | 1430 | 463 |
| Section 8 | 33683 | 17157 | 3114 | 910 |
| Section 9A2 | 21202 | 1063 | 565 | 115 |
| Section 9B2 | 15443 | 110 | 131 | 1885 |
| Section 10 | 4,376 | 277 | 63 | 251 |
| Section 11 | 1803 | 1034 | 104 | 338 |
| Section 12 | 10319 | 3134 | 697 | 1198 |
| Section 13A | 39 | 2,999 | 42 | 4 |
| **Total** | 619647 | 76733 | 188829 | 25366 |
| **%** | **50.5** | **6.3** | **15.4** | **2.1** |

*Data source: Generated by the expert using the data presented in Geo-portal of Instat.*

Regarding to religious affiliation in the study area, the data of this indicator per each settlements are not available. But, based on the calculation of data per administrative units (by Census 2011) where the settlements are part to, Muslims represent the majority of the population, about 47.1%, followed by catholics, 21.6 % the same at national level.

### 4.3.3 Employment

During 2018, the employment rate for the population aged 15-64 years old is 59.5 %. Males are more active in the labor market. The employment rate for males 15-64 years old in 2017 was 66.7 %, while for females was 52.4 % leading to a gender gap in employment by 14.3 percentage points.

The minimum age for admission in work is not less than the age of completion of compulsory education and, in any case not less than 15 years[26]. The agricultural and services sectors have the highest share of total employment in the country with respectively 37.4 % and 42.9 %, while employment in industry constitute 19.7 % of the total employment in 2018.

There are 162,835 active enterprises in Albania. 23.2 % of enterprises are focused in trade activity, while 1.82 % "Information and communication".

#### 4.3.3.1 Employment in the affected municipalities dissagregated by sections of AIC

Economically active population in the project area is 439.005 person, representing 52% of the total working age population. Inactive population is 405.229 person, representing 48% of the working age population. Male population is more active in labor force compared to female, representing 31.7% of economically active population. Unemployment rate in affected municipalities is 28.3 %[27] slightly lower than the national average 29.3 %. Unemployment rate for females is 29.8% and it is higher than unemployment rate for males due to lower number of females involved in workforce (have a job or are looking for a job) compared to males. Employment rate is 37.3%[28], it is slightly higher compared to employment level in national level at 35.1%. The higher percentage is due to concentration of entreprises and administrative institutions in the project area, most notably in the municipality of Tirane. About 59.8 % of females aged 15-64 years were inactive in labor force compared to 35.8 % of males.

On the table below is presented employment of the population in the municipalities within project area, disaggregated by gender and per sections.

[26] Law No. 8086, date 13.3.1996 For Accession of Republic of Albania to the Conventions of the International Organization of Labour No. 105, no. 111 and no. 138 "On minimum age for admission in work"

[27] Generated by expert, by calculating the ratio of unemployed persons 15 years and over to the economically active aged 15 years and over, in %

[28] The ratio of the number of employed persons to the total number of working age population (15-64 years), in %

**Table 4-102 Data on employment in 15 municipalities affected by the road track, dissagregated by Sections of AIC Corridor.**

| Age group 15-64 years | | | | | | | | | | | Total Age group 15-64 years |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Section of AIC Corridor | Male | | | Female | | | Economically active (Labour Force) | | | Inactive Population | |
| | Employed | Unemployed | Inactive | Employed | Unemployed | Inactive | Male | Female | Total | | |
| Section 1 | 20651 | 13958 | 25586 | 11995 | 8656 | 41797 | 34609 | 20651 | 55260 | 67383 | 122643 |
| Section 2 | 4696 | 3518 | 7529 | 2720 | 1787 | 11152 | 8214 | 4507 | 12721 | 18681 | 31402 |
| Section 3 | 5709 | 5815 | 7732 | 2772 | 3521 | 13290 | 11524 | 6293 | 17817 | 21022 | 38839 |
| Section 4 | 10711 | 4234 | 10141 | 4246 | 2087 | 17502 | 14945 | 6333 | 21278 | 27643 | 48921 |
| Section 5B | 100101 | 30297 | 63289 | 72239 | 24978 | 107648 | 130469 | 97146 | 227615 | 170937 | 398552 |
| Section 5C | 4661 | 1272 | 2553 | 2129 | 724 | 5456 | 5860 | 2926 | 8786 | 8009 | 16795 |
| Section 6+7 | 15582 | 3096 | 7745 | 8811 | 2443 | 14758 | 18680 | 11252 | 29932 | 22503 | 52435 |
| Section 8 | 14295 | 5146 | 12296 | 6974 | 3489 | 21693 | 19600 | 10304 | 29904 | 33989 | 63893 |
| Section 9A2 | 3971 | 1631 | 3414 | 1932 | 763 | 6017 | 5443 | 2854 | 8297 | 9431 | 17728 |
| Section 9B2 | 6821 | 1699 | 4396 | 2830 | 1066 | 8322 | 8520 | 3896 | 12416 | 12718 | 25134 |
| Section 10 | 1309 | 702 | 1114 | 686 | 494 | 1680 | 2011 | 1180 | 3191 | 2794 | 5985 |
| Section 11 | 884 | 300 | 540 | 491 | 146 | 955 | 1140 | 682 | 1821 | 1494 | 3315 |
| Section 12 | 4433 | 1188 | 2706 | 2464 | 980 | 4769 | 5665 | 3399 | 9065 | 7476 | 16541 |
| Section 13A | 502 | 106 | 418 | 205 | 89 | 731 | 608 | 294 | 902 | 1149 | 2051 |
| **Total** | **194326** | **72962** | **149459** | **120494** | **51223** | **255770** | **267288** | **171717** | **439005** | **405229** | **844234** |
| **%** | | | | | | | **31.7%** | **20.3%** | **52%** | **48%** | **100** |

*Data source; Institute of Statistics of Albania, data from Census 2011. Author's calculations.*

The average monthly gross wage in 2019 was 51.870 ALL, gender pay gap 10.7 % and approved minimal wage was 26.000 ALL. Along the study area, the lowest average monthly wage is encounter in the Section 2 (Municipality of Vau i Dejes - 26.572 ALL) and 3 (Municipality of Kurbin-36759) of AIC. The higher average monthly wage of employee is encounter along the Section 5b (Municipality of Tirane), followed by Section 8 and 13 A (Municipality of Dropull and Municipality of Fier; 52.458 ALL and 50.752ALL respectively). Females have a wage of 10.7% lower than mens.

Data on employment indicators and employees wage highlights the gender pay gap as well as higher unemployment rate for women due to their staying at home to care for the family, as well as bearing the burden of early marriages.

As it can be shown in the following table, the majority of employed person have attained upper secondary school (40.4%), followed by person that had completed university education (30.6%).

Service sector accounts for 62.7% of total employment, industry sector has 21.4 % and agriculture sector is third with 15.9 % of employees of the working age population.

**Table 4-103 Main indicators related to employment status, employment by economic activity and employment by education in the municipalities affected by AIC Sections**

| Section of AIC Corridor | Employment rate by level of educational attainment (%) | | | Employment by economic activity | | | Employment status (%) | |
|---|---|---|---|---|---|---|---|---|
| | Primary and lower secondary | Upper secondary | University | Agriculture | Industry | Services | Employees | Own-account and contributing family workers |
| Section 1 | 11885 | 12821 | 7940 | 6209 | 7715 | 18722 | 19589 | 13057 |
| Section 2 | 2907 | 3219 | 1290 | 871 | 1933 | 4613 | 4546 | 2870 |
| Section 3 | 4138 | 3308 | 1035 | 1918 | 1968 | 4595 | 4892 | 3589 |
| Section 4 | 7459 | 5938 | 1560 | 2022 | 5209 | 7726 | 9234 | 5723 |
| Section 5B | 29630 | 71978 | 70732 | 6707 | 36378 | 129255 | 131343 | 40997 |
| Section 5C | 4299 | 1901 | 590 | 4107 | 836 | 1847 | 1735 | 5055 |
| Section 6+7 | 12953 | 8562 | 2878 | 14474 | 2196 | 7722 | 6562 | 17831 |
| Section 8 | 7912 | 8976 | 4381 | 3387 | 6005 | 11878 | 12145 | 9124 |
| Section 9A2 | 2196 | 2491 | 1216 | 3134 | 897 | 1871 | 3370 | 2533 |
| Section 9B2 | 5113 | 3385 | 1153 | 4776 | 1802 | 3073 | 3554 | 6097 |
| Section 10 | 644 | 826 | 525 | 513 | 275 | 1207 | 1077 | 918 |
| Section 11 | 341 | 575 | 459 | 532 | 242 | 601 | 892 | 483 |
| Section 12 | 1710 | 2883 | 2304 | 1228 | 1745 | 3926 | 4476 | 2421 |
| Section 13A | 231 | 320 | 156 | 117 | 149 | 440 | 377 | 330 |
| **Total** | **91418** | **127181** | **96220** | **49995** | **67350** | **197476** | **203792** | **111028** |
| **%** | **29** | **40.4** | **30.6** | **15.9** | **21.4** | **62.7** | **64.7** | **35.3** |

*Data source; Generated by expert, using the indicators presented in Geoportal Instat*

### Employment in affected settlements

Official data related to employment and unemployment figures at the settlement level are not available[29]. The table below is generated by expert using Census data for the settlements that extend 1.5 km width along the road corridor.

[29] As result of consultations with representatives of municipalities and administrative units (in which these settlements are part, by the new territorial division). Representatives from the institutions above stated that they have no information regarding

According to this assessment result that there are 44.491 employed people along the study area and 21.088 unemployed. Unemployement rate is 32.1% higher than the national level (29.3%). This figure is influenced by the higher number of inactive females in the work force and their unpaid engagement in households.

Within project coridor employment rate is 31 % comparing to national level at 25.5%. This is, given the high portion of rural area and agricultural land in study area, most of the population are engaged in agricultural activity. The hightest percentage of employed people is along the Section 5B, Section 6+7, Section 10. This should be taken into consideration in case during the construction phase, project implementor plans to engage local population as a work force.

The hightest percentage of unemployed people is encounter along Section 9B2. One of the reasons may be that settlements in rural area have lower surface of agricultural land per capita available compared to other sections and also lower number of business which offer employment opportunity along this section. In urban area, where is included the city of Memaliaj the unemployment rate is higher due to low employment opportunities and the main sourses of incomes for the city are the pensions (Census data). Further analyses during ESIA preparation will indicate the exact number of unemployed people within the Project footprint and the number of directly affected jobs (and family livelihood) within the businesses structures affected by the project, as well as those affected by permanent take of land.

The following table give a summary on employment indicators in settlement level, dissagregated by sections of AIC, meanwhile more detailed data related to employment indicators per each settlement are presented in Annex XX. Data on employment, main sources of incomes and main activities along the study area.



employments indicators. In some cases, a formal request was sent by the municipality itself to the employment office but the information was not provided

**Table 4-104 Data on employment in the settlements affected by the road track, disaggregated by Sections of AIC Corridor.**

| AIC Sections | Settlements | Active working age population (15-65) | Male | | | Female | | |
|---|---|---|---|---|---|---|---|---|
| | | | Employed | Unemployed | Inactive | Employed | Unemployed | Inactive |
| Section 1 | Shtuf, Muriqan, Obot, Oblike, Berdice e Madhe,Mali Hebaj, Beltoje, Ashte, Kosmac, Meglush, Bushat, Plezhe, Shkjeze, Mabe, Dajc, Gjader, Piraj, Blinisht, Rraboshte Merqi, Balldren, Balldren I Ri | 20550 | 1639 | 923 | 3367 | 1322 | 4713 | 8587 |
| Section 2 | Lezha city, Ishull Shengjin, Ishull Lezhe, Rrile, Shenkoll, Gajush | 22237 | 2522 | 1422 | 3770 | 2482 | 4984 | 7057 |
| Section 3 | Fushe Milot, Prozhme, Shullaz, Fushe Mamuras, Bushnesh, Koder-Thumane, Fushe-Thumane | 9386 | 1341 | 734 | 1285 | 510 | 1966 | 3550 |
| Section 4 | Derven, Bilaj, Larushk 2, Arrameras, Hasan, Rinas, Breg Shkoze, Ndermjetes, Berxulle, Mukaj | 9671 | 896 | 424 | 2152 | 684 | 1899 | 3617 |
| Section 5B | Kashar, Mazrek, Kus, Allgjate, Lalm Menik, Peze Helmes, Peze e Vogel, Maknor, Peze e Madhe, Mushnik, Zambish, German, Lekaj | 11383 | 741 | 459 | 3236 | 1247 | 1769 | 3930 |
| Section 5C | Gose e Madhe (Kercukaj), Gose e vogel, Zhame Sektor, Zham Fshat, Gramsh, Konjat, Dushk I madh | 9032 | 802 | 551 | 2093 | 551 | 1590 | 3446 |
| Section 6+7 | Golem I madh, Lushnja city, Saver, Krujtje e Poshtme, Bishqethem, Lumth, Gorre, Rrapez Fshat, Rrapez Sektor, Ardenice,, Kolonje, Pirre, Vajkan | 28540 | 2325 | 1959 | 7138 | 4072 | 4879 | 8168 |
| Section 9A2 | Levan Frakull e Madhe, Kafaraj, Ade, Sheq Musalala, Kashisht, Varibop, Floq, Buzemadh, Gjonc | 11979 | 858 | 403 | 2415 | 815 | 2749 | 4742 |
| Section 9B2 | Dames, Behaj, Malas, Zhulaj, Lulezim, Toc, Qesarat, Iliras, Memaliaj Fshat, Memaliaj | 10010 | 1129 | 490 | 2537 | 1093 | 1480 | 3280 |
| Section 10 | Tepelene city | 2970 | 412 | 368 | 664 | 512 | 412 | 602 |
| Section 11 | Humelice, Cepun, Mashkullore | 1131 | 90 | 40 | 251 | 116 | 228 | 407 |
| Section 12 | Arshi Lengo, Kordhoce | 999 | 88 | 32 | 236 | 58 | 187 | 397 |
| Section 13A | Dervican, Goranxi, Vanister, Haskove, Sofratike, Terihat, Gorice, Frashtan, Lugar, Grapsh, Jorgucat, Kakavie | 5600 | 244 | 198 | 1326 | 560 | 1194 | 2076 |
| **Total** | | **143,488** | **30,470** | **13,086** | **28,049** | **14,021** | **8,002** | **49,859** |

### 4.3.4 Migrations

After the nineties, Albanians have been involved in three migration cycles which may be considered intensive, irregular and evolving : i) winter-spring 1990-1991 when the massive emigration to Italy and Greece occurred; ii) August 1991 when the massive emigration to Italy occurred; iii) spring 1997 when massive emigration to EU member states occurred because of high insecurity in the country. These three cycles were produced from the combined actions of economic and political factors.

Albania is still considered a country of origin as well as a transit, and destination country for economic immigrants, asylum-seekers and refugees. Albania had two types of migration: the migration outside the country and the other one is migration within the country. Both types of migrations have their peak in the period 1991-2001.

Internal migration in Albania is mostly synonymous with urbanization. During 2014, around 32 thousand inhabitants[30] moved within the country, by changing the region, town or village of their usual residence. Generally, internal migrants belong to the category of youth. Net migration in Albania has shown slight increase compared to the last two years, indicating a value of – 15.030[31].

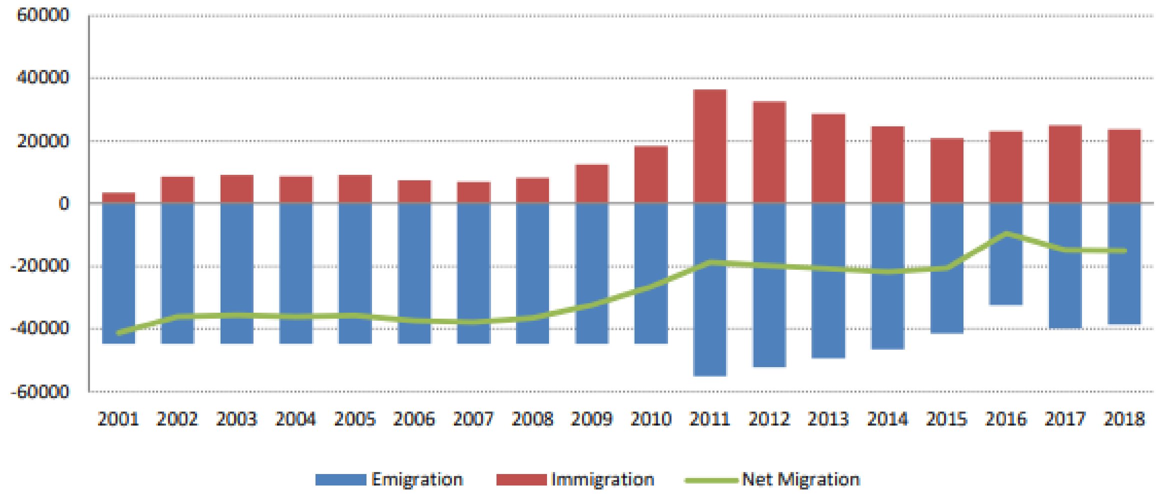


**Figure 4-102 Emigration, Immigrations and Net migration, 2001-2018 Net**

Migration indicator (Number of emigrations, immigration and net migration) disaggregated by municipalities are not available[32]. The main indicators available, which indirectly are related to migration in affected municipalities are; the population change between the years 1989-2011 and remittances costs presented in the following table.

The municipality of Lezhe (Section 2), Vore (Section 4) and especially municipality of Tirane (section 5B) has shown a rapid increase of the population for the 20-year period (89'-11') as result of higher incoming flows. The municipalities of Kruje (Section 4) and Kurbin (Section 3) has shown also positive value in population change.  This came as result of the population movement in areas with better economic opportunities, especially in the Tirana-Durres area. Internal migration has occurred from peripheral areas to urban centers and areas with high accessibility to infrastructure.

Dropull municipality (Section 13A of AIC), is the most affected area by the massive migration of the population over the last two decades. About 80 % of the population has left the municipality for the period 89'-11'. The population is mainly displaced in Greece due of the proximity with the neighbouring country, looking for better economic opportunities. Other settlements along the study area that have lost more than

[30]Decision of the Council of Ministers no. 1008, dated 16.12.2015; 'On the approval of the National Extended Migration Profile, 2014

[31]http://instat.gov.al/media/5154/population-of-albania-first-january-2019.pdf

[32]Official response of INSTAT Albania

20 % of the population are that of Mallakaster-Section 9B2, Memaliaj-Section 9B2, Rrogozhine- Section 5C, Tepelene-Section 10 and rural area of Gjirokaster city-Section 11 and 12.

7.29 % of the households in affected municipalities have remittances as the main source of incomes.

**Table 4-105 Population change for the period 1989-2011 and percentage of the households with remittances as the main source of incomes.**

| Section of AIC Corridor | Population change 89-11 % | Population change 01-11 % | Incomes from Remittances in 2011 (%) |
|---|---|---|---|
| Section 1 | -62.4 | -12.8 | 6.97 |
| Section 2 | 34.8 | 11.5 | 9.25 |
| Section 3 | 3.05 | -13.1 | 8.25 |
| Section 4 | 14.7 | -1.7 | 7.16 |
| Section 5B | 69.6 | 28.4 | 4.9 |
| Section 5C | -12.8 | -24.3 | 20.14 |
| Section 6+7 | -13.9 | -19.1 | 13.7 |
| Section 8 | -1.1 | -11.4 | 9.22 |
| Section 9A2 | 4.8 | 11.2 | 14.5 |
| Section 9B2 | -65.7 | -56.3 | 18.9 |
| Section 10 | -54.1 | -33.4 | 6.32 |
| Section 11 | -63.4 | -37.5 | 4.82 |
| Section 12 | -20.5 | -17.1 | 2.42 |
| Section 13A | -80.3 | -79.4 | 11.2 |
| **Total** | **-10.2** | **-0.08** | **7.29** |

*Source of data; Generated by expert using the data published on Geoportal, Instat*

In settlement level, the percentage of the population that have migrated during years varies from 15 % in settlement that belong to the municipality of Tirane (Section 5B of AIC) to 75 % in the settlements belonging to the Municpality of Dropull (Section 13A). A general ovierview relating to migration of the population in affected settlements33 is presented in Table 4-106 Demographic indicators in affected settlements by sex and group age per each section of AIC Corridor, number of families and migrants..

## 4.3.5 Economic activity

During year 2018[34], Albanian economy performed a real Gross Domestic Products (GDP) growth rate by 4.07 % compared with year 2017. Services sector continue to represent the main share in the economy for year 2017, by 47.7 % of GDP and they increased by 6.06 % in real terms. Industry and Construction realized 20.4 % of GDP. Industry rise by 1.8 % in real terms, meanwhile Construction by 7.04 %. Agriculture, hunting and forestry with 19 % share of GDP, grew by 0.84 % in real terms.

At the end of year 2018 there are 162,835 active enterprises in Albania. Mostly of enterprises are focused within trade economic activity with 30.1 %, while 1.8 % in economic activity "Information and communication". Enterprises with legal form "Sole traders" are dominating in the Albanian economy with 60.5 %, of which 41.5 % of them are operating in area of trade.

### 4.3.5.1 Economic activities in affected municipalities

Based on data of the year 2017[35], the total number of enterprises in the wider project area is 83,473. It represents 52 % of the enterprises in Albania. The highest share of 76% active enterprises are registered under the domain of service provision in 2017. Retail trade is the second largest economic activity as 42.8 % of the registered business operate as trade enterprises. The third in row is the sector of Producer of goods with 24 % of the active enterprises out of which 58.3% are goods in the agriculture, forestry and fishing activities. Municipality of Tirana has the biggest number of enterprises, located mainly in the first

[33] According to perceptions of the stakeholders consulted during the field visits
[34] Source: Press release; Gross domestic products 2018. Final estimates 2017 and Semi-final 2018. Instat
[35] Enterprises indicators by municipality, Instat 2018

part of the Section 5B. In the project area there are 258 businesses per 1000 economically active population[36]. Data regarding the total number of active enterprises by economic activity, AIC Sections and the main economic sector are presented in the following table.



[36]Generated by expert

**Table 4-107 Distribution of economic activity by sectors and Sections of AIC**

| Section of AIC Corridor | Total | Producers of goods | Agriculture forestry and fishing | Industry | Construction | Provision of services | Trade | Transport and storage | Accommodation and food service activities | Information and communication | Other Services |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Section 1 | 9,143 | 2,895 | 2,135 | 591 | 169 | 6,248 | 2,953 | 224 | 1,521 | 139 | 1,411 |
| Section 2 | 3,211 | 1,012 | 713 | 191 | 108 | 2,199 | 1,066 | 112 | 543 | 22 | 456 |
| Section 3 | 1,447 | 278 | 99 | 130 | 48 | 1,169 | 605 | 74 | 259 | 15 | 217 |
| Section 4 | 2729 | 658 | 136 | 422 | 101 | 2071 | 1076 | 121.5 | 378 | 32 | 463 |
| Section 5B | 47,039 | 5,408 | 333 | 3,159 | 1,916 | 41,631 | 16,117 | 1,611 | 6,601 | 1,879 | 15,423 |
| Section 5C | 1,263 | 727 | 645 | 66 | 16 | 536 | 253 | 22 | 176 | 8 | 68 |
| Section 6+7 | 6,808 | 4,339 | 3,965 | 294 | 80 | 2,469 | 1,353 | 104 | 534 | 44 | 443 |
| Section 8 | 6,969 | 2,667 | 2,049 | 448 | 170 | 4,302 | 2,372 | 231 | 780 | 48 | 871 |
| Section 9A2 | 541 | 206 | 158 | 35 | 13 | 335 | 175 | 32 | 59 | 3 | 66 |
| Section 9B2 | 1116 | 433 | 328 | 80 | 25 | 683 | 328 | 53 | 178 | 8 | 116 |
| Section 10 | 767 | 449 | 389 | 33 | 27 | 318 | 147 | 16 | 80 | 6 | 69 |
| Section 11 | 146 | 55 | 44 | 8 | 3 | 91 | 43 | 6 | 18 | 1 | 23 |
| Section 12 | 1,976 | 740 | 592 | 115 | 33 | 1,236 | 585 | 80 | 251 | 14 | 306 |
| Section 13A | 318 | 147 | 92 | 50 | 5 | 171 | 73 | 14 | 50 | 6 | 28 |
| **Total** | **83,473** | **20,014** | **11,678** | **5,622** | **2,714** | **63,459** | **27,146** | **2,701** | **11,428** | **2,225** | **19,960** |
| **%** | | **24.0** | **58.3** | **28.1** | **13.6** | **76.0** | **42.8** | **4.3** | **18.0** | **3.5** | **31.5** |

As it can be shown in the following table, 64.95 % of the enterprises are registered as sole traders by legal form, 21.57 % of the enterprises are juridical persons 37 and the enterprises registered as farmers represent 13.49 %. Foreigner and Joint enterprises in the area under the study represent only 4.4 % of

[37] By Instat classification on legal form of enterprises, 'Juridical Person' enterprises includes; a) Limited Liability Companies, b) Joint Stock Companies; c) Public Enterprises; d) Public Administration; e) NGO, Intern. Organization; f) Other Companies

the total. 66.13 % of enterprises are under the administration of males and 33.8 % of enterprises are headed by females. In 2017, the distribution of active enterprises by region indicates that enterprises with women owners or managers are largely concentrated in Tirana municipality (Section 5B), about 37%.

**Table 4-108 The number of active enterprises in 2017 by legal form, ownership, gender of the administrator/owner and number of businesses per 1000 working age population dissagregated by Sections of AIC.**

| Section of AIC Corridor | Total | Active enterprises by municipality and legal form, year 2017 | | | Active enterprises by municipality and ownership | | Active enterprises by municipality and the gender of the administrator/owner | | No. of businesses per 1000- working age population |
|---|---|---|---|---|---|---|---|---|---|
| | | Farmers | Physical persons | Juridical persons | Albanian | Foreigner and Joint | Male | Female | |
| Section 1 | 9,143 | 2078 | 5895 | 1170 | 9212 | 130 | 6400 | 2743 | Varies from 150 (Vau I Dejes) to 193 businesses in Lezhe |
| Section 2 | 3,211 | 644 | 2,134 | 433 | 2932 | 80 | 2248 | 963 | 193 businesses |
| Section 3 | 1,447 | 84 | 1104 | 259 | 1425 | 22 | 1013 | 434 | 96 businesses |
| Section 4 | 2729 | 107 | 1951 | 671 | 2634 | 95 | 1910 | 819 | 137 businesses |
| Section 5B | 47,039 | 232 | 33250 | 13557 | 43808 | 3231 | 29635 | 17404 | Varies between 140 (Rrogozhine) to 208 businesses (Tirane) |
| Section 5C | 1,263 | 632 | 557 | 74 | 1253 | 10 | 884 | 379 | 140 (Rrogozhine) to 215 businesses in Lushnje |
| Section 6+7 | 6,808 | 3912 | 2498 | 398 | 6781 | 27 | 4766 | 2042 | 215 businesses |
| Section 8 | 6,969 | 2008 | 4178 | 783 | 6907 | 62 | 4878 | 2091 | 197 businesses |
| Section 9A2 | 541 | 157 | 325 | 59 | 538 | 3 | 379 | 162 | 197 businesses |
| Section 9B2 | 1116 | 317 | 683 | 116 | 311 | c | 781 | 335 | Varies between 88.4 (Mallakaster) to 94 bussineses (Memaliaj) |
| Section 10 | 767 | 383 | 286 | 98 | 762 | 5 | 577 | 190 | 128 |
| Section 11 | 146 | 42 | 83 | 21 | 146 | 0 | 102 | 44 | 195 businesses |
| Section 12 | 1,976 | 578 | 1124 | 274 | 1952 | 24 | 1383 | 593 | 195 businesses |
| Section 13A | 318 | 83 | 147 | 88 | 309 | 9 | 241 | 77 | 155 businesses |
| **Total** | **83,473** | **11257** | **54215** | **18001** | **78970** | **3698** | **55197** | **28276** | |
| **%** | | **13.49%** | **64.95%** | **21.57%** | **94.61%** | **4.43%** | **66.13%** | **33.87%** | |

**Note: C means that further details affects confidentiality*

Regarding the size of the enterprises, small businesses are more distributed. It represents 87.6 % of the total number of businesses, while large businesses with 50 or more employees account for 1.4 % of total enterprises. More detailed data on the size of enterprises distributed in the territory of municipalities affected by the project and divided by sections of AIC are shown in the following table.

**Table 4-109 Size of enterprises by the number of employees. Data source; Instat, Enterprises indicators by Municipality, 2017**

| Section of AIC Corridor | Total | Size of enterprises | | | |
|---|---|---|---|---|---|
| | | 1-4 employed | 5-9 employed | 10-49 employed | 50 or more employed |
| Section 1 | 9,143 | 8417 | 333 | 314 | 79 |
| Section 2 | 3,211 | 2890 | 173 | 122 | 26 |
| Section 3 | 1,447 | 1302 | 68 | 64 | 13 |
| Section 4 | 2729 | 2374 | 164 | 136 | 55 |
| Section 5B | 47,039 | 39513 | 3857 | 2762 | 907 |
| Section 5C | 1,263 | 1200 | 32 | 27 | 4 |
| Section 6+7 | 6,808 | 6572 | 113 | 101 | 22 |
| Section 8 | 6,969 | 6352 | 280 | 263 | 74 |
| Section 9A2 | 541 | 492 | 22 | 21 | 6 |
| Section 9B2 | 1116 | 1061 | 21 | 27 | 7 |
| Section 10 | 767 | 714 | 19 | 27 | 7 |
| Section 11 | 146 | 133 | 6 | 5 | 2 |
| Section 12 | 1,976 | 1798 | 81 | 80 | 17 |
| Section 13A | 318 | 265 | 27 | 17 | 9 |
| **Total** | **83,473** | **73083** | **5196** | **3966** | **1228** |
| **%** | | **87.55%** | **6.22%** | **4.75%** | **1.47%** |

*Note: C means that further details affect confidentiality

In the following paragraph are presented information on economic activity per each section in municipal level.

**Section 1**

In the municipality of Shkoder (which territory is crossed from km 0+000 to km 14+500 of AIC section) 8,021 person are employed in public sector[38].

In the municipality of Vau i Dejes (territory of municipality crossed from km 14+500 to km 23+500 of AIC section), most of the economic activities are concentrated in central areas with easier access, near the national road Tirane - Hani I Hotit. About 70% of businesses have an annual income of less than 2 million ALL, which indicates the low level of economy and businesses in the territory while industrial activities are located in Bushat and Vau-Dejes. There are 135 persons employed in the administrate office of the municipality, and also 227 employees other public service facilities.

In the municipality of Lezhe (territoriy of the municipality is crossed from AIC section starting from km 23+500 to km 40+965), The main economic activities operating in the territory of the municipality are cement factories, brick factory, shoe factories, fish processing factories, marble processing, etc. There are 193 businesses per 1000 economically active inhabitants. There are 134 state institutions which employ high share of the population. About 58 % of the labor force employed in public sector works in Lezhe administrative unit. The total number of employees in 2016, in Lezhe municipal office (including administrative units, contract staff or other depending institutions of the municipality such as library, etc.) is about 755 people[39].

[38]Action Plan of Drainage Service, Leviz Albania, Shkoder Municipality, 2017

[39]http://www.lezha.gov.al/web/plani_i_menaxhimit_te_mbetjeve_lezhe_2017_2021_final_draft_10_12_16_1594.pdf

**Section 2**

Regarding the information on economic activities for these section, which crosses the territoriy of Lezhe municipality starting from km 0+000 to km 16+000, please refer the above paragraph where are presented informations for Municipality of Lezhe.

**Section 3**

In the municipality of Kurbin (which territory is crossed from section 3 of AIC starting from km 0+000 to km 11+500) most of the businesses operates in the field of services, trade, construction and freelancer. Economic activity is mainly concentrated along the E672 motorway and in the vicinity of the national road Sh1. A good part of the businesses is concentrated in the town of Lac.

Other important sectors are; agriculture, fishing and tourism. Patoku Lagoon gives opportunity for fishing and day-to-day tourism development. From 2013, the number of active businesses increased by 49 %.

Municipality has also high potential for development of agriculture and livestock. The area is distinguished for the production of honey, forage, vegetables, fruit crops, vineyards and olive groves. The livestock sector is distinguished for the production of woolen products, poultry, pigs and breeding of bees.

This section crosses also very few the territory of Municipality of Kruje (starting from km 11+000 to 13+455 of Section 3). For the information regarding the economic activity for this municipality please refer to following paragraph, under Section 4.

**Section 4**

In the last 5 years, the number of businesses along section 4 has increased from 16% (Municipality of Vore) to 28% (Municipality of Kruje). Most of these businesses in Vore municipality are located along the Tirane-Durres highway (E672), where especially are present about 50 hotels and residences and also in the village of Gjokaj. Services are the main source of employment, followed by industry. Employment in agriculture sector is low due to informality in rural areas. Near the study area, in Preze administrative unit territory operate several large companies, mentioning: Plastic and Shoe factory, Potato production plant, Sausage processing plant and Rinas Airports

In local level (administrate of the Municipality of Vore) are employed a total of 395 persons, 43 person are employed in Preze administrative unit office, 40 employees in Berxulle and 183 in Vore, while in public services are employed 93 person40.

Regarding the municipality of Kruje (crossed from section 4 of AIC, starting from km 0+000 to km 15+000), following are main industries: Fashion, quarries inert and limestone exploitation points, cement, wood and marble pocessing, etc. The municipality is distinguished for the production of field crops, forage crops, vegetables in greenhouses, fruit groves, vineyards, olive groves, plants medical and snail cultivation.

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**Section 5B**

Over the last five years there has been an increase on the number of enterprises from 11 % (in municipality of Tirane) to 97% (Municipality of Rrogozhine). Along this section is situated the biggest center of economy in Albania (the municipality of Tirane, crossed from section 5B of AIC, starting from km 0+000 to km 26+000). Most of the biggest economic activities are concentrated along Tirane-Durres highway (industry, wholesale, central offices). About 2 % of big enterprises with 50 or more employed, main financial services (banks) and the most important administrative institutions in the country are located in Tirane. The main activities in the industry sector are mostly related to food processing, beverage production, metal and wood processing, paper processing and printing. Among the largest employers, private enterprises are the ones that have the highest weight compared to state-owned enterprises (with more than 450 workers). From private enterprises dominates footwear manufacturing sector (which mainly works with ordering materials),

40Budget report 2018, official website of Vore municipality call centers, banks, physical security subjects, private education, television, telecommunications, road construction enterprises. Biggest employers are: Electricity Distribution Operator (OSHEE), Intercom Data Service (IDS), Alba Call and Alba Shoes Group.

Agriculture and livestock is well developed in the territory of municipality of Rrogozhine (crossed from section 5B of AIC, starting from km 26+000 to km 33+573).

**Section 5C**

Over the last five years there has been an increase on the number of enterprises from 97 % (in municipality of of Rrogozhine) to 147% (Municipality of Lushnje). In the municipality of Rrogozhine (crossed from section 5B of AIC, starting from km 26+000 to km 33+573) there are about 31 seasonal businesses operating in coastal area. In the territory operate; the Meggle milk factory; Teqja Pipe Production Factory, the dairy processing factory and the vegetable processing manufactory.

The section crosses partially the territory of Lushnje form km 5+500 to 10+085. Information regarding economic activities in the Municipality of Lushnje is presented under Section 6+7, in the following paragraphs.

**Section 6+7**

This section, which run in the territory of Lushnje municipality is mainly oriented to agriculture and light processing industry of agricultural products. Economically active population of rural areas is employed in the agricultural sector, while the labor force of the city of Lushnje is more oriented towards services and trade (45.4%). Most of trade enterprises are concentrated in the city of Lushnje. Big businesses such us; processing industries, fuel stations, etc. are mainly located along the national road linking Lushnje with Fier municipality. In Lushnje there are 2610 solar greenhouses of agricultural production mainly for cultivation of tomatoes and vegetables, as well as with cultivation of strawberries, which have the highest demand in terms of exports. Regarding livestock production, the administrative units of Kolonje, Krutje and Bubullime are distinguished for milk production, meat and eggs. A considerable number of dairies operate in the territory, as well as two of the largest dairy and livestock companies: Lufra and Delta.

This section crosses very few the territory of Fier municipality (from km 25+000 to km 28+037). The information on economic activites for municipality of Fier is presented in the following paragraphs, under section 8.

**Section 8**

The number of businesses is increased by 75% in 2017 compared to 2013. The oil extraction and processing industry has an important role in the economic development of the Fier Region due to the large hydrocarbons reserves in the territory. Oil extraction and processing enterprises are the largest and with the highest number of employees. Enterprises with the highest number of employees are: Bankers Petroleum, AlbPetrol, Bolv Oil and Alb Star

**Section 9A2**

Very important is collection and storage of agricultural products, mainly located in Levan administrative unit. In Frakull area there are the highest number of agricultural greenhouses, where are produced vegetables.

For information regarding economic activity in Mallakaster municipality, see the following paragraph, under section 9B2.

**Section 9B2**

Along this section, one of the main economic activity of the area is the Refinery of Ballsh, located in Mallakaster is. About 622 people are employed in municipal administration office, public services and administrative units.. Over 300,000 olive trees are counted around the territory. Another important sector is livestock farming, about 82 farmers raise a considerable number of goats.

About 49% of the enterprises in Memaliaj operates in agriculture and livestock sector, which is responsible for almost half of output and employment. Meanwhile, the economy of the territory is characterized by the presence of informality and the prevalence of small and family businesses. In addition to the service sector, there are efforts to gradually develop industrial activity, which consists mainly in the initial processing of medicinal plants.

**Section 10**

Section 10 crosses very few the territory of Memaliaj municipality (starting from km 0+000 to km 5+200), the information on economic activities is presented above under section 9B2.

Most of the businesses along section 10 operate in the city of the Tepelene. In the service sector, the most important is the trade activity and accommodation (hotels). The industrial activity is gradually increasing, consisting of small and light industry businesses (Tepelena Mineral Water), as well as the initial processing of medicinal plants. Agricultural activities relate to Olive cultivation and the production of olive oil. An investment worth mentioning is that of the fish farming business, built on the banks of Vjosa river, near the bridge of Hormove. In Tepelene some families provide their income by trading of Aromatic Medical Plant. This activity provides 40,000 - 100,000 Albanian Lek (ALL) of incomes per year per household.

**Section 11 and Section 12**

In the municipality of Gjirokaster which territory is crossed from Section 11 and Section 12 of AIC the number of businesses has increased by 48% in 2017 compared to 2013. . Livestock from the producer of goods is the main economic activity for rural population along this section. Many enterprises, including small and medium-sized food units, such as Fresh Company, which produces drinks, and Boukas Company which produces alcoholic beverages (wines) and also gas stations, hotels, restaurants and supermarkets operates close to SH4 motorway (national road to Kakavie ) in the vicinity of the city of Gjirokaster. In a short distance from the Greek border is located Glina Mineral Water Company. Most of service activities are located in the city of Gjirokaster. Gjirokastra is also known for its tourism potential. The high number of employees in the services sector is directly related to tourism (accommodation, catering, folk art, etc.). Public services engage considerable number of employees. The number of people employed in the municipality office and its dependent structures at the end of 2017 is 625.

**Section 13**

During 2017, the number of businesses along this section which cross the territory of Dropull municipality was increased by 31.4% compared to 2013. The concentration of large enterprises is higher in Dropulli Siperm administrative unit, due to the existence of most suitable infrastructure and the proximity with the Greek border that facilitates the export of most of the production of these companies across the neighboring countries. In public administration are employed about 110 persons. Industrial economic zone is located along the Interurban Highway SH4, where operate the most important of processing and manufacturing industries. The largest enterprises in municipality are: Fresh Company, Elka S.A, Veko Company, Agna Group, Gjirofarm Milk Industry, Glina Bottling Filling Industry etc. The number of employees in agricultural farms during the year 2016 is 314 persons[41].

#### 4.3.5.2 Economic activities in affected settllements

A summary on economic activities in settlements dissagregated by sections of AIC as provided by representatives of administrative units/municipalities and community (in some cases) in the study area is shown in the following table, while more detailed data on economic activities per each settlements along AIC is shown in Annex XX 'Data on employment, main sources of incomes and economic activities'.

[41]General Local Plan of Dropull municipality

**Table 4-110 The main sector of employment, economic activities and the largest businesses operating in the settlements affected by AIC route**

| AIC Sections | Settlements | The main sector of employment, main economic activities operating in the study area and the largest businesses | Businesses for 1000 inhabitants [42] |
|---|---|---|---|
| Section 1 | Shtuf, Muriqan, Obot, Oblike, Berdice e Madhe,Mali Hebaj, Beltoje, Ashte, Kosmac, Meglush, Bushat, Plezhe, Shkjeze, Mabe, Dajc, Gjader, Piraj, Blinisht, Rraboshte Merqi, Balldren, Balldren I Ri | Agriculture is the main sector of employment for the work force of the settlement along the section 1. The largest businesses along this section are; a shoe factory in Mabe settlement where are employed 200 person, Cement factory 'Colacem Albania sh.p in Balldren , where are employed about 53 person,<br>Furniture manufacturing, gas stations, auto services and car spare parts trading, hotels and restaurant are also important economic activities. | Varies from 10 in Oblike adm.unit to 17 in Bushat and Berdice |
| Section 2 | Lezha city, Ishull Shengjin, Ishull Lezhe Rrile, Shenkoll, Gajush | Services are the main sector of employment for the work force of the settlement along the section 2, especially in Lezhe where are employed 76% of the population. The largest businesses along this section are; a Ceramic factory, bank services, inert points, confectionery and shoe factory, restaurants and gas stations. Public institution mainly located in Lezhe city are also an important employment sector for about 30% of the population. Agriculture and tourism are the main economic activities in Shenkoll. | Varies from 10 businesses in adm.unit Shenkoll to 62 in Lezhe city |
| Section 3 | Fushe Milot, Prozhme, Shullaz, Fushe Mamuras, Bushnesh, Koder-Thumane, Fushe-Thumane | Agriculture is the main economic activity for the work force of the settlement along the section 3, while only for the first part of the section, in Fushe Milot settlement services are the main employment sector. The main economic activities are; a shoe factory in Koder Thumane (where are employed 200 person); gas stations, hotel and restaurants, construction material trading and butcher shops | Varies from 8 businesses in Koder Thumane adm.unit to 12 in Milot |
| Section 4 | Derven, Bilaj, Larushk 2, Arrameras, Hasan, Rinas, Breg Shkoze, Ndermjetes, Berxulle, Mukaj | In most of the settlements along section 4, agriculture is the main economic activity for the work force, while in settlements of Larushk, Rinas and Breg Shkoze the service sector is the main sector of employment for the population. The main economic activities are; the Airport of Rinas, 2 confection manufacture, 1 in Larushk and 1 in Berxulle, Agricultural products wholesaler, gas stations, auto services, restaurants, tiles paving, stove trade store, furniture trade, gas station and restaurant | Varies from 14 businesses in Berxulle adm.unit to 32 in Arrameras, Larushk |
| Section 5B | Kashar, Mazrek, Kus, Allgjate, Lalm Menik, Peze Helmes, Peze e Vogel, Maknor, Peze e Madhe, Mushnik, Zambish, German, Lekaj | The main economic activity for the work force along the first part of the section till km 10+000 is the service sector, while for the other part of this section agriculture is the most important sector. The largest businesses are located in the first part of the section (mainly in Kashar) and includes; Cleaning service, building material store, fabric product manufacture, food product supplier, shoe store, transportation service, auto service and auto accessories store. Some big businesses are located also in Peze Helmes settlement and deals with food product supplier, manufacturing cable systems, grocery store, olive oil processing factory, furniture manufacture. | Varies from 18 businesses in Lekaj adm.unit to 34 in Kashar |
| Section 5C | Gose e Madhe (Kercukaj), Gose e vogel, Zhame Sektor, Zham Fshat, Gramsh, Konjat, Dushk I madh | The main economic activity for the work force is agriculture. The main businesses operating along this section are; farm equipment store, service and auto repair shop, gas stations, grocery store, olive oil processing factory, restaurants, Metal processing, fruit and vegetables wholesaler.<br>92 person along this section are employed in state administration offices. | Between 23 businesses in Dushk adm.unit to 24 in Gose |
| Section 6+7 | Golem I madh, Lushnja city, Saver, Krujtje e Poshtme, Bishqethem, Lumth, Gorre, Rrapez Fshat, Rrapez Sektor, Ardenice,, Kolonje, Pirre, Vajkan | The main economic activity for the work force in rural areas is agriculture, while in urban area (city of Lushnje) is the service sector. The main businesses operating along this section are; Lufra nad Soal company which deals with milk processing and dairy products, Agricultural inputs and manufacture, import-export fruit and vegetables, car dealer, gas stations, auto services, tractor dealer, production of confection, trade point fertilizers for agricultural production, construction company, furniture manufacture, catering, dried flower market, etc. | Varies from 18 in Vajkan to 55 in Lushnje city |

[42] Data from Functional Zone Report in 12 Counties of Albania, UNDP

| | | | |
|---|---|---|---|
| Section 9A2 | Levan Frakull e Madhe, Kafaraj, Ade, Sheq Musalala, Kashisht, Varibop, Floq, Buzemadh, Gjonc | The main economic activity for the work force is agriculture. The main businesses operating along this section are; various mechanical services, bar and restaurants, agro-food processing factory, gas station, agricultural pharmacy, four production company, olive oil processing factory, agricultural products collection points, furniture manufacturing firm, etc. | Varies from 8.0 to 16.8 (in Levan area) |
| Section 9B2 | Dames, Behaj, Malas, Zhulaj, Lulezim, Toc, Qesarat, Iliras, Memaliaj Fshat, Memaliaj | The main economic activity for the work force is agriculture. The main businesses operating along this section are; marble processing point, olive oil processing factory, bar restaurant and hotel, market, gas station | Varies from 11 (Fshat Memaliaj), 19 (Dames) to 29 in Memaliaj |
| Section 10 | Tepelene city | The main sector of employment is the service sector (for about 82% of the work force). The main businesses are bank service, hotel and restaurants, gas station, milk processing company and trade service units, such as; coffee bar, market, clothing store, etc | About 64 businesses/1000 inhabitants |
| Section 11 | Humelice, Cepun, Mashkullore | The main economic activity for the work force is livestock and agriculture sector. The main businesses operating along this section are; gas station, milk processing factory, furniture manufacturing and a shoe production factory. | About 21 businesses per 1000 inhabitants |
| Section 12 | Rshi Lengo, Kordhoce | The main economic activity for the work force is service sector and agriculture and livestock. The main businesses operating along this section are; gas stations, concrete production company, restaurant and hotel. | Varies from 16 businesses/1000 inhabitants in Arshi Lengo to 18 In Kordhoce |
| Section 13A | Dervican, Goranxi, Vanister, Haskove, Sofratike, Terihat, Gorice, Frashtan, Lugar, Grapsh, Jorgucat, Kakavie | The main economic activity for the working age population is the service sector, followed by industry. The largest businesses along this section are; Elka Company (which deals with foods and beverage trade and distribution), Gjirofarm (milk processing and dairy company), Fresh company, gas stations and bar- restaurant, metal processing factory, furniture manufacturing agricultural pharmacy, construction activity. | About 15 businesses/1000 inhabitants |

Data sources; The data are provided from consultation with representatives of municipalities/and units or community residing in affected settlements

The main economic activity along the study area is agriculture, considering that the AIC corridor runs almost in agricultural land. Along the study area dominate mainly mixed agricultural activity. In most of the settlements in rural area the households have animal husbandry and the livestock production for most of the population is used for self consumption, but also for sell. A part of the population sells the milk to dairies producers which collect for processing and production and other by-products. There are some milk processing and dairy company amongs the settlements of Section 1, 6+7, 9A2, 11, 13A. Along the settlements of Section 3 (known for production and trade of pork), 11 and 12 a substantial part of the revenew is generated by livestock production.

There are some locations along the study area known for olive and vegetables production and trading not only for domestic market, but also for export outsite the country.

Olive cultivation is very important in terms of income for the population residing in the settlements of Lekaj (Section 5B), along all settlements of Section 5C, in Golem I Madh (Section 6+7), Ardenice (Section 6+7), Vajkan (Section 6+7), along all settlements of Section 9A2 and in settlements Dames, Behaj, Malas, Zhulaj, Lulezim, Toc, Qesarat, Iliras which belong to Section 9B2. There are several olive oil processing plants amongst the settlements, where residents produce olive oil against a tarif and then trade it to local market. Most of olives are used to produce olive oil and the rest are used for table olives.

Production of vegetables in greenhauses is mainly developed along the Section 1 (mainly along the settlements in the first part of the section and in Kosmac settlement), in Fushe Mamurras (Section 3), Berxulle (Section 4), Peze Helmes (Section 5B), along the settlements of adm.unit Dushk (Section 5C), in all the settlements of Section 6+7 except the city of Lushnje and in Kafaraj, Sheq Musalala and Ade (Section 9B). Greenhouses are mainly cultivated with vegetables, meanwhile in the settlements of Section 6+7 a large part of the surface in greenhauses is cultivated with strawberries.

Given that agriculture is the main economic activity in the study area and considering rural profile along AIC Corridor the livelihood of the population using agriculture activity as the main source of income will be adversely impacted.

Services and industry sector are the main economic activities especially for the population reside in urban areas along the AIC corridor. This sectors are much more developed along the urban settlements of Section 2 (city of Lezhe) and also in some rural settlements, partially for the settlements along Section 4, first part of the section 5B, in Kashar area which is known as a potential industrial zone, in urban area along section 6+7 (city of Lushnje), section 10 (City of Tepelene) and along the settlements in section 13A (although this section runs over agricultural land, the agriculture as economic activity is not very well developed). Only in Lezha city (section 2 of AIC) there are 1364 businesses (belonging to service and industry sector) in total.

Other economic activities in the settlements and along the AIC corridor inludes; confectionary shoe factories, Cement factory, Ceramic factory, bank services (only in urban areas of AIC sections; Lezhe, Lushnje, Memaliaj and Tepelene), Airport (Rinas, Section 4), building material store, olive oil production fabric (distributed mainly in Section 5C, 6+7, 9A2 and 9B2 ), trade point fertilizers for agricultural production , furniture manufacture, metal processing, fruit and vegetables wholesaler, milk processing and dairy products, construction company, agricultural products collection points (mainly in section 6+7 and Section 9A2), marble processing point, foods and beverage trade and distribution, and gas stations, hotels and restaurants (which are the economic activities that dominate in the study area, especially where the AIC Corridor runs over existing road). In each settlement along the study area there is at least a coffee bar and a grocery store/market where local products or packaged products are marketed.

The number of businesses that will be entitled for compensation will be high especially when the AIC Corridor run along the existing road. Primary data provided in an early stage of the project revealed that approximately 280 businesses structures will be affected by AIC corridor. Demolition of businesses structures will require identification of new location in local area or termination of the business in case new location is less favorable. During ESIA preparation, more detailed social survey will reveal specific impact for the businesses (located in the proximity of AIC sections) and in this way will help to design mitigation and social assistance measures.

### 4.3.6 Land use

The total area of Albania is 2,875,000 ha or 28,750 km$^2$. According to the cadastral division, this area consists of 696,000 ha of agricultural land, 1,052,000 ha of forests, 505,000 ha meadows and pastures, and 632,000 ha unproductive land, roads, urban land etc.

Agricultural land in Albania accounts for about 24% of the total land area. Albania is ranked among Europe's countries with less agricultural land per inhabitant, averaging 0,23-0,24 ha / capita. If we refer to the land currently cultivated (about 460.000), the surface per capita is 0,15-0,16 ha.

As a result of the land privatization reform, in Albania there are about 460,000 households in agriculture and livestock activities.

Arable land is mostly used by small agricultural households for gardens, vineyards, orchards, farming and nurseries. Due to insufficient domestic agricultural production, there is an import of large quantity of food product.

Forests in Albania cover an area of about 1,052,000 ha, or about 37% of total Albania's area. This percentage of forestation is rated as a great advantage of Albania from the aspect of protection and improvement of the environment. The forests of the coastal region are mainly composed of forests of pine, while those of the municipalities along the corridor route are mainly bushes, shrubs and underbrush.

A considerable area of the country's territory is covered by pastures and meadows. This is more emphatic in the hilly area of Tirana and in the southern part of the country (Memaliaj, Tepelena and Gjirokastra). Meadows and pastures cover about 478,000 ha or 17% of the country's surface.

In addition to above, an area of 648,000 ha or 22% of the country's surface is land not used for agricultural purposes. This surface is used for urban purposes (built with construction) and/or is surface covered by road network and unproductive land (no value for agriculture) etc. Table and graph below show the allocation of the land fund in the Republic of Albania.

**Table 4-111 Allocation of the land fund**

| Naming | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|
| Total Land | 2,875 | 2,875 | 2,875 | 2,875 | 2,875 |
| Arable Land | 696 | 696 | 696 | 696 | 696 |
| % | 24 | 24 | 24 | 24 | 24 |
| Forest | 1,043 | 1,041 | 1,041 | 1,053 | 1,052 |
| % | 36 | 36 | 36 | 37 | 37 |
| Meadows and Pastures | 505 | 505 | 491 | 478 | 478 |
| % | 18 | 18 | 17 | 17 | 17 |
| Others | 632 | 632 | 647 | 648 | 648 |
| % | 22 | 22 | 22 | 22 | 22 |

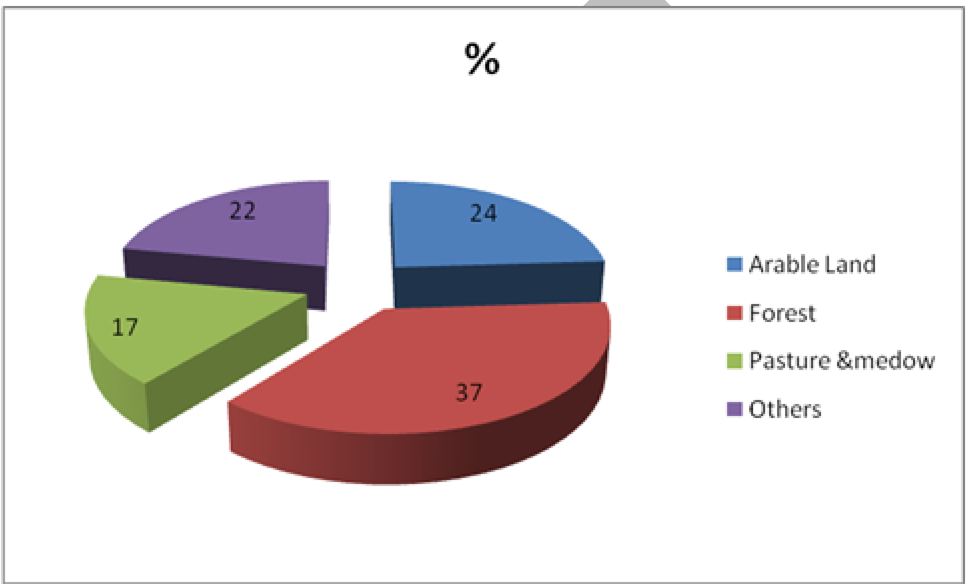


**Figure 4-103 Land Structure in 000 ha**

By analyzing the land of the affected sections through the five systems: Urban, Agricultural, Natural, Water and Infrastructure system, the biggest is natural system (including forests, pastures and meadows) and it covers from 11,57% up to 81,33% of the territory. The second with the size is agricultural system whereas the size of the urban system is the smallest one.

The table below shows the land use according to the five systems

**Table 4-112 Use of the land within the sections according to the land use systems**

| Systems (in %) | Sections | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6-7 | 9 | 10 | 11-12 | 13 |
| Urban system | 3.28 | 6.96 | 2.02 | 8.3 | - | 6.63 | 5.98 | | 3.19 | 2.02 |
| Agricultural system | 22.02 | 34.90 | 32.84 | 38.2 | - | 77.27 | 70.18 | 16 | 13.66 | 18.03 |
| Natural System | 75.22 | 55.51 | 51.92 | 50.4 | - | 11.57 | 20.56 | 57.8 | 81.33 | 78 |
| Water system | 20.44 | 2.07 | 3.00 | 1.3 | - | 2.04 | 1.58 | | 0.9 | 1.3 |
| Infrastructure system | 1.06 | 0.56 | 0.22 | 8.3 | - | 2.25 | 1.70 | | 3.19 | 0.66 |

According to actual data, the land surface is planted with 142,600 ha of cereals or 20,4% of total area, 207,300 ha of forage crops or 29.8%, 31,100 ha of vegetables or 4.47%, 10.100 ha of potatoes or 1.45%, 14900 ha of white bean or 2.14% and 7.100 ha of other plants. So, from 696,000 ha of total area, are planted with field plants only 423,100 ha or 60,79%. Despite favorable natural conditions, irrigation as hydro-technical measure of land water regime is applied only to 225,000 ha.

From the above figures it is estimated that about 230, 000 ha or about 34% of the total area of agricultural land is not sown. The reasons are technical and social. A part of this surface is not planted because they are low fertile soils and the yields do not justify production costs. The rest is not sown because many families have emigrated and migrated or have no economic opportunity. These surfaces are highly degraded and are particularly affected by erosion.

Among the regions where the AI corridor is crossed, the regions with the most developed agriculture are Shkodra, Lezha, Lushnja, Fier and the Dropull area in the Gjirokastra region. These regions are distinguished from other regions because they have land with higher fertility. As a result, yields and production of agricultural products are higher.

Albania has a Mediterranean climate that allows cultivating of different fruit trees. According to the vertical zone in Albania cultivated fruit trees of Mediterranean climate, vineyards, olives and citrus to those of continental climate.

**Table 4-113 Number of fruit trees in Albania**

| Denomination (number of trees in 000) | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|
| Fruit trees | 11,225 | 11,607 | 11,909 | 12,254 | 12,405 |
| Olives | 7,443 | 8,000 | 8,620 | 8,994 | 9,225 |
| Citrus | 916 | 1,010 | 1,125 | 1,200 | 1,282 |
| Pergolas | 5,743 | 5,859 | 5,974 | 6,075 | 6,109 |
| Vineyards (Ha) | 10,073 | 10,136 | 10,178 | 10,383 | 10,438 |

In recent years, in the area where the AIC passes, there is developing the area planted with vineyards, citrus and olives. The increase of the vineyard surface is evident in the western coastal lowlands, while the olive grows mainly in the Fier, Mallakastra and Tepelena areas.

## Land Take

Based on Preliminiray report on Expropriation, land take in the area under the study include several categories of land use: agricultural land, forests land, pastures, urban land and buildings, which presents all types of land categories according to Albanian legislation. The analysis of land take is done by using the the orthophotos provided by technical team, where were determined the villages affected by each section of the Corridor and the length of the land to be expropriated by categories (land plot, agricultural land, forest land and pasture land). The surface of land to be expropriated per each segment and alternative was calculated based on two assumptions.

1. The space of expropriation is equal to the space of road safety + secondary road, canals etc (according to the Albanian road code).
2. Construction of parallel lanes or the increase of the lanes in the future.

For each construction has been assumed an average surface of 250 $m^{2.}$

Total area of land along the AIC footprint to be expropriated and per categories of land is shown in the following table:

| Land use types | Land to be expropriated (Ha) |
|---|---|
| Building plot | 24.81 |
| Agricultural land | 1304.8 |
| Pasture | 124.4 |
| Forest | 158.6 |

| | |
|---|---|
| Constructions | 15.32 |

**Table 4-114 The main sector of employment, economic activities and the largest businesses operating in the study area**

Considering Conceptual Stage of the Project, land take requirements may be change. In this regard, details on land take surface and ownership will be known during the Detailed Desing of the Project and after preparing of Ressetlement Action Plan.

Based on consultation with affected parties and their experiences with other projects a part of the population may face social negative impacts and effects on their assets from land take proccess. In this aspect, population affected includes individuals that do not have registered their properties. Based on existing legislation on expropriation, the affected population cannot be compensated if their properties are not registered in the State Cadastre Agency (although they may have ownership documents).

### 4.3.6.1 Land price

In Albania, the land market has begun to develop. Land prices differ based on land use and its destination. In the western coastal lowlands, land prices are higher because of its use for construction. For this reason, farmers have abandoned land use for agricultural purposes in these areas. In the rest of territory, far from the coastline, land prices are lower. Farmers in these areas do not use the land hence the price is lower. The land is not used due to import of agricultural products and natural disasters (especially floods).

Land prices for each affected municipality according to DCM no 89, date 03.02.2016 "On the definition of the land value mapping in Albania" are presented on the table below

**Table 4-115 Land prices in affected municipalities**

| Section | Municipality | Village | Prices of land categories in Albanian Lek/m$^2$ | | | |
|---|---|---|---|---|---|---|
| | | | Building plot | Arable land | Pasture | Forest land |
| Section 1 | Shkodra | Barbullush | 322 | 270 | 117 | 165 |
| | | Bushat | 429 | 270 | 117 | 165 |
| | | Melgush | 325 | 270 | 117 | 165 |
| | | Ashte | 348 | 270 | 117 | 165 |
| | | Muriqan | 293 | 270 | 117 | 165 |
| | | Obote | 293 | 270 | 117 | 165 |
| | Lezhe | Balldren I Ri | 303 | 209 | 117 | 165 |
| | | Gocaj | 228 | 209 | 117 | 165 |
| | | Piraj | 228 | 209 | 117 | 165 |
| | | Blinisht | 228 | 277 | 117 | 165 |
| | | Kodhel | 228 | 209 | 117 | 165 |
| | | Dajc | 308 | 253 | 117 | 165 |
| | | Mabe | 228 | 209 | 117 | 165 |
| Section 2 | Lezhe | Ishull Shengjin | 3435 | 441 | 117 | 165 |
| | | Ishull Lezhe | 337 | 370 | 117 | 165 |
| | | Rile | 245 | 209 | 117 | 165 |
| | | Shenkoll | 233 | 209 | 117 | 165 |
| | | Gajush | 228 | 209 | 117 | 165 |
| Section 3 | Kurbin | Fush Milot | 295 | 291 | 117 | 100 |
| | | Gurez | 278 | 278 | 117 | 100 |
| | | Fush Mamuras | 370 | 357 | 117 | 100 |
| | | Thumane | 442 | 442 | 83 | 100 |
| | | Bushtnesh | 327 | 327 | 83 | 100 |
| Section 4 | Kruje | Koder Thumane | 322 | 362 | 83 | 100 |
| | | Gromes | 287 | 421 | 83 | 100 |

| Section | Municipality | Village | Prices of land categories in Albanian Lek/m² | | | |
|---|---|---|---|---|---|---|
| | | | Building plot | Arable land | Pasture | Forest land |
| | | Bubq | 237 | 233 | 83 | 100 |
| | Vore | Berxull | 5147 | 448 | 117 | 165 |
| | | Fush Preze | 2452 | 448 | 117 | 165 |
| Section 5B and 5C | Tirane | Kashar | 4242 | 448 | 117 | 165 |
| | | Yzberisht | 4242 | 448 | 117 | 165 |
| | | Vaqar | 528 | 448 | 117 | 165 |
| | | Pez e Vogel | 878 | 448 | 117 | 165 |
| | | Pez e Madhe | 878 | 448 | 117 | 165 |
| Section 6+7 | Lushnje | Konjat | 491 | 364 | 117 | 100 |
| | | Dushk I Madh | 503 | 364 | 117 | 100 |
| | | Golem | 483 | 364 | 117 | 100 |
| | | Karbunare | 2130 | 364 | 117 | 100 |
| | Lushnje | Krutje | 545 | 364 | 117 | 100 |
| | | Bubullime | 476 | 364 | 117 | 100 |
| Section 8 | Fier | Hovoleas | 365 | 269 | 117 | 125 |
| | | Kryegjate | 250 | 269 | 117 | 125 |
| | | Pojan | 250 | 269 | 117 | 125 |
| | | Shtyllas | 321 | 269 | 117 | 125 |
| | | Levan | 2345 | 269 | 117 | 125 |
| Section 9A2 and 9B2 | Fier | Frakull e Madhe | **362** | 269 | 117 | 125 |
| | | Kafaraj | **250** | 269 | 117 | 125 |
| | | Frakull e vogel | 292 | 269 | 117 | 125 |
| | | Varibob | 507 | 269 | 117 | 125 |
| | | Gorishove | 438 | 269 | 117 | 125 |
| | Memaliaj | Krahes | 125 | 112 | 83 | 100 |
| | | Lulzim | 157 | 112 | 83 | 100 |
| | | Qesarat | 125 | 112 | 83 | 100 |
| | | Iliras | 125 | 112 | 83 | 100 |
| | | Vasjar | 125 | 112 | 83 | 100 |
| | | Memaliaj Fshat | 125 | 112 | 83 | 100 |
| Section 10 | Tepelene | Becisht | 125 | 112 | 83 | 100 |
| | | Dragot | 157 | 112 | 83 | 100 |
| | | Lekel | 125 | 112 | 83 | 100 |
| | | Hormove | 125 | 112 | 83 | 100 |
| Section 11 | Gjirokaster | Humelice | 246 | 152 | 167 | 100 |
| | | Palokaster | 246 | 152 | 167 | 100 |
| | | Cepune | 246 | 152 | 167 | 100 |
| | | Andon Poci | 246 | 152 | 167 | 100 |
| | | Mashkullore | 2080 | 152 | 167 | 100 |
| Secti on 12 | Gjirokaster | Arshi Lengo | 2080 | 152 | 167 | 100 |
| | | Asim Zenel | 2010 | 152 | 167 | 100 |
| | | Kordhoce | 355 | 152 | 167 | 100 |
| Section 13A | Dropull | Dervican | 1880 | 152 | 167 | 100 |
| | | Goranxi | 1880 | 152 | 167 | 100 |
| | | Haskove | 2010 | 152 | 167 | 100 |
| | | Dhuvian | 2010 | 152 | 167 | 100 |
| | | Terihat | 1880 | 152 | 198 | 100 |
| | | Gorice | 1880 | 152 | 167 | 100 |
| | | Jorgucat | 1880 | 152 | 167 | 100 |
| | | Zervat | 2010 | 152 | 167 | 100 |
| | | Bularat | 1880 | 152 | 167 | 100 |
| | | Vrisera | 246 | 152 | 167 | 100 |
| | | Kakavije | 246 | 152 | 198 | 100 |

### Agricultural land in affected settlements

Almost all the settlements along the AIC route of the project will be affected by land take, mainly agricultural land. Expropriation and take of land will have potential negative impacts to agricultural activities which represent the main source of income for the settlements in rural area along the AIC route and also to the livelihood of households that use the agricultural production for their own consumption.

In the following table is presented a summary of agricultural land in affected settlement, size and typology of land plots as an indication of potential impact of land take/land use at the settlement level, while in Annex XX. Data on Agricultural Land is presented a detailed information on agricultural land per each settlement affected by AIC route[43].

**Table 4-116 Data on agricultural land in affected settlements**

| AIC Sections | Settlements | Total agricultural land surface (ha) | Agricultural land per capita (m) | Surface occupied by orchards, vineyards and olive groves (ha) | Greenhouses (ha) | Areas occupied by natural vegetation such as; shrubs, forests and pastures (ha) |
|---|---|---|---|---|---|---|
| Section 1 | Shtuf, Muriqan, Obot, Oblike, Berdice e Madhe,Mali Hebaj, Beltoje, Ashte, Kosmac, Meglush, Bushat, Plezhe, Shkjeze, Mabe, Dajc, Gjader, Piraj, Blinisht, Rraboshte Merqi, Balldren, Balldren I Ri | 8789.3 | 2985 | 243.4 | 276.7 | 3179 |
| Section 2 | Lezha city, Ishull Shengjin, Ishull Lezhe Rrile, Shenkoll, Gajush | 2830.8 | 3360 | 210.26 | 1 | 0 |
| Section 3 | Fushe Milot, Prozhme, Shullaz, Fushe Mamuras, Bushnesh, Koder-Thumane, Fushe-Thumane | 4261 | 2867 | 731 | 42 | 195 |
| Section 4 | Derven, Bilaj, Larushk 2, Arrameras, Hasan, Rinas, Breg Shkoze, Ndermjetes, Berxulle, Mukaj | 3679 | 2850 | 45.93 | 6.1 | 129.28 |
| Section 5B | Kashar, Mazrek, Kus, Allgjate, Lalm Menik, Peze Helmes, Peze e Vogel, Maknor, Peze e Madhe, Mushnik, Zambish, German, Lekaj | 5661.9 | 1943 | 434.6 | 36 | 3600 |
| Section 5C | Gose e Madhe (Kercukaj), Gose e vogel, Zhame Sektor, Zham Fshat, Gramsh, Konjat, Dushk I madh | 3029 | 2500 | 1478 | 7.5 | 190 |
| Section 6+7 | Golem I madh, Lushnja city, Saver, Krujtje e Poshtme, Bishqethem, Lumth, Gorre, Rrapez Fshat, Rrapez Sektor, Ardenice,, Kolonje, Pirre, Vajkan | 4187.9 | 4065 | 202.6 | 79.1 | 78.6 |
| Section 9A2 | Levan Frakull e Madhe, Kafaraj, Ade, Sheq Musalala, Kashisht, Varibop, Floq, Buzemadh, Gjonc | 2954.7 | 2670 | 849.7 | 62.7 | 60 |

43 As provided by consultation with agricultural specialist in municipalities/administrative units and in some cases with community

| | | | | | | |
|---|---|---|---|---|---|---|
| Section 9B2 | Dames, Behaj, Malas, Zhulaj, Lulezim, Toc, Qesarat, Iliras, Memaliaj Fshat, Memaliaj | 4837 | 2211 | 318 | No data available | No data available |
| Section 10 | Tepelene city | - | - | - | - | - |
| Section 11 | Humelice, Cepun, Mashkullore | 595 | 2750 | 112 | No data | No data |
| Section 12 | Arshi Lengo, Kordhoce | 925 | 2350 | 65 | 0 | 0 |
| Section 13A | Dervican, Goranxi, Vanister, Haskove, Sofratike, Terihat, Gorice, Frashtan, Lugar, Grapsh, Jorgucat, Kakavie | 2939 | 3458 | 18.8 | 1 | 4049.8 |
| **Total Settlements** | | **91,011** | **2834** | **9,557** | **876.8** | **18963.56** |

Data source; Consultation with agricultural specialist in municipalities/administrative units of affected settlements

In the settlements residing in northern part of AIC route Section 1, Section 3 and also Section 4 predominate mostly agricultural land with mixed seasonal crops and rural settlements, partially permanent crops areas and partially forest area. Among the settlements of Section 2 predominate seasonally mixed crops in agricultural land, large part of urban areas (city of Lezhe) and rural settlements.

Settlements of Section 5B and 5C has a mixed use of land. Forests in high and mountainous areas. Permanent and seasonal mixed crops and areas with permanent crops (vineyards, olives, fruit trees). Partly semi - urban areas and settlements around pond lands.

In settlements of Section 6 + 7 and Section 9A2 predominate mainly mixed seasonal crops. Area with permanent crops (olive and vineyard) and greenhouses. Large part of urban area (Lushnje) and rural settlements.

In settlements of Section 9B2 there is a mixed land use. Predominate Forests in high and mountainous areas. Permanent and seasonal mixed crops and areas with permanent crops (vineyards, olives). Partially rural areas. Along Section 10 predominate mainly urban area and very few seasonally planted agricultural land.

Among settlements of Section 11 predominate mainly forest in mountainous areas, mixed use of seasonally planted land and rural settlements.

Seasonal mixed crops and rural settlements are the main use of land among the settlements of Section 12.

Forests in high and mountainous areas predominate the territory of setltlements along section 13A. Large part of agricultural land, partially mixed seasonal crops and rural settleements.

### 4.3.7 Land property

In Albania, after the 1990s, were carried out reforms as: land privatization, land registration, restitution and compensation of properties, legalization of illegal constructions, for public properties and the transfer of immovable property of the state to local government units etc. Official data shows that state-owned agricultural land is 139328.15 hectares or 20.2% of the fund of agricultural land of the country and in private ownership is 548201.6 ha or 79.8%.

**Table 4-117 Composition of the agricultural land fund by ownership**

| County | Area owned by the state | Area under private ownership | Total Area |
|---|---|---|---|
| Berat | 17,138.6 | 35,654.5 | 52,793 |
| Dibër | 15,891 | 25,163 | 41,054.31 |
| Durrës | 2,856 | 37,613 | 40,469 |
| Elbasan | 17,471.02 | 55,766 | 73,237 |

| | | | |
|---|---|---|---|
| Fier | 14,527.58 | 107,301 | 121,828.31 |
| Gjirokastër | 13,228 | 31,817 | 45,045 |
| Korçë | 26,973.5 | 63,445 | 90,419 |
| Kukës | 13,679 | 11,613 | 25,292 |
| Lezhë | 3,595 | 31,123 | 34,718 |
| Shkodër | 1,597 | 48,921 | 50,517.99 |
| Tiranë | 5,882.24 | 47,014 | 52,896.14 |
| Vlorë | 6,489.21 | 52,771.17 | 59,260.38 |
| TOTAL | 139,328.15 | 548,201.6 | 687,529.75 |

*Data Source: Agricultural Land Fund (2018)*

### 4.3.8 Legal status of settlements

#### 4.3.8.1. Residential Units and Buildings

As shown on the table below, there are 223,408 buildings and 427,378 dwellings located in the territory of the municipalities crossed by sections of AIC corridor. Out of these, 317,783 are inhabited and 109,595 are uninhabited. The high number of unoccupied dwellings comes as result of migration of the population.

Data regarding the number of buildings and dwellings distributed by sections of AIC Corridor and based on territories of municipalites affected are presented in the table below.

**Table 4-118 Total number of buildings for residential purpose and dwellings in 15 municipalities crossed by the road track, dissagregated by sections of AIC.**

| Sections of AIC Corridor | Buildings | Dwellings | | | |
|---|---|---|---|---|---|
| | | Total housing units | Inhabited dwellings | | Non inhabited conventional dwellings |
| | | | Conventional dwellings | Unconventional dwellings | |
| Section 1 | 40285 | 59687 | 46257 | 272 | 13158 |
| Section 2 | 9460 | 16389 | 11100 | 78 | 5211 |
| Section 3 | 12192 | 17133 | 13322 | 94 | 3717 |
| Section 4 | 16934 | 21185 | 16408 | 93 | 4684 |
| Section 5B | 65468 | 196271 | 148889 | 737 | 46645 |
| Section 5C | 7289 | 8750 | 6116 | 44 | 2590 |
| Section 6+7 | 17356 | 25725 | 20073 | 105 | 5547 |
| Section 8 | 18576 | 34875 | 25771 | 125 | 8979 |
| Section 9A2 | 8761 | 10146 | 6646 | 16 | 3484 |
| Section 9B2 | 12738 | 16177 | 9636 | 33 | 6508 |
| Section 10 | 2495 | 3893 | 2529 | 20 | 1344 |
| Section 11 | 2659 | 2948 | 1482 | 8 | 1458 |
| Section 12 | 4260 | 9039 | 6603 | 13 | 2423 |
| Section 13A | 4935 | 5160 | 1311 | 2 | 3847 |
| Total | 223408 | 427378 | 316143 | 1640 | 109595 |
| **%** | | | **73.80** | **0.40** | **25.80** |

*Data source: Population and Housing Census, 2011. Author's calculations*

28.1 % of the buildings within the project area are constructed before 1991; 22.8 % are constructed from 1991-2000 and 20.6 % between the period from 2001-2011. The number of buildings and the period of construction per sections and based on territories of municipalities affected is presented in the following table.

**Table 4-119 Buildings for residential purposes per sections of AIC and period of construction**

| | Period of construction |
|---|---|

| Sections of AIC Corridor | Total | Before 1991 | From 1991-2000 | From 2001-2011 | Don't know |
|---|---|---|---|---|---|
| Section 1 | 40285 | 12097 | 7700 | 7569 | 12919 |
| Section 2 | 9460 | 1795 | 2222 | 2765 | 2678 |
| Section 3 | 12192 | 3294 | 2629 | 2613 | 3656 |
| Section 4 | 16934 | 4054 | 3626 | 4057 | 5197 |
| Section 5B | 65468 | 15723 | 19997 | 13951 | 15797 |
| Section 5C | 7289 | 1858 | 1600 | 1492 | 2339 |
| Section 6+7 | 17356 | 5274 | 4268 | 3495 | 4319 |
| Section 8 | 18576 | 5495 | 4282 | 3083 | 5716 |
| Section 9A2 | 8761 | 2585 | 1693 | 1491 | 2992 |
| Section 9B2 | 12738 | 6031 | 1424 | 1344 | 3939 |
| Section 10 | 2,495 | 1,223 | 216 | 887 | 169 |
| Section 11 | 2659 | 988 | 292 | 1129 | 250 |
| Section 12 | 4260 | 1203 | 757 | 1753 | 547 |
| Section 13A | 4,935 | 1,214 | 224 | 282 | 3215 |
| **Total** | **223408** | **62834** | **50930** | **45911** | **63733** |
| **%** | | **28.1** | **22.8** | **20.6** | **28.5** |

Regarding the ownership of the apartments/private houses, 88.1 % of the households own their house/apartment or are in process of finalizing the ownership status.

### Table 4-120 Private households per sections of AIC Corridor and tenure status of dwellings

| Sections of AIC | Tenure status of the dwelling | | | |
|---|---|---|---|---|
| | Total | Owning or in process of acquiring legal act | Renting dwelling | Living free of rent in dwelling |
| Section 1 | 47566 | 42467 | 1434 | 3665 |
| Section 2 | 11423 | 10150 | 849 | 424 |
| Section 3 | 13778 | 12309 | 586 | 883 |
| Section 4 | 16839 | 15971 | 359 | 509 |
| Section 5B | 152354 | 128449 | 18739 | 5166 |
| Section 5C | 6237 | 5961 | 104 | 172 |
| Section 6+7 | 20404 | 19501 | 526 | 377 |
| Section 8 | 26178 | 23707 | 1493 | 978 |
| Section 9A2 | 6712 | 5814 | 28 | 870 |
| Section 9B2 | 9769 | 9310 | 276 | 183 |
| Section 10 | 2,564 | 2,369 | 99 | 96 |
| Section 11 | 1493 | 1416 | 25 | 52 |
| Section 12 | 6658 | 5954 | 529 | 175 |
| Section 13A | 1,314 | 1,298 | 7 | 9 |
| **Total** | **323289** | **284676** | **25054** | **13559** |
| **%** | | **88.1** | **7.7** | **4.2** |

Most of the buildings in the wider area of the project are private houses. Apartment buildings consist only 4.61 % and are located mostly in Tirane municipality (Section 5B), followed by Shkoder municipality (first part of Section 1).

84.71% of these buildings are 1-storey building. In the following table is shown the distribution of residential buildings by type, number of floor and by municipality.

**Table 4-121 Residential buildings in the municipalities affected by the project and distributed per sections of AIC Corridor**

| Sections of AIC | Type of building | | | | | Number of floors | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | Detached house | Semi-detached house | Row (or terraced) house | Apartment building | 1 | 2 | 3-5 | 6+ |
| Section 1 | 40285 | 32726 | 4883 | 1533 | 1143 | 35279 | 3770 | 999 | 237 |
| Section 2 | 9460 | 7853 | 921 | 323 | 363 | 8546 | 493 | 284 | 137 |
| Section 3 | 12192 | 10544 | 918 | 405 | 325 | 11338 | 523 | 270 | 61 |
| Section 4 | 16934 | 14708 | 1366 | 548 | 312 | 15460 | 1007 | 361 | 106 |
| Section 5B | 65468 | 48973 | 7341 | 3319 | 5835 | 48619 | 9674 | 5006 | 2169 |
| Section 5C | 7289 | 6465 | 479 | 238 | 107 | 6754 | 408 | 119 | 8 |
| Section 6+7 | 17356 | 15382 | 1032 | 459 | 483 | 15449 | 1394 | 405 | 108 |
| Section 8 | 18576 | 14651 | 2483 | 577 | 865 | 15877 | 1760 | 738 | 201 |
| Section 9A2 | 8761 | 8186 | 389 | 131 | 55 | 7618 | 979 | 137 | 27 |
| Section 9B2 | 12738 | 11755 | 551 | 179 | 247 | 11848 | 639 | 215 | 36 |
| Section 10 | 2,495 | 2,198 | 111 | 72 | 114 | 2,310 | 106 | 68 | 11 |
| Section 11 | 2659 | 2149 | 400 | 84 | 26 | 2472 | 154 | 24 | 9 |
| Section 12 | 4260 | 2665 | 714 | 480 | 401 | 3056 | 751 | 379 | 74 |
| Section 13A | 4,935 | 4,774 | 140 | 8 | 13 | 4,617 | 287 | 21 | 10 |
| **Total** | **223408** | **183029** | **21728** | **8356** | **10289** | **189243** | **21945** | **9026** | **3194** |
| **%** | | **81.93** | **9.73** | **3.74** | **4.61** | **84.71** | **9.82** | **4.04** | **1.43** |

### Residential buildings in settlements affected

The following table present a summary on number of buildings and type in affected settlements, as provided by consultations with community and representatives of each administrative units office, while in Annex XX. Data on buildings and the type per each settlement affected by AIC route.

**Table 4-122 Data on residential buildings in affected settlements**

| AIC Sections | Settlements | No of Buildings | Type of buildings |
|---|---|---|---|
| Section 1 | Shtuf, Muriqan, Obot, Oblike, Berdice e Madhe,Mali Hebaj, Beltoje, Ashte, Kosmac, Meglush, Bushat, Plezhe, Shkjeze, Mabe, Dajc, Gjader, Piraj, Blinisht, Rraboshte Merqi, Balldren, Balldren I Ri | **5549** | 95-98 % detached, semi-detached house. Mainly one-storey buildings |
| Section 2 | Lezha city, Ishull Shengjin, Ishull Lezhe<br>Rrile, Shenkoll, Gajush | 4382 | 85 % houses (urban area) 98% rural area. Mainly one-storey buildings (76% urban-95 % rural ) |
| Section 3 | Fushe Milot, Prozhme, Shullaz, Fushe Mamuras, Bushnesh, Koder-Thumane, Fushe-Thumane | 3109 | 96-98 % detached, semi-detached house. Mainly one-storey buildings |
| Section 4 | Derven, Bilaj, Larushk 2, Arrameras, Hasan, Rinas, Breg Shkoze, Ndermjetes, Berxulle, Mukaj | 3329 | 98 % detached, semi-detached house. Mainly one-storey buildings |
| Section 5B | Kashar, Mazrek, Kus, Allgjate, Lalm<br>Menik, Peze Helmes, Peze e Vogel, Maknor, Peze e Madhe, Mushnik, Zambish, German, Lekaj | 4073 | 87 % (urban area) – 99 % (urban area) detached, semi-detached house. Mainly one-storey buildings |
| Section 5C | Gose e Madhe (Kercukaj), Gose e vogel, Zhame Sektor, Zham Fshat, Gramsh, Konjat, Dushk I madh | 3140 | 97 % detached, semi-detached house. Mainly one-storey buildings |
| Section 6+7 | Golem I madh, Lushnja city, Saver, Krujtje e Poshtme, Bishqethem, Lumth, Gorre, Rrapez Fshat, Rrapez Sektor, Ardenice,, Kolonje, Pirre, Vajkan | 7686 | 91 % (urban area) – 99 % (urban area) detached, semi-detached house. Mainly one-storey buildings Apertmant buildings in Lushnje and Saver |
| Section 9A2 | Levan Frakull e Madhe, Kafaraj, Ade, Sheq Musalala, Kashisht, Varibop, Floq, Buzemadh, Gjonc | 3743 | 96-99.6 % detached, semi-detached house. Mainly one-storey buildings. Apertmant buildings in Levan |
| Section 9B2 | Dames, Behaj, Malas, Zhulaj, Lulezim, Toc, Qesarat, Iliras, Memaliaj Fshat, Memaliaj | 2479 | 52 % (urban area) – 99 % (urban area) detached, semi-detached house. Mainly one-storey buildings Apertmant buildings in Memaliaj |
| Section 10 | Tepelene city | 435 | 73% detached, semi-detached house, 25% apartment buildings. Mainly one-storey buildings (60%) |
| Section 11 | Humelice, Cepun, Mashkullore | 514 | 98% detached, house<br>Mainly one-storey buildings (over 95%) |
| Section 12 | Arshi Lengo, Kordhoce | 368 | 88-96 % detached, semi-detached house. Mainly one-storey buildings. |
| Section 13A | Dervican, Goranxi, Vanister, Haskove, Sofratike, Terihat, Gorice, Frashtan, Lugar, Grapsh, Jorgucat, Kakavie | 2789 | 97% detached, house. Mainly one-storey buildings |
| **Total** | | **41,596** | **Detached house varies from 52% in urban areas in Memaliaj to 99% in most of the settlements. Mainly one-storey buildings** |

#### 4.3.8.2. Informal Areas

Informal areas are suburbs created near the large cities as result of internal migration. The informal settlements started to create before the 1990s, when residents from remote areas of Albania built their houses in the suburbs of big cities without a construction permit and without the right of use by landowners;

Defining of informal settlement is an important step before developing resettlement and compensation plans for interested parties.

As shown in the following table, the total number of Informal Areas (IA)/Informal Settlements (IS) in affected municipalities approved till 2008 is 64 Informal Areas and 3 Informal Settlements, with a total of proposed surface 7,068.31 ha.

The largest number of informal areas is encounter along the Section 5b (the municipality of Tirane), followed by Section 4 of AIC (in the municipality of Vore) and first part of Section 1 (where is included the municipality of Shkoder). The number of proposed Informal Areas in 2015 is 113 IA and the surface of proposed IA is 9,095.71 ha. From 2008 to 2015 is noticed an increase on the number of informal areas, especially in the Section 5B, Section 1, Section 2, Section 4, Section 8 and Section 9A2. In the municipalities of Lushnje, Tepelene, Memaliaj and Dropull there aren't approved informal areas.

**Table 4-123 Total number of approved Informal Areas/Settlements in the territory of municipalities affected by the project and divided by sections of AIC, till 2015.**

| AIC Section | Municipality | Informal Areas approved by Regulatory Council 2007/2008 and that approved from NTC in 2015 | |
|---|---|---|---|
| | | Number of informal areas (IA)/ Settlement (IS) | Surface of area (ha) |
| Section 1 | Shkoder | 19 IA and 2 IS | 2081.81 |
| | Vau I Dejes | 5 | 240.25 |
| | Lezhe | 2 | 79 |
| Section 2 | Lezhe | 11 | 727.43 |
| Section 3 | Kurbin | 4 | 237.8 |
| | Adm.unit Thumane (Municipality of Kruje) | - | - |
| Section 4 | Kruje | - | 495.39 |
| | Vore | 18 IA, 1 IS | 2827.58 |
| Section 5B | Tirane | 69 | 8186.45 |
| | Adm.unit Lekaj (Rrogozhine municipality) | - | - |
| Section 5C | Rrogozhine | 1 | 131.79 |
| | Adm.unit Dushk (Lushnje municipality) | - | - |
| Section 6+7 | Lushnje | - | - |
| Section 8 | Partially Fier | 37 | 989.73 |
| Section 9A2 | Partially Fier | 10 | 239.24 |
| | Adm.unit Hekal (Mallakaster municipality) | - | - |
| Section 9B2 | Mallakaster | 3 | 36.5 |
| | Memaliaj | - | - |
| Section 10 | Tepelene | - | - |
| Section 11 | Partilly Gjirokaster | - | - |
| Section 12 | Partilly Gjirokaster | 1 | 74 |
| Section 13A | Dropull | - | - |
| Total | | 177 IA and 3 IS | 16,346.97 |

*Data Source; Agency for Legalization, Urbanization and Integration of Informal and Building Areas, ALUIZNI*

**Informal settlements/zone in the project area**

Based on data provided by ALUIZNI there are 67 informal areas/settlements along/in proximity of the study area of AIC corridor (750 m each side of road corridor). The total surface of proposed informal areas is 4057.79 ha. These areas are approved by the National Territorial Council as informal areas till the year 2015. There is also another informal area along the section 12 of AIC, near Viroi lake44, but not approved yet by NTC. The road corridor passes through 4 of these informal areas (eastern part of informal area in Berxulle-Section 4 of AIC Corridor; south eastern part of informal area in Kashar-Section 5B of AIC Corridor; south eastern part of informal area in Peze e Vogel – Section 5 B of AIC Corridor; and eastern part of informal area in Kordhoce – Section 12 of AIC Corridor).
The following table present data on informal areas/informal settlements along the study area (considering the distance 750 m each side of the road), approved till 2015, divided by sections of AIC Corridor45.

**Table 4-124 Total number of approved Informal Areas/Settlements in the project area (considering 750 distance each side of the road) till 2015, distributed by sections of AIC Corridor.**

| Section of AIC | Informal area/ Settlement | Informal Areas approved by Regulatory Council 2007/2008 and that approved from NTC (by DCM no.2. date 30/12/2015) | | | | |
|---|---|---|---|---|---|---|
| | | No. of informal areas | Surface of proposed Informal Area | Total no. of buildings | Plot Surface (ha) | Surface of construction area (ha) |
| Section 1 | I.A. Oblike e Madhe | 1 | 19.05 | 258 | 6.69 | 13539.00 |
| | Muriqan | 1 | 38.09 | 260 | 6.85 | 16792.00 |
| | Bushat 1 | 1 | 49.1 | 222 | N/A/D | N/A/D |
| | I.A.Balldre I RI | 1 | 58.00 | 485 | 43.04 | 14368.00 |
| | I.A. Frutorja | 1 | 21.00 | 90 | 21.00 | 53416.00 |
| Section 2 | I.A. Barbulloje | 1 | 125.00 | 243 | 11.30 | 22950.00 |
| | Shengjin-Lezhe I.A.No.2 | 1 | 20.77 | N/A/D | N/A/D | N/A/D |
| | I.A.No.4 Ishull Lezhe | 1 | 29.22 | N/A/D | N/A/D | N/A/D |
| Section 3 | No informal areas close to the road corridor | N/A | N/A | N/A | N/A | N/A |
| Section 4 | Berxulle I.A. No. 1 | 1 | 165.20 | 875 | 12.89 | 74200.00 |
| | Berxulle I.A. No. 2 | 1 | 88.80 | 517 | 15.06 | 17810.00 |
| | I.A. Breg-Shkoze | 1 | 50.00 | 137 | 18.50 | 6845.00 |
| | Berxulle I.A No.1; I.A No.2: I.A No.3; I.A No.4 | 4 | 740.17 | N/A/D | N/A/D | N/A/D |
| Section 5 | Kashar I.A. No. 2; I.A. Nr. 3 | 2 | 410 | 1779 | 60 | 104100.00 |
| | I.A. Ura e Beshirit | 1 | 71.63 | 354 | 23.10 | 27180.00 |

44 Information taken during consultation with representative of Cepo administrative unit

45 Definition of informal areas along the study area was done by reviewing the road track in google earth with informal areas overlapped.

| Section of AIC | Informal area/ Settlement | Informal Areas approved by Regulatory Council 2007/2008 and that approved from NTC (by DCM no.2. date 30/12/2015) | | | | |
|---|---|---|---|---|---|---|
| | | No. of informal areas | Surface of proposed Informal Area | Total no. of buildings | Plot Surface (ha) | Surface of construction area (ha) |
| | I.A. No. 2 Peze-Helmes | 1 | 20.00 | 68 | 1.48 | 5166.00 |
| | I.A. No. 3 Peze e Vogel | 1 | 25.00 | 67 | 1.82 | 5098.00 |
| | Kashar I.A No.1; I.A No.2: I.A No.3; I.A No.4 | 4 | 640.29 | N/A/D | N/A/D | N/A/D |
| | Peze I.A No.1; I.A No.2: | 2 | 316.13 | N/A/D | N/A/D | N/A/D |
| | Vaqarr I.A No.1 | 1 | 193.14 | N/A/D | N/A/D | N/A/D |
| Section 6+7 | No informal areas approved | N/A | N/A | N/A/D | N/A/D | N/A/D |
| Section 8 | Mbrostar I.A No.1; I.A No.2: I.A No.3; I.A No.4: I.A No.5; I.A No.6: I.A No.7 | 7 | 191.5 | N/A/D | N/A/D | N/A/D |
| | Qender I.A No.1; I.A No.2: I.A No.3; I.A No.4: I.A No.5; I.A No.6: I.A No.7; I.A No.8; I.A No.9: I.A No.10; | 10 | 159.1 | N/A/D | N/A/D | N/A/D |
| | Dermenas I.A No.1; I.A No.2: I.A No.3; I.A No.4: I.A No.5; I.A No.6: I.A No.7; I.A No.8; | 8 | 170.5 | N/A/D | N/A/D | N/A/D |
| Section 9A2 | Levan I.A No.1 | 1 | 42.5 | N/A/D | N/A/D | N/A/D |
| | Frakull e Madhe, Kafaraj, Ade-Sheq Musalala | 3 | 63.3 | N/A/D | N/A/D | N/A/D |
| Section 9B2 | No informal areas approved | N/A | N/A | N/A | N/A | N/A |
| Section 10 | No informal areas approved | N/A | N/A | N/A | N/A | N/A |
| Section 11 | No informal areas approved | N/A | N/A | N/A | N/A | N/A |
| Section 12 | Lazarat | 1 | 74 | 360 | N/A/D | N/A/D |
| Section 13A | No informal areas approved | N/A | N/A | N/A | N/A | N/A |
| **Total** | | **67** | **4057.79** | **5715** | **221.73** | **361,464** |

*Data Source; Agency for Legalization, Urbanization and Integration of Informal and Building Areas, ALUIZNI*

N/A – There aren't approved informal areas at this location

N/A/D – Not available data

Based on the new law on Cadastre, large part of informal areas will be in the focus of a large national project which is related with the legalization of illegal constructions and assets. In this context are not included illegal constructions that prejudice major public infrastructure works, national roads, the territory or functionality of