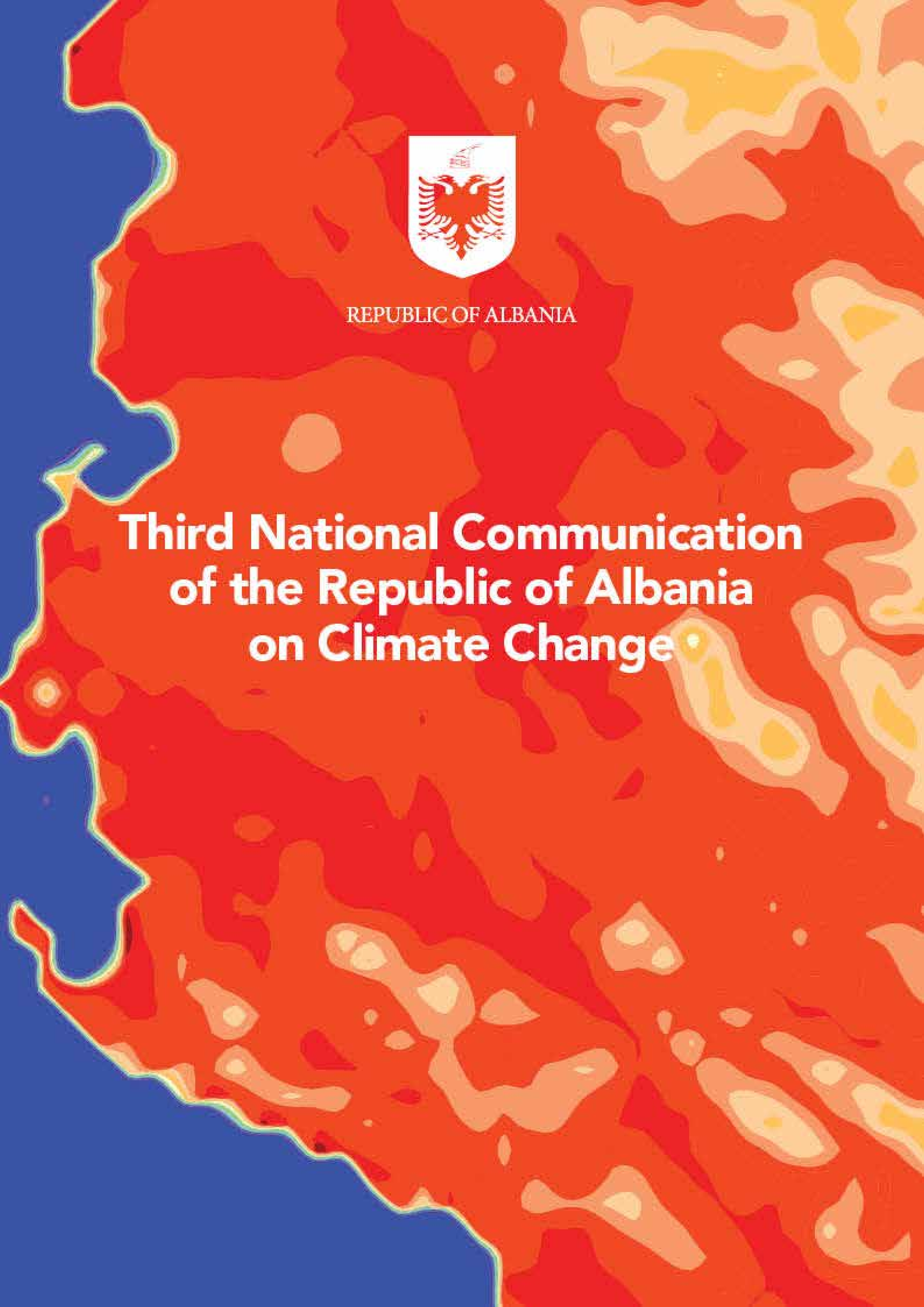

REPUBLIC OF ALBANIA

Third National Communication of the Republic of Albania on Climate Change

Empowered lives
Resilient nations.

Third National Communication of the Republic of Albania under the United Nations Framework Convention on Climate Change

TIRANA, JUNE 2016

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Ministry of Environment

Third National Communication of the Republic of Albania under the United Nations Framework Convention on Climate Change

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CONTENTS

ABBREVIATIONS

AF	Alternative Fuels
ARA	Albanian Recyclers Association
ARTI	Agency for Research, Technology and Innovation
BoA	Bank of Albania
BAT	Best Available Technology
BaU	Business as Usual
BAP	Bali Action Plan
BUR	Biennial Update Report
CCP	Climate Change Program
CCS	Climate Change Strategy
CDM	Clean Development Mechanism
CEDAW	Convention on the Elimination of All Forms of Discrimination Against Women
COP	Conference of Parties
DCM	Decree of Council of Ministers
DMRD	Drini and Mati River Deltas
EBRD	European Bank for Reconstruction and Development
EC	European Commission
ECRAN	Environment and Climate Regional Accession Network
ECT	Energy Community Treaty
EIB	European Investment Bank
EITI	Extractive Industries Transparency Initiative
EEMM	European Electricity Market Model
EFTA	European Free Trade Agreement
EU ETS	European Union's Emission Trading System
EEA	European Environment Agency
EIA	Environmental Impact Assessment
EIPPCB	European Integrated Pollution Prevention and Control Bureau
EU	European Union
EWC	European Waste Catalogue
FAO	Food and Agriculture Organization
GACMO	Greenhouse gas Abatement Cost Model
GCMs	General Circulation Models
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
GVA	Gross Value Added
GWP	Global Warming Potential
HPP	Hydro Power Plant
ICZM	Integrated Coastal Zone Management
IMF	International Monetary Fund
IMWGCC	Inter-ministerial Working Group on Climate Change
INC	Initial National Communication
INDC	Intended Nationally Determined Contribution
INSTAT	Albanian Institute of Statistics
IPCC	Intergovernmental Panel on Climate Change
IWRM	Integrated Water Resources Management Strategy
LEAP	Long Range Energy Alternatives Planning
LEDS	Low Emissions Development Strategy
LUCF	Land Use Change and Forestry
MCA	Multi-Criteria Analysis
MoE	Ministry of Environment

MoEI	Ministry of Energy and Industry
MoEFWA	Ministry of Environment, Forestry and Water Administration
MSW	Management of Solid Waste
MoTI	Ministry of Transport and Infrastructure
MoPWTT	Ministry of Public Works, Transport and Telecommunication
MoUDT	Ministry of Urban Development and Tourism
MWh	Megawatt hours
MRV	Monitoring, Reporting and Verification
MSW	Municipal Solid Waste
NAE	National Agency of Environment
NANR	National Agency of Natural Resources
NAMA	Nationally Appropriate Mitigation Action
NAP	National Adaptation Plan
NDC	National Determined Contribution
NC	National Communication
NCA	NAMA Coordinating Authority
NCSP	National Communications Support Programme
NEEAP	National Energy Efficiency Action Plan
NGO	Non-governmental organization
NIE	NAMA Implementing Entity
NSDI	National Strategy for Development and Integration
ODS	Ozone Depleting Substance
OECD	Organization for Economic Co-operation and Development
OPEX	Operational expenditures
PDF	Packaging Derived Fuel
PEF	Process Engineered Fuel
PES	Payment of Ecosystem Services
PHI	Public Health institution
POP	Persistent Organic Pollutant
PPF	Paper and Plastic Fraction
PPM	Parts per Million
PRTR	Pollutant Release and Transfer Register
QELRC	Quantified Emission Limits and Reduction Commitment
RoA	Republic of Albania
RENA	Regional Environmental Network for Accession
RES	Renewable Energy Sources
RESAP	Renewable Energy Sources Action plan
RCP	Representative Concentration Pathways
RDF	Refuse Derived Fuel
REF	Recovered Fuel
SLED	Support for Low Emission Development in South East Europe
SD	Sustainable Development
SNC	Second National Communication
TNA	Technology Needs Assessment
TPES	Total Primary Energy Sources
TPP	Thermal Power Plant
TSO	Transmission system operator
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNISDR	United Nations Office for Disaster Risk Reduction ()
WAM	With Additional Measures
WEM	With Existing Measures
WMO	World Meteorological Organization of UN

CHEMICAL SYMBOLS

CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2eq	Carbon Dioxide Equivalent
CH_4	Methane
N_2O	Nitrous Oxide
NOx	Nitrogen Oxides
NMVOC	Non Methane Volatile Organic Compounds
SO2	Sulfur Dioxide
CFC	Chloro Fluoro Carbon
HCF	Hydro Chloro Fluoro Carbon
PCF	Polychlorinated Biphenyl Fluor

MEASUREMENT

t	tone
kt	kilotone (10^3 t)
Mt	megatone (10 6 t)
ktoe	kilo ton oil equivalent
mm	millimeter
m	meter
m^3	cubic meter
km	kilometer
km^2	square kilometer
km^3	cubic kilometer
g	grams
Gg	Gigagram (10^9 g) = kt = 1000 tones
ha	hectare
J	joule
Gg	Gigajoule
TJ	Terajoule
thous.	Thousand
mln.	million
ppm	parts per million
MWt	megawatt
Wh	watt - hour
KWh	kilowatt - hour
GWh	Gigawatt - hour
$	dollars USD

FOREWORD

Seven years after Albania's Second National Communication under the United Nations Framework Convention on Climate Change, I have the honour of presenting the Third National Communication as a serious and determined commitment of the Albanian Government to this global challenge.

During the period between the two national communications, Albania has seen many important changes and developments in the field of environment, particularly in the climate change sector. Since at least three years, environment has become a priority for the Albanian Government and the environment policies have become more and more compliant with the European Union acquis and the international environmental conventions.

On behalf of the Albanian Government I guarantee you for the commitment of Albania as a serious partner to the global efforts for the reduction of greenhouse gases emissions, being fully confident that the contribution of a developing country such as Albania, with the respective obligations and responsibilities of our country under the United Nations Framework Convention, is very useful to the global challenge.

Only a few days ago, the Albanian Parliament ratified the Paris Agreement, through Law No 75/2016, dated 14/07/2016, as the main step towards its implementation. The ratification of the Paris Agreement came as a result of the previous actions undertaken under this context, such as the delivery ahead of schedule of the Intended Nationally Determined Contributions (INDC) to the UNFCCC Secretariat on 24 September 2015, and the signing of the Paris Agreement on 22 April 2016 in New York.

Though Albania is a country with a low-carbon economy, it is committed to reduce the carbon dioxide emissions by 11.5 % as compared to the baseline scenario for the period 2016 - 2030. The main mechanisms of achieving this objective are related to maintaining the low level greenhouse gases emissions from energy production sector and developing low carbon policies in order to prevent the increase of greenhouse gases emissions from other sectors of the economy.

The climate change strategy and the action plan on the mitigation of greenhouse gases, which is expected to be approved by the end of this year, set the pillars for the implementation of the NDC.

Under the management of the Inter-ministerial Group on Climate Change, lead by the Ministry of Environment, the National Adaptation Plan has been prepared and the climate changes have now been streamlined in a series of strategic policy documents, in the energy, water, transport, agriculture, forest, biodiversity and urban development sectors.

Albania's Third National Communication goes beyond the reporting commitments as an Annex I country, by developing a Greenhouse Gases Inventory for 2000-2009, by updating the mitigation analysis in line with EU objectives and the INDC document and by developing an action plan for the adaptation of coastal areas. A series of priority measures have been recommended regarding the reduction of greenhouses gases, the decrease of the demand for energy and the increase of energy supply by contributing to the sustainable development and by enabling Albania to activate resources based on the policy and market mechanisms.

By expressing my highest consideration for the valuable support and collaboration of UNDP and GEF and the extended working group in preparing the Third National Communication, I hope this document is a valuable contribution to the achievement of the objectives under the United Nations Framework Convention on Climate Change in particular, and a global environmental policy in general,

Lefter Koka

Minister of Environment

ACKNOWLEDGEMENTS

The development of the Third National Communication of Albania to the United Nations Framework Convention on Climate Change has been a joint undertaking by the Ministry of Environment (MoE) and the United Nations Development Program (UNDP) Albania. Support was provided by the Global Environment Facility (GEF) project "Enabling Albania to Prepare its Third National Communication in Response to its Commitments under the UNFCCC". Under this framework a core team of national and international experts have been mobilized representing experts from research institutions, private companies and other independent organizations working on a project basis.

Preparation of the Third National Communication of Albania was successfully supported, led and coordinated by the Ministry of Environment, while inputs and participation of national stakeholders from other line ministries, governmental institutions from different economic sectors, and specialized and/or interested NGOs has significantly contributed to its success. This work has been supported and guided by the UNDP Country Office of Albania, the UNDP Istanbul Regional Hub, the UNDP/UNEP National Communications Support Program (NCSP) and by the UNFCCC Secretariat, particularly the Implementation Program, non-Annex I Sub-Program.

Three key experts have had the overarching responsibility for developing the content of the TNC report: Ms. Eglantina Bruci, Prof. Dr. –Team Leader for Vulnerability and Adaptation, Mr. Besim Islami, Dr. – Team Leader for the GHG Inventory and Mitigation analysis and Ms. Mirela Kamberi, M.Sc. Team Leader/Project Coordinator of the UNDP Climate Change Program (CCP) of Albania. Besides their exceptional professional inputs, UNDP CCP recognizes the direct contribution of experts, from research institutions and academia, who worked under the guidance of the Team Leaders to contribute to the sectorial analysis according to their area of expertise, namely:

Vulnerability and assessment

Eglantina Demiraj Bruci, Prof. Dr. –Team Leader; Ferdinand Bego, Prof. Dr. – biodiversity; Miranda Deda, PhD. - disaster risk reduction; Abdulla Diku – agriculture and forestry; Sabri Laci, Prof. Dr. -tourism and population; Martin Le Tissier, PhD. – adaptation; Liri Mucaj, Assoc. Prof. Dr. – climate change scenarios; Vangjel Mustaqi, Assoc. Prof. Dr. – climatology; Miriam Ndini, Assoc. Prof. Dr. – hydrology; Elona Pojani, Dr. – social-economic scenarios; Andrian Vaso, Dr. – adaptation; Alban Ylli, Dr. – health; Albana Zotaj – Geographical Information System.

Greenhouse gas inventories and mitigation analysis

Besim Islami, Dr. - Team Leader/Mitigation analysis – fuel combustion technologies; Mirela Kamberi, M.Sc. – Team Leader/GHG inventory – energy and industrial processes, Abdulla Diku – land use change, forestry and agriculture, Gjergji Selfo – waste and environment, Gazmend Gjyli, Prof. Dr. – chemicals and ozone depleting substances.

National Appropriate Mitigation Actions

Jernej Stritih – NAMAs expert, Mark van Wees and Besim Islami– energy experts who drafted the NAMA "Financing Mechanism for Energy Efficiency in Buildings (Energy Efficiency Fund)", Manfred Stockmayer and Gjergji Selfo – cement industry/environment experts who drafted the NAMA "Replacing fossil fuels with non-hazardous waste in the Albanian cement industry"

Climate change Institutional and policy analysis

Zija Kamberi – legal advisor, Elona Pojani, Dr. – socio-economic analyst, Pranvera Bekteshi, Dr. – climate change expert.

Gender and Climate Change

Anke Julia Stock and Alma Bako who drafted the "Guideline to mainstreaming gender in climate change adaptation and mitigation programs and plans in Albania".

This report was prepared under the direction of Mr. Argent Alltari, the Director of Cabinet of the Ministry of Environment and National Director of the Project on Third National Communication. Special thanks go to Ms. Adriana Sokoli, the UNFCCC focal point and Ms. Laureta Dibra, Chief of Sector of Air and Climate Change, both from the Ministry of Environment. Furthermore, many thanks go to the Project Steering Committee members, Mr. Argent Alltari (Ministry of Environment), Mr. Irfan Tarelli (Ministry of Agriculture, Rural Development and Water Administration), Mr. Dritan Spahiu (Ministry of Energy and Industry), Mr. Mithat Sanxhaku (IGEWE), Ms. Efigjeni Kongjika (Academy of Sciences), Mr. Maksimiljan Dhima (Ministry of Internal Affairs), Ms. Ana Baze (Ministry of Urban Development), Mr. Shpati Braho (National Environment Agency), Mr. Krislen Kerri (Ministry of Transport and Infrastructure), Mr. Artur Zama (Ministry of Health) and Mr. Xhemal Mato (NGO Ekolevizja). The UNDP CCP appreciates the time that several research institutions, line ministries and other interested organizations took to share ideas, discuss their own practical experiences and review the draft document, instrumented and guided through the Inter-ministerial Working Group on Climate Change, headed by Ms. Olijana Ifti, Deputy Minister of Environment.

Gabriela Walker served as principal writer. Martin Le Tissier furthermore edited the document and provided proof reading of the English version of the Report. They both contributed to the entire document with their writing skills and logically linking together the technical chapters.

UNDP CCP gratefully acknowledges the important contribution of Mr. Yamil Bonduki and latterly of Mr. Damiano Borgogno of the UNDP – UNEP National Communications Support Unit for not only coordinating the peer-review of the technical chapters of the report, but also reviewing the Vulnerability and Adaptation and the Mitigation Analysis sections themselves. Dr. Carlos Lopez-Cabrera peer-reviewed the GHG inventory chapter of the TNC Report. Their comments and suggestions have been considered and reflected in the final text of the TNC.

Special appreciation must be given to the support provided by the Ministry of Environment of Albania especially to Minister H.E. Mr. Lefter Koka and his cabinet.

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The final thanks belong to the UNDP CO Communication Officer, Ms. Nora Kushti, while Mr. Henrik Lezi was very innovative when designing the TNC report and preparation for its final publication.

Despite the wide range of inputs into the process, the responsibility for this final output rests with the CCP Team Leader/Projects Coordinator and any errors and omissions thereof is not to be attributed to the other participants in the process.

Mirela Kamberi, M.Sc.

Team Leader/Projects Coordinator

EXECUTIVE SUMMARY

NATIONAL CIRCUMSTANCES

What makes our country special?

Seventy percent of Albania's territory is mountainous[1] with an average altitude of 700 m above sea level and a maximum altitude of 2,753 m in the eastern area (Mount Korab). Mountainous and hilly areas are grouped into three regions: Northern, Central and Southern, while the plain lands occur to the West along the Adriatic coast, between Hani Hoti in the North and Vlora in the South.

The geographical position of Albania determines its Mediterranean climate, characterized by mild and humid winters followed by hot and dry summers. Rainfall occurs mainly during the second half of the year. Climatic conditions differ considerably according to regions. The coastal plains have a strong maritime influence, causing a gradient of lower temperatures and reduced precipitation eastwards from the coast.

The precipitation regime is a key factor in national electricity production, since the country generates the majority of its electricity from hydropower plants. It is also very important for agriculture, which is among the most important economic activity.

Albania is rich in water resources. The hydrographical basin that feeds the water courses of Albania has a total area of 43,305 km^2 and is about 50 per cent larger than the country's territory[2]. Seven rivers and their tributaries drain towards the Adriatic Sea. The rivers of Albania are an important source of hydro power. 250 lakes occupy 4 per cent of the territory. The origin of the lakes is glacial, tectonic or manmade. However, management of the water resources has serious problems; the capacity of public water companies to manage basic services in delivering drinking water and waste water treatment is weak.

Air pollution is now recognized as a serious health problem in the main cities of Albania, therefore the enforcement of the Law "On protection of ambient air quality" and implementation of the National Strategy on Ambient Air Quality, in place since 2014, are of high priority.

Biodiversity: About 16.61 % of the country's territory, or 477,566 hectares, have protected status. Several biodiversity monitoring and research programs are being implemented, and some progress has been achieved establishing an inventory and mapping of natural and semi-natural habitats. Management of biodiversity is not founded on the use of a robust and adequate information system; instead, information is dispersed among many agencies, institutions and stakeholders, which hinder the homogeneity, compatibility, quality, reliability and comprehensiveness of available data. Some projects are under development which will provide for the up to date information on biodiversity in Albania and an easy access to the legal framework, biodiversity database, the protected areas portal, etc.

Local government units (municipalities and/or communes), through their controlling and inspecting mechanisms, are responsible for communal forests and pastures that currently occupy approximately 60% of the forest and pasture area of the territory.

Soil erosion in Albania remains a permanent threat to land stability and is a persistent environmental problem for agriculture. Some of the factors that influence erosion are: climate condi-

1 MoE, 2014
2 UNECE, 2012

tions, such as rainfall (amount, intensity and frequency); temperature; physical characteristics of soil; the conditions of the relief (slope) and land use; vegetation cover and degradation (deforestation, fires, overgrazing, etc.); topography modifications (construction of roads, urban centers, etc.); and water management policy (sewers, hydro works, dikes, etc.).

Population dynamics are determined by four factors: births, deaths, immigration and emigration. During the last five decades, the overall fertility rate has dropped from more than six to around 1.6 children per woman[3]. The population of Albania started to decline from the 1990s, largely as a consequence of a massive emigration. Between 2001-2011 it is estimated that around 500,000 people emigrated from the country. Since 2000, the migration situation in Albania has stabilized. In particular, no massive migration events of have been registered. Migration is expected not to be an issue in the future, especially once Albania has joined the EU.

The EC Progress Report 2013[4] for Albania noted that lack of capacity in healthcare management, low public spending and corruption has slowed down progress in the area of public health. Primary healthcare lacks appropriate funding and human resources. Coverage of insurance-based care is still very low. The public hospital sector remains underdeveloped, whereas the private sector is growing without proper regulation and oversight. In addition, Health Information Systems in Albania need to be reformed, in order to enable appropriate management and evaluation.

Agriculture: Relatively underdeveloped infrastructure in rural areas holds back the emergence of agricultural products onto the market. Fragmentation of agricultural land hinders the effective organization of production, reduces productivity and increases the cost of using agricultural mechanics.

In contrast, developmental and structural reforms (aimed at increasing efficiency in agricultural production, facilitating access of local agricultural products in domestic and foreign markets, as well as financially supporting businesses and farms of this sector) have been considered to be a priority for future economic policies.

Economy: Albania is a middle-income country and, over the last two decades, has been trying to establish a credible, multi-party democracy and market economy. Before the 1997 financial crisis, Albania was one of the fastest-growing economies in Europe. However, after 2008 the average annual growth halved and macroeconomic imbalances in the public and external sectors emerged. The pace of growth was also mirrored in levels of poverty and unemployment: between 2002 and 2008, poverty in the country fell by half (to about 12.4%) but in 2012 increased again to 14.3%. Unemployment increased from 2008 to 2013, with youth unemployment reaching 26.9%.[5]

Following graduation from the International Development Association (IDA) to the International Bank for Reconstruction and Development (IBRD) in 2008, Albania has generally been able to maintain positive growth rates and financial stability, despite the ongoing economic crisis. The economic situation of Albania has experienced altering patterns of development during the past years, influenced by internal and external factors. Macroeconomic stability has been maintained, as Albania was less affected by adverse regional and global economic conditions[6]. GDP is highly dependent on the service sector and agriculture, and also on remittances.

In 2011, the mineral sector accounted for about 16% of the value of industrial production and about 2% of GDP. Industrial production increased 6.10% in the second quarter of 2014 over the

3 INSTAT, 2010
4 EC, 2013
5 World Bank, 2014
6 EC, 2012

same quarter in the previous year, and averaged 2.59% between 2002 and 2014.

Electricity production rose by 48.0% during 2010. Sources of electricity in the country grew by 45.2% during this year, mainly due to an increase by about 43.4% of hydropower production. Electricity generation capacity has improved through the construction and the operation of several small hydropower plants, but the country remains over-dependent on hydrological conditions.

The main public investments in Albania (about 55% of total public investment) are concentrated on road infrastructure, which is the main mode of freight and passenger traffic. Major funding is needed to make improve the service, and most of the funds will have to come from foreign donors.

The Port of Durres, about 38 km from Tirana, is the largest port of the country and among the largest on the Adriatic and Ionian Sea, as well as a very important hub for the international market.

Increasing the efficiency of air transport through the creation of a competitive market in full compliance with international standards is one of the Albanian Governments main goals.

Tourism: Natural landscapes and rural areas provide opportunities for the development of rural tourism, ecotourism and outdoor activities (rafting, parachute jumping, mountain biking, fishing, trekking, mountain climbing, outdoor walking (hiking), hiking horse with saddle, study tours, etc.).

Coastal tourism, in particular, that includes summer tourism, focused mainly on activities close to beach areas, as well as short visits to several coastal protected zones is already well developed.

Albania is also in the process of accession to the European Union, therefore a number of pieces of legislation have been recently adopted to reflect and transpose the respective EU "*Acquis Communitaire",* particularly concerning the environmental sector.

In response to projected impacts of climate change, it is becoming widely recognized that public policies should address both mitigation and adaptation activities.

The 2009 National Action Plan focuses both on mitigation and adaptation activities as mechanisms towards combating the impacts of climate change.

Public awareness, information exchange and communication are important elements for achieving the implementation of the UNFCCC[7] and the Kyoto Protocol. Nevertheless, the issue of climate change remains relatively underestimated in the public opinion and poorly understood. Significant efforts are still required to enhance the country's monitoring, reporting and verification capacity in relation to the commitments to comply with the UNFCCC.

GHG INVENTORY

Albania's third GHG inventory covers all sources and sinks as well as all gases as mandated by 10/CP2: it considers five main modules such as energy, industrial processes, agriculture, waste, and LUCF (solvents were not considered) as guided by the 1996 revised IPCC[8] Guidelines, and the IPCC Good Practice Guidelines. The national inventory has considered three direct GHGs such as: CO_2, CH_4 and N_2O and three indirect GHGs such as: CO, NO_x, SO_2 and NMVOC. Emission factors are represented by default factors. Estimates of key sources and aggregated GHG

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emissions and removals, expressed in CO_2 equivalent, have also been provided.

Both Sectorial and Reference Approaches were used to produce the GHG emissions Inventory, allowing for the verification of the reported emissions. The deviation between the two approaches was considered satisfactory.

The **present inventory covers the refined time-series for the period 2000 – 2009**, and the **base year is 2005**.

Institutional Arrangements

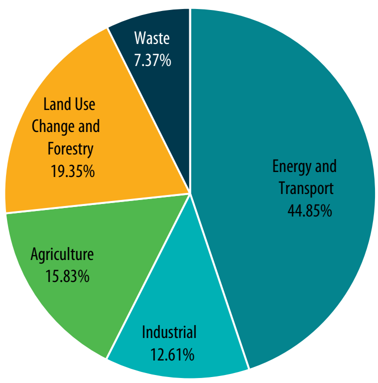
In order to ensure the continuous and regular updates of the national GHG inventory and the possibility of establishing a Monitoring, Reporting and Verification (MRV) system, specific institutional arrangements have been put in place to ensure its sustainability. Relevant recommendations are provided in the form of a draft Governmental Decree to ensure a legally binding national system for collecting/managing and processing the necessary data to developing a Greenhouse Gas Inventory on a regular basis.

Other line ministries/agencies, academia, universities and interested professionals have also been involved in the process of preparing the inventory. Training materials have been prepared for each sector, including a step-by-step process for completing inventory tables, explanation of good practices and sources of data and emission factors. Data for each activity category, emissions and conversion factor were documented directly in the sectorial and sub-sectorial MS[9] Excel worksheets of the IPCC software.

Direct GHG emissions (Gg)

Total direct GHG emissions (CO_2, CH_4, N_2O) for Albania for the base year 2005 amounted to 8,863.3 Gg of CO_2 eq., a decrease of 211.70 Gg from the amount of 9,075.0 Gg calculated for the year 2000. These emissions were distributed unevenly between the three gases recorded. In terms of CO_2 eq., the main contributor for the year 2005 is the energy sector representing 52.28% of the total, followed by Agriculture (15.83%), Industry (12.61%), LUCF (11.91%) and Waste (7.37%). It is important to mention that emissions from the LUCF sector are diminishing sharply towards 2008 - 2009, while the Industrial Processes sector is increasing its emissions.

Figure 1 CO_2 eq. emissions from all economic sectors for the year 2005 (%)



9 Microsoft Excel

Indirect GHG emissions (Gg)

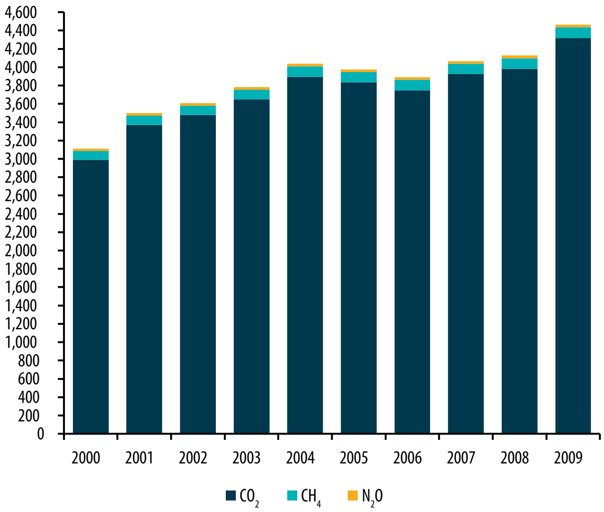
Total emissions of indirect GHG emissions (NO_X, CO, SO_2 and NMVOC) were estimated for the whole period 2000 - 2009. These emissions were also distributed unevenly between the four gases recorded. Emissions from these gases for the year 2005 are: CO emissions, 172.21 Gg, NMVOC emissions, 27.75 Gg, NO_x emissions 25.89 and SO_2 emissions amounted to 0.91 Gg.

Energy/transport sector emissions (Gg)

The Energy sector is the main source of GHG emissions in Albania. 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.

CO_2 emissions from the energy sector accounts for 97.07% of overall emissions in 2005. The transport subsector contributed 45.06% of overall CO_2 emissions in 2005 and road transport is by far the main contributor. Figure 2 shows the contribution of CO_2, CH_4 and N_2O from the Energy sector with CO_2 emissions as the most dominant contributor (accounting for 97.07% of the overall emissions in 2005).

Figure 2 Direct GHGs from Energy Sector for three main GHGs, 2000 - 2009 (Gg)



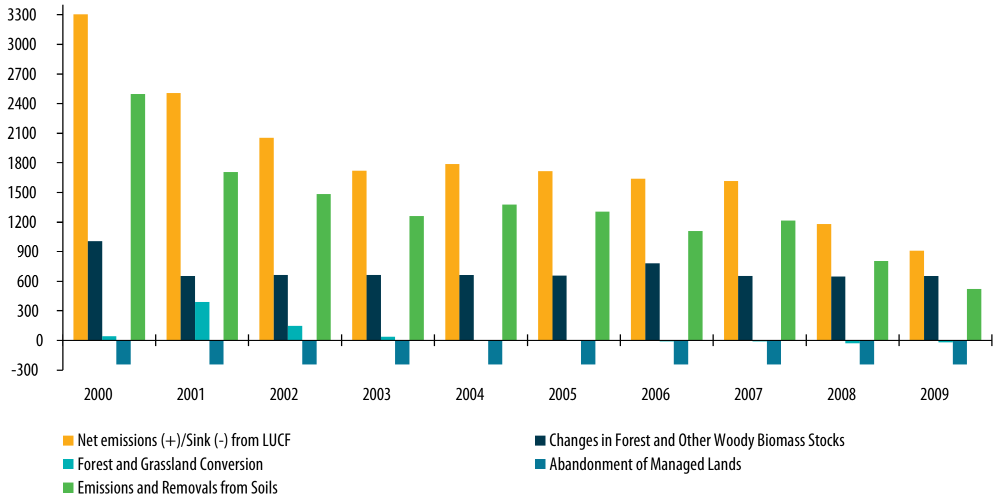
The emissions from biomass-fuelwood, in accordance with the IPCC methodology, are reported under the LUCF inventory. However, because of their importance within the energy balance, and the difficulty in realizing real figures due to the large informality of this subsector, a separate assessment is produced for their contribution.

GHG emissions from LUCF

The Land Use Change and Forestry (LUCF) sector includes emissions and removals of greenhouse gases from six land uses: forests, cropland (CO_2), grasslands (CO_2), wetlands, settlements and other lands. GHG net emissions/removals by LUCF refer to changes in atmospheric levels of all greenhouse gases attributable to forest and land-use change activities.

The total CO_2eq. Emissions from the LUCF sector in the year 2005 amounted to 1714 Gg. Total CO_2 emissions from all Land-use Change and Forestry sub sectors of are shown in figure 3.

Figure 3 Total CO_2 gas emissions from Land-use Change and Forestry (Gg)



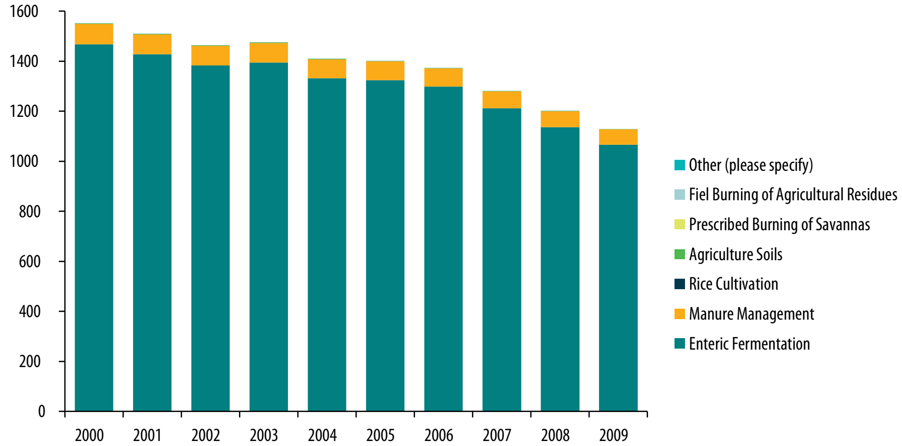
However, there are specific circumstances in regard to this sector, such as: effectiveness of investments in the implementation of afforestation programs, new trends regarding changes of forest land to agricultural land (mainly for vineyards and orchards), increase in the enforcement of electricity prices in the energy sector, etc., that lead to a fragile and unstable situation with regards to the health of forests.

GHG emissions from Agriculture (Gg)

Agriculture plays a significant but varying role in the economy and contributed 20% of GDP in 2011. However, the contribution from this sector has been decreasing year-on-year.

Around 94.65% of CH_4 gases are emitted by the livestock sector during enteric fermentation and manure management. Cattle were the main contributor of CH_4 emissions from enteric fermentations, followed by sheep. N_2O emissions were mainly produced from the application of nitric fertilizers. The emissions of CH_4 and N_2O as a result of burning agricultural residues are insignificant. Agricultural activities, such as the cultivation of crops and livestock for food, contribute to emissions. There are a large number of activities that can contribute to N_2O emissions from agricultural lands, which range from fertilizer application to methods of irrigation and tillage.

Figure 4 Total emissions in CO_2 eq. from Agriculture sub-sectors, 2000 - 2009 (Gg)

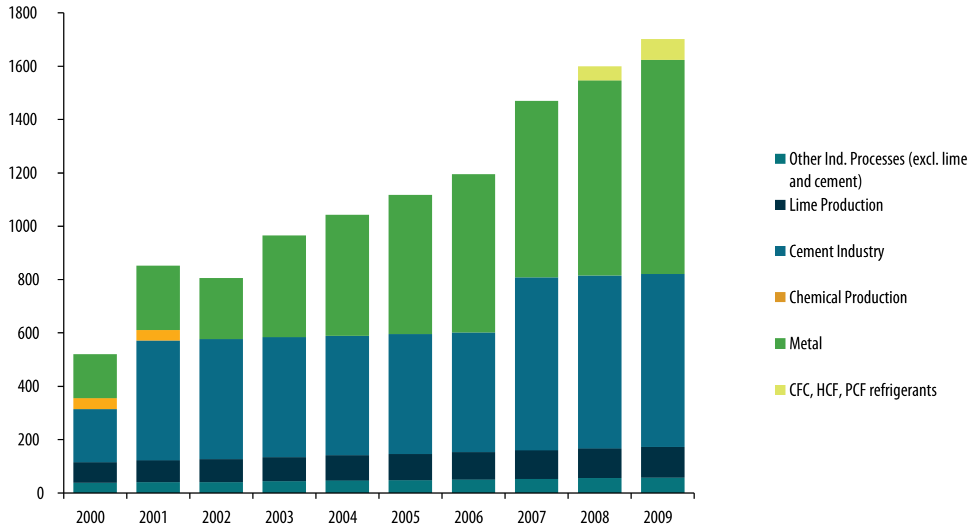


GHG emissions from Industrial Processes Sector (Gg)

The Industrial sector has been expanding due to accelerated annual growth rates of metal and cement production. Significant improvement of economic activity in some industrial sub-sectors was mainly driven by an increased foreign demand for Albanian products and their higher prices on international markets while the national currency has remained stable. This development was reflected in the growth in industrial exports and sales at home, as proxies of the volume turnover indicator.

Figure 5 presents CO_2eq. emissions from Industrial subsectors for the period 2000-2009 in Gg. In 2005 total emissions from the whole Industrial subsectors were 1,118 Gg of CO_2eq.

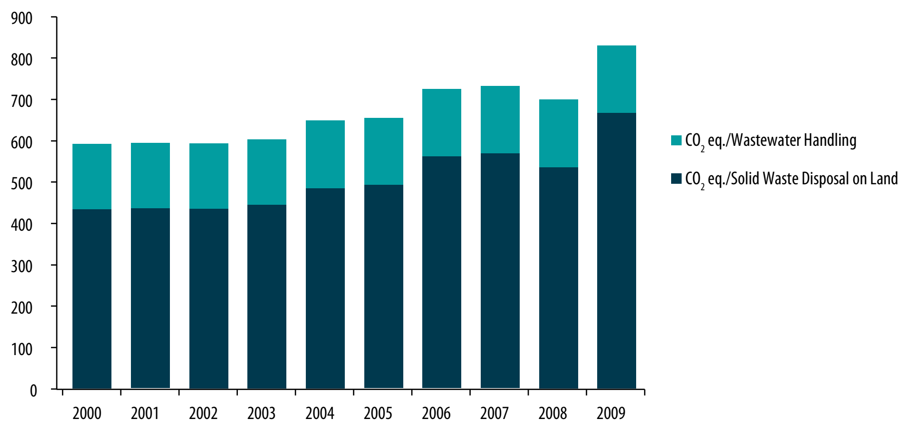
Figure 5 CO_2 eq. emissions from Industrial Sub-sectors, 2000 - 2009 (Gg)



GHG Emissions from Waste Sector (Gg)

As activity data for the waste sector are not fully complete, results of the "Waste characterization survey" were considered instead. This survey provides a national waste profile, in accordance with the European Commission SWA-Tool Methodology for the Analysis of Solid Waste (March 2004). Emissions from the waste sector show an increase since the year 2000, Figure 6 presents the contribution of GHGs emissions from waste subsectors in Gg. From Figure 6 it can be seen that the main contributor of GHG emissions from the Waste Sector is the solid waste disposal on land subsector. Methane emissions for the whole period

Figure 6 CO_2 eq. emissions from Waste subsectors, 2000 - 2009 (Gg)



are also found to be increasing as are nitrous oxide and methane emissions for the wastewater handling sub sector. For the year 2005 the total CO_2 eq. emissions for the waste sector amounted to 652.96 Gg. Based on the IPCC Good Practice Guidance, a key source analysis for GHG emissions was performed.

Uncertainty estimation

After the analysis it was found that the overall national GHG Inventory uncertainty is 9.925% and the main contributor to this uncertainty is CO_2 emissions from fuel wood consumption in the residential and service sectors.

Recommendations for future improvement

There is a need to establish a suitable facility for disaggregated information/data which can be easily used for preparing GHG inventories. Necessary secondary legislation and guidelines should be developed to specify the types of data to be provided, data providers, data collection forms to be used, as well as procedures and requirements for providing the data to INSTAT, as appropriate, from all relevant economic sectors, in terms of climate change.

Finally, in view of their importance to national policy, statistics on emissions should become part of the regular production and dissemination process of official statistics at the national level with appropriate institutional arrangements established in the Ministry of Environment and INSTAT.

VULNERABILITY AND ADAPTATION ASSESSMENT

The project 'Identification and implementation of adaptation response measures in the Drini-Mati River deltas'[10] demonstrated that Albania's northern low-lying coastal areas bordering the Adriatic Sea and in particular around the Drini and Mati River Delta is "critically vulnerable" to climate change and other extreme climatic events. Facing with the same problems, the Albanian 'Self-Assessment on Climate Change Activities'[11] identified the entire coastal area as a priority for vulnerability assessment and adaptation, to replicate the knowledge and the good results of this adaptation project.

Most of the Adriatic coastal area of Albania is flat and low-lying and this makes coastal systems, including human settlements, particularly susceptible to climate change and vulnerable to sea-level rise and changes in intensity and frequency of flooding. The narrow coastal belt, which represents only 11.78% of the overall surface of the Republic of Albania, is inhabited by 1/3 of the total population (36.3%)[12]. The biodiversity found on the coastal zone of Albania, and in particular areas such as Kune-Vain, Karavasta, Narta and Butrint that have designated protected areas, is of global significance. The coastal zone of Albania has already shown itself to be sensitive to the nature of perturbations that are expected from climate change. It is already subject to considerable anthropogenic perturbation and alteration.

The Vulnerability and Adaptation assessment (V&A) in the framework of the TNC covered the following sectors: water, agriculture, livestock, forest, crops, biodiversity, tourism and population, and health. The assessment provides a synthesis of existing and new research to identify options that could be forwarded for adaptation planning. Rather than identifying and develop-

10 financed by GEF/GoA/UNDP, 2008 -2013
11 performed as the first stage of TNC in 2012
12 Census data of 2011

ing adaptation measures on a sector-by-sector basis, the principles of Integrated Coastal Zone Management (ICZM) have been used. ICZM provides a holistic and integrated approach towards identifying adaptation measures from the outcomes of V&A analysis from individual sectors.

Analysis of Temperature and Precipitation

Albania's coastal area is likely to become warmer over time from climate change. Similarly, increasing trends in annual and seasonal temperatures, both minimum and maximum values, are expected.

Table 1: Projections of temperature changes (°C) for different time horizons

Years	2030	2050	2080	2100
Annual	1.0 (0.7 to 1.2[1])	1.7 (1.3 to 2.2)	2.8 (2.0 to 3.5)	3.2 (2.4 to 4.1)
Winter	0.8 (0.7 to 0.9)	1.2 (1.1 to 1.4)	2.0 (1.7 to 2.3)	2.4 (1.9 to 2.7)
Spring	1.0 (0.8 to 1.12)	1.5 (1.3 to 1.8)	2.6 (2.2 to 3.0)	3.1 (2.6 to 3.6)
Summer	1.6 (0.5 to 1.8)	2.5 (2.1 to 2.8)	4.3 (3.8 to 4.9)	5.3 (4.6 to 6.0)
Autumn	1.0 (1.0 to 1.1)	1.6 (1.5 to 1.8)	2.8 (2.7 to 3.0)	3.5 (3.2 to 3.7)

Analysis of extreme temperature reveals that these temperatures are also expected to increase. The projections show that high-percentile temperatures (95%) warm faster than mean temperatures, especially in summer. On the other hand, the return periods of maximum absolute temperatures are expected to drastically decrease over the Albanian coastal area. Data for Tirana indicates that temperatures of 38°C that are reached once every 50 years might occur every 3 years (RCP8.5, 4°C world) or every 7 years (RCP2.6, 2°C world). Taking also into account the simultaneous increase in minimum temperatures, an increase in intensity of heat waves is expected.

Precipitation

All the scenarios reveal a likely decrease in annual precipitation related to 1990 for all time horizons. In particular, generalizing the outputs of different scenarios results found that the annual precipitation is likely to decrease by up to -8.5% (from 47.4 to -56.0%)[13] by 2050; and by up to -18.1% (from 94.0 to -89.7%) by 2100. The high-percentile precipitation (95%) change/increase faster than average precipitation changes. This is an indicator of the intensification of heavy precipitation that causes flooding. A further consequence of the predicted changes in precipitation is related to the occurrence of the 24hr maximum precipitation over the threshold, which is considered as a hazardous event which might cause economic damages.

The return periods of maximum precipitation are expected to decrease over the Albania's coastal area. As a consequence, more frequent heavy rains with longer duration, causing flooding and economic damages, are likely to happen. On the other hand, the high reduction at 5% level of changes is indicator of a likely increase in drought frequency.

Sea Level Rise

The Adriatic Sea has experienced an average sea level rise of about 15 cm over the last century, leading to a retreating movement of the shoreline for each cm of average sea level rise. Projected sea level rise is shown in Figure 7.

13 Values in brackets represent the expected variability, respectively high (95%) and low (5%) percentile precipitation

Water Sector

Figure 7 Likely changes in annual mean sea level (cm).

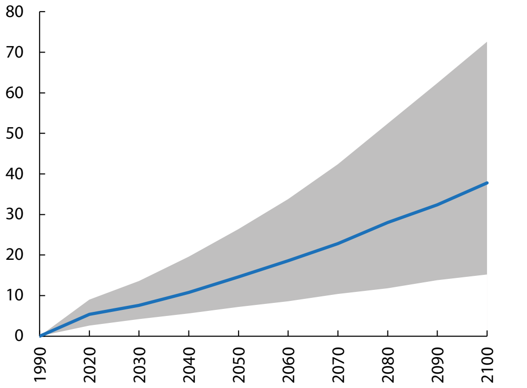
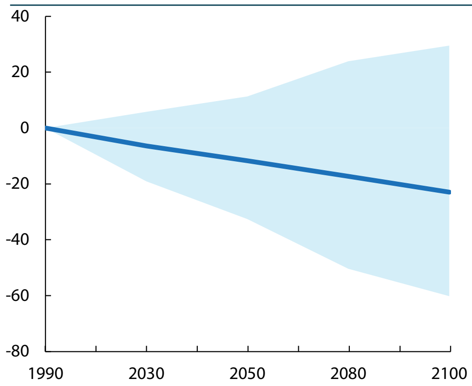


Figure 8 Seasonal runoff changes, winter average scenario



Climate change is expected to alter meteorological and hydrological regimes and possibly result in lower water availability. A decrease in total precipitation combined with higher evaporative demand would probably result in less river flow (run-off). However, the maximal values of precipitation have an increasing tendency because an increase in the frequency of the intensive precipitation is expected to occur, and this will cause an increase in flood frequency in autumn, winter and spring (Figure 8). The coastal area is flooded not only from rivers but also by sea water inundation (storm surges). The predicted values for precipitation minima will lead to an increasing frequency of droughts in summer. Climate change will affect the hydrology of watersheds, the demand for water, and the size and thickness of snow pack. These likely impacts could make the coastal region even more vulnerable, urging the mainstreaming of Disaster Risk Management (DRM) and adaptation into long-term development strategies.

The impact of climate on water demand is driven by water use and electric power consumption. In coastal areas, water demand is lowest in winter when it is considered to be below annual average demand.[14] But in late spring, summer and early fall there is a rise in the use of water and in demand for electrical power. During summer periods the demand rises significantly, peak daily demand often rises by a factor of 2 or more times the annual average. However, even in the worst case scenario the difference between the production and the need of water can be met by appropriate technical and policy approaches.

Water resources are likely to be further stressed due to projected growth in demand and climate-driven changes in supply for irrigation, cities, industry and environmental flows. The quantities of water produced are much higher than the rate of water consumption per person per day approved by law. The analysis suggests that the available water resources in Albania are sufficient to cover future demand, but there is an urgent need to establish a precise database for the state of water services and water management for indices such as: (i) water consumption measurement, (ii) non-revenue water[15]; (iii) drinking water quality.

14 Albania's Second National Communication to UNFCCC Report. UNDP 2009
15 Water that has been produced and is "lost" before it reaches the customer.

Agriculture Sector

Agriculture is sensitive to short-term changes in weather and to seasonal, annual and longer-term variations in climate, and in particular to temperature and precipitation that are key drivers of agricultural production. These direct impacts on agriculture production are compounded by effects on soil characteristic, seed genetics, pests and disease and agronomic practices that also impact crop yields. Winter temperatures are important for the survival of pest and studies have shown that an increase in temperature accelerates the development of pests in general.

A consequence of temperature variation is its impact on the growing season for agriculture. Taking into consideration seasonal temperature projections, the beginning date of the growing season will shift towards earlier dates in February over the whole coastal area and the ending date will shift towards later dates in December. Consequently, the growing season is expected to lengthen by 37 to 22 days from north to south, respectively by 2100 compared to 1990. The largest increase in temperatures is expected to be during the periods of summer and spring, which coincides with the period of plant growth and their fructification, which is expected to lead to negative effects for the majority of agricultural crops. High temperatures will limit yields in many vegetables.

For many crops the periods of maximum number of consecutive days without precipitation coincides with three quarters of their development stages. Some crops such as soybean, maize, spring wheat, barley, beans, tomatoes, cabbage, millet, onion, sorghum, pepper, sunflower and watermelon are expected to be affected. Given that for most agricultural crops the annual amount of effective rainfall is insufficient to meet their water needs, a large number of crops will require increasingly high amounts of water for irrigation.

Biodiversity

A decline in precipitation and resulting water shortages will further impact vegetation, deteriorate fresh and brackish water wetlands along the coast and consequently effect ecology and aquatic life, especially breeding water birds. A reduced temperature range, resulting from a higher rate of increase in minimum versus maximum temperatures, is likely to occur over nearly all coastal areas. The number of frost days and cold waves are very likely to become fewer. Under this scenario, the number of species of wintering water birds and waterfowls along Albania's coastal wetlands will markedly reduce. The increased temperature and the increased number of intensive rain events will likely lead to further invasion of alien plant and animal species along the coast and increase their impacts on native plant and animal species and communities.

Future climate change for Albania could accelerate habitat loss and degradation along most parts of the coastal zone, as migration of coastal wetlands and other habitats inland is impeded by embankments and drainage schemes constructed as part of the wetland reclamation work over 1950's and 1960's. Human induced impacts along the coastal zone of Albania, especially in the lowland Adriatic coast, may strongly decrease ecosystem resilience and adaptation capacity to the impacts of climate change.

Tourism Sector

Climate change is already perceived as having an impact on the tourism sector – both positive as well as negative. Up to 2030, the October-May period will remain unsuitable for sun and sea tourism, while the other period of the year will still offer a full comfort levels. Data regarding 2050 defines April as an acceptable month, June as ideal, while May, July, August, September and October as excellent months for tourist activity. A considerable increase for the need for water and energy is expected. The water demand will increase because of the increase of tourist numbers and of tourists' water demand.

In coastal areas, tourism is predominantly focused on beaches. However, due to active marine erosion each year hundreds of square meters of beaches disappear, which also leads to the drying and destroying of hundreds of pine trees. Although this is mainly caused by the improper interference of humans in the management of rivers outlets and coastlines, nevertheless, forecasts suggest that:

- *by 2030* Patoku beach is expected to totally disappear while Kune and Seman beaches will only partially survive;
- *by 2050* most part of Kune and Seman beach is expected to disappear;

Coastal Zone population

A high percentage of the Albanian population is concentrated on the coastal zone and the capital Tirana. Albania's coastal zone has a population density of 181.1 inhabitants/km^2, and this is growing. Population density is expected to increase until 2030, then it will decrease due to the reduction of the population's natural growth and also a reduction of emigrants.

To date, existing planning has effectively led to development that constitutes "maladaptation". For example, construction of tourist infrastructure has been made without considering risks of extreme events such as: flooding, storms, shoreline erosion, and long lasting drought expected to occur as a result of climate change. Road, water and electric energy supply infrastructure have suffered damages each year, especially due to sea surges (as a result of storms and high tides) and river flooding during periods when rainfalls are frequent and often intense. Evidence of the expected consequences of tides and flooding due to intense rainfalls are the events of the winter of 2009 - 2010 and 2012 - 2013 where almost the entire coastal area was inundated by water and the population affected by considerable damages to property and infrastructure.

To reverse these current maladaptive practices, and to ensure the protection and sustainable development of future activities, as well as coordination of projects that encourage donor investment in the coastal area, a National Coastal Agency has been established. An Integrated Cross Sectorial Coastal Plan by the Albanian National Agency for Territory Planning is also under development.

Health

Climate change can affect human health directly (impacts of thermal stress, death/injury in floods and storms) and indirectly through changes in the ranges of disease vectors (mosquitoes), water-borne pathogens, water quality, air quality, and food availability and quality. Actual health impacts will be strongly influenced by local environmental conditions and socio-economic circumstances, and by the range of social, institutional, technological, and behavioral adaptations taken to reduce the full range of threats to health.

Climate change scenarios suggest that there will be increased heat-related mortality, and a greater frequency of infectious disease epidemics following floods and storms. Health effects are expected to be more severe for elderly people and people with pre-existing medical conditions, while the groups who are likely to be most susceptible to the increasing risk of diseases are children and the poor and, among them, especially women.

As in most of the Mediterranean countries, malaria was a hyper-endemic disease in Albania's coastal areas until the country was declared free from malaria in 1967. In neighboring countries (e.g. Greece) malaria cases are being reported sporadically and in some cases in clusters, including cases with indigenous transmission. The impact of climate change on the epidemiology of malaria in Albania remains to be ascertained with specific entomological/parasitological investigations focused on sites of greatest risk.

Apart of its immediate threat, floods and other climate factors such as humidity and temperature have the potential of creating conditions for longer term impacts on human health. Institute of Public Health data show an unusual increase of cases with leptospirosis, a life threatening infectious disease, in Shkodra district following the floods of 2010, which was also triggered by the presence of numerous rodents which colonize this area, and by a high density of livestock.

Coastal Adaptation Plan

The main task for V&A analysis has been to prioritize the adaptation measures proposed by sectors in an integrated way and develop an Adaptation Plan for the Coastal Area.

A mechanism for the prioritization of individual defined measures was developed to provide integrated approaches towards adaptation to overcome sector specific approaches that can lead to maladaptation. ICZM principles were used to rationalize measures proposed from within individual sectors and integrate across sectors to produce the adaptation plan. The Adaptation plan consists of a series of integrated adaptation measures and actions, classified as Soft (21 measures), Green (Ecosystem-based-Adaptation, 18 measures), Grey (engineering interventions -27 ranked measures) and 1 Fiscal Adaptation measures and respective actions, recommended for implementation in three time horizons: short - (up to 2020), mid - (2020-2030) and long-term (2030-2050). In addition, a set of schematic adaptation maps for the coast were prepared.

Table 2: Taken from Adaptation Plan for the Coastal Area

Category	No	Measures Identified from sector reports	Actions	Location
SHORT TERM MEASURES (years: up to 2020)				
Combined (GREEN& Soft)	10	Measures in the Protected Areas (PAs)	• Improve management of coastal protected areas • Forest fires prevention and warning systems • Introduce monitoring system • Improve the water exchange in lagoons • Biodiversity restoration activities • Improve the lagoon systems • Implement monitoring plans	Velipoje-Shkoder, Drini-Mati, Durresi Bay, Myzeqe Field, Vjosa River Mouth

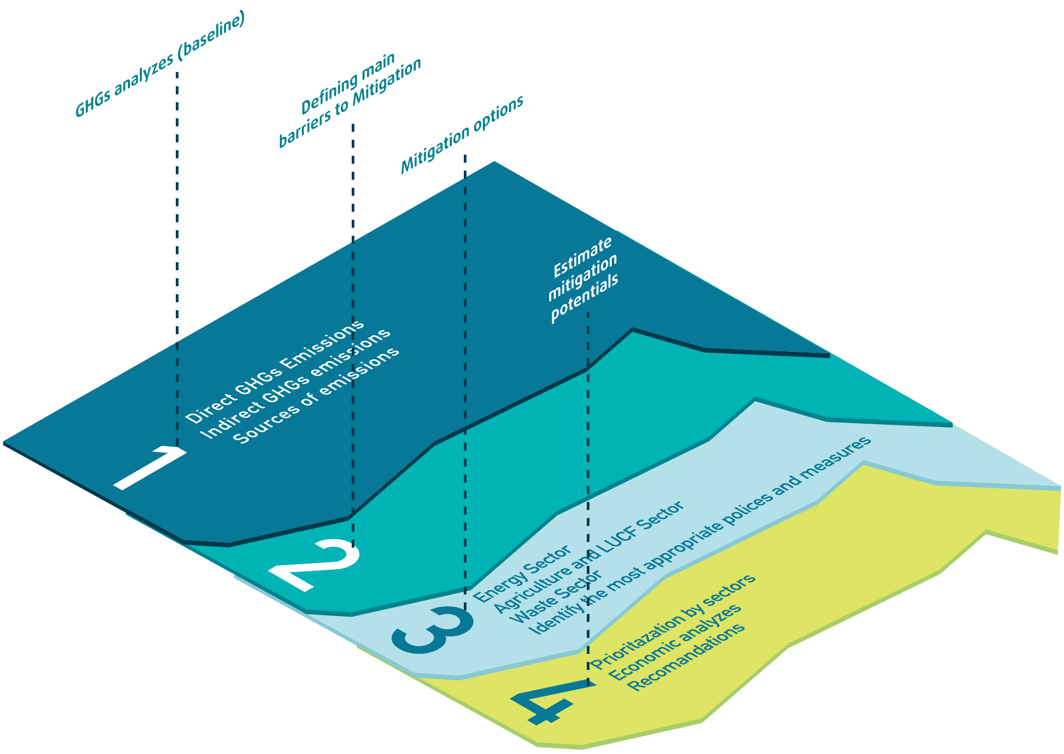
MITIGATION ANALYSIS

Albania's National Strategy for Development and Integration (NSDI I) 2007-2013 (DCM No. 342) of 12/03/2008 was a key national strategic document that states Albania is a small actor in the global environment due to its low per capita GHG emissions. Nevertheless, the strategy outlined measures for mitigation and adaptation to climate change, although the overall goal of these measures is not explicitly related to climate change. The NSDI focused on energy efficiency improvement in all sectors, with a view to reduce energy consumption and GHG emissions. Albania has taken mitigation commitments and submitted its Intended Nationally Determined Contribution (INDC) in September of 2015. Albania signed the Paris Agreement on 22 April 2016 in New York and has started the ratification process. While having associated itself with the Copenhagen accord, Albania still needs to focus on developing and adopting a comprehensive climate policy and strategy in line with the EU 2030 policy framework on climate and energy, and as well to further develop the country's capacities to monitor and report its emissions annually, and to implement the NDC and NAMAs. In the context of the EU Accession process and the Energy Community Treaty, and in line with the EU 20-20-20 objectives, Albania has already set Quantified Objectives related to energy efficiency (9%) and renewable energy sources (38%) in 2018 and 2020 respectively compared to 2009. Measures such as energy market liberalization, combined with significant investments for the development of energy transmission infrastructure and privatization of the electricity distribution sector, have resulted in an uninterrupted electricity supply to consumers.

Methodology

The mitigation analysis included in this report is based on analysis of the GHG inventory, emission trends and also development priorities. The sectors considered for the analysis of the present report were: Energy, Agriculture, LUCF and Waste. The GHG considered were CO_2, N_2O and CH_4. To assess different mitigation measures the study has followed the steps presented in Figure 9. In general, mitigation measures are focused on the main sources of GHG emissions.

Figure 9 Steps followed for the mitigation assessment



Intended Nationally Determined Contributions (INDCs) and National Appropriate Mitigation Measures (NAMAs)

The INDC of Albania is a baseline scenario target: it commits to reduce its CO_2 emissions by 11.5 % as compared to the baseline scenario for the period 2016 to 2030. This reduction is equivalent to a CO_2 emission reduction of 708 Gg by 2030. The emission trajectory of Albania allows a smooth trend for achieving 2 tons of GHG emissions per capita by 2050, which can be taken as a target for global contraction and convergence of greenhouse gas emissions.

An initial inventory of potential NAMAs in Albania was established with UNDP support (2013-2014). On the basis of a multi-criteria analysis, considering the benefits for a range of sustainable development areas, priorities were established, and two NAMAs were fully developed respectively on (i) Supporting the implementation on the National Energy Efficiency Action Plan (NEEAP) in the residential, public and commercial sector and (ii) Replacing fossil fuels with non-hazardous waste in the Albanian cement industry.

ENERGY SECTOR ANALYSIS

Albania as one of the Contracting Parties of the Energy Community Treaty is obliged to transpose and comply with the EU Directive 2009/28/EC "On the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC". To comply with, the National Renewable Energy Plan (NREAP) is adopted by the Governmental Decree no.27, dated 20.01.2016, which sets a binding national target of 38% of renewables in the final total energy consumption of the country in the year 2020 compared to 2009 together with support measures for achieving the following RES policy objectives:

i. Reduction of electricity imports;

ii. Diversification of primary energy sources for electricity supply;

iii. Reduction of transmission and distribution losses by promotion of distributed generation;

iv. Creation of local business and employment opportunities by installing and producing parts/components/systems of RES plants by Albanian industrial sector;

v. Utilisation of local energy sources especially in remote areas bringing jobs and improving life standard;

vi. Increasing share of biofuels and other fuels from renewable energy sources contribution to 10% of total fuel consumption at transport sector by 2020.

Within the country commitments under the Energy Community Treaty and INDC, a new law on Energy Efficiency No. 124, dated 12.11.2015 has been adopted, containing a number of important provisions, like (i) obligation schemes for big consumers above 3 mil. kWh (or equivalent); (ii) establishing a new Energy Efficiency Agency; (iii) establishing a ne Energy Efficiency Fund independent by budget and also with the state budget as main contributor; (iv) creating ESCOs and asking for Energy Audit of buildings, processes and transport, and also (v) the energy managers to the big consumers. The Energy Efficiency Fund as per the law will provide grants and loans or financial guarantees for the implementation of the energy efficiency projects in Albania, while the Energy Efficiency Agency will be in charge to develop, implement and monitor the energy efficiency policies and programs, including the implementation of the National Energy Efficiency Action Plan (NEEAP).

A new law on Energy Performance in Buildings is under the last stage of its endorsement, calling for the energy minimum requirements on building stock and the National Methodology for Calculation of Buildings' Performance which are going a Certification process through a national software on respect of Minimum Requirements.

2nd and 3rd drafts of the National Energy Efficiency Plan will get finalized soon, while the 1st endorsed NEEAP which sets a binding national target of 9% of energy efficiency in 2018 compared to the year 2009 contains several measures that have GHG mitigation effect:

- Thermal insulation of existing stock of public buildings and a new energy building code for new public ones;
- Encouragement for using efficient bulbs in residential, service and industry sectors;
- Energy Efficiency Promotion Programme for the power sector (improvement and extension of electricity supply, strengthened of grid stability, reduced system losses, energy saving);
- Substitution of fossil fuels (coal, oil coke, RFO) with light fuel oil efficient boilers in industry & service sector;
- Increasing Energy Efficiency of boilers/furnaces in industry & services sector.
- Increase of power factor (cosj) in industrial companies.
- Improving energy efficiency of vehicle stock, etc.

Currently Albania is updating the National Strategy of Energy, looking at the diversification of the energy sector through its gasification/utilization of Natural Gas vial TAP project in economic sectors of Albania.

The final draft of the Sustainable Transport Plan (STP) has been prepared (March, 2016) to help meet the following challenging targets for reducing energy consumption and improving the overall sustainability in the transport sector:

- Reduce air pollution impacts on health, crops, etc. (indicator: emissions of air pollutants tons/year);
- De-carbonisation, reduction of GHG emissions (indicator: emissions of CO2 tons/year);
- Energy efficiency (indicator: tons of oil equivalent).

Energy sector Baseline Scenario

The baseline scenario extended to the year 2030 assumes the following:

i. Current structure of energy supply and demand in all economic sectors.
ii. A continuous prevalent use of electrical energy for heating and warm water in residential and the service sector.
iii. A considerable portion of future demand for electricity shall be covered through the extension of the thermal generating capacities (based on imported natural gas) and hydro energy.
iv. The planned short-term measures from 1st NEAAP and NREAP are not going to be strictly implemented.
v. National energy intensity will get not significantly decreased during period 2009-2030, compared to mitigation scenario.

The generation of baseline scenario (and later of the mitigation scenario) for the energy and transport sectors has been carried out using the LEAP[16] that ensures the appropriate analysis and provides close to reality recommendations on energy strategies, adjusted to the conditions of Albania. Markal-Optimization Software was also used to evaluate the penetration rate for different technologies, GACMO (the GHG costing tool) and GHG emission time series (for the years 2000-2009) calculated under the present GHG inventory chapter were also utilized.

16 Long Energy Alternative Planning

The forecast of energy demand for the economic sectors is based on historic values for the period 2009-2014 (calibrated real values), while for the period 2015-2020 it is based on the forecasted figures according to the NREAP.

Energy Sector Mitigation Scenario

Mitigation measures, considering their GHG emissions reduction potential on a certain penetration rate and time frame are analyzed for the following categories: Residential, Service, Industry, Transport, and Energy transformation. Furthermore, the analysis evaluated the financial efficiency of identified measures by estimating the cost of reduction of CO_2 emissions, and considering specific rates of penetration for each measure. The Figure 10 compares selected GHG mitigation measures, based on their cost of emission reduction, while Figure 11 evaluates the GHG emissions mitigated by introducing different mitigation measures in the energy and transport sectors.

Figure 10 Comparison of selected GHG mitigation measures, based on thir cost of emission reduction (USD/CO_2 eq.)

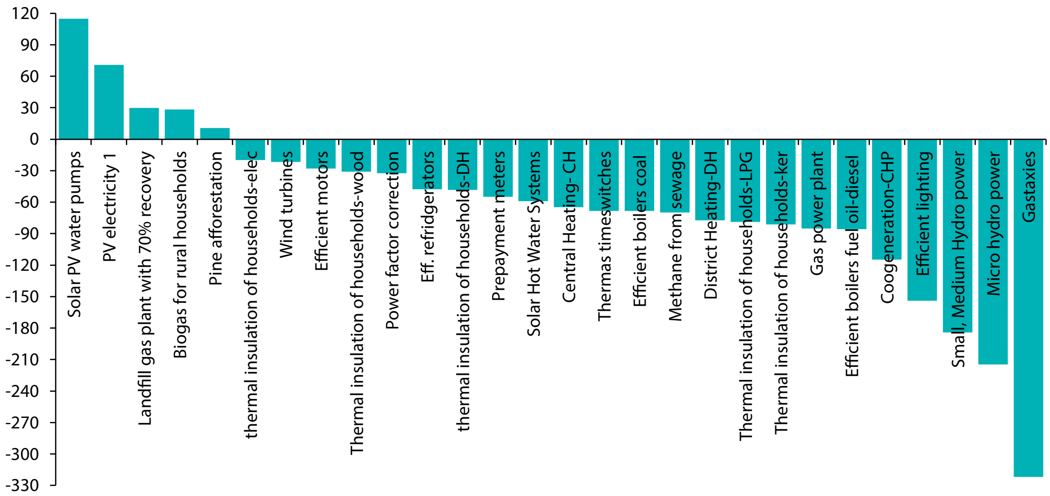
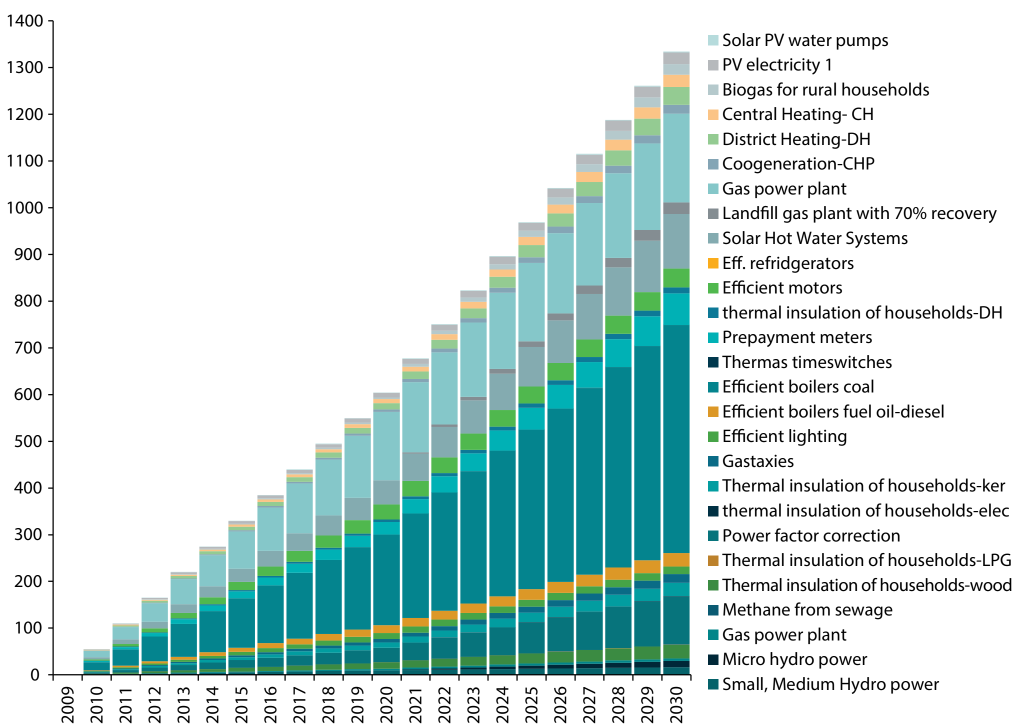
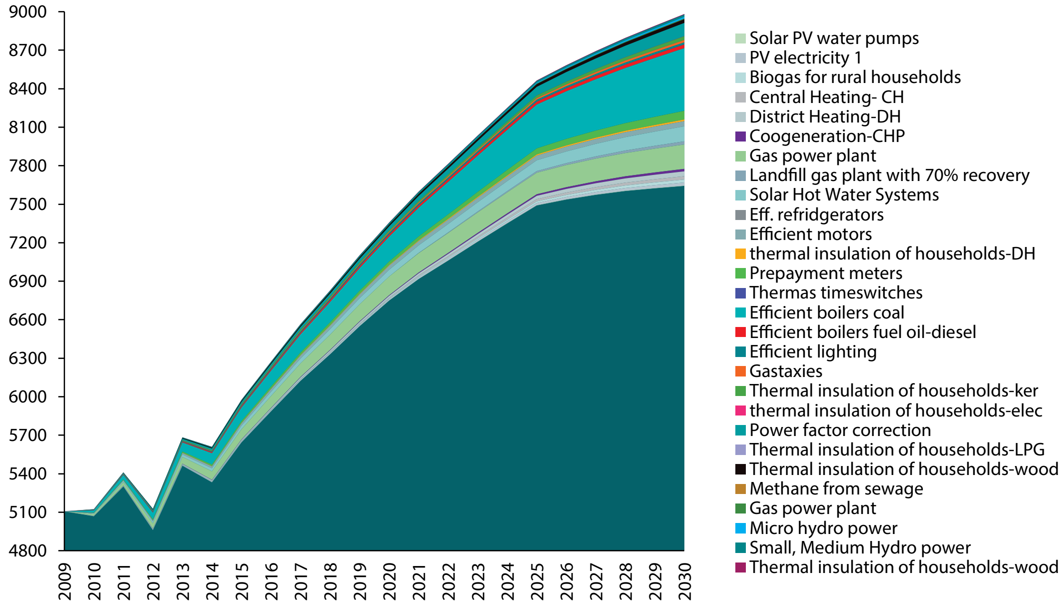


Figure 11 GHG emissions mitigated by introducing different mitigation measures in the energy and transport sector (as shown in tables 5.5 and 5.6 (in Gg of CO_2 eq.))



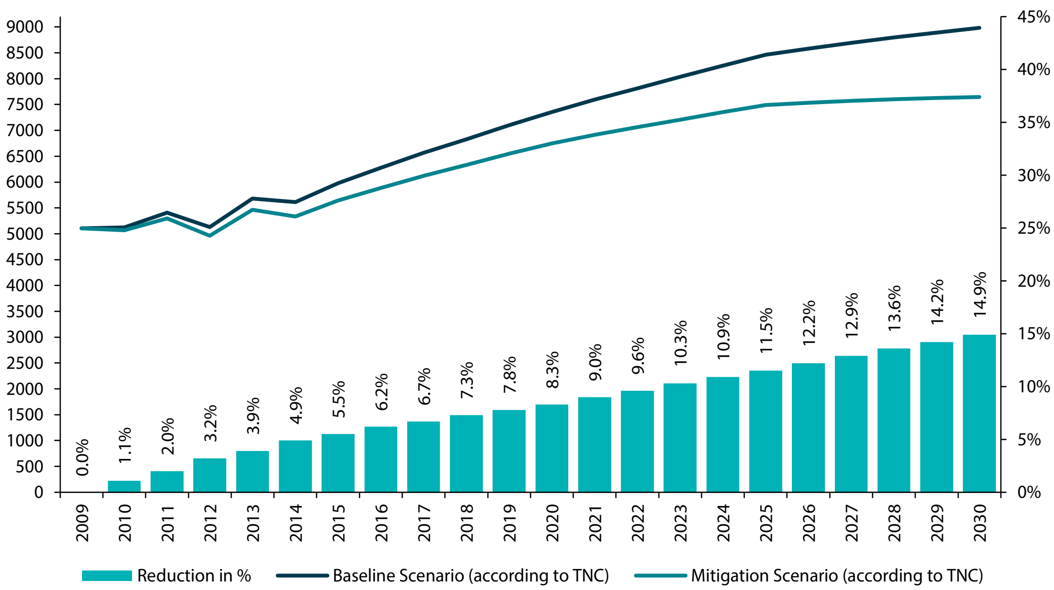
Introduction of natural gas power plants, mini hydro power plants and large hydropower plants have the biggest impact on the reduction of GHG emissions. Figure 12 shows the amount of GHG to be mitigated by introducing mitigation measures in both supply and demand side of the energy sector. It can also be observed that introducing GHG mitigation measures in the energy industry sector have the highest impact, among all sectors, on reduction of GHG emissions. They are followed by the measures in the household sector and thirdly the energy transformation sector.

Figure 12 GHG mitigation measures for the energy sector (Gg of CO_2 eq.)



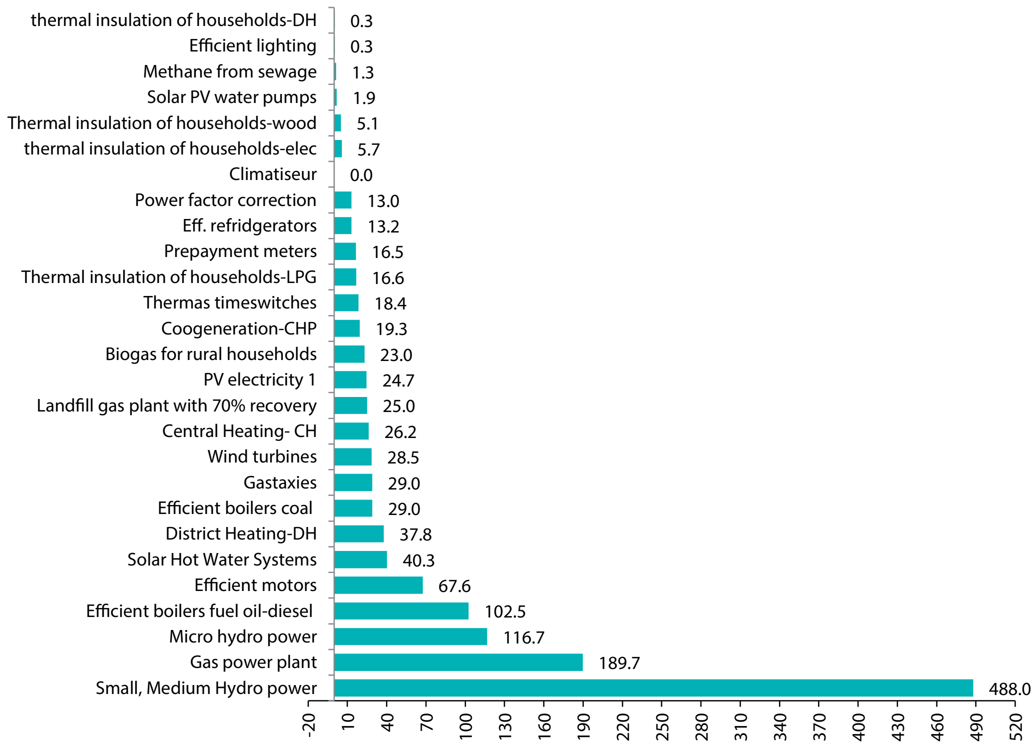
Regarding the reduction costs per unit CO_2, the demand side management is more effective compared to the supply side (energy transformation sector). Both Baseline and Mitigation scenarios are shown in Figure 13.

Figure 13 Baseline Scenario, Mitigation Scenario and the evaluated reduction potential of GHG emissions (in Gg of CO_2 eq.) from the energy&transport sector



The total effect of proposed measures that represent approx. 95% of anticipated GHG emissions reduction is shown in Figure 14.

Figure 14 Cumulative effect of energy and transport mitigation measures by the year 2030 (in Gg of CO_2 eq.)



AGRICULTURE AND LIVESTOCK SECTORS MITIGATION ANALYSIS

Agriculture activities release significant amounts of CO_2, CH_4 and N_2O to the atmosphere. The fluxes of these gases can be reduced by managing more efficiently the flows of carbon and nitrogen in agricultural ecosystems. For example, practices that deliver added N more efficiently to crops often suppress the emission of N_2O, and managing livestock to make the most efficient use of feeds often suppresses the amount of CH_4 produced.

The approaches that best reduce emissions depend on specific conditions and therefore vary from case to case. The proposed mitigation measures to reduce emissions in the agricultural sector are described below:

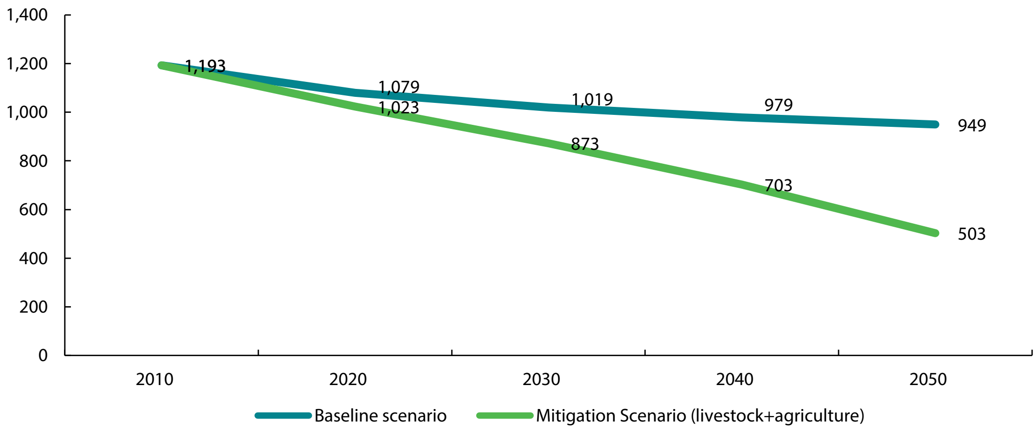
1. Enhancing removals.
2. Conversion of agricultural lands.
3. Avoiding (or displacing) emissions.

Mitigation options considered are summarized below:

1. *Cropland management*: as they are often intensively managed, they offer many opportunities to implement practices that reduce net GHGs emissions;
2. *Grazing land management and pasture improvement*: as they are usually managed less intensively;
3. *Organic soils*;
4. Livestock management;
5. *Manure management*;
6. *Bioenergy*.

Taking into consideration the mitigation measures to be introduced in both agriculture and livestock activities, a reduction of 47.01% of the agricultural sector emissions can be projected to year 2050. Figure 15 presents these results.

Figure 15 Mitigation Scenario of GHGs emission (in Gg of CO_2 eq) from agriculture sector (agriculture + livestock), for 2010-2050.



The following conclusions can be drawn by the mitigation analysis:

The agricultural sector represents a sector with considerable potential for reducing GHG emissions by implementing suitable mitigation measures.

The practice of planting trees in agricultural lands should be re-introduced. In addition to the ecosystem services they perform, they can also reduce significant amounts of GHGs.

In order to achieve the desired mitigation results, a reorganization of agricultural farms, their unions and cooperatives will offer better options to implement the mitigation measures proposed here.

Introducing anaerobic digestion as an unique treatment since it can deliver positive benefits related to multiple issues, including; renewable energy, water pollution and GHG emissions.

In addition to the above measures, which are included in the calculation of mitigation options, there are other measures that could be included in these calculations (e.g. the amount of agricultural land surface and biomass that is burned every year, cultivating organic soils, etc.

FORESTRY SECTOR MITIGATION ANALYSIS

The main CO_2 emissions from the LUCF sector originate from carbon stock changes. Other GHGs include nitrous oxide (N_2O), from cultivation of organic soils and soil organic matter mineralization (e.g. due to land use conversion and drainage of forest soils) and methane (CH_4). As further examples, CO_2 and N_2O are also emitted during forest fires and from anaerobic decomposition of organic material in wetlands. Non-CO_2 GHG emissions from agricultural land are covered by the inventory sector 'agriculture' and are therefore not part of the LUCF sector.

The main sources of GHGs emissions from the LUCF are:

- Wood Removal.
- Fuel wood removal.
- Harvested wood products.

- Biomass burning.
- Site preparation for forest plantations.
- Shifting cultivation.
- Deforestation.

The performed analysis show that the forests are managed and continue to be managed in a *non-sustainable way*, therefore the forest sector appears to be a net emitter of GHGs, due to the fact that the level of annual forest cutting is higher that the forest's natural growth. For this reason, the increase in forested areas through plantations and improvement of technological process of forests exploitation and wood burning should be a priority.

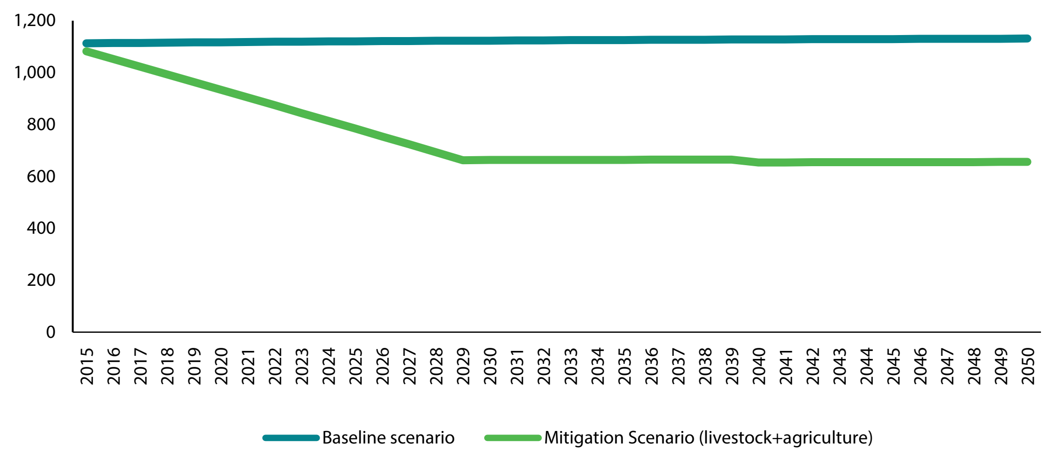
The proposed mitigation measures for the sector are:

I. Technological measures for existing forests

It is anticipated that the following technological improvement would bring the reduction of CO_2 emissions from the exploitation of the existing forests:

1. Improving forest exploitation technology.
2. Improving the efficiency of wood combustion in order to decrease the amount of wood consumption. As stated before, combustion efficiency is only 40%. Actions taken in this regard, aim at increasing the efficiency of wood utilization up to 81%, for a period of 15 years (2015-2030). The technology to be introduced doesn't cost too much and it is easy to use;

Figure 16 Projected CO_2 emissions from forests (in Gg), during the period 2015-2050



As shown in Figure 16, adopting the selected mitigation measures can reduce the amount of emissions from forests from 1,130.7 Gg of CO_2 in 2015 to 663.2 Gg in 2030. Thus, a reduction of GHGs emissions by almost 60% for a period of 15 years can be achieved. On the other hand, the proposed technological measures do not provide any further reduction between 2030-2050, since their efficiency will peak in the year 2030, and the forest sector will continue to be an emitter of GHGs.

II. Increase of the Forested Area

In order to use forests in a sustainable manner it will be very important to invest in new forests plantation. Based on the national circumstances of Albania's forestry sector, the amount of forest area to be planted each year ranges from 500 to 1,000 ha. Considering the fact that in the last 25 years there has been no significant investment in this direction, increasing the national forests fund through afforestation/reforestation should be considered as a national priority. This would represent a significant action, because forests offer many other environmental, social, economic services, as well as other services such as protecting land from degradation, etc. besides their role in sequestering GHGs. Two relevant scenarios are considered, a first that includes increasing forest area by 500 ha/year and a second by 1,000 ha/year, both for a period of 35 years (up to the year 2050). Figure 17 presents the CO_2 sequestered in Gg during 2015-2050 by rates of afforestation by 500 and 1000 ha/yr (AFF 500 ha/yr and AFF 1000 ha/yr).

Figure 17 CO_2 sequestered (in Gg), during 2015-2050, AFF 500 and 1000 ha/yr

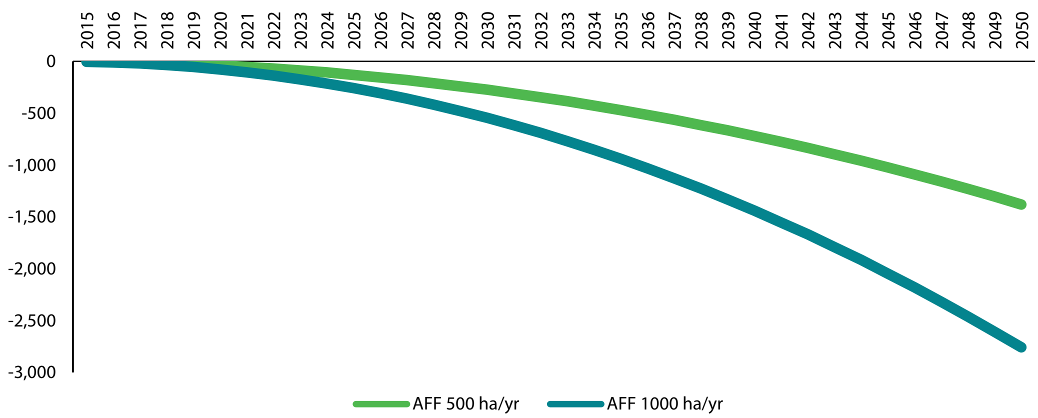


Figure 18 CO_2 balance for period 2015-2050 (in Gg), under the Baseline and Mitigation Scenario (TI+AFF 500 ha/yr)

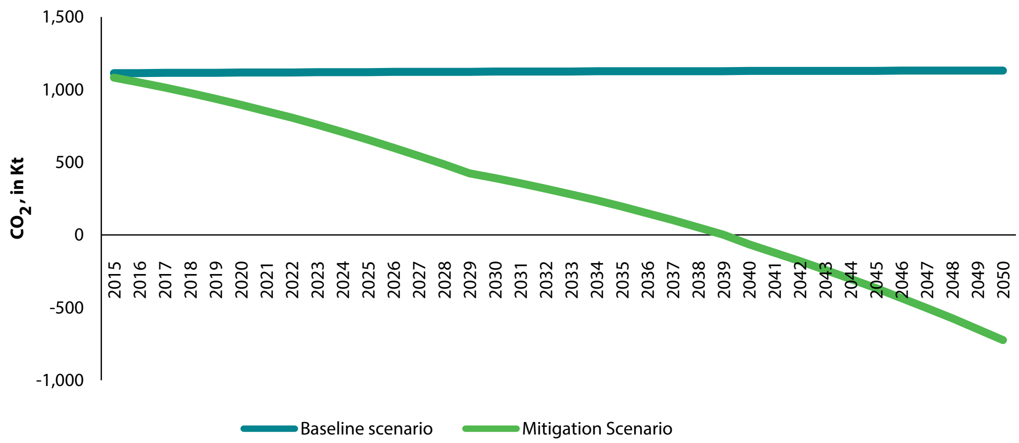


Figure 19 CO_2 balance for period 2015-2050 (in Gg), under the Baseline and Mitigation Scenario (TI+AFF 1,000 ha/yr)

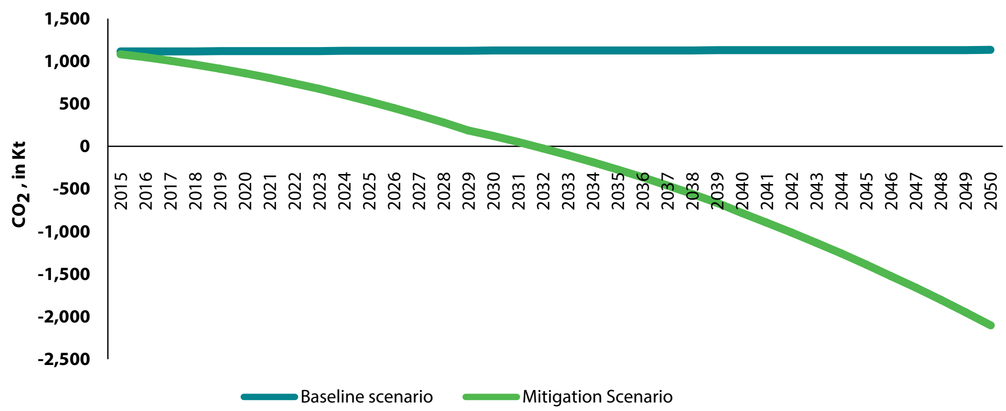


Figure 17 shows that planting 500 hectares per year will produce a total surface of about 18,000 hectares by the year 2050, mitigating approximately 1,379 Gg of CO_2 by 2050. Increasing the forested area by 1,000 hectares per year will increase the forest area to 36,000 hectares by the year 2050, mitigating up to 2,758 Gg of CO_2 during this period of time. Based on the above two scenarios and the application of technological measures, forestry emissions would be reduced and the sector would became a net sink of emissions.

Figures 18 and 19 show that with the application of the technological improvement (ITI) measures proposed, as well as afforestation (AFF) of 500 ha/year or 1000 ha/year, Albanian forests would reach their sustainable management level by the year 2040 or 2033 respectively.

In conclusion:

- The forestry sector is currently managed in a non-sustainable manner, largely as a result of a lack of investment as well as a lack of technological improvement applied to this sector.
- Implementation of technological measures for forest exploitation and wood combustion are two very important mitigation measures that could be introduced to the forestry sector. These measures could be easily implemented in the next 15 years (2015- 2030).
- Technological improvements to forest exploitation could improve the efficiency of wood utilization up to 95% from the current 80% level.
- Application of technological improvement (TI) measures proposed, as well as afforestation (AFF) of 500 ha/year, for the exploitation of Albanian forest would lead to the forest sector reaching its sustainable management level by the year 2040, or 25 years from now.
- Application of mitigation measures such as the technological improvement (TI) as well as the afforestation (AFF) of a surface of 1,000 ha/year, for the exploitation of Albanian forest would lead to the forest sector reaching its sustainable management level by 2033, or 17 years from now.

WASTE SECTOR MITIGATION ANALYSIS

Baseline and Mitigation scenarios for the waste sector are built following the methodology of the "Approach to perform waste mitigation analysis". The GHG emissions in these scenarios were calculated using the IPCC Good Practice Guidance. Population growth was derived from the INSTAT population projections for the period 2010–2025. The amount of waste per day per habitant was based on the assumption that by 2025 the entire population will have reached the actual rates of waste generation of the Tirana region. This variable will be a function of the linear progression from the average value (0.7 kg/person/day) of 2009 to 1.5 kg/person/day in 2025. The fractions of treated MSW and waste water, and the emission factors of these waste streams, vary in each scenario according to the assumptions and values advised by the IPCC Good Practice Guidance and its Reference Manual.

Three scenarios were considered:

1) Baseline Scenario for the period 2010 – 2025

In the Baseline scenario, the CO_2 eq. emissions from the entire waste sector (MSW and waste water handling) will continue to increase until 2025 as a consequence of population increase and consumption. Methane emission from waste disposal on land will also increase. The increase of population and consumption will overcome the mitigation effects of improvements in treatment technologies leading to a net growth of GHG emissions in this sector.

2) Mitigation Scenario 1 Good environmental performance scenario for the period 2010 – 2025

The main contributors to CO_2eq. emissions for the whole waste sector are the methane emissions from waste disposal on land. These methane emissions will see a decrease as waste treatment options improve over time. Higher fractions of biodegradable waste are diverted from landfills. The dumpsites are less frequently used as a result of the construction and operation of new landfills.

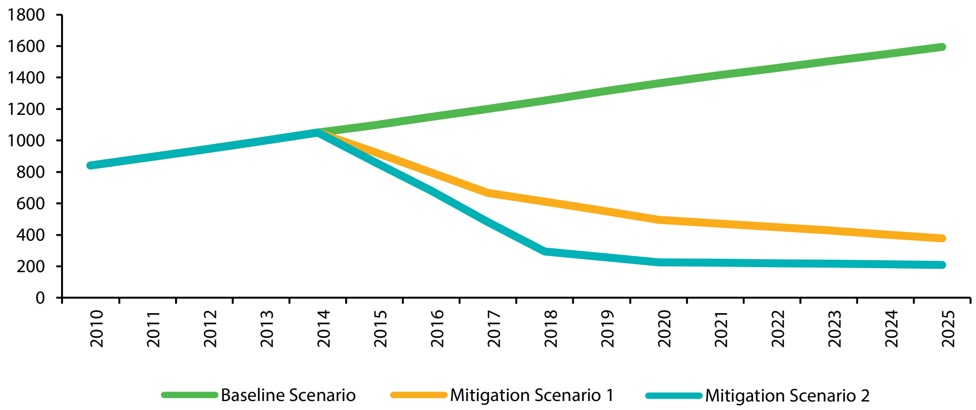
Scenario 3 Waste-Cement Industry (NAMA Scenario) for the period 2010 – 2025

The CO_2 eq. emissions from the entire waste sector are reduced over time, mainly because of the reduction in methane emissions from the waste disposal sector. With the waste NAMA in place the CO_2 eq. emissions will be significantly reduced.

Scenarios Comparison

The main contributors to GHG emissions for the whole waste sector are methane emissions from waste disposal operations. The total CO_2eq. emissions from the waste sector (including both waste and waste water subsectors) are lower for the mitigation scenario 1 and significantly lower for the mitigation scenario 2 compared to the Baseline Scenario. These emissions are reduced in the scenario implying Good environmental performance and reduced further if the NAMA scenario becomes operational (Figure 20). Emissions from the waste water treatment sector are the same under the mitigation scenarios 1 and 2, and the difference between them is related to the different emissions factors from the waste treatment sector.

Figure 20 Waste Sector-Comparison of the GHG Baseline Scenario with two GHG mitigation scenarios (in CO_2eq.)



GENERAL DESCRIPTION OF STEPS TAKEN OR ENVISAGED TO IMPLEMENT THE CONVENTION

As is recognized world-wide, climate change is an emerging governance area that presents a number of challenges for countries and their governments. These challenges are compounded by the struggle faced by many countries to understand climate change science and tools to:

1. Measure greenhouse gas emissions, and identifying corresponding mitigation actions;

2. Assess vulnerability;

3. Evaluate present and future impacts of climate change;

4. Identify the most suitable adaptation options.

At its best, climate regulation can push climate change responses up in the political agenda, establish a clear vision and framework for adaption and mitigation mechanisms, and put in place the necessary institutional and financial architecture to translate the developed strategies and policies into effective actions. Complicated considerations abound, ranging from how to integrate new institutional structures into existing frameworks, how to ensure any legislation is consistent with, and strengthens existing laws, and how to ensure any recommendations fully take account of Albania's current political, social and economic context.

Steps Taken to Implement the UNFCCC

During the last two decades, Albania has paid special attention to environmental protection in general and climate change in particular. The Albanian Constitution itself has included "*a healthy and ecologically adequate environment for present and future generation*"[17] as one of the social objectives that need to be taken into consideration by all state institutions.

Albania is a signatory Party of the UN Framework Convention on Climate Change. The UNFCCC was ratified by the Albanian Parliament in 1994. Albania has also signed the Kyoto Protocol and ratified it, as stated in law no. 9334, dated 16.12.2004, and has actively participated in the Conferences of Parties organized under the UNFCCC.

The Albanian Parliament ratified the Paris Agreement through law no. 75/2016 dated 14.07.2016, as a major step towards its implementation. Ratification of the Paris Agreement came in response to previous actions undertaken in this context such as the delivery ahead of schedule of the Intended Nationally Determined Contributions (INDC) to the UNFCCC Secretariat on 24 September 2015, and the signing of the Paris Agreement on 22 April 2016 in New York.

The Ministry of Environment is the highest governmental body responsible for environmental protection and formulation of environmental policy and legislation in the country. The MoE is also the National Focal Point to the UNFCCC and to the Kyoto Protocol as well as tracking the Clean Development Mechanism projects and National Appropriate Mitigation Actions and represents Albania in the Adaptation Fund, Green Climate Fund, etc. Recently, a new Sector on Air and Climate Change is established in the structure of MoE comprising of three staff and the National Agency of Environment has also a specific sector with tasks related to GHG emissions inventory. During the last decade the Ministry of Environment has been strongly supported by the UNDP Climate Change Programme for all climate change activities under the UNFCCC

17 Article 59(e) of the Albanian Constitution.

and the Kyoto Protocol, including the preparation of two National Communications and participation in various negotiation forums. However, there is still lack of sufficient human resources to cover the whole range of activities and commitments under the UNFCCC. Also, a proper network for data gathering and analysis is missing, which makes it difficult to comply with the UNFCCC and Kyoto Protocol reporting requirements, including the national communications and the biennial update reports (Biennial Update Reports).

An Inter-ministerial Working Group on Climate Change (IMWGCC) has been set up as a permanent coordinating body regarding climate change issues. It is headed by the Deputy Minister of Environment at the political level, and supported by nominated technical focal points in each and every related institution. This committee may improve stakeholders' coordination for more integrated responses to the challenges of climate change.

The Albanian Government in general and the Ministry of Environment in particular has recently paid great attention to the climate change development at the global level and this has been reflected by a number of important related actions. To start with, during recent years Albania has developed and adopted a number of primary and secondary pieces of legislation regarding the environment that have an impact on responses to climate change and which transpose a number of EU Environmental Directives. Additionally, it should be emphasized that legislation regulating other sectors that have a considerable impact on climate change, such as energy, forest and other sectoral legislation, have also been enacted.

According to the existing legislation, environment indicators related to climate change such as a) air temperature; b) sea level; c) precipitation; and d) level of underground waters are subject to monitoring. These rules include indicators of other features that have a pressure on the environment with respect to climate change that include the annual emissions of CO_2, NO_x and CH_4 coupled with dispersion of emissions of three gases according to different sectors of the economy, including energy, transport, waste management, agriculture and industry. However, more accurate, consistent and internationally comparable data on GHG emissions are essential for Albania, not only for the purpose of reporting to the COP under the UNFCCC Convention and Kyoto Protocol, but also for developing and shaping proper policies and actions to reduce its GHG emissions efficiently and effectively.

Albania is one of the countries that has already included in its tax system a specific tax on carbon. This tax is charged on oil by-products produced domestically or imported. Although the purpose of the carbon tax was to discourage the use of fuel emitting carbon emissions, to protect the environment and mitigate climate change no direct connection between this tax revenues and funds used for environmental protection and mitigation of climate change can be verified.

NAMAs, INDC and Climate Change Strategy

In 2007, the Ministry in charge for environment prepared the first Cross-Cutting Environment Strategy as an integral part of the National Strategy for Development and Integration (NSDI), which aimed, among other goals, to the "*reduction of greenhouse gas emission and ozone-depleting substances with the aim to contributing to prevention of climate changes*". In this strategy, policy guidelines and goals for the energy, forestry, waste management, industry and transport sectors were established, but no specific emission reduction or carbon uptake targets were defined for each of these sectors.

The NSDI also foresaw that the most powerful instrument for reducing greenhouse gas emissions effects is mainstreaming climate change issues into the decision-making process at various levels, especially of Government and Industry. Such measures need to be accompanied by amendments to the legal framework and an introduction of economic instruments in order to encourage reduction of greenhouse gas emissions and use of renewable energy resources. However, the NSDI is not tailored specifically for climate change concerns and does not contain the necessary actions for mitigating the adverse effects of climate change and of GHG emissions. The updated 2015 - 2020 Cross-Cutting Environment Strategy does contain climate change indicators, which are to be further strengthened by the Climate Change Strategy and its Action Plan for Mitigation which is under preparation supported by IPA 2013 Project, expected to be adopted by the end of 2016.

Low carbon emission developments generally are supported by other actions including the Nationally Appropriate Mitigation Actions (NAMAs), which represent a valuable opportunity for developing countries such as Albania to address greenhouse gas (GHG) emissions, while remaining true to their sustainable development priorities and needs. Assisted by UNDP, Albania has already identified a list of 11 NAMAs and fully developed two of them.

In response to the invitation to the UNFCCC parties, the Republic of Albania adopted the INDC document by the Decision of the CoM no. 762, dated 16.09.2015 and submitted it to the UNFCCC Secretariat by 24 September, 2015 It commits to reduce CO_2 emissions compared to the baseline scenario in the period of 2016 to 2030 by 11.5%. Maintaining the low GHG emission content of the electricity generation and decoupling growth from increase of GHG emissions in other sectors are the primary drivers of the country regarding mitigation contribution as its INDC.

For the implementation of the INDC, the Ministry of Environment through the IWGCC is coordinating the work between line ministries, especially the Ministry of Energy and Industry and the Ministry of Transport and Infrastructure, to assure the coherence of the targets identified in the INDC, draft National Strategy on Energy, National Action Plan on Energy Efficiency, National Action Plan for Renewable Energy, draft Sustainable Transport Plan and the relevant legislation on Energy and Climate Change.

Concerning the approximation of relevant EU Climate Change legislation into the national legislation, since November 2015 has started the process of drafting the Law on Climate Change and Decision of the CoM on monitoring and reporting of GHG, to be adopted by 2017.

A schedule for the alignment of remaining *acquis* topics on climate change is prepared and is the integral part of the DCM No.74 of 27.01.2016 "On approval of the National Plan for European Integration 2016 - 2020".

Climate Change Adaptation

The Inter-Ministerial Working Group on Climate Change (IMWG) is leading the National Adaptation Plan (NAP) process in Albania since February 2015, undertaking a parallel approach:

1. Preparing a NAP document;

2. Mainstreaming of climate change adaptation into relevant development and sectoral strategies.

The NAP process (supported by GIZ and UNDP) is a participatory and a learning approach, to be finalized and get endorsed via a Decision of the CoM by autumn, 2016. In the meantime, and since March, 2016, the NAP implementing mechanism is linked with the process of national and sectorial territorial planning. Climate proofing is included in the Strategic Environmental Assessment methodology for both plans.

Climate change is envisaged and substantially dealt with in the draft strategy for Integrated Water Resource Management (IWRM) so that the resilience of the water sector in insured. Adaptation is mainstreamed in a vertical way from the mission statement and objectives to the concrete measures.

Climate Change adaptation is also included in the Inter-sectoral strategy for agriculture and rural development in Albania (ISARD) 2015-2020, under the section of "Environment, land, forestry and water management and road infrastructure".

Climate change adaptation and best practices of EU have also become part of regional/local plans, like the Climate Change Adaptation Plan for the Tirana municipality, guided by the EU tool for developing climate-proof cities.

The Ministry of Environment's increased interest in the Climate Change adaptation is formalized through the active participation in the Global Network for Adaptation.

Recommendations

1. Enactment of a Standalone Climate Change Legislation

2. Implementation of the Climate Change Strategy

3. Establishment of a Technical Advisory Committee

4. Secure Capacity Building for the Climate Change Sector and the IMWGCC

Activities Related to Technology Transfer

Two important Decisions related to technology development have been promulgated by the Council of Ministries in regard with creation of the Units of Information Technology and Communication at the line Ministries and their dependent institutions (Decision of CoM no 303 dated 31.03.2011), and the creation of the Agency of Research, Technology and Innovation (Decision of CoM no 903, dated 26.08.2009 as amended on 17.09.2014).

In addition, new technology for meteorological monitoring has been added to the National Meteorological Network: 40 automatic meteorological stations through implementation of the "Albania - Disaster Risk Mitigation and Adaptation Project" (funded by the World Bank) and a weather radar to predict extreme weather through "ADRIATIC integrated RADAR-based and web-oriented information processing system NETWORK to support hydro-meteorological monitoring and civil protection decision" (ADRIARadNet), 2013- 2015.

Systematic Observation Networks

The meteorological monitoring system in the Republic of Albania consists of a national network of stations operated by professional monitoring staff operated by the Institute of Geosciences, Energy, Water and Environment (IGEWE). This network consists of 120 meteorological stations, of which 23 are climatological stations, 23 pluviometric posts, 74 thermometric posts, and a simple meteorological radar center. In addition, 13 phenological stations measure periodic biological phenomena. The number of meteorological and hydrological stations available in the archive is 480. The large set of valuable information coming from these many stations needs to be updated and undergo a process of digitalization.

Due to increasing demands for high quality climate related data, there is a need to strengthen the capacity of the Department of Climate and Environment of IGEWE, in particular for maintenance of monitoring stations and data processing. There is also a need for general support, additional staff, funding and technical equipment.

Science and Research

Despite the work performed during the reporting period further capacity building and investment in research is required to ensure integration into the European Research Area and contribute to the Innovation Union. Increased efforts for successful participation in the new research framework programme Horizon 2020 are also necessary.

Information on Education, Training and Public Awareness

The concept of education on climate change and sustainable development is relatively new in Albania. While sustainable development is a concept more widely incorporated into various areas in the educational system, the concept of climate change is still inadequately incorporated into different levels of the educational system.

Progress has been made in the strategic and operational management of research and technological development (RTD) programmes through the establishment of the National Agency for Research, Technology and Innovation (ARTI).

There are several faculties within the state university or private system that have graduate, post graduate level and/or PhD programs related to climate change, energy and sustainable development.

The UNDP Climate Change Programme has played an effective role in raising awareness about climate change mitigation and adaptation through the GEF projects: "Albanian Programme under the Global Solar Water Heating Market Transformation and Strengthening Initiative" and "Identification and implementation of the adaptation response measures in the Drini-Mati River deltas".

There have also been activities supported by bilateral and multilateral donors that include some public outreach as a component of a larger climate change related program. USAID has sponsored the Municipal Climate Change Strategies project to prepare municipal stakeholders for managing local climate change challenges. In addition, other activities related to climate change awareness issues have been organized by the Government entities and different active national and international NGOs operating in Albania, such as REC, Albanian Media Institute, etc.

Capacity Strengthening through the National Communications Process

Overall, the Government of Albania has considered the preparation of National Communications (NCs) to the UNFCCC as a highly valuable exercise and has put substantial resources and efforts into the 3rd one and the past communications. Many institutions and specialists have been trained, and institutional capacity has been built and sustained. To ensure country-wide ownership, the design of the NC projects included extensive stakeholder consultations during the respective stocktaking exercises and during their implementation processes to ensure that goals and objectives were consistent with national sustainable development priorities.

The National Communication Process in Albania has been extremely important for mainstreaming and integrating findings into other development sectorial strategies/policies. In addition, the NCs documents have been the main source for mobilizing other funds/projects in the area of climate change.

With regards to replicability, this was ensured by a broad stakeholder involvement throughout the NC project process. Capacity building, through training sessions on selected topics, assisted the whole process, from its conceptualization to the production of reports and in the periods between successive NCs. In addition, when there was a lack of in-house technical experts, the participation within regional networks to facilitate information and data exchange was also of high importance for capacity building.

During the preparation of the 3rd National Communication a broad range of stakeholders have been involved, including the public entities, donor community, research institutions, civil society, media, etc. Developing stewardship by the private sector and the general public, requires further work.

The NC process has revealed that it is necessary to have in place a national system that includes all the institutional, legal and procedural arrangements necessary for estimating anthropogenic emissions, and for reporting and verification of these emissions.

The TNC has tried to for the first time to integrate gender issues into the national communication process. At a first step it is designed a comprehensive guideline on mainstreaming gender into climate change adaptation and mitigation programmes and plans in Albania, using the UNDP Toolkit on Gender Responsive National Communications and other relevant UN tools and methodologies on gender equality.

NATIONAL CIRCUMSTANCES

What makes our country special?

1.1. GEOGRAPHY

The Republic of Albania is situated in south-eastern Europe, on the western side of the Balkan Peninsula. The Albanian coast borders the Adriatic Sea in the west, where it forms a sandy shore, and the Ionian Sea in the southwest, where it forms a rocky shore. Its coordinates are: North: Malësi e Madhe (42°39'55"N 19°43'57"E); South: Sarandë (39°38'54"N 20°12'52"E); West: Sazan island, Vlorë (40°30'35"N 19°16'32"E) and East: Devoll District (40°37'52"N 21°4'6"E). Albania has a land-based surface area of 28,745 km2, 1,350 km2 of which is rivers, lakes and reservoirs.

Albania has a total border that is 1,093 km in length, of which 657 km is a land border, 316 km a sea border, 48 km a river border and 72 km a lake border. Albania borders with Montenegro in the northwest, with Kosovo in the northeast, with Macedonia in the east and with Greece in the south and southeast.

The capital of Albania is Tirana. The current administrative division of the country is provided by law Nr.8653 dated 31.7.2000 "On administrative-territorial division of local government units in the Republic of Albania".

Figure 1.1: Map of Albania

Currently, the country is divided into 12 districts, 65 municipalities and 308 communes. In 2014, administrative reform began through a new law that modifies the administrative-territorial division into 12 districts and 61 municipalities. This reform was approved in April 2015, and before the local elections of 2015.

Seventy percent of Albania's territory is mountainous with an average altitude of 700 m above sea level and rising to a maximum altitude of 2,753 m in the eastern area (Mount Korab). Mountainous and hilly areas are grouped into three regions: Northern, Central and Southern, while plane lands occur to the West along the Adriatic coast, between Hani Hoti in the North and Vlora in the South.

The geological and climatic characteristics of the country have led to the existence of an extensive network of rivers and lakes; these have mixed flow regimes that are influenced especially by prevailing rainfall and snow. Albania has many natural and artificial lakes.

1.2. CLIMATE

The geographical position of Albania determines its Mediterranean climate, characterized by mild and humid winters followed by hot and dry summers. Rainfall occurs mainly during the second half of the year. Specific climatic conditions differ considerably according to regions. Coastal planes have a strong maritime influence which weakens eastwards and landwards, causing lower temperatures and reduced precipitation.

Average annual temperatures vary from 17.6°C (in Saranda to the South) to 7°C (in Vermosh to the North). Lowland areas are characterized by an almost stable distribution of annual mean temperature of 14–16°C. Annual mean maximum air temperature varies from 11.3 °C in mountainous zones, to up to 21.8 °C in the low and coastal zones, while annual mean minimums vary from –0.1°C up to 14.6 °C, respectively.

The lowest temperatures recorded have been in Sheqeras (-25.8°C), Voskopojë (-25.6°C) and in Bize (-34.7°C), while the highest were observed in Kuçovë (43.9°C), Roskovec (42.8°C) and Çiflig (42.4°C).

Some regions concentrated primarily on the north, west and southwest regions of Albania are characterized by high amounts of rainfall, with an annual average amount of 1430 mm. However, the spatial and seasonal distribution of rainfall varies; most rainfall occurs during the cold half of the year (70%). The most humid areas are the Albanian Alps in the North (Koder Shengjergj with 2935 mm and Boga with 2883 mm of annual precipitation) and Kurveleshi in the South (Nivica with 2204mm of annual precipitation). The month with the highest regime of precipitation over the whole of Albania is November, while the lowest amount of precipitation occurs during the months of July-August.

Snow falls occur in mountainous regions, i.e. the Albanian Alps, and the central and southern mountainous regions. The average depth of snowfall in mountainous areas is 60-120 cm, with the highest snowfall reaching 2-3 m depth in Vermosh, Boga, Theth , Valbona, Curraj and Lure. Snow is a rare phenomenon over the West Plain lowlands, in particular to the southwestern part of the Albanian coast. The precipitation regime is a key factor for electricity production nationally, since the country produces the majority of its electricity from hydropower plants. Precipitation is also a very important factor for agriculture, which is among the most important economic activities.

1.3. ENVIRONMENT

1.3.1. Air

Main pollutants include NO_2, O_3, SO_2, CO, PM_{10}, $PM_{2.5}$ and benzene and constitute serious health problems in main cities

Air pollution is now recognized as a serious health problem in the major cities of Albania. Rapid urbanization and associated increase in residential and commercial building construction, together with the current bad condition of streets and roads within the urban areas, have contributed significantly to air pollution. A dramatic increase in the number of cars, and the number of old vehicles in use, means that traffic in urban areas are now a major cause of air pollution.[1]

The main pollutants that affect air quality include NO_2, O_3, SO_2, CO, PM_{10}, $PM_{2.5}$ and benzene that are emitted from the burning of fossil materials for energy production and transport. Sources of air pollution have natural or anthropogenic origin.[2] Data on air pollutants levels in the main cities are shown in Table 1.1.

1 UNECE, 2012
2 MoE, 2014

The Ministry of Environment (MoE) is the authority responsible for drafting and implementing policies, strategies, national action plans and legislation that protect urban air from pollution, and also for formulating measures for reducing the level of air pollution. This Ministry is also responsible for guaranteeing the organization and functions of air quality monitoring processes. The Ministry of Health (MoH) is responsible for health issues related to air quality, while the Public Health Institute is engaged in continuous urban air quality monitoring. The MoH operates the Directorate of Public Health which is responsible for air monitoring at the regional level.[3]

Table 1.1. Annual data on air pollution in some main stations

	PM10 (µg/m3)	PM2.5 (µg/m3)	NO_2 (µg/m3)	O_3 (µg/m3)	SO_2 (µg/m^3)
Tirana	33.5	17.8	41.61	49.4	-
PHI	31.8	15.3	13	52.66	-
Vlora	34.37	16.11	7.25	75.25	-
Korça	27.52	-	5.06	66.2	5.83
Albanian Standard	60	15	60	65	60
European Standard	40	25	40	-	-

Source: MoE, 2014

1.3.2. Water resources

Albania is rich in water resources. Seven rivers and their tributaries drain towards the Adriatic Sea. 250 lakes occupy 4 per cent of the territory. The hydrographic basin that feeds the water courses of Albania has a total area of 43,305 km^2, which is about 50 per cent larger than the country's territory.[4] Table 1.2 offers some data on Albania's water resources. The rivers of Albania are an important source of hydro power. The origin of the lakes is glacial, tectonic or manmade. There are about 56 lakes of glacial origin, including those located in the Alps, Lure, Balgjaj, Martanesh, Shebenik and Valamar. Carstic lakes (82 lakes) are only located in the Dumre area. Lakes derived from tectonic activity include Lake Skadar (370 km^2), Lake Ohrid (367 km^2, with a maximum depth of approximately 300 m), Big and Small Prespa Lakes (285 km^2 and 44 km^2 respectively, with the highest tectonic height in the Balkans - 800 m above sea level) and Lake Butrint (16.3 km^2). Some of the lakes of Albania have double origins. Several artificial lakes were built for the production of electricity, including those constructed on Drin River (Fierza, Vau Deja, Koman) and Mat River (Ulza and Shkopeti). Artificial lakes are used for irrigation of agricultural lands, including those located in Gjançi, Thane, Kurjani and Bezhani. Along the Adriatic-Ionian coastal zone there are a series of lagoons, including those of Viluni, Kune-Vain Patoku, Bishtaraka, Karavasta, Narta, Orikumi. Lakes in hills and highlands are important for tourism, ecosystem protection and fish production.

Table 1.2: Data on water resources

Indicators	Value
Total annual flow	39.22 billion m3/year
Renewable water resources	13,300 m^3 per capita
Renewable groundwater resources	1,250 million m^3/year
Main rivers	Drini, Mati, Ishmi, Erzeni, Shkumbini, Semani and Vjosa
Main Lakes	Prespa, Ohrid and Shkoder
Main use of water resources	Urban, industrial, agricultural purposes and for hydroelectricity.
Water losses	>60 % in all cities
Water supply from public system	85% of population covered
Agriculture uses	43% of area covered by the irrigation system
Energy production	90%

Source: Adapted from UNECE, 2012 and the World Bank, 2010

3 Council of Ministers, 2010
4 UNECE, 2012

Populated areas have problems with heavy pollution of their water resources. River basin management plans are at the development stage

Several problems are associated with the current management of water resources, including:

- Weak monitoring system for both quantity and quality of surface and groundwater;
- Water infrastructure deficiencies, especially in water supply and wastewater management;
- Poor maintenance of water infrastructure;

Weak regulatory and financial framework in the water sector, together with a lack of a long-term strategy, which should act as a program for all activities and projects in the water sector.

All the above issues have led to the heavy pollution of water resources in populated areas. These problems of quality are exacerbated by a growing demand for water resources in some parts of the country where inland waters are the scarcest. Implementation of the *acquis* in the area of water quality remains as a big challenge. The capacity of public water companies to manage basic services in delivering drinking water and waste water treatment is weak. River basin management plans are still at the development stage.

The management of water resources at the national level falls under the responsibility of the National Water Council (NWC), which is an inter-institutional body headed by the Prime Minister with a membership from several Ministers. At the regional level responsibility lies with the Watershed Management Councils (WMC) headed by the Prefect.

1.3.3. Biodiversity and Nature Protection

Albania's flora constitutes 29% of the species in Europe and 47% of the flora of the Balkan Peninsula and about 17% of the country territory has protected status

The mountainous topography, the different geological strata, types of soil and combination of continental and Mediterranean climate, are the main factors defining Albania's ecosystem diversity. Several vegetation zones can be defined by altitude:

- Mediterranean shrub floor, that rises up to 800 m above sea level;
- Oak floor, that ranges from 400 to 1,200 m above the sea;
- Beech floor, that extends from 800 to 2,000 m above sea level, and;
- Alpine pastures floor, that extends from 1,800 to 2,700 m above sea level.

The flora of Albania is composed of over 3,220 species, of which 1% are endemic and 5% sub-endemic. This flora diversity constitutes 29% of the species in Europe and 47% of the flora of the Balkan Peninsula. A wide variety of mammals, birds and reptiles live within this diverse vegetation. In the marine waters over 110 species of fish are found representing almost Mediterranean Sea varieties, while in lake and river waters about 52 species are found. In Ohrid Lake some endemic species with high environmental value are found, including an endemic spotted trout or trout (*Salmo letnica*).[5]

About 16.61 % of the country's territory, or 477,566 hectares, have protected status. An overview of designated protected areas in Albania is given in Table 1.3. However, the current coverage of protected areas does not represent all the different habitat-types that exist in the country.[6] Illegal activities, such as hunting, wood cutting and construction, are quite frequent activities in protected areas and the administrative capacity of the inspectorates to regulate and restrict them remains weak.[7]

5 MoE, 2014
6 MoEFWA and UNDP, 2009
7 EC, 2013

Protected areas in Albania

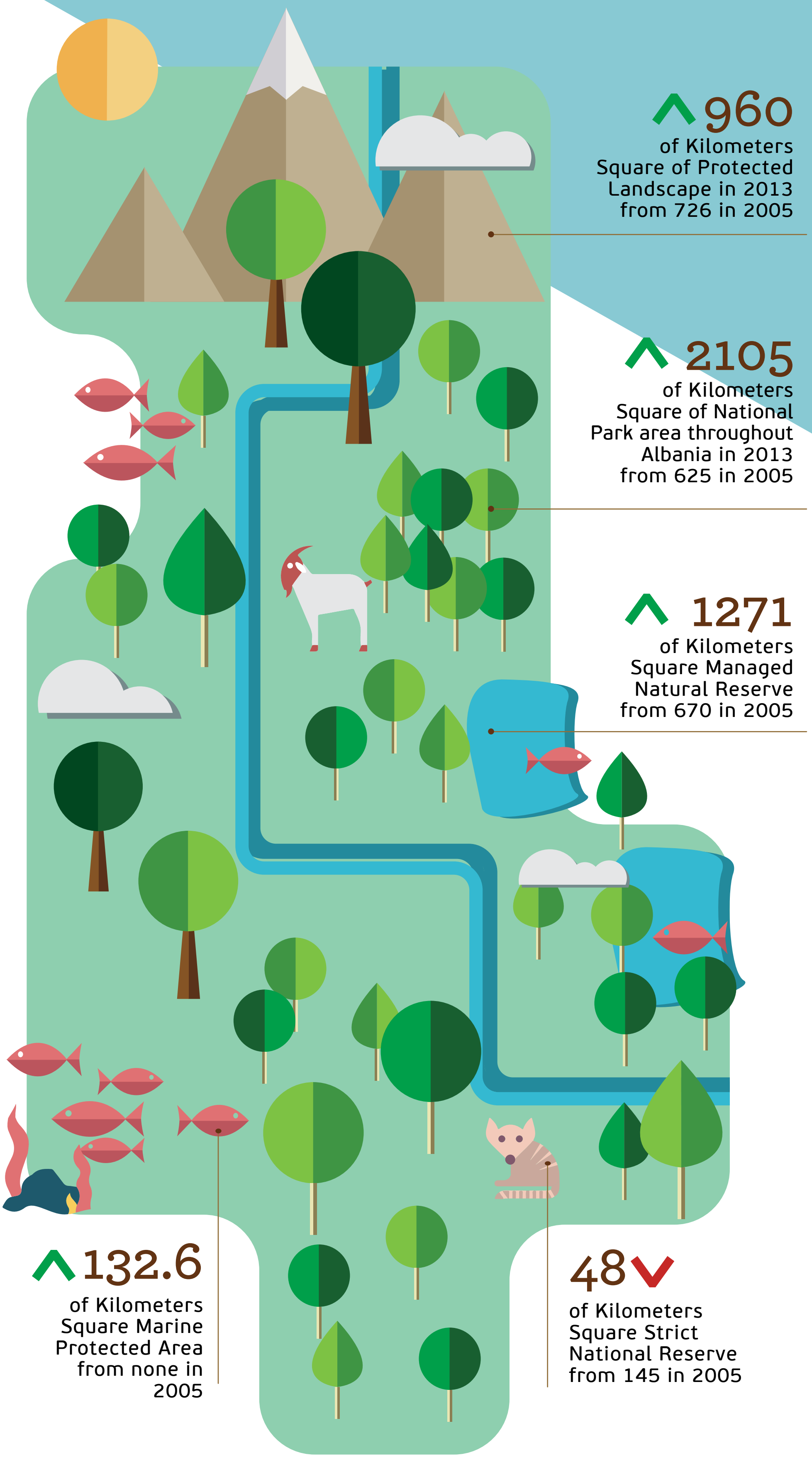


Table 1.3. Protected areas in Albania

National PA category	IUNC category	PA number		PA surface (Ha)			PA category share in the total surface of PAs (%)	
		2002	2013	2002	2013	change	2002	2013
Strict Nature reserve/scientific reserve	I	4	2	14500	4800	-9700	9%	1%
National park	II	12	15	25890	210501.4	184611	16%	46%
Nature monument	III	300	750	4360	3470	-890	3%	1%
Managed nature reserve/natural park	IV	26	23	42960	127180.1	84220	26%	28%
Protected Landscape	V	3	5	59200	95864.4	36664	36%	21%
Protected area of Managed resources/ Protected area with multiple use	VI	4	4	18245	18245	0	11%	4%
Total		349	799	165155	460,060.9			
Share of PA in the territory of Albania (%)				5.7	16			

Source: UNECE (2012) and ME (2013)

An analysis of the status of protection of fauna and flora species shows that 18.7% of all fauna and flora species found in the territory of Albania are endangered. The first Red List of Albanian Fauna and Flora providing information on threatened species present in Albania was published in 2007 according to criteria established by the International Union for Conservation of Nature (IUCN). According to more up-to-date information gathered from monitoring reports, Table 1.4 identifies endangered species found at national level. Three hundred and thirty eight species of animals and three hundred and eight species of plants are currently protected by domestic legislation.[8]

The Ministry of Environment is the responsible authority for nature and landscape protection, the network of Protected Areas, ecosystems and habitats, and varieties of flora and fauna.[9] MoE is also responsible for drafting policies and managing forests and pastures. Several biodiversity monitoring and research programs are being implemented, and some progress has been achieved with the inventory and mapping of natural and semi-natural habitats. At the same time, however, management of biodiversity is not supported by an adequate information system. Instead, information is dispersed among many agencies, institutions and stakeholders, which obstructs the homogeneity, compatibility, quality, reliability and comprehensiveness of available data.[10]

Table 1.4: Albania's endangered species

	Total species present in Albania	Endangered species	Percent of total endangered
Mammals	91	46	50.1
Birds	330	115	34.8
Reptiles	37	37	100
Amphibians	15	15	100
Fish	311	54	17.4
Insects	680	108	15.9
Mollusks	183	130	71

Source: UNECE (2012)

8 MoEFWA and UNDP, 2009
9 Based on the Law No. 9587, dated 20.07.2006 "On protection of biodiversity"; on the Law No.10006, dated 23.10.2008 "On protection of wildlife;, and Law No.8906, dated 06.06.2002 "On protected areas",
10 UNECE, 2012

1.3.4. Forestry

Over the last 70 years, Albanian forestry has suffered significant changes as a result of which forest area has been reduced by more than 300,000 ha mostly due to clearance for agriculture. Estimates of the surface of forest area are made available for all regions of the country for 1990, 2000, 2005 and 2010. Between 1990 and 2010, forest areas available for the supply of timber have decreased in almost all regions of the country by about 30%. Over the past 20 years, Albania has lost an average of about 1.5 percent of forest area available for timber supply every year. A portion of this loss in the last decade is also due to the changed status of the functions of the forest, where a part of the forest available for supply of timber becomes used for other purposes, such as recreation, protection of biodiversity, etc. Moreover, the more accessible forest stands have been significantly degraded through overharvesting and overgrazing, which has changed the forest age structure, species composition and reduced the forest underwood. For several years tree felling exceeded the net annual increment resulting in a decrease in growing stock.

Other adverse effects from loss of forest are a reduction in the forest's natural water retention capacity, increased threat of forest fires, and the disappearance of wildlife and bird species that require larger undisturbed forest complexes. In 2009 the forestry lands (high forests, low forests/coppices, shrubs and other areas with forest vegetation) encompassed 1,071,880.2 ha, which accounts for 37.28 per cent of the territory of Albania. The total biomass of forest in Albania is estimated to be about 53 million tons, of which 86% is originates from high forest. The average biomass per hectare calculated for the entire forest area is about 33 t ha, which is the lowest in the Western Balkan region. The main governmental institution responsible for the development of forestry policies and legislation, and monitoring and management of forests, is the Ministry of Environment, whose responsibilities include protection, management, governance and control of forest and pasture areas. The regional and district structures of MoE exercise forest management and control functions in public and private forests. The Forestry Police, as a specialized control organization, guarantees the implementation of legal requirements regarding all forests and pastures whether their ownership is public, private or communal. Local government units (municipalities and/or communes), through their controlling and inspecting mechanisms, are responsible for communal forests and pastures that currently occupy approximately 60% of the forest and pasture area of the territory of the Republic of Albania.

1.3.5. Land Erosion

Soil erosion in Albania remains a permanent problem for land use and is a persistent environmental problem in agriculture. For more than two decades, conditions that enhance and exacerbate erosion for erosion have occurred. Some of the factors that influence erosion are climate conditions, such as rainfall (amount, intensity, and frequency), temperature, physical characteristics of soil; relief (slope) and land use; vegetation cover degradation (deforestation, fires, overgrazing, etc.); topography modifications (construction of roads, urban centers, etc.); water management policy (sewers, hydro works, dikes, etc.).

Land erosion is estimated to be at high levels in all river basins and especially along the Seman and Shkumbini rivers. Measures to prevent erosion are often missing or not appropriate to the local situation. Sporadic investments have been undertaken only along some streams in the vicinity of residential areas or next to road axes. Agronomic practices in these areas are orientated towards pasture plants (alfalfa), contributing to better protection of the soil from erosion. The risk to agricultural lands at from erosion is considered moderate to high. Official data show that about 167,646 ha or 25% of agricultural land the potential danger from erosion is moderate, while about 442,200 ha or 75% of land the danger is high. Cultivation of nuts and olives has led to a positive contribution in protecting land from erosion. Management practices of community forests have improved the situation of low forest (oak), causing a positive impact on the protection of land resources. Erosion acts against the natural balance of ecosystems. Coastal areas are more susceptible to weathering than highland areas of the Center and the East. In addition to land erosion, landslides transport considerable amounts of nitrogen, which seriously damages the fertility of the land. Human activity that alters land-use causes increased levels of soil erosion (construction, tourism, etc.).

1.3.6. Waste

Waste management remains a serious cause of concern in Albania. The management of waste is decentralized. Municipalities have very weak or no capacities to manage waste so that, in most cities, they out-source waste collection and transportation services to private companies. Generally, waste management fees include the collection and transportation of waste to depositories. Rural areas are not yet covered by waste management services. Most rural areas dispose of their waste directly into rivers or onto roads. Waste is, therefore, often transported by water courses relocating it to another region and contaminating the water. Municipal waste has a high percentage of organic waste and there are no recycling procedures in place to reduce the amount of organic waste being deposited in landfills.

Organic waste in landfills is the main source of CH_4 emissions. There are a lack of reliable systems for managing hazardous waste (those produced by industries and households). The recycling industry is nascent and has to import most of the required raw materials from outside the country. The majority of waste is burned or disposed unsafely in legal and illegal dumpsites. These dumpsites are often located in sensitive areas leading to environmental pollution. There are several private companies that recycle, collect and process different types of waste (scrap, paper, plastic, textiles and used tires). There are about 12,000 informal individual collectors, and about 60 companies that collect different types of recyclable waste. The lack of separation of waste at source remains a problem. Much of recyclable waste comes from urban waste sources, and partly from the industry sector. There are still no facilities to handle hazardous, medical and construction waste, and no clear procedure for the management and control of landfills.

In 2013, legislation on waste management was adopted and management plans are being prepared for a number of cities, including Tirana, Lezha and Shkodra. To date, only two sanitary landfills complying with EU standards exist. The construction of one landfill in Korça is under way. New investments in the area of waste management should focus more on waste separation and recycling.

1.4. POPULATION

Albania's demographic profile has undergone significant changes since the 1960s and particularly during the years following the end of the Communist Regime, which involved profound social and economic reforms. As reported by the 2011 Census survey (October 2011), the resident population in Albania was 2,821,977 inhabitants. This represents a population decline by around 8.0 per cent; in the 2001 census the enumerated population was 3,069,275.

Population dynamics are determined by four factors: births, deaths, immigration and emigration. During the last five decades, the overall fertility rate has dropped from more than six to around 1.6 children per woman. During the inter-census period 2001-2011 the number of births per year has decreased significantly, from about 53,000 in 2001 to about 34,000 in 2011, while the number of deaths has remained stable at around 20,000 per year. Under these conditions, the decline of fertility is supposed to be one of the factors that has caused the population decline. In addition, the population of Albania started to decline from 1990 as a consequence of massive emigration. Between 2001 and 2011 it is estimated that around 500,000 people emigrated. Major internal and international population movements have taken place creating challenges for the government's economic and social policies. Since 2000, the migration situation in Albania has stabilized. In particular, there have been no massive migration events. Migration is expected not to be an issue in the future, and ascension to the EU is not expected to have a significant impact.

Rural to urban migration, as well as migration from inland and mountain areas to the coastal areas, have been key features of population re-distribution during the years of transition, and are expected to characterize migration to urban areas at least for the next decade. The 2011 Census showed for the first time that the population living in urban areas was higher than rural areas (53.5 per cent vs. 46.5 per cent respectively).

The sex ratio at birth (the number of males per 100 females) worldwide is 105, however, for Albania this figure is 107.8. There is a major decrease of the sex ratio after age 80, which is a common phenomenon as women have a higher life expectancy than men. The average age of the population has increased from 30.6 years in 2001 to 35.3 in 2011. The average population density across the whole country has reduced from 107 persons per square kilometer in 2001 to 97 persons per square kilometer in 2011. The population density in the prefectures of Tirana and Durrës are higher compared to other prefectures, respectively 454 and 343 persons per square kilometer, due to an increase of population from high internal movements towards these prefectures.

The number of private households is 722,262. This represents a decrease in the absolute number of households by 4,633 units or 0.6 per cent compared to the previous census. The average size of a household declined from 4.2 in 2001 to 3.9 members in 2011. In urban areas this indicator is 3.6, while in rural areas it is 4.2 household members.

1.5. HEALTH[11]

An overview of Albania's demographic and health profile in 2014 is shown in Table 1.5.

In 2011, the total health expenditures in Albania accounted for 6% of the Gross Domestic Product (GDP). Although health expenditure per capita has increased significantly over the past decade, the Albanian health sector remains underfunded. The total number of doctors in Albania is insufficient to meet health needs. The number of hospitals and hospital beds has decreased in recent years in Albania. There is a need for a robust system of public health to protect the health risks and promote healthy behavior in the Albanian population. A robust system of health care, with sufficient numbers and well trained personnel, should provide equal and adequate access to health care. In recent years there have been significant investments in health technology in Albania, including CAT unit, radiotherapy and mammography equipment.

The burden of disease, such as cancer, cardiovascular diseases, diabetes and chronic obstructive pulmonary disease, are some of the main health concerns for Albania, with a potential increase in the coming decades if proper precautions are not taken. Life expectancy in Albania has increased steadily over the past twenty years in both sexes (in males, from 67 in 1990 to 73 in 2012; in females, from 71 in 1990 to 75 years in 2012[12]). Many changes, including demographic transition, led to a clear epidemiological transition over the past two decades with a significant decrease of infectious diseases, in contrast to a large increase in chronic diseases. If no new measures are taken the prevalence of smoking may increase, and this can seriously inhibit an increase of life expectancy and increase the potential burden of chronic diseases. In 2010, lifestyle factors accounted for more than 70% of the total burden of disease in Albania.

The health policy in Albania is defined, coordinated and directed by The Ministry of Health (MoH). The Institute of public Health is the institution that supports the MoH and Regional Structures of Public Health in fulfilling the functions and services of public health. The draft sector strategy of health development 2007 – 2013 has defined in detail the strategic priorities, objectives and expected results for the health sector[13]. The main goal of the reform in hospital services has been the provision of qualitative, safe, accessible and cost effective services. The EC Progress Report 2013[14] for Albania further notes that a lack of capacity in healthcare management, low public spending and corruption have slowed down progress in the area of improvement of public health. Primary healthcare lacks appropriate funding and human resources. The coverage of insurance-based care is still very low. The public hospital sector remains underdeveloped whereas the private sector is growing without proper regulation.

In addition, Health Information Systems in Albania need to be reformed, in order to enable appropriate management and evaluation of the Albanian health system. These include monitoring of prevention interventions and key steps in health care reform. Better statistical data, periodic health surveys and administrative data to improve health care will enable the design of programs to increase the quality of the Albanian health system, and will help in setting priorities and health policies based on facts (evidence).

11 Adapted from PHI, 2014
12 World Health Organization, 2014 cited in PHI, 2014
13 Council of Ministers, 2010
14 EC, 2013

Table 1.5: Albania demographic and health profile

Population	3,020,209 (July 2014 est.)
Median age	Total: 31.6 years; male: 30.3 years; female: 32.9 years (2014 est.)
Population growth rate	0.3% (2014 est.)
Birth rate	12.73 births/1,000 population (2014 est.)
Death rate	6.47 deaths/1,000 population (2014 est.)
Net migration rate	-3.31 migrant(s)/1,000 population (2014 est.)
Urbanization	Urban population: 53.4% of total population (2011) rate of urbanization: 2.27% annual rate of change (2010-15 est.)
Major cities - population	TIRANA (capital) 419,000 (2011)
Infant mortality rate	Total: 13.19 deaths/1,000 live births male: 14.68 deaths/1,000 live births female: 11.54 deaths/1,000 live births (2014 est.)
Life expectancy	Total population: 77.96 years male: 75.33 years female: 80.86 years (2014 est.)
Total fertility rate	1.5 children born/woman (2014 est.)
Nationality	noun: Albanian(s); adjective: Albanian
Ethnic groups	Albanian 82.6%, Greek 0.9%, other 1% (including Vlach, Roma (Gypsy), Macedonian, Montenegrin, and Egyptian), unspecified 15.5% (2011 est.)
Religion	Muslim 56.7%, Roman Catholic 10%, Orthodox 6.8%, atheist 2.5%, Bektashi (a Sufi order) 2.1%, other 5.7%, unspecified 16.2% (2011 est.)
Languages	Albanian 98.8% (official - derived from Tosk dialect), Greek 0.5%, other 0.6% (including Macedonian, Roma, Vlach, Turkish, Italian, and Serbo-Croatian), unspecified 0.1% (2011 est.)
Literacy	Total population: 96.8%; male: 98%; female: 95.7% (2011 est.)
School life expectancy (primary to tertiary education)	Total: 10 years male: 10 years female: 10 years (2001)
Child labor - children ages 5-14	Total number: 72,818 Percentage: 12 % (2005 est.)
Education expenditures	3.3% of GDP (2007)
Maternal mortality rate	27 deaths/100,000 live births (2010)
Children under the age of 5 years underweight	6.3% (2009)
Health expenditures	6.3% of GDP (2011)
Physicians density	1.11 physicians/1,000 population (2011)
Hospital bed density	2.4 beds/1,000 population (2011)
Obesity - adult prevalence rate	21.3% (2008)

1.6. POLITICS

Albania is fully committed to becoming an EU member state and gained EU candidate status on June 24th 2014.

Albania was the last country in Eastern Europe during the early 1990s to undergo a transition from a totalitarian communist regime to an incipient system of democracy. Because Albania was isolated from the outside world for more than four decades this transition was especially tumultuous and painful, making a gradual approach to reform difficult. With the move towards democracy, Albania has experienced large scale political, institutional and socioeconomic changes. From a deeply isolated country of constitutionally denied freedoms and rights, as well as imposed atheism, it has been transformed into a country that embraces political pluralism where the freedoms and rights of individuals and minorities are respected and guaranteed. Albania has had a rapid and uneven reform process concerning the transition to a free market economy. Albania is fully committed to becoming an EU member state and great efforts are being made to improve the economy and to survive in the single market. Albania gained EU candidate status on June 24th 2014.

Today, Albania is a constitutional republic with a democratically elected parliament. The president is the Head of State and has general powers as Commander-in-Chief of the army and Chair of the National Security Council. He is also the head of the High Council of Justice. Legislative power is concentrated in the Albanian Parliament.[15] The system of government is based on the separation and balancing of legislative, executive and judicial powers.[16] The legislative power belongs to a single organ, the Assembly of Albania. The Assembly consists of 140 deputies. The Council of Ministers is created at the beginning of each legislature of the Assembly after the legislative election as well as when the position of the Prime Minister is vacant. The Prime Minister is the main figure of the executive power.

1.7. ECONOMY

Albania is a middle-income country that has made enormous strides in establishing a credible, multi-party democracy and market economy over the last two decades. Before the global financial crisis, Albania was one of the fastest-growing economies in Europe, enjoying average annual real growth rates of 6%, accompanied by rapid reductions in poverty. However, after 2008 the average annual growth halved and macroeconomic imbalances in the public and external sectors emerged. The pace of growth was also mirrored in poverty and unemployment: between 2002 and 2008, poverty in the country fell by half (to about 12.4%) but in 2012 it increased again to 14.3%. Unemployment increased from 2008 to 2013, with youth unemployment reaching 26.9%.[17]

Following graduation from the International Development Association (IDA) to the International Bank for Reconstruction and Development (IBRD) in 2008, Albania has generally been able to maintain positive growth rates and financial stability, despite the ongoing economic crisis. The economic situation of Albania during the past years, influenced by internal and external factors, has experienced altering patterns of development. Macroeconomic stability has been maintained, as Albania was less affected by adverse regional and global economic conditions.[18] GDP is highly dependent on the service sector and agriculture. Meanwhile, the industry sector – including energy production, is emerging. After 2002, the Albanian economy experienced a period of increasing economic growth, peaking with its highest level in 2008 (7.5%). After 2008, the economy has undergone a declining growth, registering the lowest level in 2013 (0.4%). The causes have been attributed not only to the global economic crises, but also to internal policies and development. However, this pattern is expected to not continue as the IMF World Economic Outlook has foreseen a rate of growth of 2.7%, 2.9% and 3.4% for

15 Bushati et al, 2012
16 Councils of Ministers, 2010
17 World Bank, 2014
18 EC, 2012

2014, 2015 and 2019 respectively.[19]

The construction sector continued to contract during the first nine months of the year 2010, while the agricultural sector is estimated to have recorded satisfactory growth. The low rates of economic growth continued in the following years, respectively: 2.8% in 2011, 1.3% in 2012 and 0.4% in 2013. Slowness of economic activity was mainly caused by poor performance of investment and private consumption, which continued to suffer from low confidence of economic agents and tight financial conditions. Consumption and private investment were not favored by conservative bank policies for lending. These policies have resulted from difficulties that characterized financial markets in the euro area and the perception of high risk of credit default. On the other hand, fiscal stimulus and foreign demand had a positive contribution to economic growth.[20]

The main institutions responsible for the financial and economic development and stability are the Ministry of Finance and the Bank of Albania. The Ministry of Finance is the main responsible authority for financial and budgetary issues in Albania.[21] The Bank of Albania is an independent constitutional institution. The main goals of the Bank are to achieve and maintain price stability; to promote and support the development of a foreign exchange regime and system, the internal financial market, and a payment system; and to foster monetary and credit conditions conducive to stability and economic development in the country; to promote and maintain liquidity, solvency and a normal functioning of a market-based banking system.[22]

In 1992, the authorities ran a program directed towards establishing a modern banking system. The reforms proved effective and led to an increase in formal private sector credit and a rise in the number of private banks. The banking sector is continuously evolving due to a full privatization process and international private banks are becoming part of the banking sector.[23] A summary of the data on GDP for each economic sector and GDP patterns, over the last decades is presented in Table 1.6 and 1.7 while Figure 1.2 shows a graph of the trend of GDP growth since 2003.

Table 1.6: GDP for different economic sectors

Economic Sector	2006	2008	2010	2013****
Agriculture, hunting and forestry GDP (mln Lek)	154,648.10	182,118.20	211,346.10	n/a
% of added value	20%	20%	20%	n/a
% of growth of sector (value added/contribution to GDP)	2.5%*	7.1**	9%***	positive contribution
Services GDP (in mln Lek)	438,605.70	551,029.00	634,812.10	n/a
% of added value	57%	59%	61%	60%
% of growth of sector (value added/contribution to GDP)	4.2%*	6.6**	5.6%***	-0.5%
Industry GDP (in mln Lek)	88,207.30	95,229.50	128,504.00	n/a
% of added value	12%	10%	12%	n/a
% growth of sector (value added/contribution to GDP)	15%*	8.7**	19.8%***	+0.9
Construction GDP (in mln Lek)	113,723.70	145,450.60	119,973.10	n/a
% of added value	15%	16%	11%	n/a
% growth of sector (value added/contribution to GDP)	4%*	10.9**	-23.1%***	positive contribution

Source: Data adapted from statistical annexes of BoA (2013) and author's own calculations
**data from BoA (2006)*
***data from BoA Statistical Database*
****data from BoA Annual Report (2010)*
*****approximate values derived from BoA (2013)*

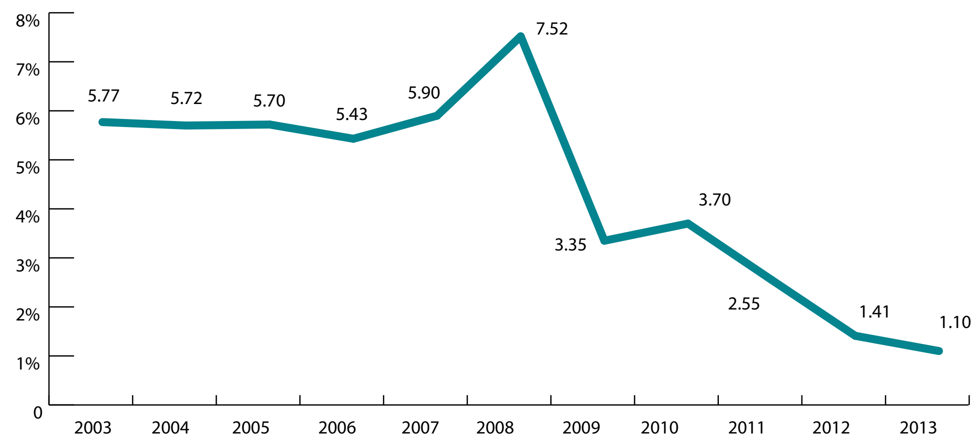
19 IMF, 2014
20 BoA (2006), BoA (2008), BoA (2010) and BoA (2013)
21 Councils of Ministers, 2010
22 Law No8269, dated 23.12.1997 "On the Bank of Albania"
23 Bushati et al, 2012

Table 1.7: Summary of GDP

	1996	2002	2006	2008	2010	2013
GDP (million ALL)	346,403.20	622,710.80	882,208.80	1,089,293.10	1,222,462.10	1,445,767.5*
GDP/capita (000 ALL)	103.6	190.8	280	342.3	387.5	480*
GDP growth (%)	9.1	4.2	5	7.5	3.8	0.4
Inflation rate (%)			2.4	3.4	3.6	1.9
Unemployment (%)		15.8	13,8	12,5	13,7	13,0

Source: Adapted from BoA (2006), BoA (2008), BoA (2010); BoA (2013), INSTAT Statistical database, and BoA Statistical Database (2014)
**Data from World Bank database*

Figure 1.2 Annual GDP Growth in Albania (2003-2012)



Source: World Bank Indicator, 2013

1.8. AGRICULTURE

Agriculture is one of the main economic sectors, contributing to approximately 20% of the value added in the economy. Nevertheless, developments and structural reforms are necessary to achieve a sustainable development of the sector.

Agriculture is one of the main economic sectors in Albania, contributing to approximately 20% of the value added in the economy.

Albania is divided into four main agro-ecological areas, with the largest amount of agricultural land and higher quality land is lying in the first two agro ecological zones. During the last decade the sector has experienced moderate growth starting from 2006. However, the development of the sector is highly constrained by several structural problems. Relatively underdeveloped infrastructure in rural areas holds back the emergence of agricultural products onto the market. Agricultural land fragmentation hinders the effective organization of production, reduces productivity and increases the cost of using agricultural mechanics. Meanwhile, agricultural land is not utilized at full capacity as a result of the phenomenon of external and internal migrations of population. This phenomenon, together with issues concerning ownership of land, has limited continuing investment in the agricultural sector. Despite the general expansion of credit to the economy during the period 2000 - 2008, credit for agriculture activities has remained at low levels. However, the expansion of the sector during 2005 - 2013 is believed to have contributed to the general economic increase in the country. In addition, the increase of agricultural prices on world markets conveys positive incentives for long-term production growth of this sector of the Albanian economy. This has been supported by developmental and structural reforms (aimed at increasing efficiency in agricultural production, facilitating access of local agricultural products in domestic and foreign markets, as well as financially supporting businesses and farms of this sector) that have been considered to be a priority for future economic policies.

1.9. INDUSTRY

The industry sector has recorded very positive developments during the last decade. Albania is known for its reserves of chromium, iron, nickel and copper. Their exploitation and processing is an important economic activity. Historically, after 1944, extractive industries and mineral processing of chromium, copper, iron and coal has provided substantial income. The sector has been completely dominated by state-owned enterprises. In 1994, with the adoption of a new mining law, the sector began to open to private investment. Industry generated 58% of GDP in Albania during the communist area with its major branches of heavy industry, light and food industries.

Since 1990, the economic profile of the country has changed drastically. The important sub-sectors of industry, such as chemical, metallurgical and mechanical industries, and other branches related to them, have reduced by more than three times their 1990 figures.

However, in the last years the industry sector has experienced positive trends. The industry sector sales in 2006, accounted for about a quarter of total sales of economic enterprises, making the industry sector to be second in importance after the service sector.

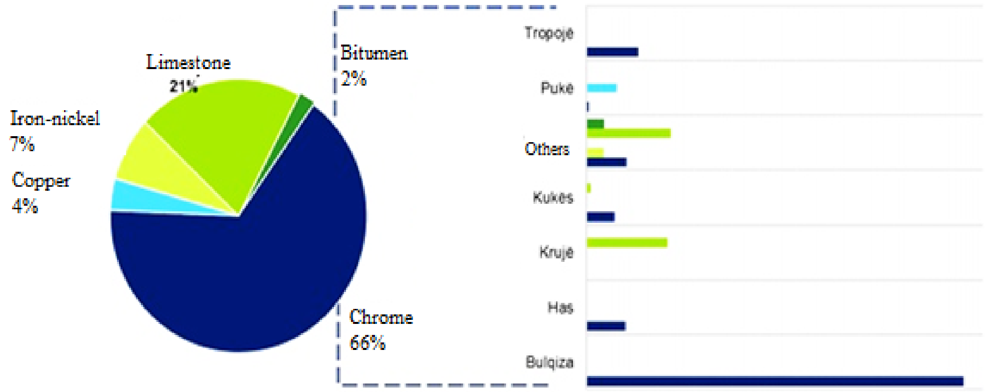
For several years, a significant contribution in the growth of industry sales in general has been provided by the processing industry sub-branch. The small share originating from extractive industries is attributed to a lack of domestic and foreign investment. During the first three quarters of 2008, the turnover index in industry volume increased on average by about 7.4 percent in annual terms; this value was higher than the annual average of the past four years (5.4 percent). A significant improvement of economic activity in the sector in 2010 was mainly driven by increased foreign demand for Albanian products and increased prices in world markets. This development was reflected in the growth of industrial exports and sales in the country, as reflected by the turnover volume.

In 2011, the mineral sector accounted for about 16% of the value of industrial production and about 2% of the GDP. Industrial production increased 6.10% in the second quarter of 2014 over the same quarter in the previous year and averaged 2.59% from 2002 until 2014 (Figure 1.3). Figure 1.4 shows some figures of the relative share of sub-sectors of mineral production and their distribution throughout the country in 2011. Good performance of the industry sector has been associated with an increased number of employees at this sector.

Figure 1.3 Albania Industrial Production % (2002-2014)

Source: www.tradingeconomics.com, INSTAT

Figure 1. 4 Relative share of sectors of mineral production and their geographic distribution



Source: EITI (2011): http://www.albeiti.org/industria-nxjerrese/sektori-minerar/

1.10 CONSTRUCTION SECTOR

During the period 2003 - 2008, construction saw a double-digit growth in terms of value added, supported by the rising tide of approved permits for private construction, the high demand for housing, dynamic demographic movements, as well as a favorable support funding climate. Its annual growth during that period varied between 10 - 15%, making construction the top sector in relation to development.

After 2008, a tightening of construction permits slowed the sector down. In 2008, investments in road infrastructure projects were judged to have prompted the growth of construction activity. Starting from the second half of 2009, activity in the construction sector fell sharply (22.5% on average in 2010), housing prices showed downward trends, as well as decreased values in engineering constructions (20.3% average annual decline in 2010).

The decline in value contributed by construction after 2009 has been influenced by the decline in demand for residential buildings, public investment or production capacities of businesses, as well as lower reliance on credit given to this branch compared with previous years. In particular, the demand for housing has slowed down in response to consumer uncertainty. After a strong contraction during 2012, the construction sector recorded a temporary increase in the second quarter of 2013, mainly related to public investment. Beyond short-term fluctuations, construction activity continued to suffer from a weakness of private investment in the economy.

Despite the initial growth of this sector, extreme concentration of buildings in certain territories confirmed the continued lack of urban development vision, not guaranteeing long-term sustainability of the branch. Moreover, construction continues to be dominated by housing buildings, leaving behind other strategic features, such as investments in road infrastructure, industrial buildings, land improvement and agricultural infrastructure and other investments that are directly related to quality of life in small communities and rural areas.

1.11. ENERGY

The energy sector is a priority sector for the government. Albania is endowed with a wide variety of energy resources ranging from oil and gas, coal and other fossil fuels, hydropower, natural forest biomass and other renewable energy.[24] The total final energy consumption for

24 MoEFWA and UNDP, 2009

2008 was 1879 Ktoe. Energy consumption by fuel is as follows: coal 1. 2%, oil by-products 64.4%, electricity 22.7%, fuel wood 11.7%. Energy consumption by sectors is as follow: Industry 13%, Transport 44%, Residential 23%, Service Sector 10%, Agricultural and others 10%. Finally, the energy Supply in Albania reached 2105 Ktoe in 2010.[25] Table 1.8 offers an overview of energy production from each energy source and available resources for consumption for the period 2003-2014.

Table 1.8: Production levels and consumption of primary energy products in ktoe (2001-2011)

Description	Year											
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014*
Production of primary products	1,016	1,179	1,149	1,237	1,080	1,159	1,263	1,643	1,494	1,676	2,041	2,021
– Lignite	19	19	15	15	15	20	3	3	2	2	2	0
– Crude oil	360	444	418	500	564	578	577	744	895	1,031	1,207	1,368
– Natural gas	12	9	10	10	16	8	8	13	15	15	16	28
– Electric power	422	472	469	475	258	327	450	666	358	406	598	406
– Fuelwood	198	233	230	230	215	215	213	205	208	207	202	202
– Others	5	2	8	8	12	12	12	12	18	17	17	17
Available for final consumption	1,802	2,079	2,050	1,827	1,809	1,915	1,945	1,968	1,952	1,848	2,123	2,157
– Lignite	18	21	18	18	18	23	53	58	71	83	73	93
– Crude oil	1,208	1,366	1,352	1,281	1,256	1,261	1,207	1,207	1,172	1,044	1,235	1,287
– Natural gas	0	0	0	0	0	0	1	1	0	4	5	8
– Electric power	377	458	447	296	314	410	462	487	486	495	593	561
– Fuelwood	198	233	230	230	215	215	213	205	208	207	202	193
– Others	2	1	2	2	6	7	9	9	14	15	15	16
Energy independency (in %)	56.36	56.69	56.06	67.72	59.68	60.54	64.94	83.50	76.54	90.72	96.16	93.70

Source: INSTAT database

*Note: * Preliminary data for year 2014. Final data will be published in September 2016*

The energy sector in Albania faces difficulties in supplying its consumers with electricity because of its dependence on hydro sources, coal, and fossil fuels. Albania has significant potential for producing energy from renewable sources. To improve the sector production during the last few years, Albania has been working to change its energy efficiency policy by supporting the use of renewable energy sources, making that a part of the country's energy strategy.

Albania is endowed with a wide variety of energy resources: oil and gas, coal and other fossil fuels, hydropower, natural forest biomass and other renewable energy

The supply of oil, gas and petroleum products comes from local production and also from foreign sources. Local production of oil, gas and petroleum products fulfills 15% of the economy needs and it is beginning to play an important part in the local market year on year due to an increase of domestic production that will also help to establish fair equilibrium in the supply sectors.

Albania is not linked with international gas networks, and the local production of natural gas is very low. The consumption of Liquefied petroleum gas (LPG) has significantly increased and is playing an increasingly large role in the domestic market, being used in both food industry and construction and as an alternative energy source to replace electricity in the housing and services sector. Currently, the capacities of coal mines are at their minimum, producing around 7,000 - 9,000 tons, compared to 2 million tons produced during the 1990s. Seventy percent of the reserves are found in the Tirana-Durres basin, ten percent in Korce-Pogradec, and four percent in Memaliaj. Biomass is the most widely used energy resource in Albania, predominantly in the form of firewood combined with many shrubs and agricultural residual plants. Residues from tree felling and low-quality wood are mainly used. Biomass waste from agriculture is not used to a great extent and is usually destroyed on the spot. The use of biogas is underdeveloped despite the available resources.

Electricity generation is vulnerable due to an over-reliance on hydropower sources

25 Bushati et al, 2012

The estimates of the National Agency of Natural Resources based on the updated National Energy Efficiency Action Plan 2010 - 2018 show the potential of increasing the extraction and utilization of biomass in Albania from different sources such as forestry, agriculture and livestock (for biogas production). Forests cover a large part of Albania's territory (2.5 percent) with proven reserves of fuel wood estimated at 125 to 250 million m3 or 6 Mtoe, However, these resources are endangered due to the lack of forestry management and extensive cuts.[26]

Albania's electricity generation is vulnerable due to an over-reliance on hydropower plants. Even though Albania is referred to in Europe as a country with considerable water reserves, so far only 35 % of the hydro power potential of the country has been utilized. The financial viability of the electricity sector remains elusive due to losses in the electricity network and distribution, problems with bill collection, while tariffs are still below cost-recovery putting undue pressure on public finances. Some data on electricity production for the period 2000 - 2014 are given in Table 1.9. Electricity production rose by 48.0% during 2010. Sources of electricity in the country grew by 45.2% during the year, mainly due to the increase by about 43.4% of hydropower production.[27] Adverse weather conditions seriously reduced electricity output, which fell by 48% in 2011.[28] To avoid load shedding electricity was imported, which had a negative impact on economic growth and the trade balance. In 2013, the positive contribution of industrial production to economic growth is attributed mostly to double-digit growth in the first quarter, mainly driven by the export of electricity.[29]

The Albanian Government has reformed and liberalized the electricity market by adopting the Albanian Market Model and Regulatory Framework that provides for concessionary agreements for small hydropower plants, oil and gas, and promoting the construction of energy parks. Electricity generation capacity has improved through the construction and the operation of several small hydropower plants (SHPPs) but the country remains over-dependent on hydro-generation for energy production.[30]

Table 1.9: Energy production (2000-2014)

Description	Year														
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Available electricity	5,711,957	5,408,933	5,348,925	5,745,480	5,870,959	5,878,201	6,053,896	5,726,635	6,296,215	6,629,130	6,772,750	7,210,731	7,619,409	7,857,033	7,793,736
Net domestic production	4,709,870	3,659,025	3,122,405	4,829,688	5,392,439	5,354,244	5,448,830	2,898,706	3,831,014	5,201,014	7,673,728	4,036,309	4,724,800	6,959,326	4,726,246
Thermo	143,589	136,905	106,712	81,275	76,001	76,987	92,630	72,380	0	0	0	0	0	0	0
Hydro	4,566,281	3,522,120	3,015,693	4,748,413	5,316,438	5,277,257	5,356,200	2,826,326	3,831,014	5,201,014	7,673,728	4,036,309	4,724,800	6,959,326	4,726,246
Gross Import (including exchanges)	1,223,898	1,819,244	2,279,078	1,241,943	868,827	1,253,484	1,242,300	2,934,515	2,758,600	1,964,480	1,004,571	3,474,966	3,230,144	2,322,528	3,355,987
Gross Export (including exchanges)	221,811	69,336	52,558	326,151	390,307	729,527	637,234	106,586	293,399	536,364	1,905,549	300,544	335,535	1,424,821	288,497
Consumption of electricity	5,711,957	5,408,933	5,348,925	5,745,480	5,870,959	5,878,201	6,053,896	5,726,635	6,296,215	6,629,130	6,772,750	7,210,731	7,619,409	7,857,033	7,793,736
Electrical losses	2,479,399	2,058,358	1,886,012	2,254,525	2,193,886	2,404,615	2,481,174	2,085,184	2,139,985	2,328,322	2,167,199	2,179,157	3,250,039	3,305,622	2,783,182
Consumption of electricity by domestic users	3,232,558	3,350,575	3,462,913	3,490,955	3,677,073	3,473,586	3,572,722	3,641,451	4,156,230	4,300,808	4,605,551	5,031,574	4,369,370	4,551,411	5,010,554

Source: INSTAT database

26 Bushati et al, 2012
27 BoA, 2010
28 EC, 2012
29 BoA, 2013
30 EC, 2012

Albania is working for a reliable and sustainable energy sector, development of which shall be based on using all energy options in order to meet its own energy demand and to create added value for Albania citizens in alignment with principles of environmental, economic and social responsibility. The country has significant renewable energy resource potential from hydropower, wind, and solar energy originating mainly from its geographic and climatic conditions. Albania is proposing to become a wind power exporter agreeing to export surplus wind energy to Italy via a planned undersea power cable.

Suitable areas in Albania for wind farm locations are the hilly regions of the coast, the hills of Northern Albania and the mountains of Southern and Eastern Albania. In addition, solar energy is a very promising energy source for the future as a result to the countries geographical position, such that solar potential energy is quite high. Most areas of Albania are exposed to more than 1,500 kWh/m^2 per year, creating good opportunities for investments in solar energy.

The Ministry of Energy and Industry (MoEI) is responsible for stable and reliable energy supply for the economy. The most pressing issue for future economic development of Albania's energy sector is its ability to respond to the increase of energy consumption per capita by maintaining a low relative level of energy intensity which would induce an efficient and competitive economy in an increasingly open international market.

1.12. TRANSPORT

Fifty five percent of total public investment is concentrated on road infrastructure, which is the main mode of freight and passengers traffic

The transport sector in Albania has grown since 1990. Due to an increase in the number of vehicles, as well as infrastructure improvements, the total traffic load has been continuously increasing and public investment to respond to the needs of the sector has also increased. The Ministry of Transport and Infrastructure (MoTI) is the responsible institution for the development of the transport sector. The Transport Sector chapter of the National Plan for European Integration (2014 - 2020) defines the transportation policy and priorities for each mode of transportation. More specifically, some the goals and priorities include: For road transport:

- Approximation of Albanian Legislation with the EU's Acquis;
- Increase of road security;
- Promotion of an integrated intermodal transport system, which includes infrastructure/transportation by land and sea;
- Road maintenance through public and private sector cooperation;

- For rail transport:
  - Approximation of Albanian Legislation with the EU's;
  - Further restructuring of the railway system, the creation of the Albanian Railway Authority, the reorganization of the Albanian Railways through total separation of operating activities from management activities and infrastructure maintenance;
  - Intensification of work for the creation of an integrated system of transport, focused on the connection of ports of Durres, Vlora, and Shëngjini by rail;

- Maritime Transport:
  - Approximation of Albanian Legislation with the EU's;
  - Construction of an intermodal port in Shengjin, which will be one of the largest ports in the region, and will also serve as a connecting point between the Adriatic Sea and other countries in the central and eastern Balkans;
  - Construction of new tourist ports, equipped with the necessary infrastructure and modern logistics for this purpose;

- Air Transport:
  - Approximation of Albanian Legislation with the EU's;
  - Opening of the market and reducing the cost of travel fees for passengers in order to increase the movement of passengers and goods;
  - Promotion of investments based on public-private partnership for domestic tourism purposes;
  - Construction of a new airport in the south of the country;
  - Enhancing regional collaboration in the area of air transport;
  - Enable a better performance of air safety functions, as well as strengthening the administrative and technical capacity in this sector.

1.12.1 Road Transport

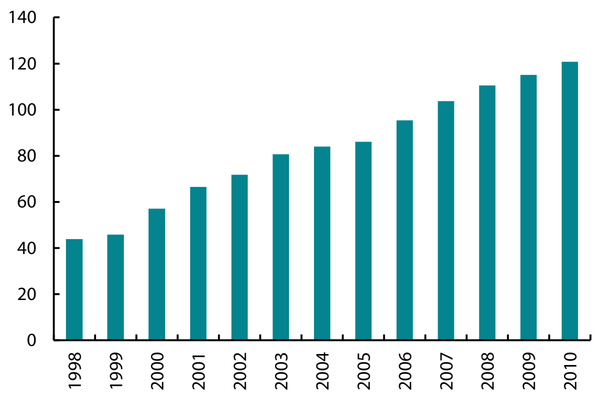
The main public investments in Albania (about 55% of total public investment) are concentrated on road infrastructure, which is the main mode of freight and passengers traffic. The overall road network in Albania has a length of 18,000 km, including all categories of roads shown in table 1.10:

Table 1.10: Road network extension in Km

Road Category	Extension (in Km)
National Main Roads,	3,636
Communal road	10,500-11,000
Under the jurisdiction of different autonomic units, companies or industries	4,000

Albania has a fleet of more than 350,000 vehicles, the vast majority of which are used. Data from INSTAT and Ministry of Public Works and Transport (2010) offer an overview of road transport for the period 1998 - 2010 (Figure 1.5).

Figure 1.5 Number of Vehicles for 1000 inhabitants (1998-2010)



Source: INSTAT and Ministry of Public Works and Transport database (2010)

1.12.2. Rail Transport

The rail network in Albania consists of 447 km of main railway lines and 230 km of secondary railway lines. The network was built between 1946 and 1986 to serve the Albanian industry, and connects several important cities, with the most important passenger connection being the Durres-Tirana line. It extends from the north border station of Bajze, to the south border station of Vlora, and to the east border station of Pogradec (close to the border with Macedonia).

Albania's railway network connects to the international railway network through the line Bajze–Podgorica (Montenegro), which currently carries international freight transport. The connection to Montenegro was built in 1986 and rebuilt in 2003, and provides access to the European railway network. However, this service is not offered to passengers. It is also associated with the Port of Durres, which is the entrance gate of Corridor VIII.

The three main railway lines in Albania are:

- From Tirana, leading north, passing through Vora, Mamurras, Lac, Milot, Lezha, Shkodra and Hani i Hoti Bajze (for passengers up to Shkodra).

- From Tirana, leading southeast, passing through in Durres, Golem, Kavaja, Rrogozhine, Peqin, Elbasan, Librazhd, Perrenjas and Guri i Kuq. The latter is located very near the town of Pogradec.

- From Tirana, leading south, passing through Durres, Golem, Kavaja, Rrogozhine, Lushnje, Fier and Vlora.

After 1991, most industries that were served by the railway closed down. As a result, the railway lost almost all of its income, and Government support was no longer available as the financial resources were redistributed to invest in road improvement programs and other infrastructural priorities. Freight transport figures dropped from 584 million tons-km in 1990 to 278 million tons-km in 1991 and 60 million tons-km in 1992, while the level of passengers transport dropped from 779 million passengers-km in 1990 to 95 million passengers-km in 1997.[31] Since 1991, there has been a long period of low investment, and maintenance work has been restricted only to essential areas. The tracks are working but are in poor condition. The rolling stocks (wagons, passenger coaches and locomotives) are old and in need of renewal. Train speeds are very low and the service is poor and irregular.

In 2006, the Albanian Government signed a Stabilization Association Agreement with the European Union. In the framework of this agreement, the Albanian Railway (HSH) is projected to be restructured along EU principles and codes. However, major funding is needed to make the service attractive again, and most of these funds have to come from foreign donors. Figures 1.6 (a and b) show some statistical data about the number of passengers/year and amount of goods/year processed within this network.

Figure 1.6.a Passenger Transport in the rail network (in thousands)

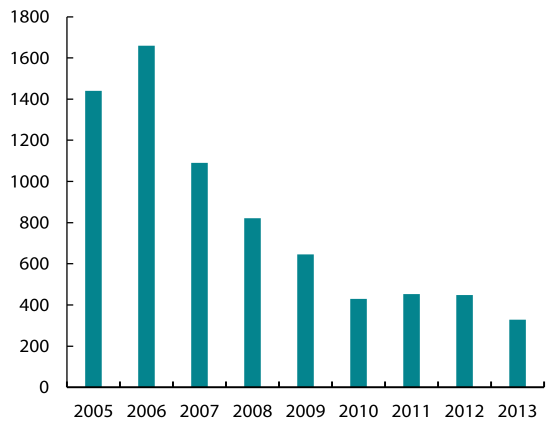
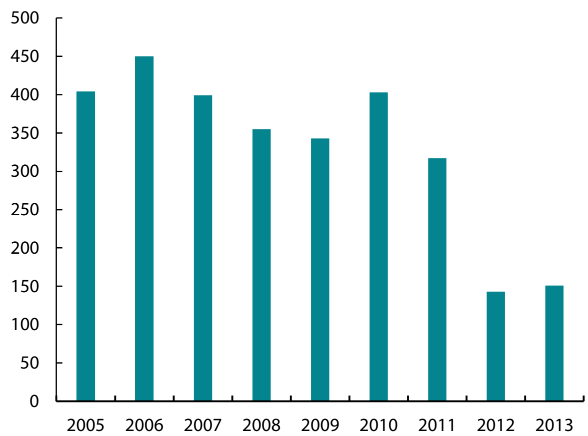


Figure 1.6.b Freight Transport in the rail network (in thousands tonnes)



Source: Institute of Transport Statistics Database

31 Statistical data of the Annual Transport Trends 1970-2013 obtained from the Ministry of Transport and Infrastructure Statistics Office.

1.12.3. Maritime Transport

Located in a very favorable geographical position, in the south-eastern Balkans, with a coastline of about 440 km, and with favorable natural conditions Albania relies on seaports that play an important role, not only for the development of transport but also for the development of international trade and economy. The country's main ports are:

Port of Durres, about 38 km from Tirana. It is the largest port in the country and among the largest in the Adriatic and Ionian Sea, as well as a very important hub for the international market. The Port of Durres is situated in the south-western part of the city of Durres. Operational infrastructure consists of 11 berths with a quay depth varying from 7.5 m - 11.5 m. The Port of Durres is currently responsible for 78% of national maritime trade. During September 2013, the EBRD financed a 10 million EUR project to deepen the entrance channel and harbor basin in order to enable entry of vessels with larger drafts.

Port of Vlore, the second largest port in Albania, located about 90 km south of Port of Durres, is defined as the second entrance gate of Corridor VIII. The port is used for both passenger transportation and cargo ships, covering about 10% of export-import goods. The master-plan of this port, a collaboration of the Albanian and Italian government, aims for its gradual improvement within a 2 - 3 year period. This master plan is still under implementation.

Port of Shëngjini, located about 60 km north of the port of Durres is the closest port to Kosovo, The Former Yugoslav Republic of Macedonia, Serbia and other regional countries, and is the only port in the area used mainly for processing various goods. The port is being developed in order to increase the boarding ability for goods processing, processing capacity and safety of navigation. The project "Europorti Shëngjini" is expected to be constructed on the rocky coast of Shëngjini. The master plan was revised in 2005 and is the basis for investments which are growing from year to year. The investments for the implementation of this Master Plan were divided into three phases: Currently the third phase is being implemented and will be completed in 2020. Construction will have major impacts on national and international trade and freight transportation, and is intended to modernize the Albanian port capacities with requirements of an international port in terms of construction and function. The new Port of Shëngjin is planned to be the deepest port of the Mediterranean, capable of processing ships of all sizes and drafts, goods for Euro-Balkan export-import, and capable of processing a minimum of 2.6 million containers per year, or about 52% of annual capacity of goods.

The Port of Saranda is a secondary port, located about 160 km south of Port of Durres. It is used for both passengers and goods transportation. This port is being developed as a tourist port. A World Bank project, worth 4 million dollars, 20% of which are provided by the Albanian government, aimed at building an independent yacht port (marina).

Maritime shipping in Albania is considered a prime area for growth in the future. Based on the urban area plan of the Albanian Euro–Balkans transit corridors, it is calculated that over 230,000 km2 of the Balkans require marine transiting of goods, signifying a minimum volume demand of 40 million tons of goods per year.

1.12.4. Air Transport

The International airport of Albania, "Nënë Tereza" (Mother Teresa), is situated adjacent to the village of Rinas, 17 km to the northwest of Tirana, and has an overall capacity of one million passengers per year. The regional airport in Kukes is functional but not in full use as planned. Besides "Mother Teresa" Airport, there are another eight civil aviation tracks, most of them unpaved and some out of use. Increasing the efficiency of air transport through the creation of a competitive market in full compliance with international standards is one of the main goals of the MoTI.

1.13. TOURISM[32]

Albania is praised by many operators and international visitors. Landscape and nature are considered the strengths of the tourist sector

Tourism is one of the main economic activities in Albania, providing jobs and income as well as making a significant contribution to Government revenues. The direct contribution to GDP from tourism spending in Albania in 2009 is of the order of 7.6%.[33] The sector is susceptible to a number of factors, including flooding risk, beach quality, coastal erosion and waste management. Despite the lack of planned management of the tourist sector, the private sector has responded positively to the demands of the tourism market. In particular, coastal tourism is well developed that, includes summer tourism, focused mainly on activities close to beach areas, as well as short visits to several coastal protected zones. Most tourists in coastal destinations are from Albania, Kosovo and Macedonia. Foreign tourists, such as Scandinavians, Polish, Italians, Austrians, British and Germans, are present in small numbers, and mainly visit Saranda, as this city offers not only coastal tourism, but also the possibility of visits to cultural attractions around the area. The distribution of tourists in coastal areas is uneven: Velipoja and Shëngjini have a strong dependency on the Kosovo market, while southern coastal areas are mostly preferred by tourists living in Albania as well as overseas visitors. Beach tourism in Albania has a pronounced seasonal character, starting in June-July with the maximum number of visitors arriving in August and an immediate decline in the number of tourists after September 1st.

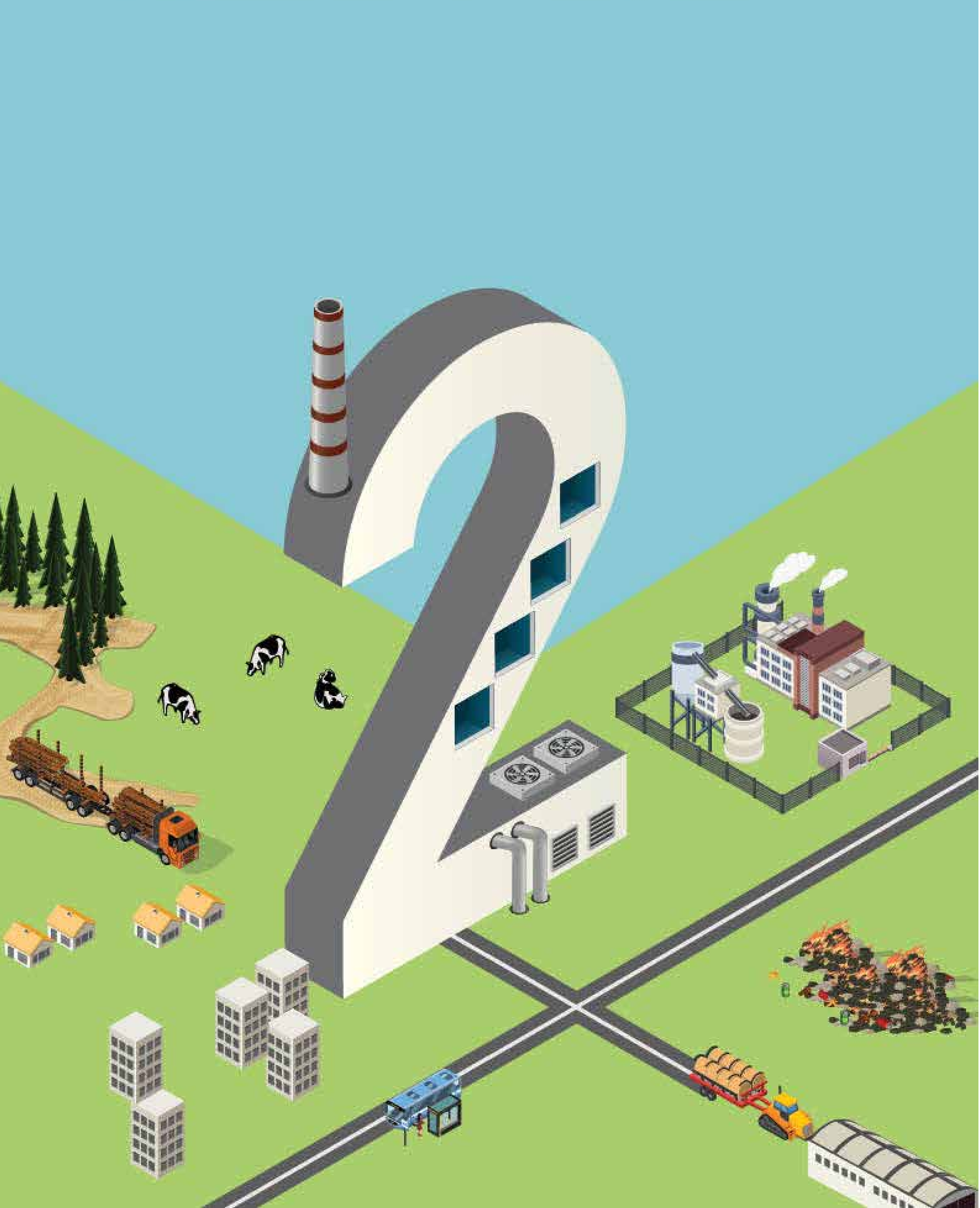
Although not the main purpose of touristic visits in Albania, archeology, heritage and culture are identified as key strengths of Albania in various studies carried out on the tourist sector. The World Heritage Sites archeological parks of Butrint, Berat and Gjirokastra, followed by a series of historical and cultural attractions and monuments are popular. The main destinations visited by organized tours to cultural and tourist sites are: Shkodra, Lezha, Kruja, Durres, Tirana, Fier, Berat, Elbasan, Korca, Përmeti, Gjirokastra, Saranda and Vlora. However, the number of foreign tourists visiting cultural attractions is quite low.

Albania is praised by many operators and international visitors for its landscape and nature, which are also considered the strengths of the tourist sector. Climate geography and physical diversity of territory, represented by a range of mountains, lakes, rivers and lagoons, accompanied by a rich biodiversity of flora and fauna present in many natural parks and natural reserves in the country, are considered to have an immense potential for tourism development of nature and rural tourism in Albania. Local communities residing in the vicinity of most natural resources retain a traditional lifestyle and a rich cultural heritage, which are perceived as an added value. Natural and rural areas provide opportunities for the development of rural tourism, eco-tourism and outdoor activities (rafting, parachute jumping, mountain biking, fishing, trekking, mountain climbing, outdoor walking (hiking), horse trekking, study tours, etc.).

32 Adapted from the Draft National Strategy for Tourism 2014-2020 (MUDT, 2014)

33 MPWTT, 2012

GREENHOUSE GAS INVENTORY



How much are we emitting/sequestering GHG?

2.1 INTRODUCTION

As a non-Annex I Party to the UNFCCC, Albania is eligible for expedited financing for the preparation of its National Communications (NCs) to the UNFCCC. The GEF/UNDP Enabling Activity project enabled Albania to prepare its Initial National Communication (INC), which was submitted to the UNFCCC by July 2002. The Second NC was submitted to the UNFCCC by November, 2009. Table 2.1 presents the main emitting sectors (and removals) and years used for the estimations undertaken on each of the two NCs Green House Gas (GHG) inventories.

Table 2.1: Main activities carried out for the estimation of GHG in INC and SNC.

National Communication	Main Activities - Years	Results
Initial National Communication	Included seven main GHG-emitting sectors: (i) energy; (ii) industrial processes; (iii) agriculture and livestock; (iv) land use change and forestry (LUCF); (v) waste; (vi) solvents; and (vii) international bunkers. Estimated emissions for the year 1995.	The inventory was the basis for the GHG mitigation analysis, which projected GHG emissions for each year up to the end of 2020.
Second National Communication	Built on the results of the INC and the 2004 Technology Needs Assessment (TNA). Estimated GHG emissions and removals to the period 1990-2000, 2000 was used as the base year. Estimated GHG emissions for the following sectors: i) energy; ii) industrial processes; iii) agriculture; iv) waste; v) LUCF; and vi) solvent and other product uses. Overall uncertainty in the second GHG inventory was much less than for the INC though data gaps remained in certain categories, particularly fuel wood consumption.	The inventory of the SNC was the basis for the GHG mitigation analysis, which was extended to 2025 and had a pronounced focus on fuel combustion technologies (the main emitting sector).

2.2 SCOPE AND METHODOLOGY

The Inventory carried out a more comprehensive and deeper analysis than the previous inventory (i.e., more detailed activity levels). The year 2005 is the baseline year, while the inventory covers the recalculated time-series for the period 2000 - 2009. The inventory covers all sources and sinks categories as per the IPCC guidelines methodology with particular focus on bottom-up approach and detailed focus on the energy/transport sector.

GHG inventory was updated for the period 2000-2009 with 2005 as the baseline year.

Given the role of the energy activities in the emissions of GHGs and the quality of the data available, the inventory adopted the higher tiers of the IPCC methodology and maintained a strong data validation focus on the fuel combustion technologies (energy and transport sectors). Since the SNC there have not been any major studies to improve the emission factors or other estimates. The TNC recommended a legal framework in order to ensure a legally binding national system for collecting/managing and processing the GHG data that will serve as the basis of future GHG inventories. The IPCC Good Practice Guidelines have been followed for the estimation of GHGs of all categories.

Albania's third GHG inventory covers all sources and sinks, as well as all gases as mandated by 10/CP2: it considers as the five main modules energy, industrial processes, agriculture, waste, and LUCF (solvents were not considered) as guided by the Revised IPCC of 1996. The national inventory has considered three direct GHGs: CO_2, CH_4 and N_2O, and three indirect GHGs: CO, NO_x, SO_2 and NMVOC. Estimates of key sources have been provided as well. Aggregated GHG emissions and removals expressed in CO_2 Eq. have also been provided.

2.3 INSTITUTIONAL ARRANGEMENTS

Specific institutional arrangements were put in place to ensure the sustainability of the process of preparing the GHG inventories. A set of professionals were engaged to form the GHG inventory team (each of the team experts responsible for one or more sectors) leading as well the capacity building of the relevant structures within the Ministry of Environment and its National Agency of Environment to deal with GHGs inventories. In order to ensure continuous and regular updates of the national GHG inventory, and the possibility of establishing in the near future a Monitoring, Reporting and Verification (MRV) system, other line ministries/agencies, academia, universities and interested professionals were also involved in the process. Training materials were prepared for each sector, including a step-by-step process for completing inventory tables, explanation of good practices and documenting/archiving the sources of data, the activity data and emission factors.

Specific institutional arrangements were put in place to ensure the sustainability of the process of preparing GHG inventories

Data for each activity rate, emissions and conversion factor were documented directly in the sectorial and sub-sectorial MS Excel worksheets of the IPCC software (1996 IPCC Software for National Greenhouse Gas Inventories). This documentation process increases the long-term sustainability, quality, and transparency of the Inventory Process.

As mentioned above, relevant recommendations are provided in the form of a draft Decision of the CoM (Governmental Decree) to ensure a legally binding national system for collecting/managing and processing the necessary data to developing the Greenhouse Gas Inventory on a regular basis.

As part of the process, a National Climate Change Steering Committee has been appointed and regularly updated within the TNC Process, providing information and policy guidance, to furthermore ensure streamlining of the results of the TNC to sectorial policies and/or strategies. The Steering Committee is comprised of representatives from the Ministry of Environment, Ministry of Energy and Industry, Ministry of Transport and Infrastructure, Ministry of Urban Development, Ministry of Economy and Tourism, Ministry of Agriculture, Rural Development and Water Administration Ministry of Health, Ministry of Internal Relations, Academy of Science, National Agency of Environment, Institute of Geosciences, Energy, Water and Environment and environmental related NGOs.

As part of the efforts to mainstream climate change into sectorial policies, an Inter-Ministerial Committee on Climate Change has been established by an Order of the Prime Minister on April, 2014, led by the Deputy Minister of Environment with all other line ministries participating at the level of general technical directors. The Inter ministerial Committee has been updated accordingly.

2.4 SOURCES OF INFORMATION FOR THE GHG INVENTORY

Activity data for each sector considered in the GHG Inventory are national in scope

All activity data concerning each sector are national. The main activity data source/provider are Institute of Statistics (INSTAT), Ministry of Environment, Ministry of Transport and Infrastructure, Ministry of Energy and Industry, National Agency for Natural Resources, Ministry of Agriculture, Rural Development and Water Administration, Extractive Industries Transparent Initiative, etc., although they did not provide activity data for GHG inventory purposes according to the IPCC nominations. Other data providers/sources are the Bank of Albania, General Directory of Customs and different data bases, surveys and studies assisted by international organizations (including World Bank, UNDP, EBRD, EIB, FAO, EU, etc.), public/private universities and different NGOs.

Table 2.2 presents a summary of the methodology and other specific considerations on different sectors, as well as data uncertainties, barriers and sector-specific limitations in estimating the GHG inventory for the TNC.

Table 2.2: Summary Table

Methodology: The TNC inventory is based on the IPCC's Revised 1996 Guidelines. It has a narrower and deeper analysis than the previous inventory and has addressed all emission/sink categories called for in the IPCC methodology with particular focus on bottom-up and detailed focus on the energy/transport sector. The baseline is the year 2005.

The following were specific considerations and findings of the GHG inventory:

- **Industrial cement production**: Given the increase in cement production, there was a need for a detailed study on CO_2 equivalent emissions from cement factories which took the form of a small study for activity data validation and/or macroeconomic impact: related NAMA.
- **Fuel wood consumption/transport sector:** Given the role of the energy related activities, the inventory has maintained a strong data validation focus on the energy and transport sectors.
- **Data uncertainties:** There was a high data uncertainty foreseen in the industrial processes and solvents sectors, due to both data shortcomings and lack of trained inspectors. To overcome this, the TNC identified policy developments in the industry sector. As for solvents, given their negligible importance to the inventory, it was advised that they be excluded from the TNC inventory.

  The calculated level of uncertainty is 9.946%, for the year 2005**,** the main contributor is fuel wood consumption from different sectors: residential, service (public and private) and small agro-food industries. The second contributor to the uncertainty of the GHG inventory is data activity from industrial subsectors: cement and factories. As previously mentioned, the uncertainty in the cement industry is mitigated by data coming from a separate study related to preparation of a NAMA (National Appropriate Mitigation Action) on using non-hazardous waste as fuel for the cement industry. On the other hand, a biomass survey was carried out to mitigate the uncertainties regarding fuel wood consumption.
- **Barriers**: The liberalization, privatization and subsequent fragmentation of the oil and energy sector have made it more difficult to obtain data. The TNC inventory team in close cooperation with the Directory of Hydrocarbons Policy within the Ministry of Energy and Industry, however, managed to apply appropriate estimation techniques to develop a GHG inventory for energy and to undertake the necessary internal consistency checks, including spot surveys for data collection as needed.
- **Sector-specific limitations.** The TNC provided information on whether and how recent studies in the transport sector have improved data reporting.

  Additionally, the TNC managed to address the issue of inventory uncertainty with regards to wood collection, particularly illegal cutting and individual collection by implementing a field data testing program. This was needed because the SNC inventory team found difficult to harmonize the Energy and LUCF components of the IPCC's methodology regarding fuel wood consumption. Limited field fuel wood surveys and data testing helped as well to validate consumption levels and establish benchmarks that can be used to harmonize results.

A National Climate Change Steering Committee, involving delegates from different Ministries, has been appointed to streamline results to sectoral policies or strategies and a Prime Minister Order established an Inter-Ministerial Committee on Climate Change on April, 2014

2.4.1 GHGs considered

Carbon Dioxide emissions released from energy and transport sectors have been estimated by utilization of two approaches: top-down (total for 3,835.33 Gg) and bottom–up (total for 3,828.31 Gg), according to which emissions from separate sectors and source categories were estimated, and then emissions were also summarized. Usage of these two approaches allowed Albania to make a judgement based on the fuel spectrum of the carbon dioxide emissions (top-down), and on the sector distribution (bottom-up). In both approaches, default IPCC emission factors for each fuel type were used.

Estimation showed that the difference between the two approaches is approximately 0.18%. Also a detailed analysis was carried out concerning CO_2 emissions from other sectors: Land Use Change and Forestry (LUCF), Agriculture, Waste and Industrial Processes.

Methane emissions coming from the Agriculture, Waste, Energy & Transport, Industrial Processes and LUCF are also estimated. To evaluate the amount of emissions from coal mining and hydrocarbon fuel extraction the amount of extracted fuel was multiplied by the emission factor, which depends upon the type of coal mining or upon the stage of fuel processing in the oil and gas industry. Methane from oil extraction industry has increased slightly because of an increase in crude oil production. Methane emissions from livestock are calculated by multiplying the livestock population (cattle, sheep, etc.) by the corresponding emissions coefficients.

Nitrous oxide emissions from fossil fuel combustion were obtained by multiplying the energy content of coal, oil products, and gas consumed by the corresponding emission factors, following the IPCC Guidelines.

The activity data for the period 2000-2009, show that: i) Albania has never produced HFC and PCF: those substances have always been imported; ii) no consumption of HFC and PCF was identified in the fire-protection sector; iii) there is no production of HFC and PCF aerosols and solvents; iv) there is no foam production using HFC and PCF, there was a very small consumption of HFC identified in the refrigeration and air condition sector during the years 2008 - 2009.

Emissions of **indirect greenhouse gases** such as carbon monoxide and nitrogen oxides were estimated as well according to the IPCC Methodology.

2.4.2 Direct GHG Emissions for the period 2000-2009

Albanian's total direct GHG emissions (CO_2, CH_4, N_2O) for the year 2005 were 8,864.6 Gg of CO_2 *equiv*. derived from five main categories; Energy, Industry, Agriculture, Waste and LUCF. The time series of emissions per sector for the period 2000 – 2009 are presented in Table 2.3.

Table 2.3: Anthropogenic greenhouse gas emissions in Albania, by gas and sector (In Gg)

Source: IPCC Methodology-Albania, years 2000-2009

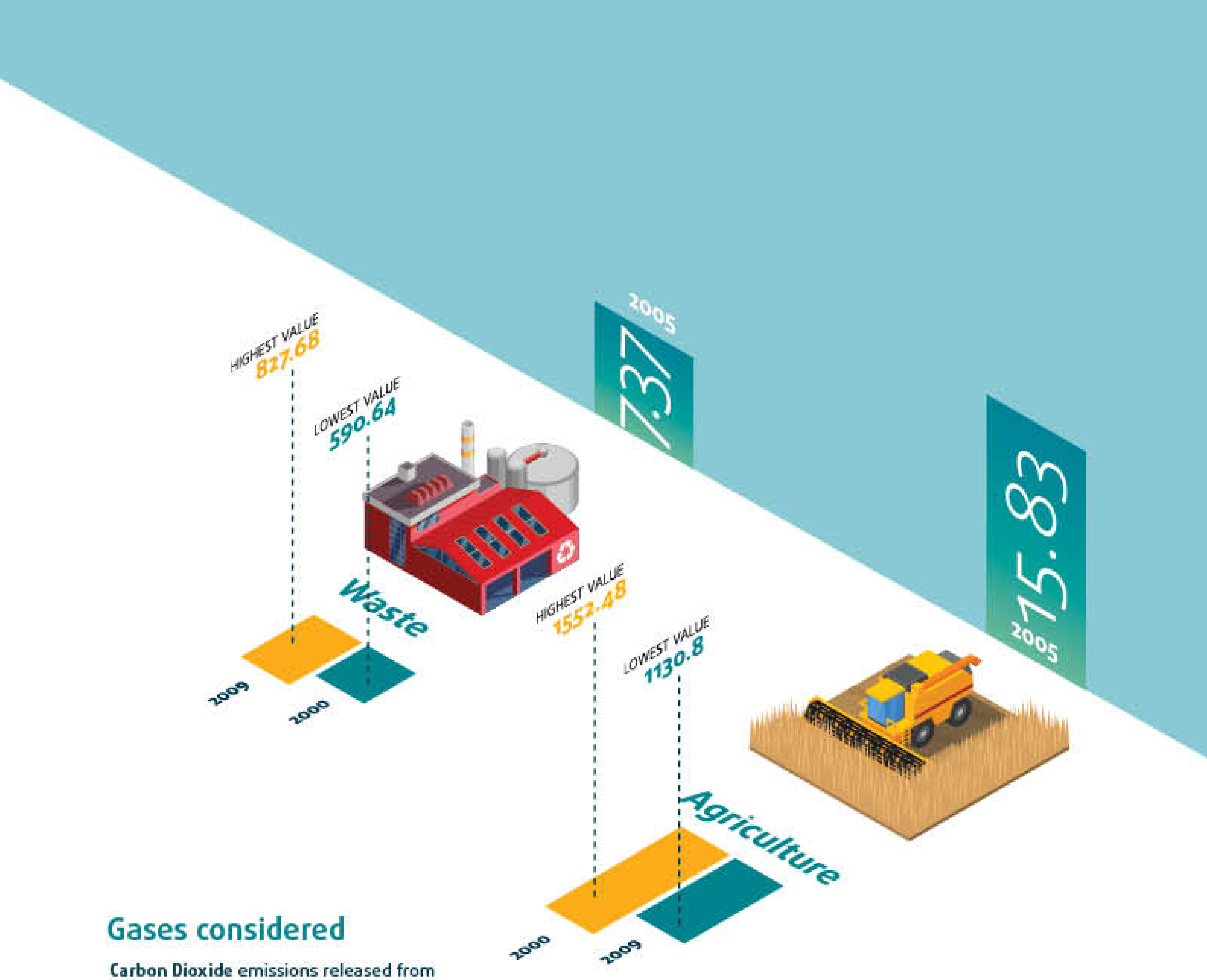
Gases	Sectors	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
CO_2	1 Energy	2,987.90	3,372.10	3,477.95	3,648.75	3,896.11	3,835.33	3,749.38	3,925.06	3,983.30	4,319.45
	2 Industrial Processes	520.00	852.00	806.00	966.00	1,043.00	1,118.00	1,195.00	1,470.00	1,547.00	1,623.12
	3 Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4 Land-Use Change & Forestry	3303.00	2506.00	2055.00	1719.00	1790.00	1715.00	1638.00	1617.00	1179.00	911.00
	5 Waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	6,810.90	6,731.10	6,339.95	6,333.75	6,728.11	6,668.33	6,582.38	7,013.06	6,709.30	6,853.57
CH_4	1 Energy	4.73	4.75	4.92	5.13	5.43	5.34	5.38	5.45	5.50	5.50
	2 Industrial Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3 Agriculture	73.78	71.77	69.58	70.12	69.58	66.66	65.32	60.96	57.21	53.70
	4 Land-Use Change & Forestry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5 Waste	24.14	24.24	24.19	24.65	26.69	26.96	30.30	30.66	29.08	35.28
	Total	102.65	100.76	98.69	99.90	101.70	98.96	101.00	97.07	91.79	94.48
N_2O	1 Energy	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.10
	2 Industrial Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3 Agriculture	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	4 Land-Use Change & Forestry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5 Waste	0.27	0.27	0.27	0.27	0.28	0.28	0.28	0.28	0.28	0.28
	Total	0.36	0.37	0.37	0.37	0.38	0.38	0.38	0.38	0.39	0.39
CO_2eq.	1 Energy	3,111.93	3,499.67	3,609.11	3,784.34	4,038.02	3,975.37	3,890.28	4,067.45	4,129.86	4,466.04
	2 Industrial Processes	520.00	852.00	806.00	966.00	1043.00	1118.00	1195.00	1470.00	1599.00	1701.12
	3 Agriculture	1552.48	1510.27	1464.28	1475.62	1464.28	1402.96	1374.82	1283.26	1204.51	1130.8
	4 Land-Use Change & Forestry	3303.00	2506.00	2055.00	1719.00	1790.00	1715.00	1638.00	1617.00	1179.00	911.00
	5 Waste	590.64	592.74	591.69	601.35	647.29	652.96	723.1	730.66	697.48	827.68
	Total	9,078.3	8,962.0	8,527.4	8,546.6	8,981.9	8,864.6	8,821.5	9,169.6	8,810.0	9,036.8

Figures 2.1 - 2.8 show the contribution of direct GHG emissions expressed in CO_2 Eq., in physical units and in relative percentages, calculated based on IPCC Methodology (as referred on table 2.3). The figures demonstrate that in terms of CO_2 eq., the main contributors for the year 2005 are Energy (44.85%), Agriculture (15.83%), Industry (12.61%), LUCF (19.35%) and Waste (7.37%).

It is important to mention that the LUCF sector is becoming a higher source of removals ("sink") during the period 2008 - 2009, while "industrial processes" are increasing their emitting contribution.

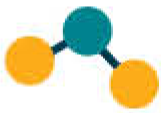
LUCF sector became an increase source of removals ("sink") towards the years 2008-2009

The highest emissions contributor is Carbon Dioxide (CO_2) with 75.02% (2000), 75.22% (2005) and 75.71% (2009), the second highest contributor is Methane (CH_4)with 23.75% (2000), 23.45% (2005) and 22.07% (2009); the third is Nitrous Oxide (N_2O) with 4.12% (2000) and 4.12% (2009) and the fourth is the group of CFC, HCF, PCF refrigerants with 0.00% (2000), 0.00% (2005) and 0.87% (2009) (figure 2.6).



Gases considered

Carbon Dioxide emissions released from energy and transport sectors have been estimated by utilization of two approaches: top-down (total for 3,835.33 Gg) and bottom-up (total for 3,828.31 Gg), according to which emissions from separate sectors and source categories were estimated, and then emissions were also summarized.

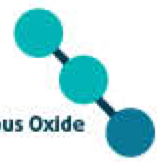


Carbon Dioxide

Methane emissions coming from the Agriculture, Waste, Energy & Transport, Industrial Processes and LUCF are also estimated. To evaluate the amount of emissions from coal mining and hydrocarbon fuel extraction the amount of extracted fuel was multiplied by the emission factor, which depends upon the type of coal mining or upon the stage of fuel processing in the oil and gas industry. Methane from oil extraction industry has increased slightly because of an increase in crude oil production. Methane emissions from livestock are calculated by multiplying the livestock population (cattle, sheep, etc.) by the corresponding emissions coefficients.

Methane

Nitrous oxide emissions from fossil fuel combustion were obtained by multiplying the energy content of coal, oil products, and gas consumed by the corresponding emission factors, following the IPCC Guidelines.



Nitrous Oxide

Direct CO_2 eq. Emissions from Economic Sectors

Year 2005 - Values in Percentage

Figure 2.1 CO_2 eq. emissions from all economic sectors (2000 - 2009) (Gg)

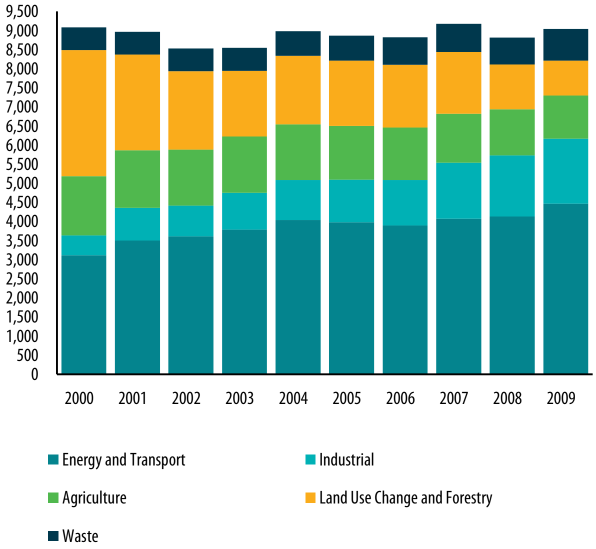


Figure 2.2 CO_2 eq. emissions from all economic sectors (2000 - 2009) (%)

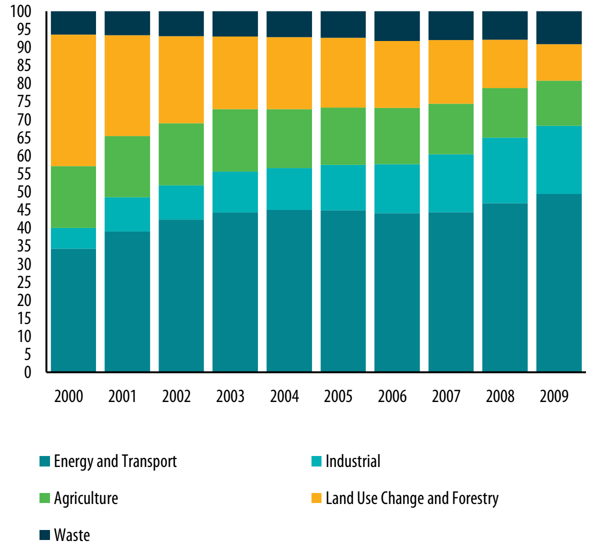


Figure 2.3 CO_2 eq. emissions from all economic sectors for the year 2005 (%)

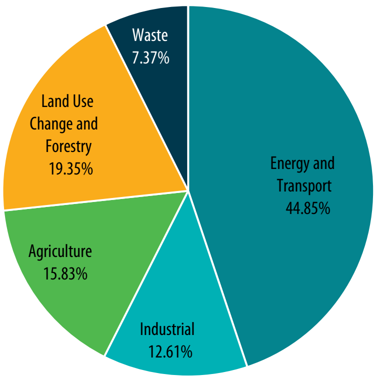


Figure 2.4 CO_2 eq. emissions from all economic sectors for the year 2009 (%)

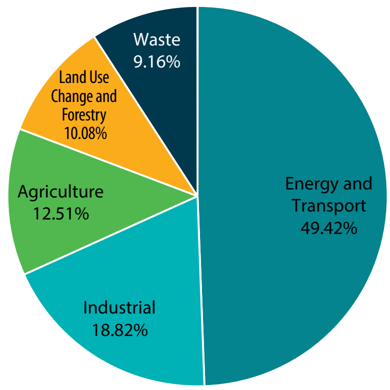


Figure 2.5 CO_2 eq. emissions from all economic sectors for the years 2000, 2005 and 2009 (Gg)

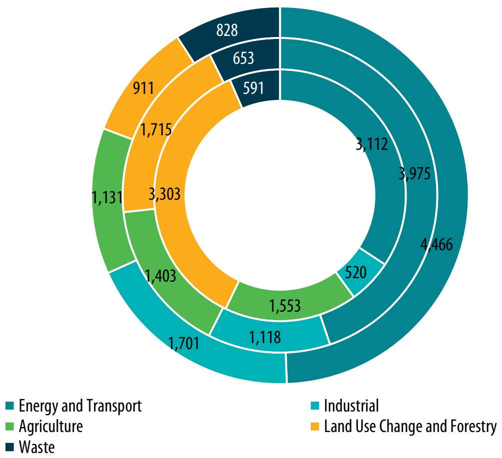
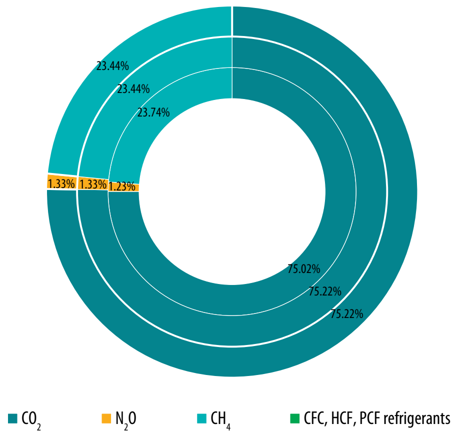


Figure 2.6 CO_2 eq. emissions for the years 2000, 2005 and 2009 (%)



2.4.2 Indirect GHG Emissions for the period 2000-2009

The inventory of total emissions from indirect GHG emissions (nitrogen oxides, carbon monoxide, sulphur oxides and NMVOC) were also estimated for the whole period 2000 - 2009. Their total is shown in Table 2.4, while figures 2.7-2.8[18] show the share of two indirect GHG emissions for 2000, 2005 and 2009 respectively. In general, energy industries and transport sectors were also the main sources of indirect GHG emissions (mainly for NOx, CO and SO_2), followed by the burning of crop residues and forest fires, while NMVOC emissions derive mainly from energy and industrial processes.

Figure 2.7 CO emissions from all economic sectors for the years 2000, 2005 and 2009 (Gg)

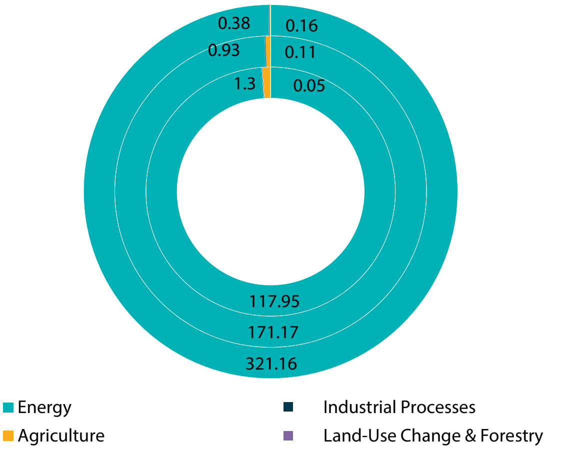
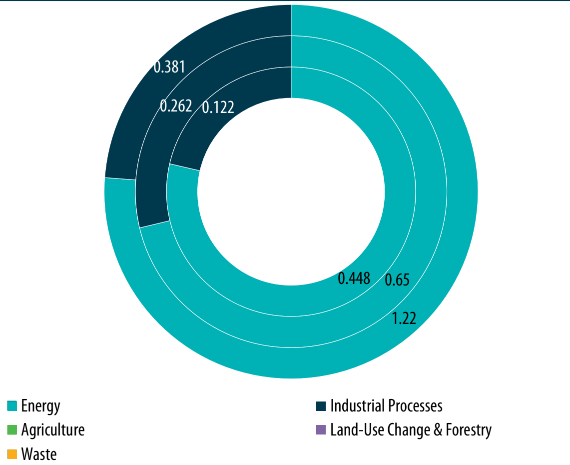


Figure 2.8 SO_2 emissions from all economic sectors for the years 2000, 2005 and 2009 (Gg)



According to the final version of the inventory, for the base year selected for this report (2005) tables 1 and 2 from the Decision 17/CP.8 Annex are included on Tables 2.5 and 2.6.

Table 2.4: Anthropogenic indirect greenhouse gas emissions in Albania, (in Gg)

Gases	Sectors	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
CO	1 Energy	117.95	118.86	123.32	133.24	152.06	171.17	194.26	222.82	258.53	321.16
	2 Industrial Processes	0.05	0.08	0.08	0.09	0.10	0.11	0.11	0.14	0.15	0.16
	4 Agriculture	1.30	1.26	1.19	1.13	1.03	0.93	0.82	0.68	0.53	0.38
	5 Land-Use Change & Forestry (LUCF)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6 Waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	119.30	120.21	124.59	134.47	153.20	172.21	195.20	223.64	259.21	321.70
SO_2	1 Energy	0.45	0.45	0.47	0.51	0.58	0.65	0.74	0.85	0.98	1.22
	2 Industrial Processes	0.12	0.20	0.19	0.23	0.24	0.26	0.28	0.34	0.36	0.38
	4 Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5 Land-Use Change & Forestry (LUCF)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6 Waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	0.57	0.65	0.66	0.73	0.82	0.91	1.02	1.19	1.34	1.60
NO	1 Energy	17.76	17.90	18.57	20.06	22.90	25.77	29.25	33.55	38.93	48.36
	2 Industrial Processes	0.04	0.06	0.06	0.07	0.08	0.08	0.09	0.11	0.11	0.12
	4 Agriculture	0.05	0.05	0.04	0.04	0.04	0.04	0.03	0.03	0.02	0.01
	5 Land-Use Change & Forestry (LUCF)	0.17	0.09	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6 Waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	18.02	18.10	18.70	20.18	23.01	25.89	29.37	33.68	39.06	48.49
NMVOC	1 Energy	18.57	18.71	19.42	20.98	23.94	26.95	30.58	35.08	40.70	50.56
	2 Industrial Processes	0.37	0.61	0.58	0.69	0.75	0.80	0.85	1.05	1.11	1.16
	4 Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5 Land-Use Change & Forestry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6 Waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	18.94	19.32	19.99	21.67	24.69	27.75	31.44	36.13	41.81	51.73

Source: IPCC Methodology-Albania, years 2000-2009

18 Values for this charts (figures 9-12) are taken from all sheets of overview module, IPCC-GHG Inventory (2000-2009)

Table 2.5: National greenhouse gas inventory of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocola and greenhouse gas precursors (year 2005)

Greenhouse gas source and sink categories	CO_2 emissions (Gg)	CO_2 removals (Gg)	CH_4 (Gg)	N_2O (Gg)	CO (Gg)	NO_x (Gg)	NMVOCs (Gg)	SO_x (Gg)
Total national emissions and removals	6257.3333	-248.00	98.23	0.37	172.21	25.89	27.75	0.91
1. Energy	3835.33	0	4.610	0.08	171.17	25.77	26/95	0.65
A. Fuel combustion (sectoral approach)	3835.33		4.25	0.08	157.80	23.757	24.84	0.01
1. Energy industries	282.47		0.02	0.00	0.743	0.112	0.117	0.000
2. Manufacturing industries and construction	484.44		0.13	0.02	4.827	0.727	0.760	0.003
3. Transport	2080.96		0.09	0.01	3.342	0.503	0.526	0.001
4. Other sectors	987.46		4.01	0.05	148.889	22.416	23.442	0.007
5. Other (please specify)	NO		NO	NO	NO	NO	NO	NO
B. Fugitive emissions from fuels	NO		0.3600		13.37	2.013	2.105	0.000
1. Solid fuels			0.03		1.114	0.168	0.175	0.000
2. Oil and natural gas			0.330		12.256	1.845	1.930	0.00
2. Industrial processes	1118.00	NO	0.00	0.00	0.11	0.080	0.800	0.260
A. Mineral products	48.00				0.00477	0.0036	0.0343	0.0111
B. Chemical industry	0.00		NO	NO	0.00	0.0	0.000	0.0
C. Metal production	523.00		NO	NO	0.0515	0.0374	0.374	0.121
D. Other production	547.00				0.0538	0.0391	0.3914	0.1274
E. Production of halocarbons and sulphur hexafluoride								
F. Consumption of halocarbons and sulphur hexafluoride								
G. Other (please specify)	NO		NO	NO	NO	NO	NO	NO
3. Solvent and other product use	NE			NE			NE	
4. Agriculture			66.66	0.011	0.930	0.04	0.000	0.000
A. Enteric fermentation			63.07					
B. Manure management			3.56	0.0004			0.0000	
C. Rice cultivation			NO				NO	
D. Agricultural soils			0.000	0.010			0.000	
E. Prescribed burning of savannahs			NO	NO	NO	NO	NO	
F. Field burning of agricultural residues			0.03	0.00047	0.93	0.04	0.000	
G. Other (please specify)			NO	NO	NO	NO	NO	
5. Land-use change and forestry	1962.00	-248.00	0.00	0.00	0.00	0.00	0.00	0.00
A. Changes in forest and other woody biomass stocks	658.00	NO						
B. Forest and grassland conversion	NO	-5.00	NO	NO	NO	NO		
C. Abandonment of managed lands		-242.00						
D. CO_2 emissions and removals from soil	1304.00	NO						
E. Other (please specify)	NO	NO	NO	NO	NO	NO		
6. Waste			26.96	0.28	0.00	0.00	0.00	0.00
A. Solid waste disposal on land			23.42		NO		NO	
B. Waste-water handling			3.54	0.28	NO	NO	NO	
C. Waste incineration					NO	NO	NO	NO
D. Other (please specify)			NO	NO	NO	NO	NO	NO
7. Other (please specify)	NO	NO	NO	NO	NO	NO	NO	NO
Memo items								
International bunkers	62.41		0.00138	0.00069	0.051	0.0088	0.0088	0.002
Aviation	21.25		0.00046	0.0005	0.017	0.003	0.0027	0.001
Marine	41.16		0.0092	0.0002	0.034	0.005	0.0054	00001
CO_2 emissions from biomass	658.00							

Signs for removals are always (–) and for emissions (+).

Table 2.6: National GHG Inventory of anthropogenic emission of HFCs, PFC and SF_6 (year 2005)

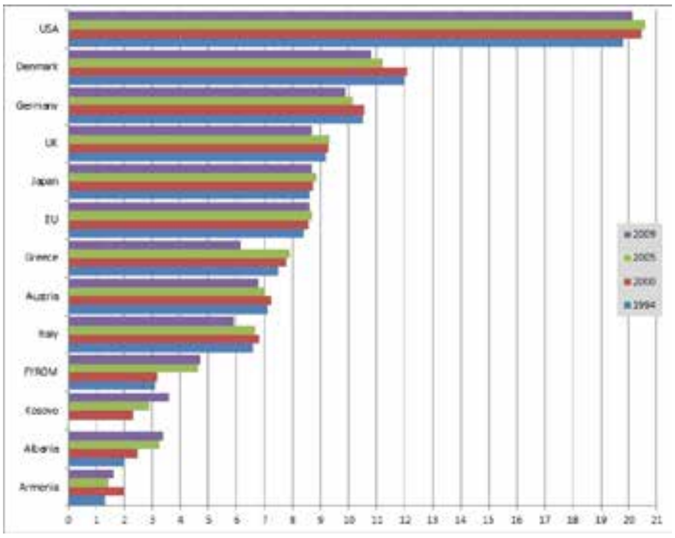
Greenhouse gas source and sink categories	HFCs[a,b] (Gg) HFC-23	HFC-134	Other (to be added)	PFCs[a,b] (Gg) CF_4	C_2F_6	Other (to be added)	SF_6[a] (Gg)
Total national emissions and removals	NO	NO	NO	NO	NO	NO	NO
1. Energy							
A. Fuel combustion (sectoral approach)							
1. Energy industries							
2. Manufacturing industries and construction							
3. Transport							
4. Other sectors							
5. Other (please specify)							
B. Fugitive emissions from fuels							
1. Solid fuels							
2. Oil and natural gas							
2. Industrial processes	NO	NO	NO	NO	NO	NO	NO
A. Mineral products							
B. Chemical industry							
C. Metal production	NO	NO	NO	NO	NO	NO	NO
D. Other production							
E. Production of halocarbons and sulphur hexafluoride	NO	NO	NO	NO	NO	NO	NO
F. Consumption of halocarbons and sulphur hexafluoride	NO	NO	NO	NO	NO	NO	NO
G. Other (please specify)							
3. Solvent and other product use							
4. Agriculture							
A. Enteric fermentation							
B. Manure management							
C. Rice cultivation							
D. Agricultural soils							
E. Prescribed burning of savannahs							
F. Field burning of agricultural residues							
G. Other (please specify)							
5. Land-use change and forestry							
A. Changes in forest and other woody biomass stocks							
B. Forest and grassland conversion							
C. Abandonment of managed lands							
D. CO_2 emissions and removals from soil							
E. Other (please specify)							
6. Waste							
A. Solid waste disposal on land							
B. Waste-water handling							
C. Waste incineration							
D. Other (please specify)							
7. Other (please specify)	NO	NO	NO	NO	NO	NO	NO
Memo items							
International bunkers							
Aviation							
Marine							
CO_2 emissions from biomass							

Note: The activity data for the period 2005 show that: i) Albania has never produced HFC and PCF: ii) No consumption of HFC and PCF was identified in the fire-protection sector; and iii) there is consumption of HFC identified in the refrigeration and air condition sector (only for the years 2008 and 2009 and for more details please read the respective section).

2.4.3 Main CO_2 indicators

CO_2 emission indicators are of prime importance in the debate on the potential for global warming and may signal a significant change in the level of efforts among developed countries and countries in transformation (such as Albania). For the purpose of comparison among countries, Figure 2.9 shows the position of Albania among a number of different countries in terms of CO_2 emissions per capita and per energy sector for the years 1994, 2000, 2005 and 2009.

Figure 2.9 CO_2 Emissions from the Energy Sector for Selected Countries [Ton CO_2/Capita]



According to Figure 2.9, the CO_2 per capita for Albania is around 3.3 to 4.5 times lower than the average amount for industrialized countries, which can be explained by:

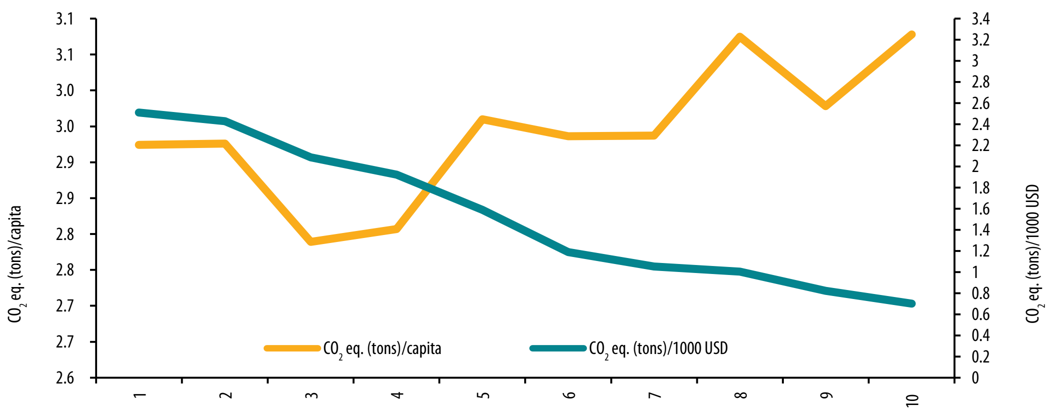
- Energy consumption per capita in Albania is remains the lowest among the selected countries;
- Electricity production is based almost exclusively on hydro energy (more than 98% of electricity is generated by Hydro Power Plants);

The residential sector consumes 67% of total electricity generated. Activities such as residential space heating, domestic hot water, and cooking, use mainly electric power.

2.4.4 Trends

Figure 2.10 shows trends of both CO_2 emissions per GDP (in 1,000 USD) and CO_2 emissions per capita for the period 2000 - 2009. A very important conclusion can be drawn, namely that CO_2 emissions per capita have been increasing (more energy consumption associated with increasing standard of life for Albanians) and on the other hand CO_2 emissions per GDP have been reduced during this period. This is an important consideration for establishing GHG mitigation scenarios.

Figure 2.10 Trend of CO_2 emissions (tons) per capita and CO_2 emissions per GDP (tons/1000 USD) for Albania



2.5 ENERGY/TRANSPORT SECTOR EMISSIONS

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.

To calculate GHG emissions, both Sectorial and Reference approaches were used, allowing for verification of the reported emissions. The deviation between the two approaches was satisfactory. Carbon dioxide emissions released from energy and transport for the year 2005 were estimated to be a total of 3,835.33 Gg by the Reference approach and 3,828.31 Gg by the Sectoral approach, according to estimates made from separate sectors and source categories and emission summaries. Utilizing these two approaches allowed Albania make a judgement based on the fuel spectrum of carbon dioxide emissions (reference approaches), and on the sector distribution (sectoral approaches). In both approaches the default IPCC emission factors for each fuel type are used.

Figure 2.11 Direct GHGs from Energy Sector for three main GHGs, 2000 - 2009 (Gg)

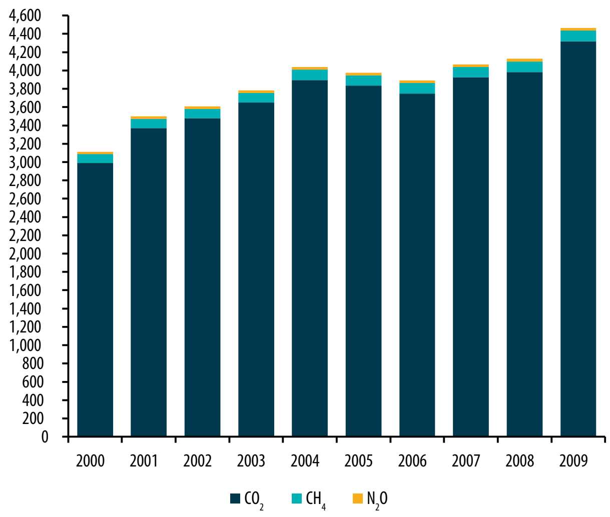
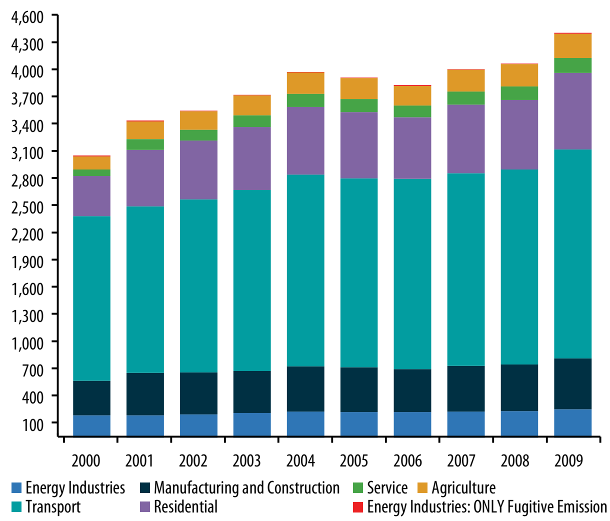


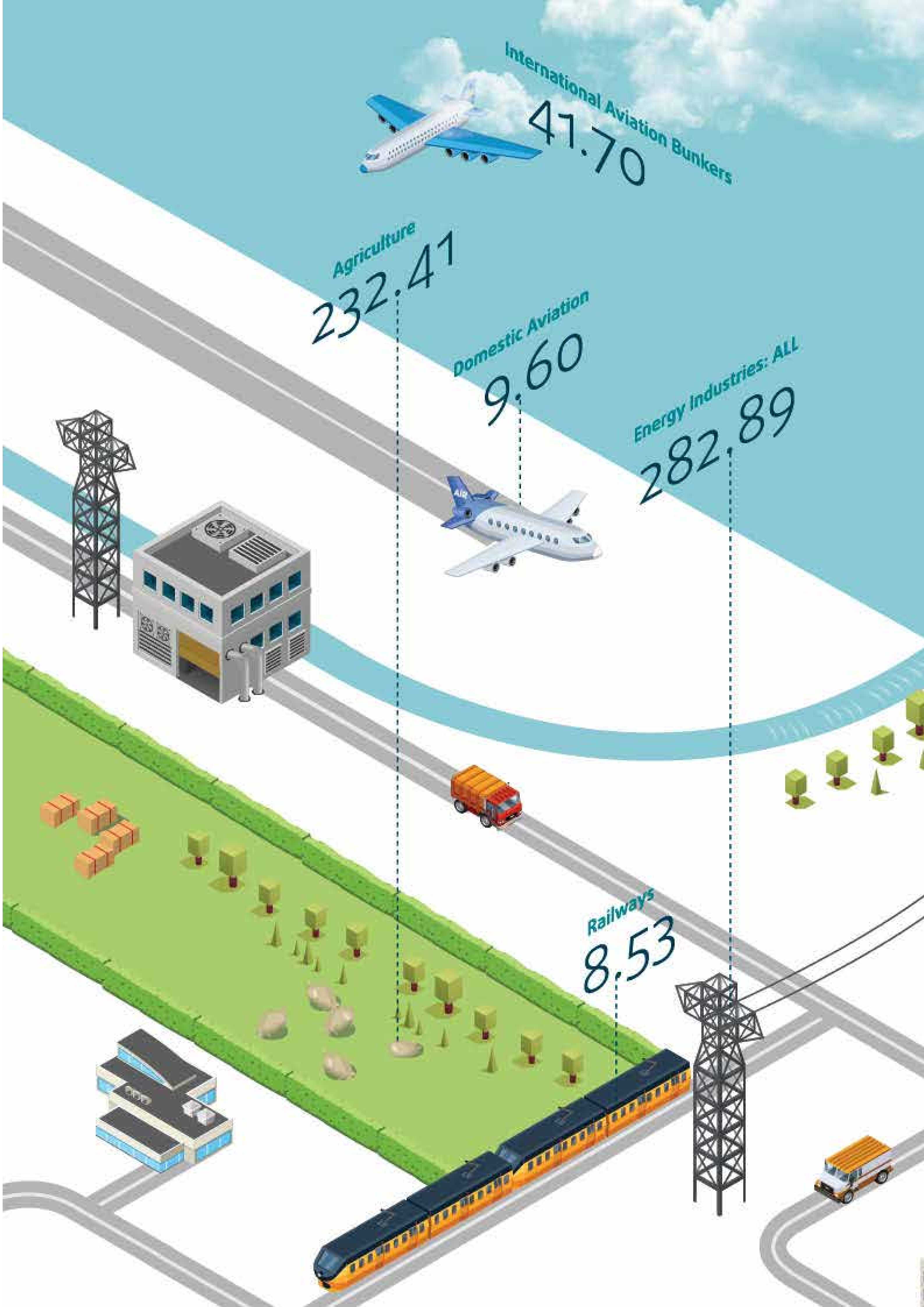
Figure 2.12 Direct GHG emissions from each sub-sector of Energy Sector, 2000-2009 (Gg)



According to IPCC Guidelines (1996), emissions arising from energy activities (fossil fuel combustion and fugitive emissions), are calculated for the following sectors: Energy and Transformation Industries, Manufacturing Industry & Construction, Transport, Small Combustion (Commercial/Institutional buildings, Residential buildings, Agriculture /Forestry/ Fishing), & Other Sectors. Table 2.7 provides the contribution of GHGs from the Energy sector with CO_2 emissions as the dominant contributor (accounting for 96.48% of the overall emissions in 2005), while table 2.8 gives the CO_2 contribution of energy subsectors to the overall GHG emissions of the energy sector, with the transport subsector playing a continuous larger role (with 52.47% in 2005). The same results are also shown in Figures 2.11 and 2.12.

CH_4 emissions derived from coal mining and handling (mining and post mining) have been calculated based on the Tier 1 approach. These emissions were estimated based on the amount of coal produced and using the general equation provided in the 1996 IPCC Guidelines.

Fugitive emissions from oil and natural gas systems are a direct source of greenhouse gases due to the release of methane (CH_4) and formation of carbon dioxide (CO_2) (i.e., CO_2 is present in the produced oil and gas when it leaves the reservoir), plus some CO_2 and nitrous oxide (N_2O) from non-productive combustion activities (primarily waste gas flaring). Carbon dioxide emissions are calculated using Tier 1 assuming that all hydrocarbons are fully oxidized. The GHG inventory reports fugitive CH_4 emissions from oil and gas activities including venting and flaring (See Table 2.8).



International Aviation Bunkers
41.70
Agriculture
232.41
Domestic Aviation
9.60
Energy Industries: ALL
282.89
AIR
Railways
8.53

Direct CO_2 eq. Emissions from Energy/Transport

Year 2005 - Values in Gg

CO_2 emissions from the energy sector accounted for 97.07% of overall emissions in 2005. The transport subsector contributed 45.06% of overall CO_2 emissions in 2005 of which road transport is by far the main contributor.

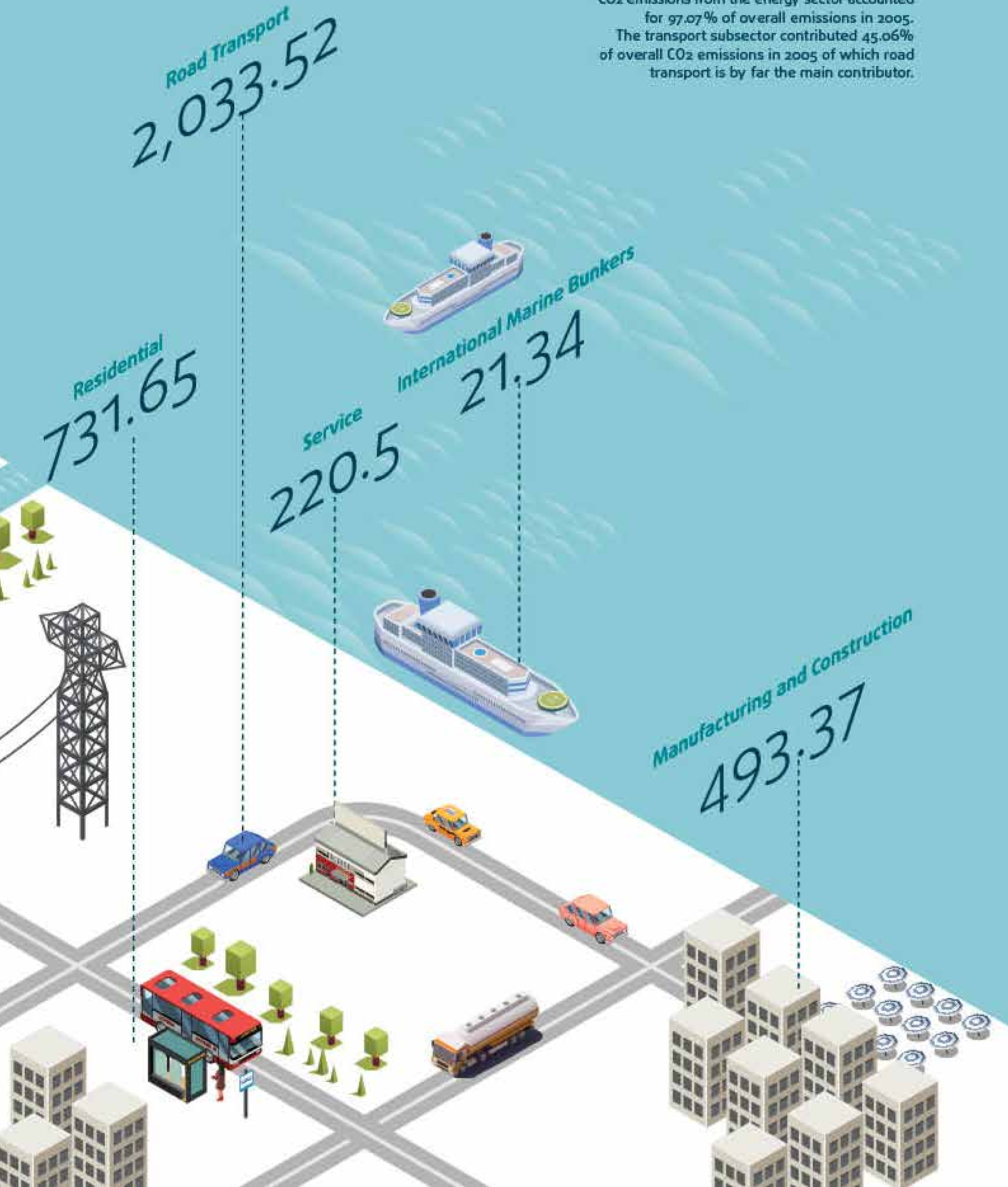


Table 2.7: Contribution of CO_2, CH_4, and N_2O from the Energy subsectors (Gg)

Sub-sectors	Gases	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Whole Energy and Transport Sectors	CO_2	2,987.90	3,372.10	3,477.95	3,648.75	3,896.11	3,835.33	3,749.38	3,925.06	3,983.30	4,319.45
	CH_4	4.73	4.75	4.92	5.13	5.43	5.34	5.38	5.45	5.50	5.50
	N_2O	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.10
	CO_2 eq.	3,111.93	3,499.67	3,609.11	3,784.34	4,038.02	3,975.37	3,890.28	4,067.45	4,129.86	4,466.04
Whole Energy and Transport Sectors	All fossil fuel	3,111.93	3,499.67	3,609.11	3,784.34	4,038.02	3,975.37	3,890.28	4,067.45	4,129.86	4,466.04
	Fuel wood	1,005.00	652.00	665.00	663.00	660.00	658.00	781.00	654.00	649.00	650.00
Energy Industries: ALL	CO_2	245.87	247.86	257.43	270.38	286.42	282.47	284.80	287.71	291.20	312.40
	CH_4	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	N_2O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CO_2 eq.	246.29	248.28	257.85	270.80	286.84	282.89	285.22	288.13	291.62	312.82
Energy Industries: ONLY Fugitive Emission	CO_2	0	0	0	0	0	0	0	0	0	0
	CH_4	0.35508	0.35608	0.35708	0.35808	0.35908	0.36008	0.36108	0.36208	0.36308	0.36408
	N_2O	0	0	0	0	0	0	0	0	0	0
	CO_2 eq.	7.46	7.48	7.50	7.52	7.54	7.56	7.58	7.60	7.62	7.65
Manufacturing and Construction	CO_2	372.77	458.84	455.92	456.46	492.76	484.44	461.39	497.27	506.17	553.64
	CH_4	0.12	0.12	0.12	0.13	0.14	0.13	0.13	0.14	0.14	0.14
	N_2O	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	CO_2 eq.	381.49	467.56	464.64	465.39	501.90	493.37	470.32	506.41	515.31	562.78
Transport	CO_2	1,815.93	1,830.58	1,901.29	1,991.93	2,110.10	2,080.96	2,098.12	2,119.58	2,145.32	2,301.47
	CH_4	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09
	N_2O	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	CO_2 eq.	1,817.61	1,835.36	1,906.07	1,996.71	2,115.09	2,085.95	2,103.11	2,124.57	2,150.31	2,306.46
Transport	Domestic Aviation	8.38	8.45	8.77	9.19	9.74	9.60	9.68	9.78	9.90	10.62
	Road	1,774.53	1,788.84	1,857.95	1,946.52	2,061.99	2,033.52	2,050.29	2,071.26	2,096.41	2,249.00
	Railways	7.44	7.50	7.79	8.16	8.65	8.53	8.60	8.68	8.79	9.43
	National Navigation	25.58	25.79	26.78	28.06	29.72	29.31	29.55	29.86	30.22	32.42
	Pipeline Transport	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Residential	CO_2	353.14	536.46	556.49	599.43	645.25	632.78	579.22	654.87	667.03	738.69
	CH_4	3.47	3.49	3.63	3.80	4.03	3.97	4.00	4.05	4.09	4.09
	N_2O	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06
	CO_2 eq.	441.51	625.25	648.22	694.73	745.38	731.65	678.72	755.42	771.52	843.18
Service	CO_2	56.31	99.15	104.43	113.46	125.27	122.69	109.59	126.91	130.01	145.02
	CH_4	0.66	0.66	0.69	0.72	0.77	0.75	0.76	0.77	0.78	0.78
	N_2O	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	CO_2 eq.	73.27	116.11	122.02	131.68	144.54	141.54	128.65	146.18	149.49	164.50
Agriculture	CO_2	143.88	199.21	202.39	217.09	236.31	231.99	216.26	238.72	243.57	268.23
	CH_4	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	N_2O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CO2 eq.	144.30	199.63	202.81	217.51	236.73	232.41	216.68	239.14	243.99	268.65
International Marine Bunkers	CO_2	18.54	18.69	19.41	20.34	21.54	21.25	21.42	21.64	21.90	23.50
	CH_4	0.0008	0.0008	0.00084	0.0009	0.0009	0.00092	0.0009	0.0009	0.00094	0.00101
	N_2O	0.0002	0.0002	0.00021	0.0002	0.0002	0.00023	0.0002	0.0002	0.00024	0.00025
	CO_2 eq.	18.62	18.77	19.49	20.43	21.63	21.34	21.51	21.73	21.99	23.60
International Aviation Bunkers	CO_2	35.91	36.20	37.60	39.39	41.73	41.16	41.49	41.92	42.43	45.52
	CH_4	0.0004	0.0004	0.00042	0.0004	0.0005	0.00046	0.0005	0.0005	0.00047	0.00051
	N_2O	0.0015	0.0015	0.00157	0.0016	0.0017	0.00172	0.0017	0.0018	0.00177	0.0019
	CO_2 eq.	36.38	36.68	38.10	39.91	42.28	41.70	42.04	42.47	42.99	46.12
International Bunkers	CO_2	54.45	54.89	57.01	59.73	63.27	62.41	62.91	63.56	64.33	69.02
	CH_4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	N_2O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CO_2 eq.	54.45	54.89	57.01	59.73	63.27	62.41	62.91	63.56	64.33	69.02
Others	CO_2	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CH_4	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	N_2O	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CO_2 eq.	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Table 2. 8: GHG emissions in CO_2 eq. from Energy subsectors (Gg)

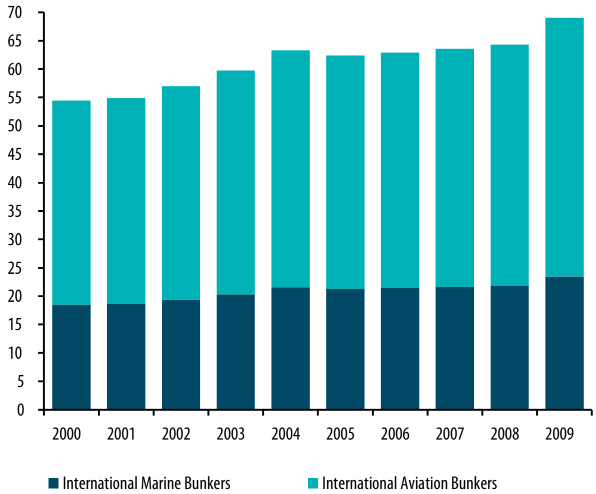
Sub-sectors	Gasses	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Whole Energy and Transport Sectors	CO_2 eq.	3,111.93	3,499.67	3,609.11	3,784.34	4,038.02	3,975.37	3,890.28	4,067.45	4,129.86	4,466.04
Energy Industries: ALL	CO_2 eq.	246.29	248.28	257.85	270.80	286.84	282.89	285.22	288.13	291.62	312.82
Energy Industries: ONLY Fugitive Emission	CO_2 eq.	7.46	7.48	7.50	7.52	7.54	7.56	7.58	7.60	7.62	7.65
Manufacturing and Construction	CO_2 eq.	381.49	467.56	464.64	465.39	501.90	493.37	470.32	506.41	515.31	562.78
Transport	CO_2 eq.	1,817.61	1,835.36	1,906.07	1,996.71	2,115.09	2,085.95	2,103.11	2,124.57	2,150.31	2,306.46
Transport	Domestic Aviation	8.38	8.45	8.77	9.19	9.74	9.60	9.68	9.78	9.90	10.62
	Road	1,774.53	1,788.84	1,857.95	1,946.52	2,061.99	2,033.52	2,050.29	2,071.26	2,096.41	2,249.00
	Railways	7.44	7.50	7.79	8.16	8.65	8.53	8.60	8.68	8.79	9.43
	National Navigation	25.58	25.79	26.78	28.06	29.72	29.31	29.55	29.86	30.22	32.42
	Pipeline Transport	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Residential	CO_2 eq.	441.51	625.25	648.22	694.73	745.38	731.65	678.72	755.42	771.52	843.18
Service	CO_2 eq.	73.27	116.11	122.02	131.68	144.54	141.54	128.65	146.18	149.49	164.50
Agriculture	CO_2 eq.	144.30	199.63	202.81	217.51	236.73	232.41	216.68	239.14	243.99	268.65
International Marine Bunkers	CO_2 eq.	18.62	18.77	19.49	20.43	21.63	21.34	21.51	21.73	21.99	23.60
International Aviation Bunkers	CO_2 eq.	36.38	36.68	38.10	39.91	42.28	41.70	42.04	42.47	42.99	46.12
International Bunkers	CO_2 eq.	54.45	54.89	57.01	59.73	63.27	62.41	62.91	63.56	64.33	69.02
Others	CO_2 eq.	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

2.5.1 International Bunkers and Biomass Emissions

In the frame of the TNC, GHG emissions (CO_2, CH_4, N_2O and CO_2 eq.) from the International Aviation and Marine Bunkers are shown in Figure 2.13. Emissions from international traffic, in accordance with the IPCC methodology are reported separately and are excluded from the national totals. Analyses show that the GHG emissions from international bunkers have increased over the whole period with the main contribution coming from international marine bunkers.

Emissions from biomass-fuelwood, in accordance with the IPCC methodology, are reported under the LUCF sector inventory. Although important within the energy balance of Albania, obtaining real figures was difficult due to the fact that most of the information is not duly recorded; therefore a separate assessment was pro-

Figure 2.13 CO_2 eq. emissions from International Bunkers for the period 2000-2009 (Gg)



duced for their contribution. The highest uncertainty arises from non-registered cuttings (cuttings by farmers to fulfil their own needs). Some uncertainty concerning the activity data for this category exists. Figure 2.14 shows fuelwood consumption by the energy sector in kTOE (2000 – 2009), and Figure 2.15 shows CO_2 emissions (Gg) from fuelwood/biomass consumption by the energy sector (2000 – 2009).

Figure 2.14 Fuel wood consumption (kTOE) for energy purposes (2000 - 2009)

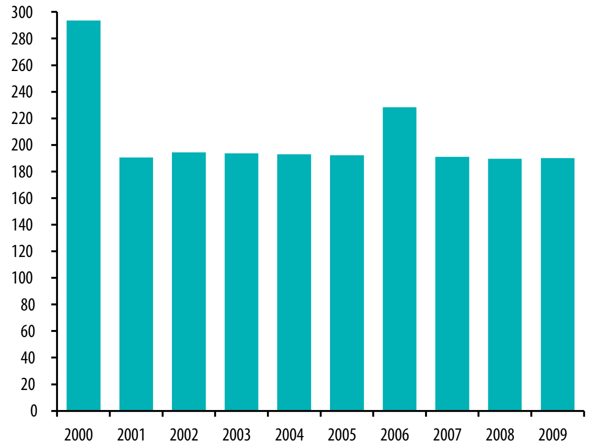
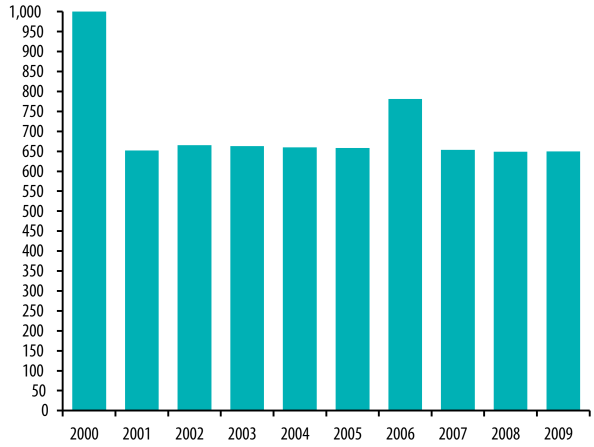


Figure 2.15 CO_2 emissions (Gg) from fuel wood burning as energy source (2000 - 2009)



2.6 LUCF SECTOR EMISSIONS

Lack of accurate data regarding forest stocks is one of the main problems for LUCF emissions estimation.

Analysis of the "Land Use Change and Forestry" (LUCF) sector includes emissions and removals of greenhouse gases from six land uses: forests, cropland (CO_2), grasslands (CO_2), wetlands, settlements and other lands. LUCF GHG net emissions/removals refers to changes in atmospheric levels of all greenhouse gases attributable to forest and land-use change activities, including but not limited to (1) emissions and removals of CO_2 from decreases or increases in biomass stocks due to forest management, logging, fuel wood collection, etc.; (2) conversion of existing forests and natural grasslands to other land uses; (3) removal of CO_2 from the abandonment of formerly managed lands (e.g. croplands and pastures); and (4) emissions and removals of CO_2 from soil associated with land-use change and management.

One of the main problems of the forest sector is the lack of accurate data regarding forest stocks (increase, decrease of area and volume, etc.) Forest cadastres do not fully reflect the real situation of national forests. On the other hand, there is not any cadastre for the whole country in which relevant land use changes for the territory are evidenced / recorded**.**

2.6.1 Emissions and Removals of CO_2 from decreases or increases in biomass stocks due to forest management, logging, and fuel wood collection

Emissions and removals of CO_2 from forest management, logging, and fuel wood collection due to decreases or increases in their biomass stocks were considered in this category. The main data used to compute the changes in Forest and Other Woody Biomass Stocks were:

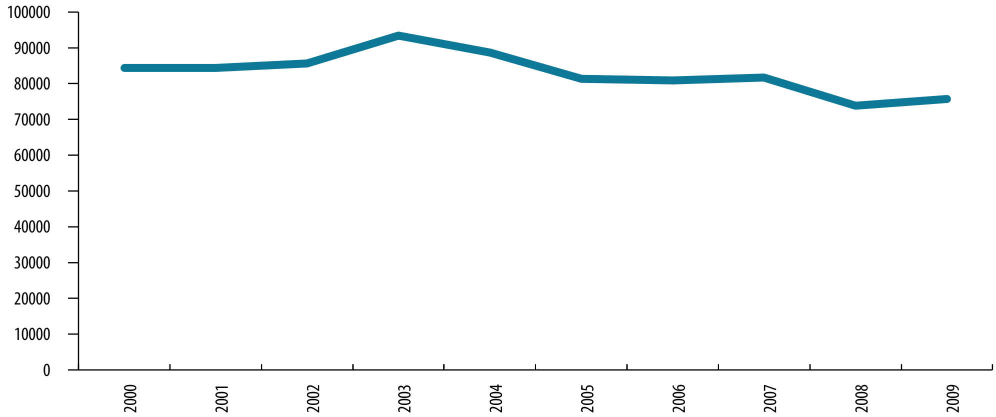
1. The calculation of the forest area for each year and average annual growth of biomass stock in forests under their respective categories,
2. The calculation of the afforested area and their annual growth.

Calculations also took into consideration non-forest tree species (fruit trees, olive trees, citrus, vineyard, etc.). Additionally, the annual loss of biomass from forests due to logging, forest fires and illegal cutting was also calculated.

The value of carbon fraction of dry matter and biomass conversion/expansion ratio for all calculations was 0.5 (taken from the IPCC guidelines). This methodology was used because of a lack of data for each forest species. Data on the volume of forests during the period 2000 to 2009 were provided by the Ministry of Environment.

Linear correlation (Figure 2.16) was used in order to reduce the large discrepancies of total volume of forest stocks that were encountered during the period 2000 to 2009 and get an average annual volume of biomass changes.

Figure 2.16 Linear correlation used for evaluation of total volume of stock (1000 m^3)

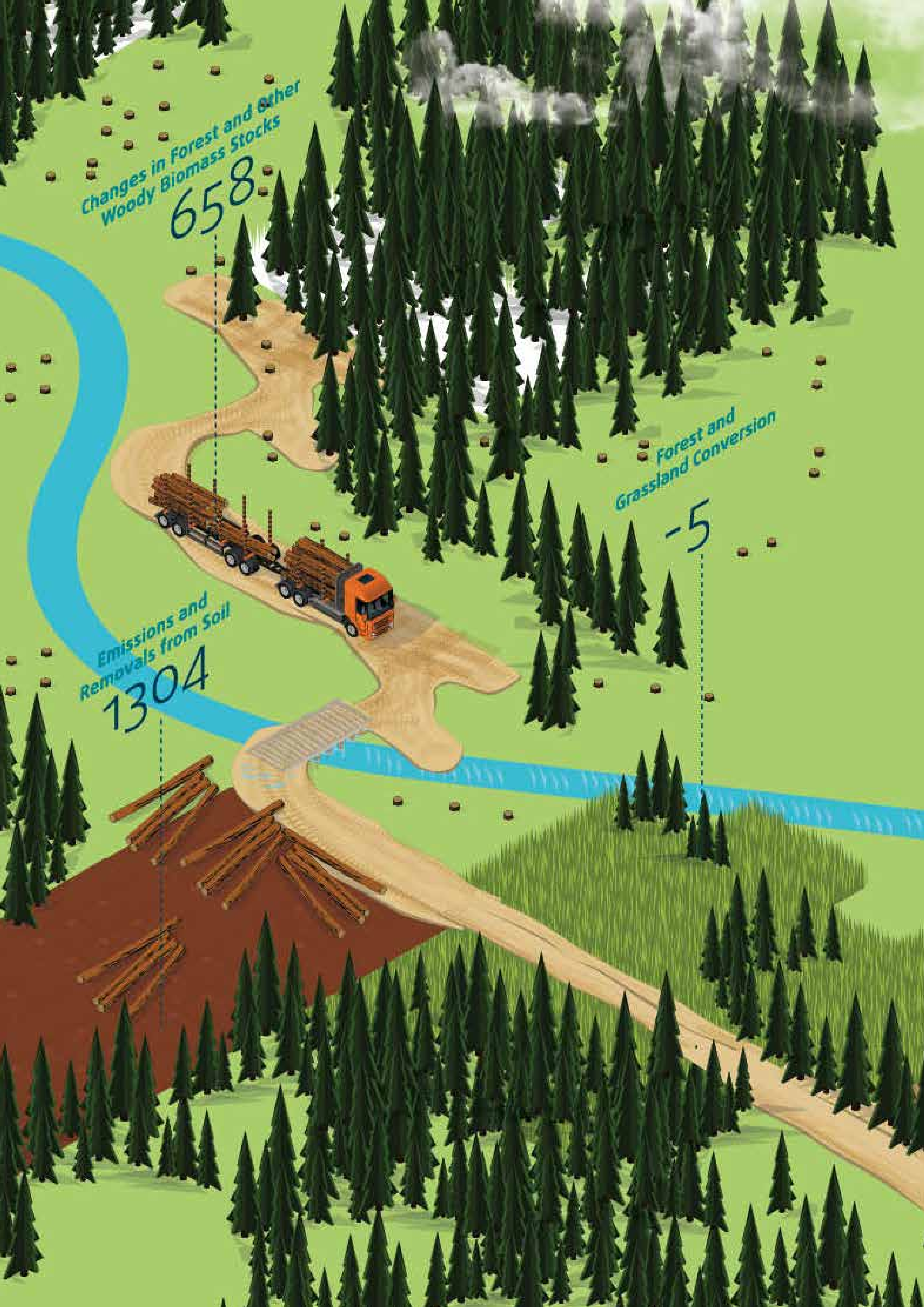


Calculation of annual forest growth was made using the data for forest exploitation and cuttings from the National Forest Cadastre (Ministry of Environment), while the volume of forest cut for firewood was calculated indirectly, since it is not duly reported.

There is evident improvement regarding the role of forests as GHG sink after 2005, due to limitation of massive cutting and beginning of afforestation programs in the forest sector.

The reduction of the volume of forest for the whole period of the inventory (2000 - 2009) was approximately 757,000 m^3/year more than the annual natural increment of forests, leading to the conclusion that **this sector is a net emitter**. The decrease of the forest volume stock is also reflected in Figure 2.16, where in the year 2000 the volume of forests in Albania was 83.295 million m^3 while in 2009 this volume had decreased to 75.726 million m^3. Thus, over a period of 10 years, the volume stock had decreased by about 7.57 million m^3. This is a clear indicator showing that forests were not managed in sustainable way during that period.

Due to increased law enforcement in the forest sector limiting forest cutting, as well as the beginning of afforestation in the years after 2005, there is an evident improvement with regards to the role that forests can play as a GHG sink compared to the year 2000. However due to the specific circumstances of the sector, such as: effectiveness of investments in the implementation of afforestation programs, new trends regarding the change of forest land to agricultural land (mainly for vineyards and orchards), increase in electricity prices, enforcement in the energy sector, etc., the situation with regards to the health of forests remains very fragile and unstable. Thus, managing forests in sustainable way, remains a compelling challenge.



Changes in Forest and Other Woody Biomass Stocks
658
Forest and Grassland Conversion
-5
Emissions and Removals from Soil
1304

CO_2 eq. Net Emissions/Removals from Land Use Change and Forestry

Year 2005 - Values in Gg

Lack of accurate data regarding forest stocks is one of the main problems for LUCF emissions estimation. There is evident improvement regarding the role of forests as GHG sink after 2005, due to limitation of massive cutting and beginning of afforestation programs in the forest sector.

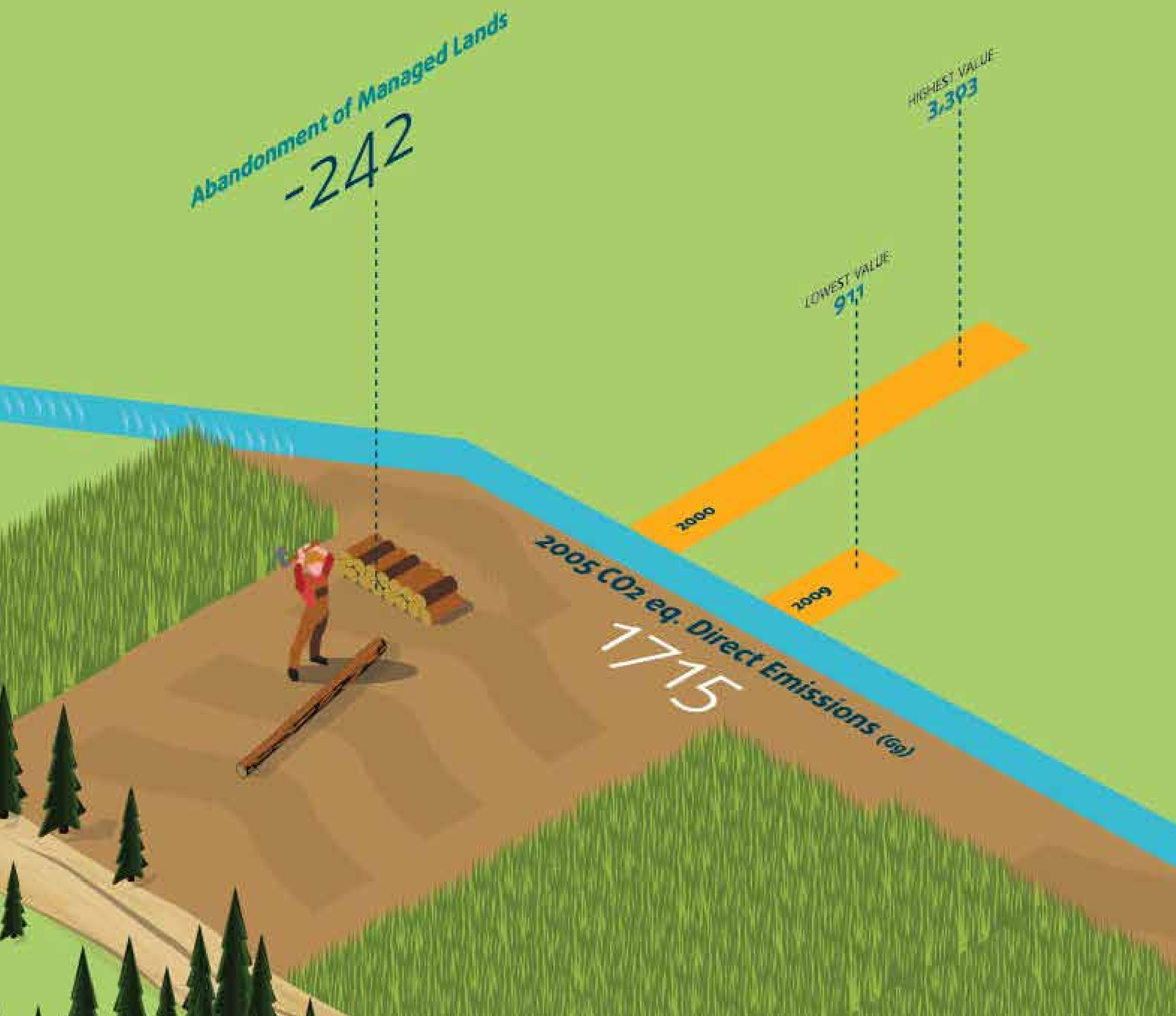


Figure 2.17 Emissions from Forest and Other Woody Biomass Stocks (Gg)

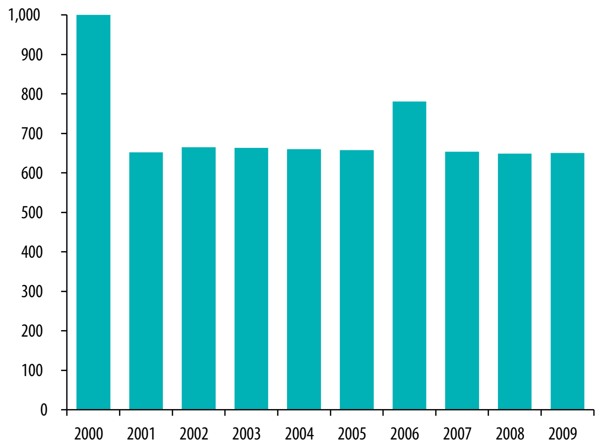
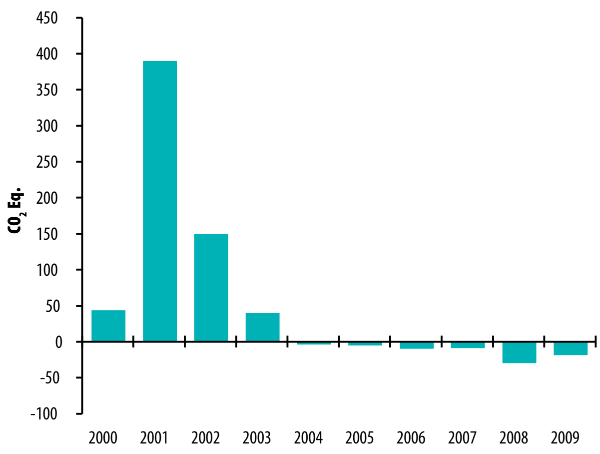


Figure 2.18 Emissions from Forest and Grassland Conversion (Gg)



2.6.2 Emissions from Forest and Grassland Conversion

Calculation of the amount of forest and grassland conversion has been made taking into consideration the annual change in forest area and forest biomass volume before and after conversion. In addition, in this calculation the 10 year average converted area – "t-10" is taken into account. The entire period 2000 to 2009 shows losses in biomass due to forest cutting. This reduction of biomass is due to a reduction in the annual volume of forest as well as changes with the converted area in the 10-year period. As can be observed in Figure 2.18 (years 2004 - 2009) this sub-sector has changed from a net emitter to a "sink". This was mainly due to limitation of massive cuttings of forests, law enforcement and afforestation activities.

2.6.3 Abandonment of Managed Lands

Calculations' results show that abandoned lands are net GHGs "sinks"

The annual carbon uptake in above-ground biomass re-growth (for periods of 20 years and over) and total carbon and carbon dioxide uptake from abandoned lands have been calculated. The area of abandoned lands has not changed during the inventory period (2000 – 2009) - it remains at 120,000 ha. Since the time these areas were created until 1992, lands have been used for agriculture. After 1992, due to a combination of lack of irrigation, their slope, lack of nourishing elements and distance from residential areas, these lands have been abandoned and are now used as pasture lands. Results from an analysis of abandoned lands indicate that they are sinks of GHGs. This is due to the annual biomass they produce. The annual amount of biomass calculated per 1 ha of abandoned land is 1.1 tons of dry matter/ha. Annual carbon uptake in above-ground biomass is 0.55 ton C/ha. Figure 2.19 present the emissions from abandonment of managed lands (Gg) and Figure 2.20 the emissions from changes in soil carbon for mineral soil (Gg) for period 2000 to 2009.

2.6.4 Changes in Soil Carbon

Although the entire period 2000 to 2009 results in positive GHGs emissions, due to significant changes in land-use practices and the increase of lands planted mainly with fruit trees, the net amounts of GHG have been decreasing, especially for the period 2006 to 2009. This has occurred because of the reduction of intensive management practices of agricultural land, as well as the reduction of land cultivated with crops and cultivated with cereals. The reduction of GHGs emissions is also a result of a 35 to 45% reduction (regarding the comparative period (t-20)), of the area of agricultural land cultivated during the years 2000 to 2009. Table 2.9 presents the main GHG emissions from the LUCF subsectors for the period 2000 to 2009.

Figure 2.19 Emissions from abandonment of managed lands (Gg)

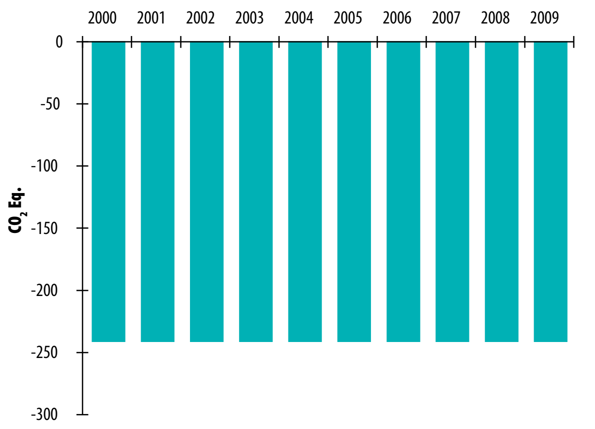


Figure 2.20 Emissions from changes in soil carbon for mineral soil (Gg)

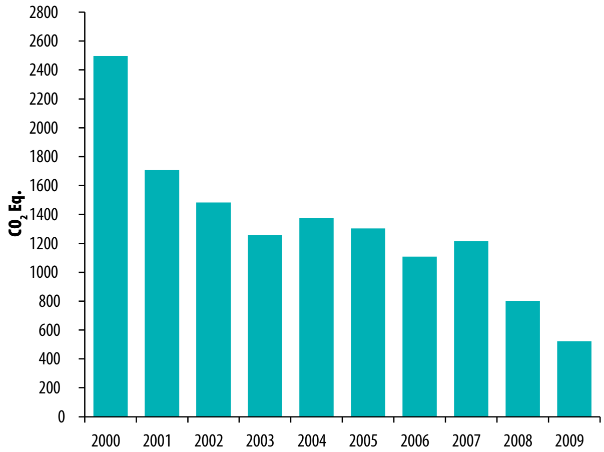
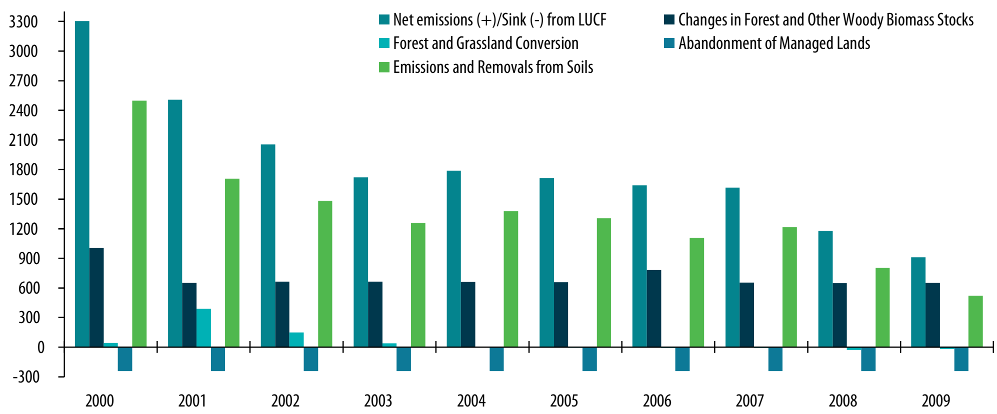


Table 2.9 Emissions in CO_2 eq. from LUCF subsectors (Gg)

Sub-sectors	Gasses	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Whole Land Use Change and Forestry Sector	CO_2	3,303	2,506	2,055	1,719	1,790	1,715	1,638	1,617	1,179	911
	N_2O	0	0	0	0	0	0	0	0	0	0
	CH_4	0	0	0	0	0	0	0	0	0	0
	CO_2 eq.	3,303	2,506	2,055	1,719	1,790	1,715	1,638	1,617	1,179	911
Changes in Forest and Other Woody Biomass Stocks	CO_2	1005	652	665	663	660	658	781	654	649	650
	N_2O	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CH_4	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CO_2 eq.	1005	652	665	663	660	658	781	654	649	650
Forest and Grassland Conversion	CO_2	43	390	150	40	-4	-5	-10	-9	-30	-19
	N_2O	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CH_4	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CO_2 eq.	43	390	150	40	-4	-5	-10	-9	-30	-19
Abandonment of Managed Lands	CO_2	-242	-242	-242	-242	-242	-242	-242	-242	-242	-242
	N_2O	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CH_4	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CO_2 eq.	-242.00	-242.00	-242.00	-242.00	-242.00	-242.00	-242.00	-242.00	-242.00	-242.00
Emissions and Removals from Soil	CO_2	2497	1707	1483	1258	1375	1304	1109	1215	802	522
	N_2O	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CH_4	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CO_2 eq.	2497	1707	1483	1258	1375	1304	1109	1215	802	522
Other (please specify)	CO_2	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CH_4	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	N_2O	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CO_2 eq.	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Total CO_2, emissions from all sub sectors of Land-use Change and Forestry are shown in Figure 2.21. The input data have been revised to take into consideration data gaps and areas of analysis that need improvement. Some of the data gaps have been overcome by appropriately developed methods. The total CO_2-eq emissions for the year 2005 reached 1714 Gg of CO_2. Forest and Other Woody Biomass Stocks emitted during 2005 reached around 658k Gg of CO_2. Forest and Grassland conversion have absorbed 6 Gg of CO_2. Abandonment of managed land absorbed 242 Gg of CO_2. Emissions from soils were 1304 Gg of CO_2. Mineral soils have emitted 1304 Gg of CO_2.

Figure 2.21 Total CO_2 gas emissions from Land-use Change and Forestry (Gg)



However, there remains a need for more accurate data to reflect changes occurring in the forestry sector, such as forestation/afforestation, forest improvement, forest fires and damages affected by them, etc. There is also a need for a detailed study to assess the state of abandoned land across the country. Overall, an update of the national cadastre is necessary to reflect all types of land use (agricultural land, forest, pastures, abandoned lands, water areas, urban area, etc.).

2.7 AGRICULTURE SECTOR EMISSIONS

Agriculture is one of the key sectors of the economy as it provides employment to about half of the population

Agriculture is one of the key sectors of the Albanian economy, contributing about 20% of GDP (2011). However, due to growth in other sectors of the Albanian economy, the contribution of agriculture in GDP has been decreasing, although the sector is still the main source of employment for more than a half the population.

Livestock constitutes more than half of the total value of agricultural production. Although development of animal husbandry has not been encouraged, the number of cattle and of small ruminants is increasing rapidly. The anticipated continuous increase in livestock could create problems for the environment in the future because the density of livestock per acre of land is already very high. The high density of small ruminants in pastures and forests causes similar problems.

For the calculation of GHGs the Excel spreadsheets are used, in accordance with the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories. In the absence of any specific study/research, reference was made to the IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories for determination of factors for each crop, such as; residue/crop product ratio, dry matter fraction, carbon fraction, Nitrogen-Carbon (N-C) Ratio, etc. and. However, it should be mentioned that for some crops such as soybeans, tobacco, sunflower, foregoes, vegetables and beans there is no data for the above mentioned factors, and this has generated a small gap in calculations of total GHG emissions from the agriculture sector.

Methane emissions are generated mainly from enteric fermentation and manure management as shown in Figures 2.22-.2.23. Cattle were the main contributor of CH_4 emissions from enteric fermentations, followed by sheep. N_2O emissions were mainly produced from the application of nitric fertilizers. The emissions of CH_4 and N_2O as a result of burning agricultural residues are insignificant.

Time series of GHG emissions for the individual agriculture sub-sectors for each year of the period 2000-2009 are given in Table 2.10.

Figure 2.22 CH_4 emissions from livestock sector for the period 2000-2009 (Gg)

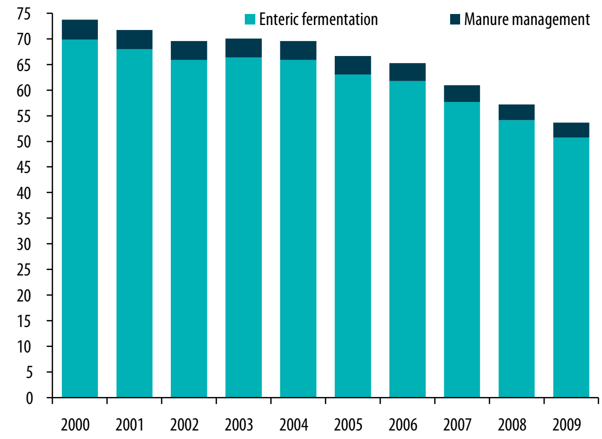


Figure 2.23 N_2O emissions from the livestock sector related to manure management (Gg)

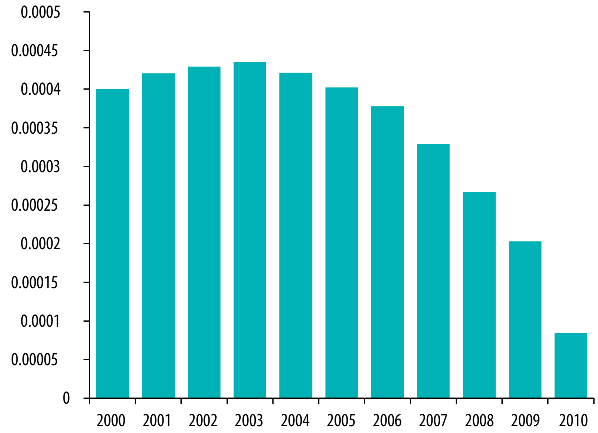
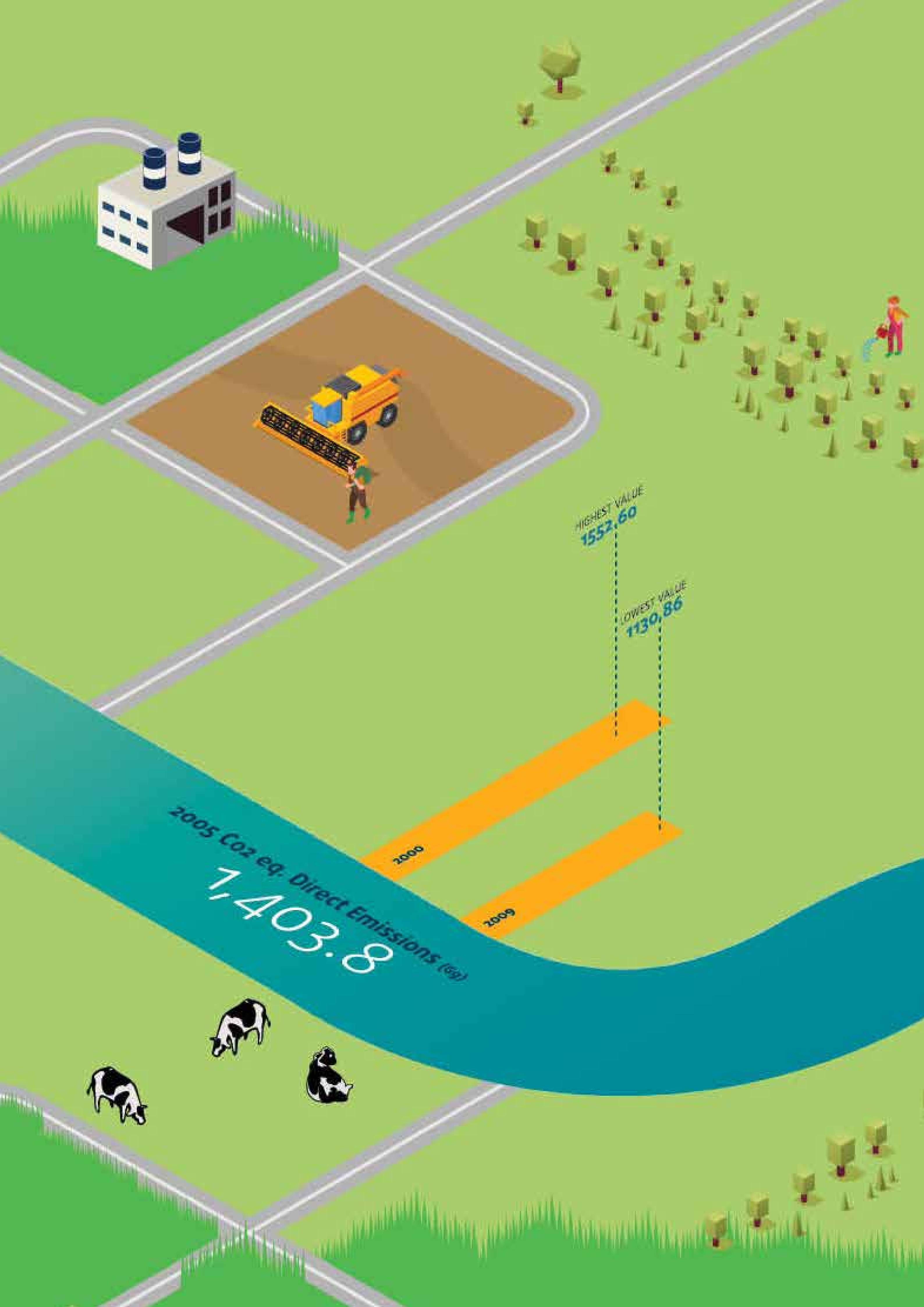


Table 2.10: GHG emissions from individual Agriculture sub-sectors for each year of the period 2000 - 2009 (Gg)

Sub-sectors	Gases	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Whole Agriculture Sectors	CO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	N_2O	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	CH_4	73.78	71.77	69.58	70.12	69.58	66.66	65.32	60.96	57.21	53.70
	CO_2 eq.	1552.60	1510.40	1464.41	1475.75	1464.41	1403.08	1374.94	1283.36	1204.59	1130.86
Enteric Fermentation	CO_2	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	N_2O	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CH_4	69.88	67.97	65.88	66.37	65.88	63.07	61.81	57.67	54.11	50.75
	CO_2 eq.	1467.51	1427.43	1383.50	1393.79	1383.50	1324.46	1298.01	1210.98	1136.34	1065.81
Manure Management	CO_2	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	N_2O	0.0004	0.0004	0.00043	0.0004	0.0004	0.0004	0.0004	0.0003	0.00027	0.0002
	CH_4	3.86	3.77	3.67	3.72	3.67	3.56	3.48	3.26	3.06	2.91
	CO_2 eq.	81.18	79.30	77.20	78.25	77.20	74.88	73.20	68.56	64.34	61.17
Rice Cultivation	CO_2	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	N_2O	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CH_4	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CO_2 eq.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Agriculture Soils	CO_2	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	N_2O	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	CH_4	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CO_2 eq.	2.38	2.31	2.22	2.28	2.22	2.18	2.17	2.11	2.04	1.98
Prescribed Burning of Savannas	CO_2	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	N_2O	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CH_4	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CO_2 eq.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Field Burning of Agricultural Residues	CO_2	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	N_2O	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CH_4	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04
	CO_2 eq.	1.07	0.67	0.98	0.64	0.70	0.93	0.89	0.89	0.80	0.82
Other (please specify)	CO_2	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	N_2O	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CH_4	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CO_2 eq.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

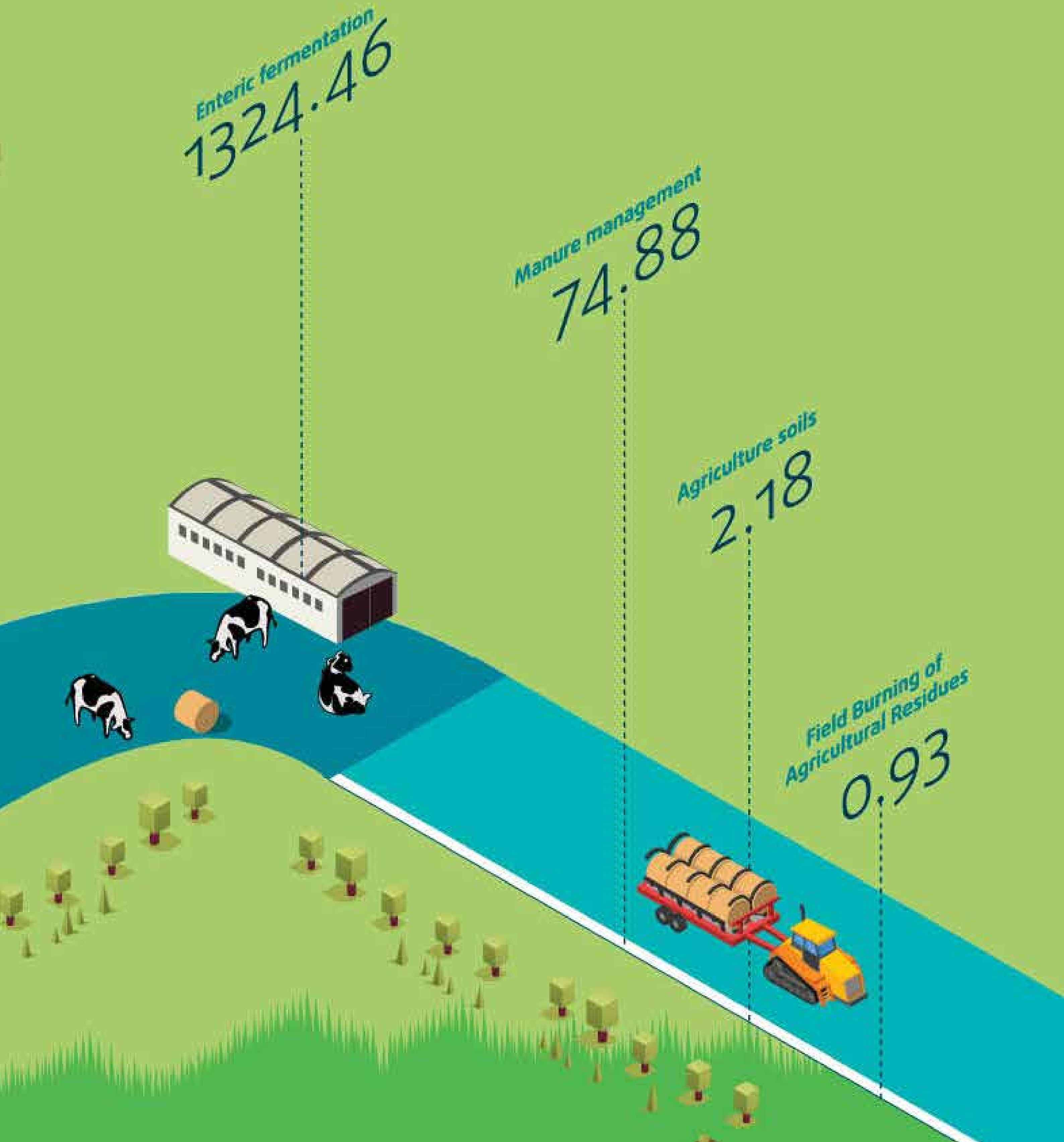


HIGHEST VALUE
1552,60
LOWEST VALUE
1130,86
2000
2009
2005 Co2 eq. Direct Emissions (Gg)
1,403.8

Direct CO_2 eq. Emissions from Agriculture and Livestock

Year 2005 - Values in Gg

Agriculture is one of the key sectors of the economy as it provides employment to about half of the population. Gaps in calculation of total GHG emissions for the Agriculture sector are due to the lack of accurate data for some crops like soybeans, tobacco, sunflower, foregoes, vegetables and beans



As seen in Table 2.10, the amounts of greenhouse gases emitted from agriculture are apparently decreasing, probably due to a reduction in the total number of animals during the reporting period. Around 94.65% of CH_4 gases are emitted by the livestock sector during enteric fermentation and manure management. Enteric fermentation refers to the fermentation of feed as part of the normal digestive processes of livestock. Specifically, the emissions factors are based on the animal average energy requirement, average feed intake to satisfy their energy requirements and the quality of the feed consumed.

Manure management refers to capture, storage, treatment and utilization of animal manure in an environmentally sustainable manner. It can be retained in various holding facilities. Animal manure (animal waste) can occur in a liquid, slurry or solid form. Dry systems included activities such as spreading the manure daily, dry feedlots, solid storage, and unmanaged manure from pasture livestock. Liquid systems are often found in intensive livestock management systems, which occur through manure practices using tanks or lagoons for storage. These systems create ideal anaerobic conditions. The most substantial manure emissions are associated with confined animal management operations, where manure is handled in liquid-based systems.

Animal waste is utilized by distribution on fields in amounts that enrich soils without causing water pollution or unacceptable high levels of nutrient enrichment. Manure management is a component of nutrient management. Methane gases constitute around 5.35% of the total methane emitted from the livestock sector.

Livestock manure emits methane (CH_4) emissions from enteric fermentation and both CH_4 and nitrous oxide (N_2O) under anaerobic (oxygen-less) conditions. This is because the organic material within the manure begins to be decomposed by anaerobic bacteria; the results of this decomposition include methane, carbon dioxide, and stabilized organic material.

Production of N_2O during storage and treatment of animal wastes can occur via combined nitrification – de-nitrification of nitrogen contained in the wastes. The amount of N_2O released depends on the system and duration of waste management.

Agricultural activities such as the cultivation of crops and livestock for food contribute to emissions in a variety of ways: Various management practices for agricultural soils can produce nitrous oxide (N_2O) emissions. There are a large number of activities that can contribute to N_2O emissions from agricultural lands, which range from fertilizer application to methods of irrigation and tillage.

Management of agricultural soils accounts for about half of the emissions from the Agriculture sector (Figure 2.24). Smaller sources of emissions include burning crop residues, which produce N_2O (Figure 2.25). Emissions of three gases CO_2, CH_4 and N_2O from agriculture sector are presented in Figure 2.26, as can be seen, Methane is the main gas, others are not significant. The total GHG emissions from all agricultural sub sectors are presented in Figure 2.27.

Figure 2.24 N_2O emissions from Agricultural Soil during the period 2000 - 2009 (Gg)

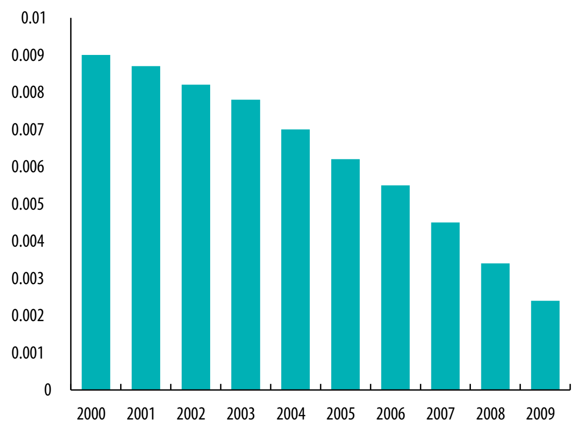


Figure 2.25 N_2O emissions from field burning of agricultural residues Gg) for the period 2000 - 2009

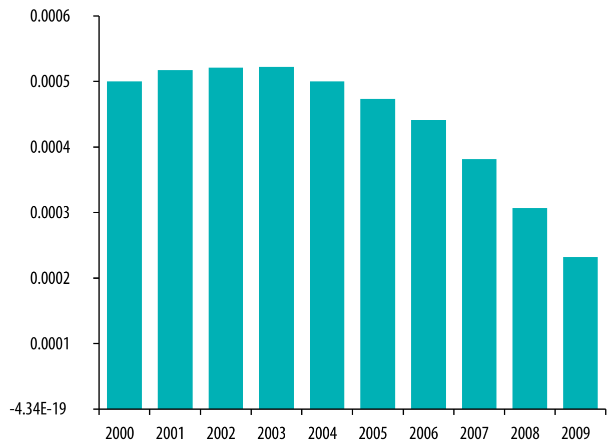
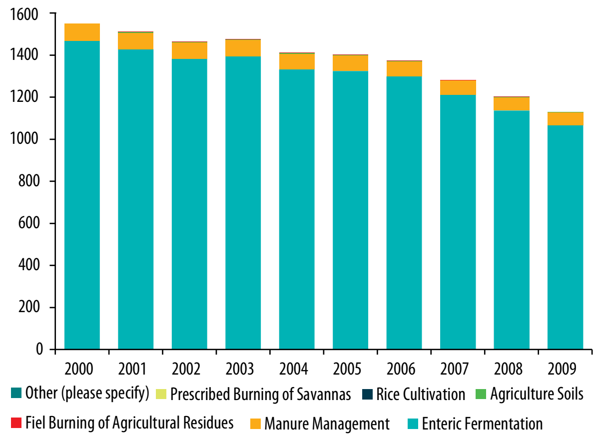


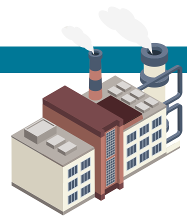
Figure 2.26 GHG emissions in CO_2 eq. from Agriculture sub-sectors, 2000 - 2009 (Gg)

Figure 2.27 Total emissions in CO_2 eqv. from Agriculture sub-sectors, 2000 - 2009 (Gg)



2.8 INDUSTRY SECTOR EMISSIONS

2.8.1 Industrial Processes Sector GHG emissions



Significant improvement of economic activity in some branches of industry arose from an increasing foreign and national demand for Albanian products and their higher prices in international markets while the national currency remained stable. This was reflected in the growth in industrial exports and sales at home. Industrial sector sales accelerated their annual growth rate in a stable manner, registering an approximate annual average growth of above 5%, especially metal production and the cement industry. This increase was triggered mainly by accelerated sales growth in the extracting industry. Figures 2.28 - 2.33 show the emissions from the main industrial subsectors.

The Industrial sector emissions have been increasing due to accelerated annual growth rate of metal and cement production

Emission Factors and Conversion Factors were taken from the IPCC Guidelines for National Greenhouse Gas Inventories, and applied to Albania's condition for each industrial sub sector, while the activity data for each were gathered either from environmental permits (plant's specific data) or from the ministry in charge of the industry sector.

Figure 2.28 CO_2 eq. emissions from whole industrial sub-sectors, 2000 - 2009 (Gg)

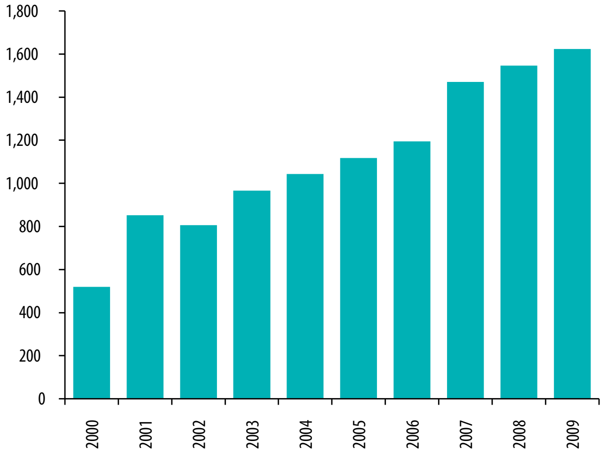


Figure 2.29 CO_2 eq. emissions from Other Ind. Processes (excl. lime and cement), 2000 - 2009 (Gg)

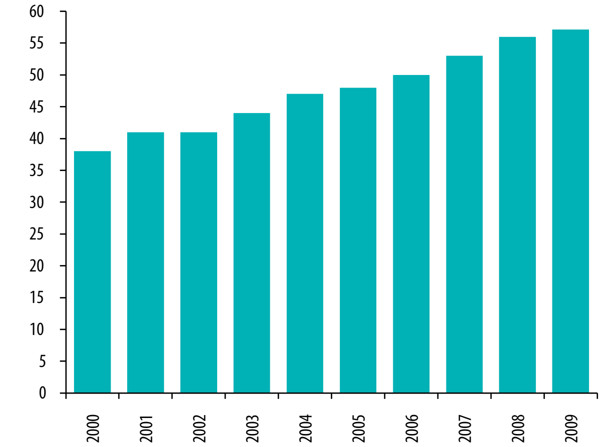


Figure 2.30 CO_2 eq. emissions from Lime Products, 2000 - 2009 (Gg)

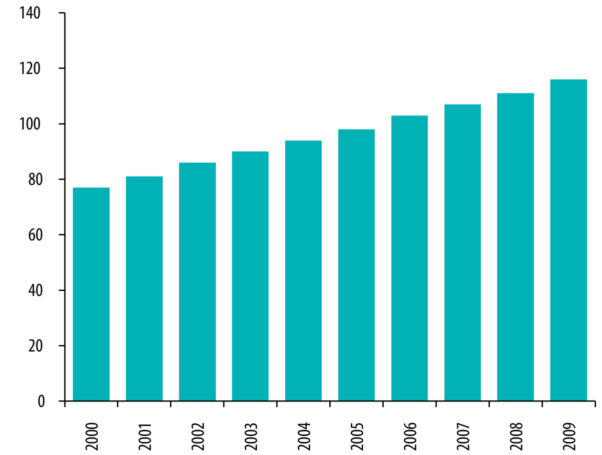


Figure 2.31 CO_2 eq. emissiosn from Cement Production, 2000-2009 (Gg)

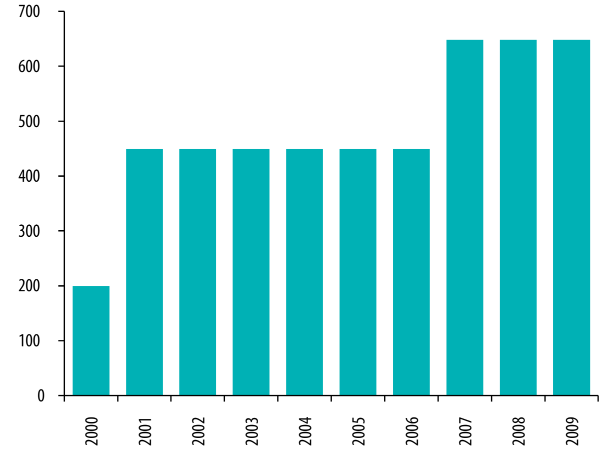


Figure 2.32 CO_2 eq. emissions from Chemical Industry, 2000 - 2009 (Gg)

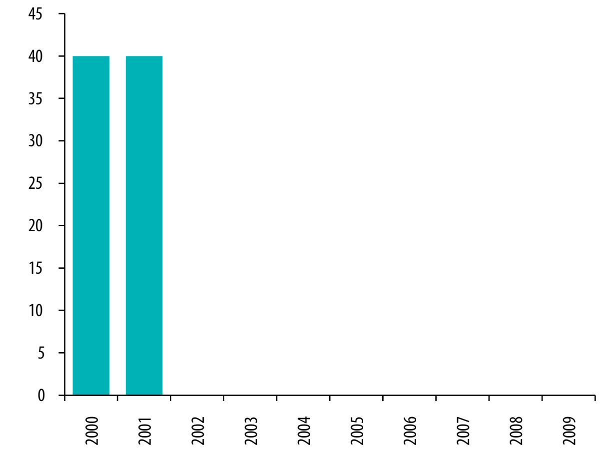
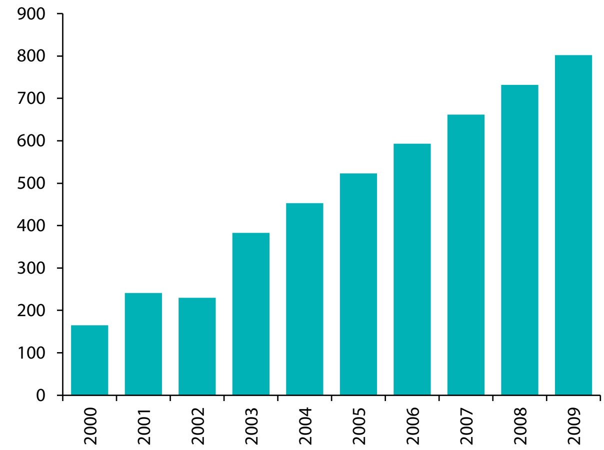


Figure 2.33 CO_2 eq. emissions from Metal Production, 2000 - 2009 (Gg)



The main sources of emissions were the cement industry, followed by metal production. In 2000, CO_2 emissions from cement production were 200 Gg or about 38.46% of total CO_2 eq. emissions from the industry sector (as shown in the Figures 2.34-2.35), while in 2009 the emissions reached 648 Gg or about 39.32% of total. This conclusion brings into attention the need for more precise activity data to lower the uncertainty level for this sector, which makes a high contribution to the Industry sector in Albania. This requires a deeper analysis of cement plants in Albania to obtain direct activity data. The second sub-sector with fewer emissions, but with the highest growth rate, is metal production: in 2000, CO_2 emissions were 165 Gg or about 31.73% of total CO_2 eq. emissions from the industry sector, meanwhile in 2009 this figure increased to

802 Gg or about 47.15% % of total (the year they reached the first position of emitters).

Figure 2.34 CO_2 eq. emissions from Industrial Sub-sectors, 2000 - 2009 (Gg)

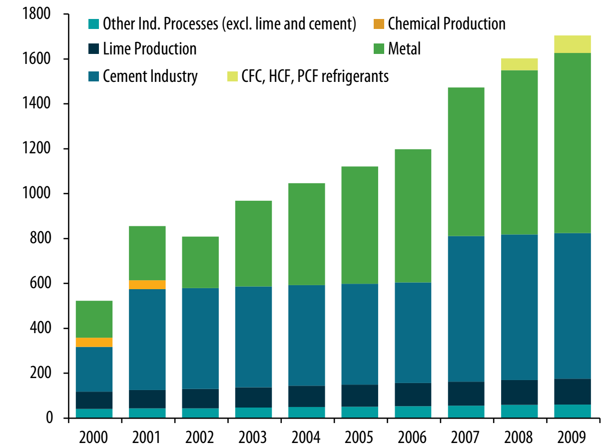


Figure 2.35 CO_2, eq. emissions from Industrial sub-sectors, 2000 - 2009 (%)

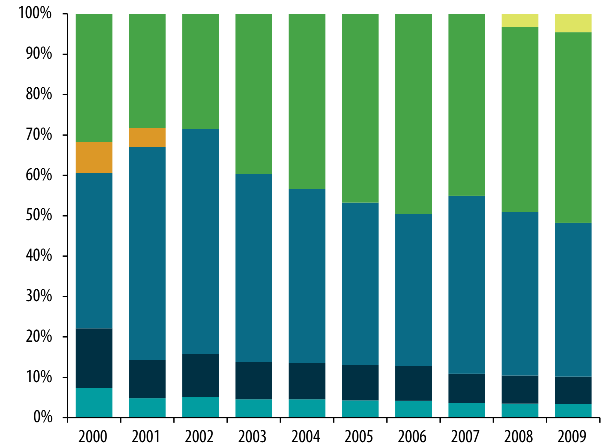
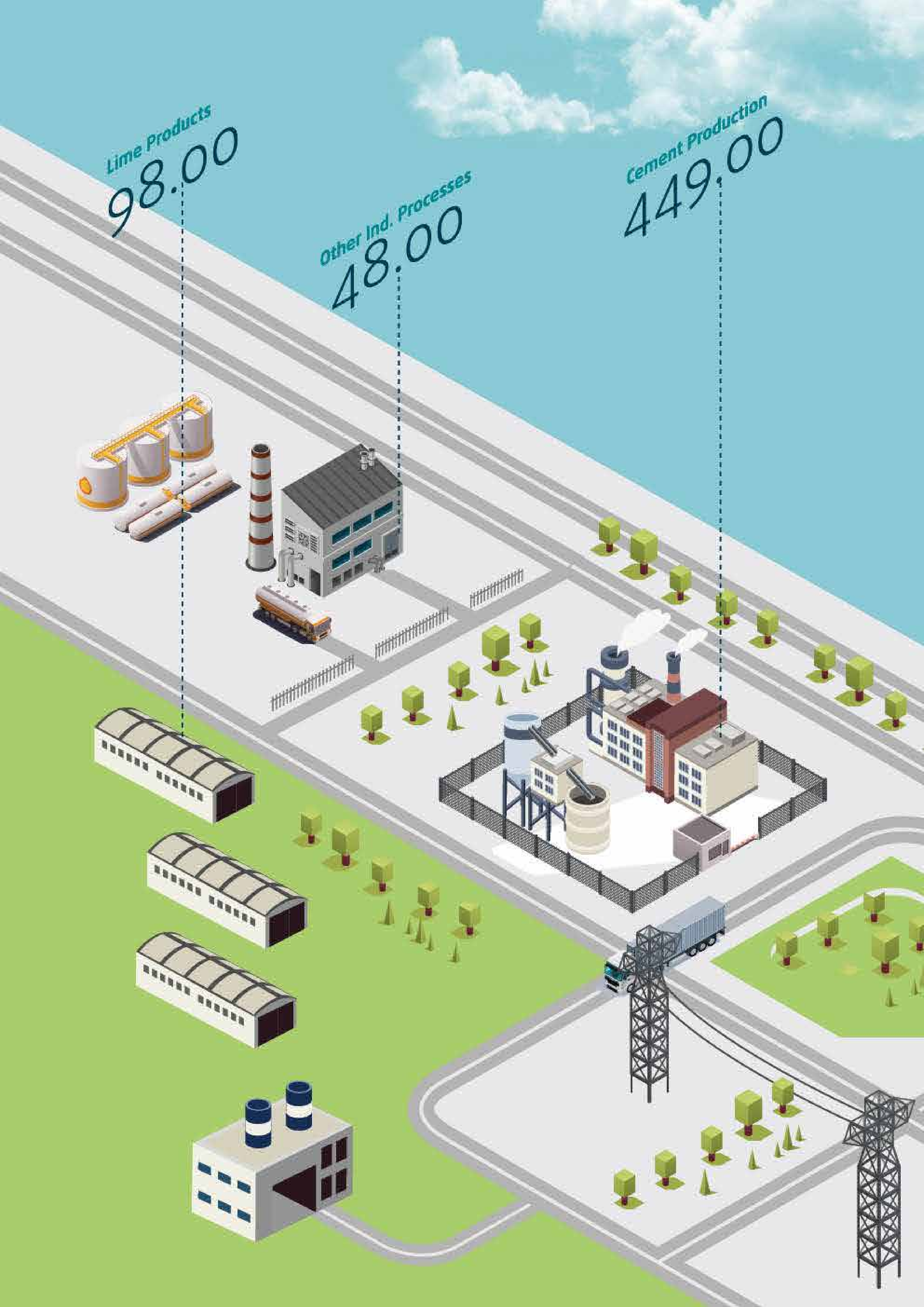


Table 2.11 provides the contribution of the individual industrial sub-sectors in the GHGs emissions coming from the industrial processes sector.

Table 2. 11: Contribution of individual industrial sub-sectors in GHGs emissions (Gg)

Sub sectors	Gases	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Whole Industrial Sub-Sectors	CO_2	520.00	852.00	806.00	966.00	1,043.00	1,118.00	1,195.00	1,470.00	1,547.00	1,623.12
	CH_4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	N_2O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CFC, HCF, PCF refrigerants	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	52.00	78.00
	CO_2 eq.	520.00	852.00	806.00	966.00	1,043.00	1,118.00	1,195.00	1,470.00	1,599.00	1,701.12
Other Ind. Processes (excl. lime and cement)	CO_2	38.00	41.00	41.00	44.00	47.00	48.00	50.00	53.00	56.00	57.12
	CH_4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	N_2O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CO_2 eq.	38.00	41.00	41.00	44.00	47.00	48.00	50.00	53.00	56.00	57.12
Lime Products	CO_2	77.00	81.00	86.00	90.00	94.00	98.00	103.00	107.00	111.00	116.00
	CH_4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	N_2O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CO_2 eq.	77.00	81.00	86.00	90.00	94.00	98.00	103.00	107.00	111.00	116.00
Cement Production	CO_2	200.00	449.00	449.00	449.00	449.00	449.00	449.00	648.00	648.00	648.00
	CH_4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	N_2O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CO_2 eq.	200.00	449.00	449.00	449.00	449.00	449.00	449.00	648.00	648.00	648.00
Chemical Industry	CO_2	40.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CH_4	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	N_2O	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CO_2 eq.	40.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Metal Production	CO_2	165.00	241.00	230.00	383.00	453.00	523.00	593.00	662.00	732.00	802.00
	CH_4	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	N_2O	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CO_2 eq.	165.00	241.00	230.00	383.00	453.00	523.00	593.00	662.00	732.00	802.00
Others (please specify)	CO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CH_4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	N_2O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CO_2 eq.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CFC, HCF, PCF refrigerants	CFC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	HCF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.06
	PCF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CO_2 eq.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	52.00	78.00



Lime Products
98.00
Other Ind. Processes
48.00
Cement Production
449.00

Direct CO_2 eq. Emissions from Industrial Processes

Year 2005 - Values in Gg

The Industrial sector emissions have been increasing due to accelerated annual growth rate of metal and cement production. The main sources of emission are the cement industry, followed by metal production.

2.8.2 Use of CFC, HCF, PCF refrigerants, and their related GHG emissions

The activity data for the period 2000 to 2009, show that:

- Albania has never produced HFC or PCF: those substances have always been imported;
- No consumption of HFC or PCF were identified in the fire-protection sector;
- There is no production of HFC or PCF aerosols and solvents;
- There is no foam production using HFC or PCF;

There is only consumption of HFC identified in the refrigeration and air condition sector for the years 2008 to 2009.

- The results of the GHG emissions from the consumption of HFC identified in the refrigeration and air condition sector for the years 2008 to 2009 are as follows:
- Year 2008 - the calculated GHG emissions are 0.04 Gg HCF-134a (equivalent of 52 Gg CO_2)
- Year 2009 - the calculated GHG emissions are 0.06 Gg HCF-134a (equivalent of 78 Gg CO_2)

2.9 WASTE SECTOR EMISSIONS

As activity data for the waste sector is not fully complete, results of the "Waste characterization survey" were considered.

The activity data for the waste sector were gathered mainly from the "Annual register of urban and inert waste production according to municipalities and districts". However, these data were not fully compliant with the needs of the GHG inventory due to:

- Lack of measurements/registration of daily amount of the waste production;
- Contradictory data with regard to the population figures registered by the Institute of Statistics (INSTAT) and figures declared by Municipalities;
- Lack of solid waste data produced by several industries/private enterprises on steel and ferro-chromium, food, cement, textile, leather processing/leather confection, tyre industry (especial in re-treading of used tyres), plastic, and detergents.

To help with estimations, the results of the "Waste characterization survey[19]" were also taken into consideration to provide a national waste profile in accordance with the European Commission SWA-Tool - Methodology for the Analysis of Solid Waste (March 2004).

Disposal and treatment of municipal and industrial wastes produce the following GHG emissions:

- CH_4 emissions from solid waste disposal: in Albania the solid wastes are disposed through open dumping (landfill) without inclusion of methane recovery systems. Therefore methane is the highest emitter in this sector;
- CO_2 emissions from waste incineration: in Albania there are no plants for solid waste incineration, therefore there are no carbon dioxide emissions from the waste sector;
- N_2O emissions from human sewage and domestic/industrial wastewaters handling: in Albania wastewater is managed without prior handling and/or treatment systems so only people living in urban areas are considered to obtain the related N_2O emissions. On the other hand, industrial wastewater have been included when calculating N_2O emissions

19 The waste characterization survey was carried out in accordance with the European Commission SWA-Tool - Methodology for the Analysis of Solid Waste, (March 2004), which provides a methodology for determining a national waste profile i.e., generation of a sampling plan that will provide nationally representative samples, and extrapolation of the results obtained to national level. The methodology also takes account of the following international guidance documents:

- European Commission - Development of a Methodological Tool to Enhance the Precision & Comparability of Solid Waste Analysis Data,
- European Standard EN 14899 - "Characterization of waste - Sampling of waste materials - Framework for the preparation and application of a Sampling Plan".

for the period 2000 – 2009. A small share of domestic wastewater is collected in sewer systems, with the remainder ending up in river discharge. Some industrial wastewater may be discharged into municipal sewer lines where it combines with domestic wastewater.

During 2000 – 2009, sewer systems were present only in Albania's main cities. Their primal purpose is to convey waste water out of the cities limits. By the end of 2009, two other small waste water treatment systems had become functional, but the fraction of domestic waste water treated does not influence the outcome of the default river discharge method[20].

Table 2.12 gives the contribution of individual subsectors to GHG emissions in the waste sector, while Table 2.13 gives the contribution of individual GHGs to total emissions from the waste sector.

Table 2.12: Contribution of individual waste subsectors to GHG emissions (Gg)

Sub-sectors	Gasses	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Whole Waste Sector	CO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	N_2O	0.27	0.27	0.27	0.27	0.28	0.28	0.28	0.28	0.28	0.28
	CH_4	24.14	24.24	24.19	24.65	26.69	26.96	30.30	30.66	29.08	35.28
	CO_2 eq.	590.64	592.74	591.69	601.35	647.29	652.96	723.1	730.66	697.48	827.68
Solid Waste Disposal on Land	CO_2	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	N_2O	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CH_4	20.66	20.74	20.7	21.11	23	23.42	26.71	27.04	25.47	31.68
	CO_2 eq.	433.86	435.54	434.7	443.31	483	491.82	560.91	567.84	534.87	665.28
Wastewater Handling	CO_2	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	N_2O	0.27	0.27	0.27	0.27	0.28	0.28	0.28	0.28	0.28	0.28
	CH_4	3.48	3.5	3.49	3.54	3.69	3.54	3.59	3.62	3.61	3.6
	CO_2 eq.	156.78	157.2	156.99	158.04	164.29	161.14	162.19	162.82	162.61	162.4
Waste Incineration	CO_2	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	N_2O	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CH_4	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CO_2 eq.	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Other (please specify)	CO_2	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	N_2O	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CH_4	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	CO_2 eq.	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Table 2.13: Contribution of the individual GHGs gases (Gg) and their total CO_2eq in the waste sector

GHGs	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
CO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N_2O	0.27	0.27	0.27	0.27	0.28	0.28	0.28	0.28	0.28	0.28
CH_4	24.14	24.24	24.19	24.65	26.69	26.96	30.30	30.66	29.08	35.28
CO_2 eq.	590.64	592.74	591.69	601.35	647.29	652.96	723.1	730.66	697.48	827.68

20 The river discharge method measures the emissions from untreated water. The amount of waste water treated by the two small treatment plants is very small in comparison to other untreated waste water. The reduction of emissions as a result of the functioning of these two small treatment plants is too small in comparison to the emissions from the untreated waste water.

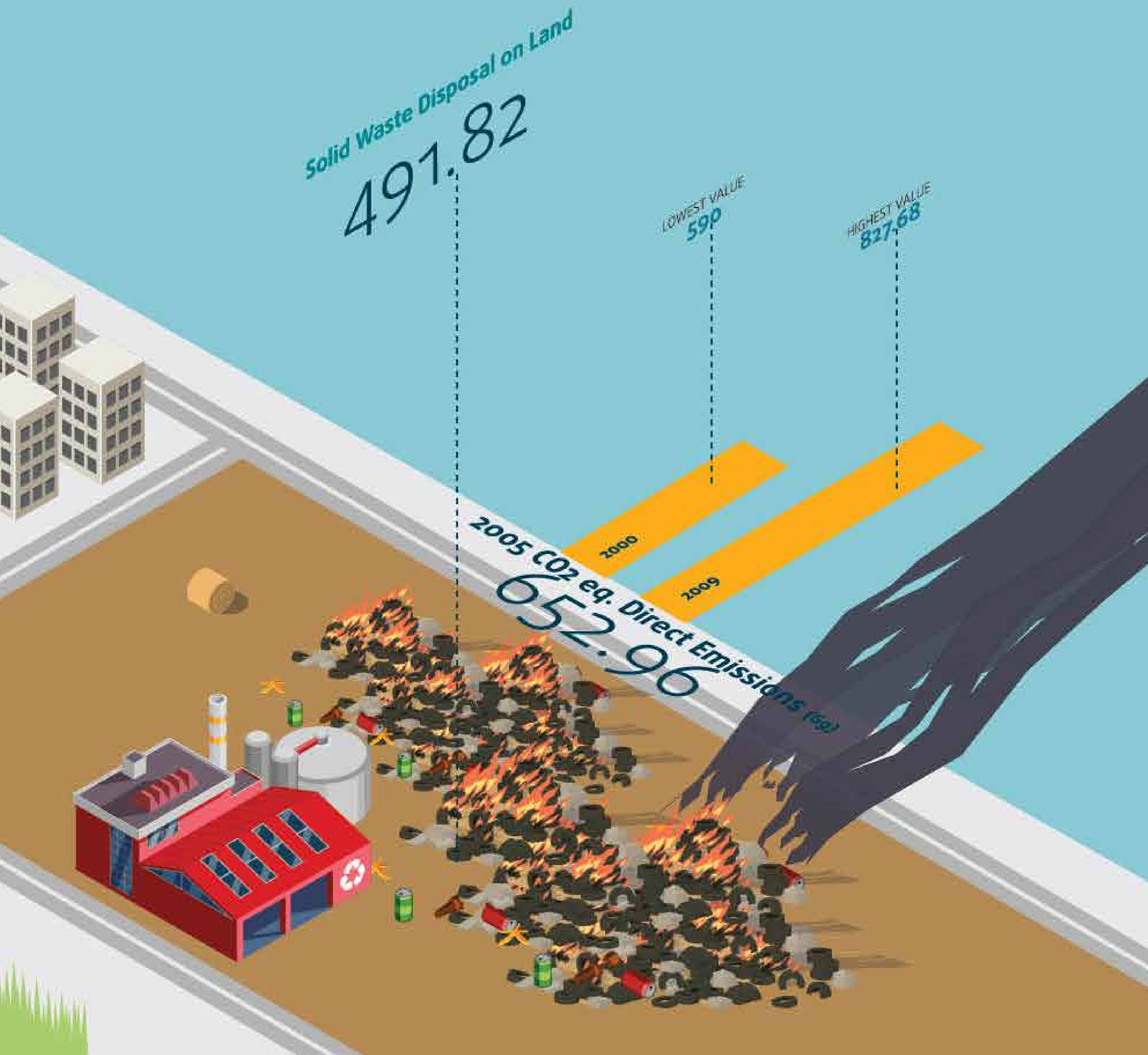

Wastewater Handling
161.14
Lack of measure of daily amount
of the waste production

Direct CO_2 eq. Emissions from Waste and Wastewater

Year 2005 - Values in Gg

As activity data for the waste sector is not fully complete, results of the "Waste characterization survey" were considered.

Data lacking for Measurement



Methane emissions for the analysed period (2000 - 2009) are increasing for solid waste disposal on land, ranging from 24.14 Gg in 2000 to 35.8 Gg in the year 2009. Nitrous oxide emissions for the whole analysed period (2000 - 2009) are also increasing for wastewater handling, ranging from 0.272 Gg in 2000 to 0.28 Gg emission in the year 2009 (Figures 2.36 and 2.37).

Figure 2.36 CH_4 emissions from Solid Waste Disposal on land subsector, 2000 - 2009 (Gg)

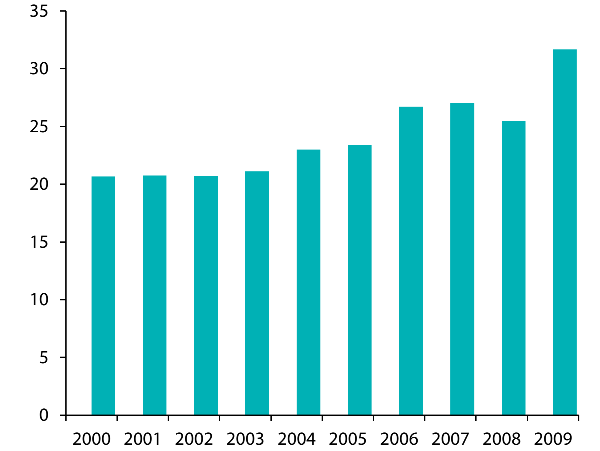
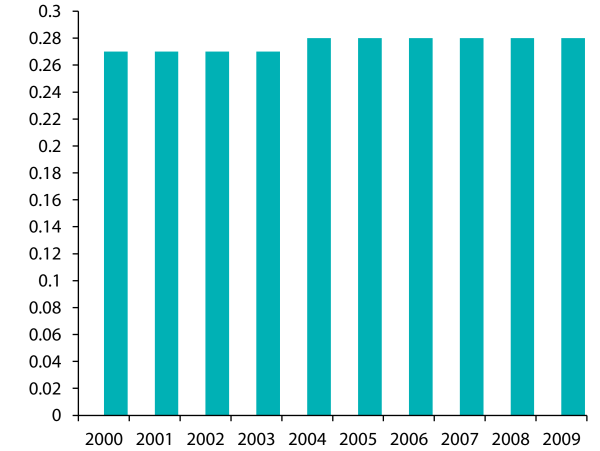


Figure 2.37 N_2O emissions from Wastewater handling subsector, 2000 - 2009 (Gg)



Methane emissions from wastewater handling are also increasing from 3.48 Gg in 2000 to 3.6 Gg emissions in 2009 (Figure 2.38).

It is obvious (Figure 2.39) that the highest amount of GHG emissions in the Waste Sector are methane emissions (more than 80.38% from the total emissions for the year 2009), compared to smaller amounts of N_2O emission (less than 19.62%, calculated as CO_2 eq.).

Figure 2.38 CH_4 emissions from Wastewater handling subsector, 2000 - 2009 (Gg)

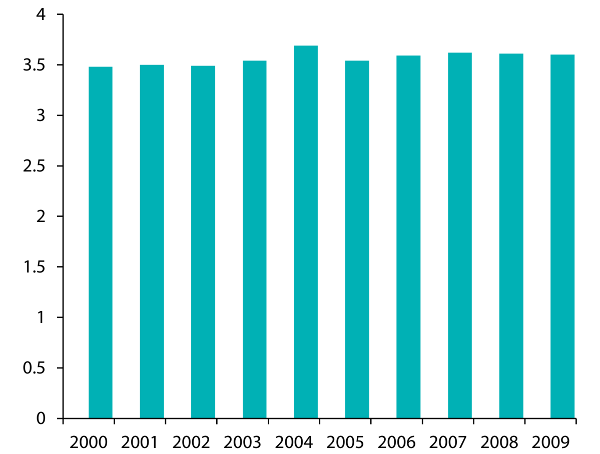
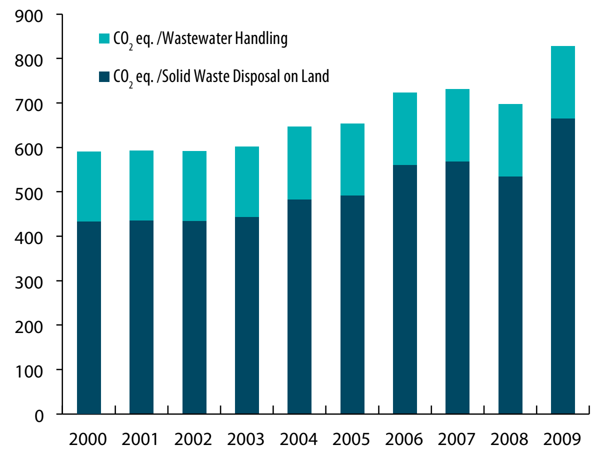


Figure 2.39 CO_2 eq. emissions from Waste subsectors, 2000 - 2009 (Gg)



2.10 KEY SOURCE ANALYSIS

Table 2.14 presents the main categories of GHG emissions expressed in Gg for each gas and also expressed in CO_2 eq.

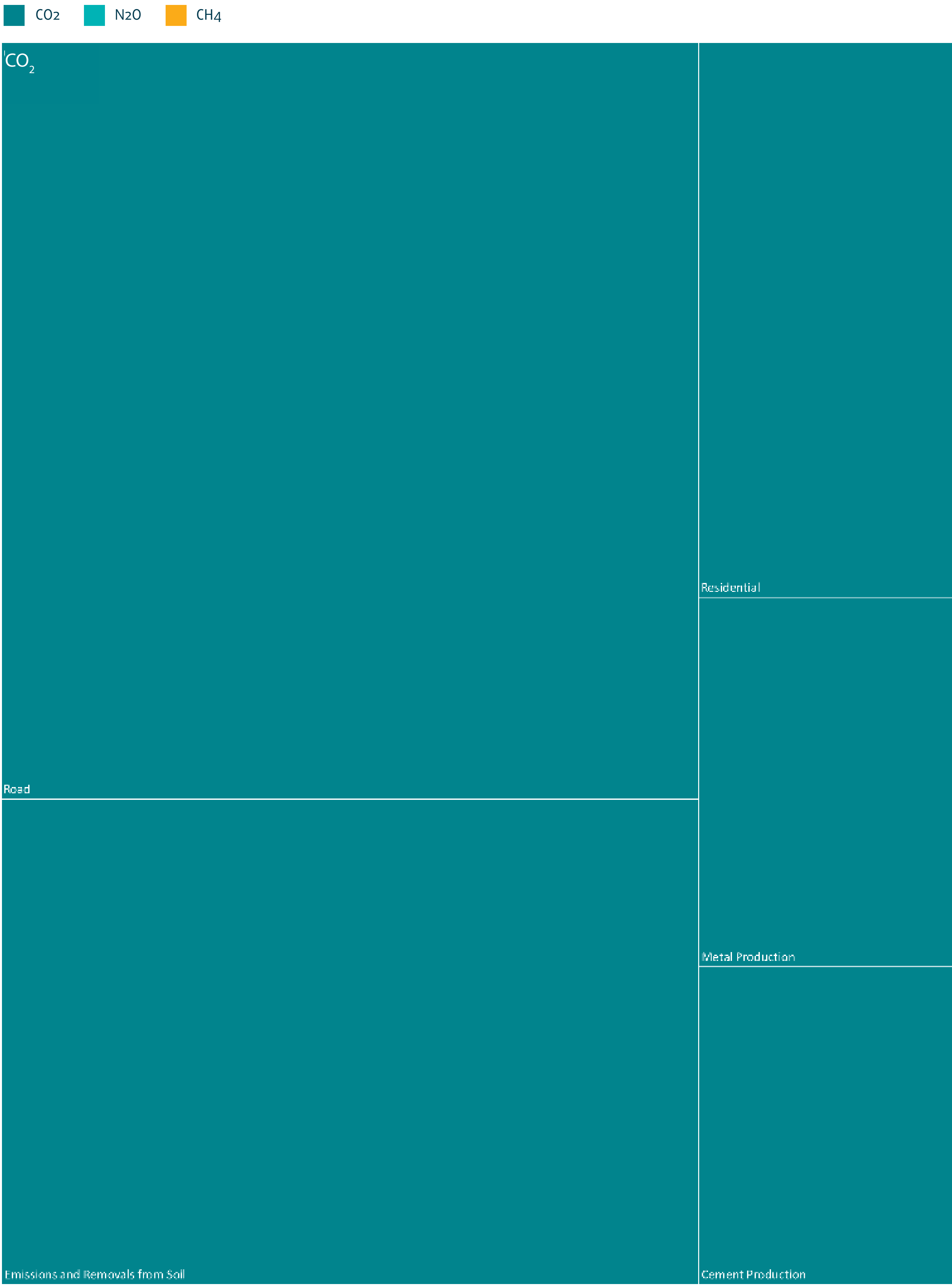
Table 2.14: Main categories of GHG emissions expressed in Gg

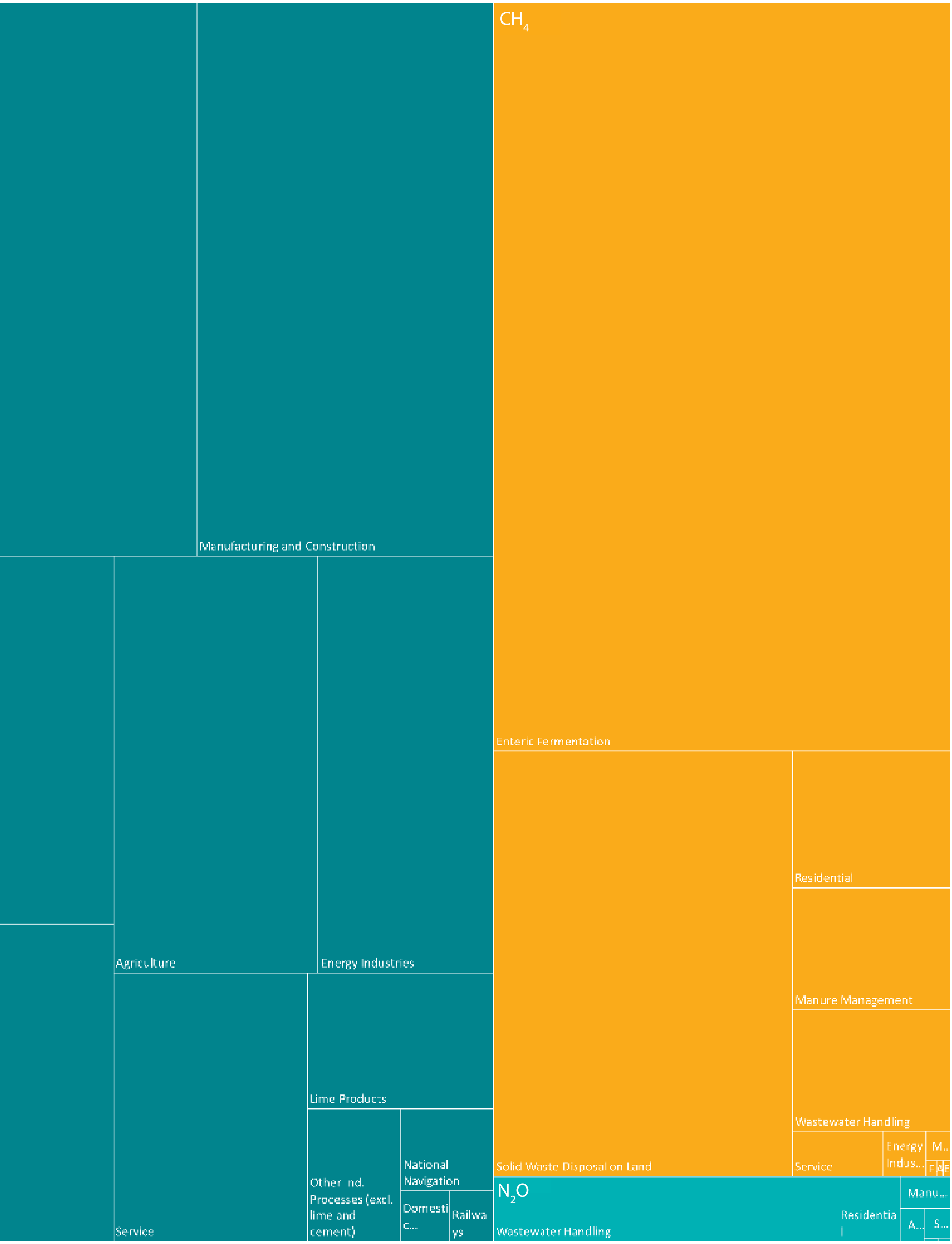
Nr	Emission category	Amount (Gg)	
		per gas	as CO2 eq.
1	CO_2 from Road	2,033.52	2033.52
2	CH_4 from Enteric Fermentation	63.07	1324.47
3	CO_2 from Emissions and Removals from Soil	1304	1304.00
4	CO_2 from Residential	632.78	632.78
5	CO_2 from Manufacturing and Construction	484.44	484.44
6	CO_2 from Metal Production	523.00	523.00
7	CH_4 from Solid Waste Disposal on Land	23.42	491.82
8	CO_2 from Cement Production	449.00	449.00
9	CO_2 from Agriculture	231.99	231.99
10	CO_2 from Energy Industries	282.47	282.47
11	CO_2 from Service	122.69	122.69
12	CO_2 from Lime Products	98.00	98.00
13	N_2O from Wastewater Handling	0.28	86.80
14	CH_4 from Residential	3.97	83.37
15	CH_4 from Manure Management	3.56	74.76
16	CH_4 from Wastewater Handling	3.54	74.34
17	CO_2 from Other Ind. Processes (excl. lime and cement)	48.00	48.00
18	CO_2 from National Navigation	29.31	29.31
19	CH_4 from Service	0.75	15.75
20	N_2O from Residential	0.05	15.50
21	CO_2 from Domestic Aviation	9.60	9.60
22	CO_2 from Railways	8.53	8.53
23	CH_4 from Energy Industries-Fugitive	0.36008	7.56
24	N_2O from Manufacturing and Construction	0.02	6.20
25	N_2O from Service	0.01	3.10
26	N_2O from Agriculture Soils	0.01	3.10
27	CH_4 from Manufacturing and Construction	0.13	2.73
28	CH_4 from Field Burning of Agricultural Residues	0.03	0.63
29	CH_4 from Energy Industries	0.02	0.42
30	CH_4 from Agriculture	0.02	0.42
31	N_2O from Field Burning of Agricultural Residues	0.00047	0.15
32	N_2O from Manure Management	0.0004	0.12
33	N_2O from Energy Industries	0.00	0.00
34	CO_2 from Energy Industries-Fugitive	0	0.00
35	N20 from Energy Industries-Fugitive	0	0.00
36	N_2O from Agriculture	0.00	0.00
37	CH_4 from Other Ind. Processes (excl. lime and cement)	0.00	0.00
38	N_2O from Other Ind. Processes (excl. lime and cement)	0.00	0.00
39	CH_4 from Lime Products	0.00	0.00
40	N_2O from Lime Products	0.00	0.00
41	CH_4 from Cement Production	0.00	0.00
42	N_2O from Cement Production	0.00	0.00
43	CH_4 from Metal Production	0.00	0.00
44	N_2O from Metal Production	0.00	0.00
45	CO_2 from Enteric Fermentation	0.00	0.00
46	N_2O from Enteric Fermentation	0.00	0.00
47	CO_2 from Manure Management	0.00	0.00
48	CO_2 from Agriculture Soils	0.00	0.00
49	CH_4 from Agriculture Soils	0.00	0.00
50	CO_2 from Field Burning of Agricultural Residues	0.00	0.00
51	CO_2 from Forest and Grassland Conversion	-6	-6.00
52	CO_2 from Abandonment of Managed Lands	-242	-242.00
53	CO_2 from Changes in Forest and Other Woody Biomass Stocks	658	658
	TOTAL (2005)		**8864.60**

This section on key sources can help to prioritize the use of available time and money in a cost-effective manner. In all inventories, some parameters or source categories will be more important for the inventory calculations than others. A ***key source category*** is one that is prioritized within the national inventory system, because its estimate has a significant influence on a country's total inventory of direct GHGs, in terms of the absolute emissions ***level and trend***. The key source method does not just look at the largest sources, but it also looks at sources that may be small now, but that may become important in the future. It does this by looking at the trend in emissions. A key source analysis for GHG emissions is performed based on IPCC Good Practice Guidance. For most categories, the Tier 1 method is simple to follow and can easily be implemented in a spreadsheet. Accordingly, for the year 2005, the following steps were followed:

1. Expressing the emissions in CO_2-Eq.
2. Ranking the sources from largest to smallest in an Excel Spreadsheet.
3. Expressing the emissions in percentages versus total amount for the year 2005.
4. Adding the emissions starting from the top value, and getting the cumulative ones until reaching 95% (of the total amount for the year 2005).

Main categories of GHG emissions expressed in Gg




Manufacturing and Construction
Agriculture
Energy Industries
Service
Lime Products
Other Ind. Processes (excl. lime and cement)
National Navigation
Domestic...
Railways
CH4
Enteric Fermentation
Solid Waste Disposal on Land
Residential
Manure Management
Wastewater Handling
Service
Energy Indus...
M...
N2O
Wastewater Handling
Residential
Manu...
A...
S...

The categories included in the 95% segment are the key categories Figures 2.40- 2.41 and table 2.15 present all categories ranked from the maximum up to the point they reach 95% of total GHG emissions.

Figure 2.40 GHG Key Source Emissions, 2005 (Gg)

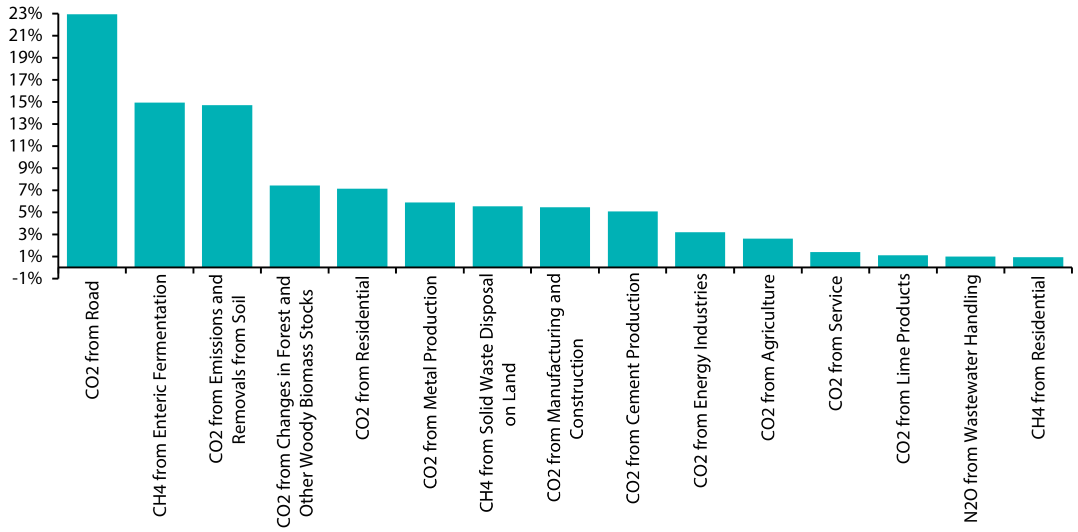
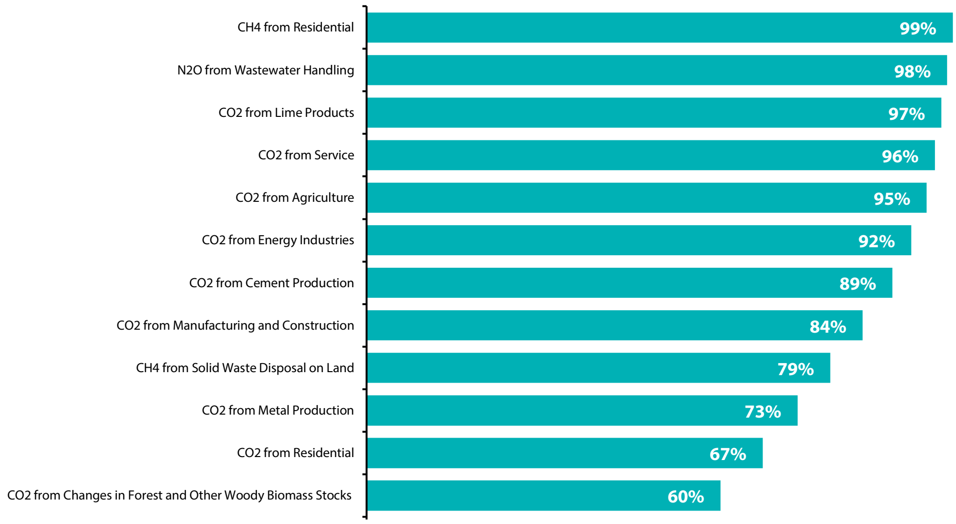


Figure 2.41 GHG Key Sources for the year 2005



Conclusions reached of GHG emissions - key source analysis for the year 2005 are presented in Table 2.15 below.

Table 2.15: GHG key sources for the year 2005

(In Gg)

Nr	Emission category	Per gas	As CO2 eq.	%	Cumulative
1	CO_2 from Road	2,033.52	2033.52	22.9399%	22.94%
2	CH_4 from Enteric Fermentation	63.07	1324.47	14.9412%	37.88%
3	CO_2 from Emissions and Removals from Soil	1304	1304.00	14.7103%	52.59%
4	CO_2 from Changes in Forest and Other Woody Biomass Stocks	658	658.00	7.4228%	60.01%
5	CO_2 from Residential	632.78	632.78	7.1383%	67.15%
6	CO_2 from Metal Production	523.00	523.00	5.8999%	73.05%
7	CH_4 from Solid Waste Disposal on Land	23.42	491.82	5.5482%	78.60%
8	CO_2 from Manufacturing and Construction	484.44	484.44	5.4649%	84.07%
9	CO_2 from Cement Production	449.00	449.00	5.0651%	89.13%
10	CO_2 from Energy Industries	282.47	282.47	3.1865%	92.32%
11	CO_2 from Agriculture	231.99	231.99	2.6170%	94.93%

2.11 UNCERTAINTY ESTIMATION

The uncertainty estimation is an essential element of an emissions inventory to help prioritize efforts to improve the accuracy of inventory. National inventories contain a wide range of emission estimates, varying from carefully measured to order-of-magnitude estimates. The sources of uncertainties are numerous and, generally speaking, it is difficult to estimate all from data analysis. The pragmatic approach suggested by "***Good Practice Guidance and Uncertainty Management in National GHG Inventory"*** is to produce quantitative estimates consisting of using best available estimates, a combination of available measured data and expert judgement. Uncertainties found in inventory source categories vary from a few percentage points to orders of magnitude, and may be correlated, so results obtained by combining uncertainties are approximated.

Uncertainty estimation is an essential element of emissions inventory to help prioritize efforts to improve the accuracy of inventory

The overall national GHG Inventory uncertainty is 9.946% (a little bit higher compared to SNC) due to increase of the activity data from cement and lime stone production industries associated with higher uncertainty of activity level for both sub industrial sectors, while still remains the uncertainty of activity data with regards to self-collected fuel wood from rural areas. For more detailed analyses regarding the full evaluation of uncertainty level for the representative year 2005 see Tables 2.16 – 2.18.

Following the *Good Practice Guidance-GPG and its Tier 1 Approach,* which has been used to undertake uncertainty analysis for GHG Inventory results for the Third National Communication, tables of Uncertainty Calculation and Reporting for CO_2, CH_4 and N_2O are made to especially calculate the level of uncertainty in ***Energy activities, Industrial activities, and Agriculture (Tables 2.16-2.18).***

A Road Map has been proposed to provide a long-term legal framework for data collection from the whole range of energy sources.

Tier 1 estimations of uncertainties by source category suggest using the error propagation equations via Rules A and B, and simple combination of uncertainties by source category to estimate overall uncertainty for any one year. Aggregating the source categories to the level of overall consumption of individual fuels before uncertainties are combined minimizes dependency and correlation. However it should be stressed that CO_2 dominates the total GHG emissions for the years 2000 to 2009: This reduces the effect of any possible correlation.

For most emission factors, or activity data default, uncertainty estimates provided by the Good Practice were used. In order to evaluate the highest possible level of uncertainty most estimates were made using highest limit of IPCC default values recommended by *Good Practice* for quality of activity data and default of emission factors used in an GHG Inventory. However, where possible, efforts were made by expert judgments to provide more realistic values of activity data uncertainty.

The total CO_2 emissions from the waste sector were reported to be zero. However the Management of Solid Waste (MSW) over the time period 2000 to 2009 relies mostly on uncontrolled dumpsites. Intentional or unintentional fires occur occasionally at these dumpsites. As a result of these uncontrolled fires on the mass of MSW some CO_2 is released. There is no way to give an estimate of these releases due to the unpredictability of the event or to their frequency and extent.

There are fourteen sectors where expert judgments have provided estimates of a slightly lower value than the highest limit of IPCC default values (energy consumption by industry, by service, by road transport, by thermal power plant, by district heating plant, chemical industry, metal production and land-use and forestry for CO_2 production; manure management, agricultural soil and land-use and forestry for N_2O production; enteric fermentation, manure management and forest and grass conversion for CH_4 production).

2.13.1 Uncertainty Report for year 2005 (Under the Third National Communication)

See below Table 2.16, Table 2.17 and Table 2.18.

Table 2.16: Uncertainty Calculation and Reporting (CO_2)

CO2 : Tier 1 Uncertainty Calculation and Reporting

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	IPCC Source category	Gas	Base year emissions	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor	Uncertainty in trend in national emissions introduced by activity data	Uncertainty introduced into the trend in total national emissions	Emision factor quality indicator	Activity data quality indicator	Expert judgement reference number	Footnote reference number
			Gg CO2	Gg CO2 equivalent	%	%	%	%						Note E	Note E		
1	**Energy**	**CO2**	**3835.33**	**3835.33**													
1A	**Fuel combustion**	**CO2**	**3835.33**	**3835.33**													
1A1,2	Emission from stationary combustion Energy Industries, Manufacturing Industries and Construction	CO2	484.44	484.44	15	10	18.03	1.31						D	D		
1A3	Transport	CO2	2080.96	2080.96	15	10	18.03	5.63						D	D		
1A4	Other sectors	CO2	987.46	987.46	15	10	18.03	2.67						D	D		
1B	Fugitive Emissions from Fuels	CO2	0.00	0.00	15	15	21.21	0.00						D	D		
2	**Industrial Processes**	**CO2**	**1118.00**	**1118.00**													
2A	**Mineral Products**	**CO2**	**48.00**	**48.00**													
2A1	Cement Production	CO2	449.00	449.00	15	20	25.00	1.68						D	D		
2A2	Lime Production	CO2	12.00	12.00	15	20	25.00	0.04						D	D		
2B	Chemical Industry	CO2	0.02	0.02	15	20	25.00	0.00						R	R		
2C	Metal Production	CO2	523.00	523.00	15	10	18.03	1.41						D	R		
3	**Solvent and Other Product Use**	**CO2**	**0.00**	**0.00**													
4	**Agriculture**	**CO2**	**0.00**	**0.00**													
5	**Landuse Changes and Forestry**	**CO2**	**1715.00**	**1715.00**	**30**	**30**	**42.43**	**10.91**						**D**	**R**		
6	**Waste**	**CO2**	**0.00**	**0.00**								**D - IPCC source data deufault**					
	TOTAL	**CO2**	**6668.33**	**6668.33**				**12.82**				**M - Mesurement based**					
Total uncertainty estimation of GHG Inventory in %		**9.946**										**R - National refernced data**					

Table 2.17: Uncertainty Calculation and Reporting (CH_4)

CH4 : Tier 1 Uncertainty Calculation and Reporting

	IPCC Source category	Gas	Base year emissions	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncer-tainty	Uncertainty introduced into the trend in total national emissions	Emission factor quality indicator	Acivity data quality indicator	Expert judgment reference number	Footnote reference number
			Gg CO2	Gg CO2 equivalent	%	%	%	%	%	%				Note E	Note E		
1	**Energy**	**CH4**	**4.99**	**104.79**													
1A	**Fuel combustion**	**CH4**	**4.99**	**104.79**													
1A1,2	Energy Indystries, Manfacturing Industries and Construction	CH4	0.13	2.73	15	50	52.20	0.07						D	D		
1A3	Transport	CH4	0.09	1.89	15	10	18.03	0.02						D	D		
1A4	Other sectors	CH4	4.74	99.54	15	40	42.72	1.99						D	D		
1B	**Fugitive Emissions from Fuels**	**CH4**	**0.36**	**7.54**	**15**												
1B1	Solid Fuels	CH4	0.16	3.45		50	50.00	0.08						D	D		
1B2	Oil and Natural Gas	CH4	0.19	4.09		20	20.00	0.04						D	D		
2	**Industrial Processes**		**0.00**	**0.00**													
2A	**Mineral Products**	**CH4**	**0.00**	**0.00**													
3	**Solvent and Other Product Use**	**CH4**	**0.00**	**0.00**													
4	**Agriculture**	**CH4**	**66.66**	**1399.86**													
4A	Enteric Fermentation	CH4	63.07	1324.47	10	20	22.36	13.88						D	R		
4B	Manure Management	CH4	0.004	0.08	10	10	14.14	0.00						R	R		
4E	Field Burning of Agricultural Residues	CH4	0.0004	0.0084	20	20	28.28	0.00						D	D		
5	**Landuse Changes and Forestry**	**CH4**	**0.07**	**1.47**			**0.00**										
5B	Forest and Grassland Conversion	CH4	0.07	1.47	35	25	43.01	0.03						D	R		
6	**Waste**	**CH4**	**26.96**	**566.16**													
6A	Solid Waste Disposal on Land	CH4	26.96	566.16	35	25	43.01	11.41				D - IPCC source data deu		D	D		
	TOTAL	**CH4**	**101.64**	**2134.36**				18.07				M - Mesurement based					
Total uncertainty estimation of GHG Inventory in %		**9.946**										R - National referenced data					

Table 2.18: Uncertainty Calculation and Reporting (N_2O)

	IPCC Source category	Gas	Base year emissions	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions	Emision factor quality indicator	Activity data quality indicator	Expert judgement reference number	Footnote reference number
			Gg CO2	Gg CO2 equivalent	%	%	%	%	%	%				Note E	Note E		
1	**Energy**	**N20**	**0.100**	**31.000**													
1A	**Fuel combustion**	**N20**	**0.100**	**31.000**													
1A1,2	Energy Indystries, Manfacturing Industries and Construction	N20	0.020	6.200	15	50	52.20	2.70						D	D		
1A3	Transport	N20	0.010	3.100	15	10	18.03	0.47						D	D		
1A4	Other sectors	N20	0.060	18.600	15	50	52.20	8.11						D	D		
1B	Fugitive Emissions from Fuels	N20	0.000	0.000	15	0	15.00	0.00						D	D		
2	**Industrial Processes**		**0.003**	**0.794**													
2A	**Mineral Products**	**N20**															
2A1	Cement Production	N20	0.000	0.000													
2A2	Lime Production	N20	0.000	0.000													
2B	Chemical Industry	N20	0.001	0.434		0		0.00						D	D		
2C	Metal Production	N20	0.000	0.000													
3	**Solvent and Other Product Use**	**N20**	**0.000**	**0.000**													
4	**Agriculture**	**N20**	**0.010**	**3.100**													
4B	Manure Management	N20	0.001	0.273	25	50	55.90	0.13						D	R		
4D	Agricultural Soils	N20	0.002	0.620	25	25	35.36	0.18						D	R		
4F	Field Burning of Agricultural Residues	N20	0.001	0.306	20	20	28.28	0.07						D	D		
5	**Landuse Changes and Forestry**	**N20**	**0.004**	**1.240**	**20**	**30**	**36.06**	**0.37**						**D**	**R**		
6	**Waste**	**N20**	**0.280**	**86.800**	**35**	**50**	**61.03**	**44.24**				**D - IPCC source data de**		**D**	**D**		
	TOTAL	**N20**	**0.386**	**119.750**				**45.06**				**M - Mesurement based**					
Total uncertainty estimation of GHG Inventory in %		**9.946**										**R-National refernced data**					

2.12 LESSONS LEARNED FROM CHALLENGES ENCOUNTERED AND RECOMMENDATIONS

The following section describes the methodologies applied for filling data gaps used for almost all sectors. These methodologies can be used at a later stage, likely under the preparation of a biannual GHG Inventory, which is expected to start soon. The proposed methodology is the object of further adjustments and improvement, based on experiences from other countries, proposals and methodologies developed under a previous regional project on GHG inventories and TNC. Approaches used successfully were the following:

- *Interpolation and extrapolation* were used for filling different data gaps where possible, and were found to give reliable results;
- *Data* and *inventories* produced under *other domestic and international projects* (studies) in the framework of other international agreements to which Albania is a Party, in the field of environmental protection as well as in the field of energy/transport, agriculture, land use change and forestry, industry and solvents:
    - The Energy Efficiency Action Plan and RES Action Plan also have been used for calibrating different activities data for the energy and transport sector.
    - NAMA Project Document "Financing Mechanism for Energy Efficiency in Buildings (Energy Efficiency Fund)" to support the implementation of the National Energy Efficiency Action Plan (NEEAP) in the residential, public and commercial sector has been used for calibrating different activity data for energy consumption and the residential and service sector.
    - NAMA Project Document "Fuel switch in the cement sector – use of non-hazardous waste as fuel" has been used for calibrating activity data related to the cement sector.
    - EU Card project IMPAEL - surveys and analysis regarding the composition of Albanian Municipal Waste were used for calibrating activity data related to the waste sector.
- *Other countries' experiences and methodologies* proposed/used in the area of statistical data related to different sectors.
- A biomass survey was carried out to mitigate the uncertainties regarding fuel wood consumption.

2.12.1 Recommendations for future improvement

INSTAT, the State Statistics Office, has responsibility to fully responding to EU requirements for information in all sectors. There is a need to establish a suitable category of disaggregated information/data which can be easily used for the needs of the GHG inventories preparation. Necessary secondary legislation and guidelines should be developed to specify the types of data to be provided, data providers, data collection forms to be used, and procedures and requirements for providing the data to INSTAT, as appropriate, from all relevant economic sectors in terms of climate change.

The Ministry of Energy and Industry has recently prepared a Road Map for the establishment of energy data base/preparation for the National Energy Balances of Albania (Road Map). This will provide a long-term legal framework for data collection from all of Albania's energy sources, including supply, transformation, losses and consumption. Approval and implementation of this Road Map will be an important base for improvement of a GHG Inventory from Energy sector: based on the key source analysis, this will improve about 65% of the total GHG emission categories and will create the basis for preparation of the BURs.

There is a need to develop a data collection system to improve data quality for Albania's vehicle (passenger and freight) road transport stock.

All activity data concerning Industrial Processes for the period 2000 to 2009 were gathered from INSTAT, Customs Office, Ministry of Industry and Energy and Ministry of Environment. The main data gaps for industry were related to cement and lime production for the whole inventory period, as this was the period when the industries were privatized and a large number of large cement factories and small lime production enterprises were emerging on the market. In order to get the correct activity data concerning cement and lime production for the years 2010 to 2015 a pilot survey is proposed in the framework of bi-annual GHG Inventory.

LUCF activity data have data gaps, especially concerning rural areas and fuelwood consumption for energy purposes. A special pilot survey has been carried out for the year 2010-2015, the results of the survey will be utilized in the framework of the Fourth NC and Biennial Update Report (BUR).

Another problem is the lack of cadastre for the whole territory of Albania (waters, pasture, abandoned land, agriculture, bare lands, forests, resident areas, roads, etc.) where relevant changes in land use during the years will be reflected. There is currently no official institution responsible for a national cadastre.

- In relation to monitoring of forested areas there have been afforestation/reforestations programs implemented with different forest species in the country, unfortunately no accurate data exist on the state of these programs. To understand the effectiveness of the afforestation/reforestations programs it is important to monitor those activities in the field, and to provide relevant recommendations to improve the situation when needed
- Although considerable funds are spent on the improvement of forest, no accurate data exist on the change of biomass in the areas resulting from silvi-cultural interventions. Therefore, monitoring is proposed to analyse the effectiveness of silvi-cultural interventions.
- Burnt areas of forest pose a problem associated with determining a GHG inventory for the LUCF sector. This is because the forestry staff are not trained for reporting cadastres of burning and the qualitative and quantitative assessment of forest burnt areas. There is a need to established training programs for those in charge of monitoring burned areas.

A pilot survey is proposed to obtain correct activity data concerning cement and lime production for period 2010-2015, in the framework of the BURs

Planting of fast-growing species is required due to the increasing demand for firewood (as a consequence of the high price of electricity) and the necessity to protect river embankments. The planting of fast growing species (poplar, willow, etc.) is proposed and at certain locations this has already started. These species, in addition to providing firewood, offer protection from floods and soil degradation, and contribute to climate change mitigation.

Improving energy efficiency derived from firewood is important. The majority of consumers of firewood do not know how to efficiently benefit from the use of firewood. Some do not have the necessary equipment (e.g. efficient stoves, appropriate places for firewood storage, etc.), while others do not have relevant knowledge on this issue. Therefore, a public awareness campaign is proposed to be coupled with some pilot demonstration projects of good practice.

Enteric fermentation and manure management figures for each animal category for the years 2000-2009 were gathered from publications from Veterinarian Institute. In order to reduce uncertainty for enteric fermentation and manure management categories it is very important to elaborate a Survey with collaboration of INSTAT. The Survey will help define enteric fermentation and manure management activity data for each animal category of Albania's livestock.

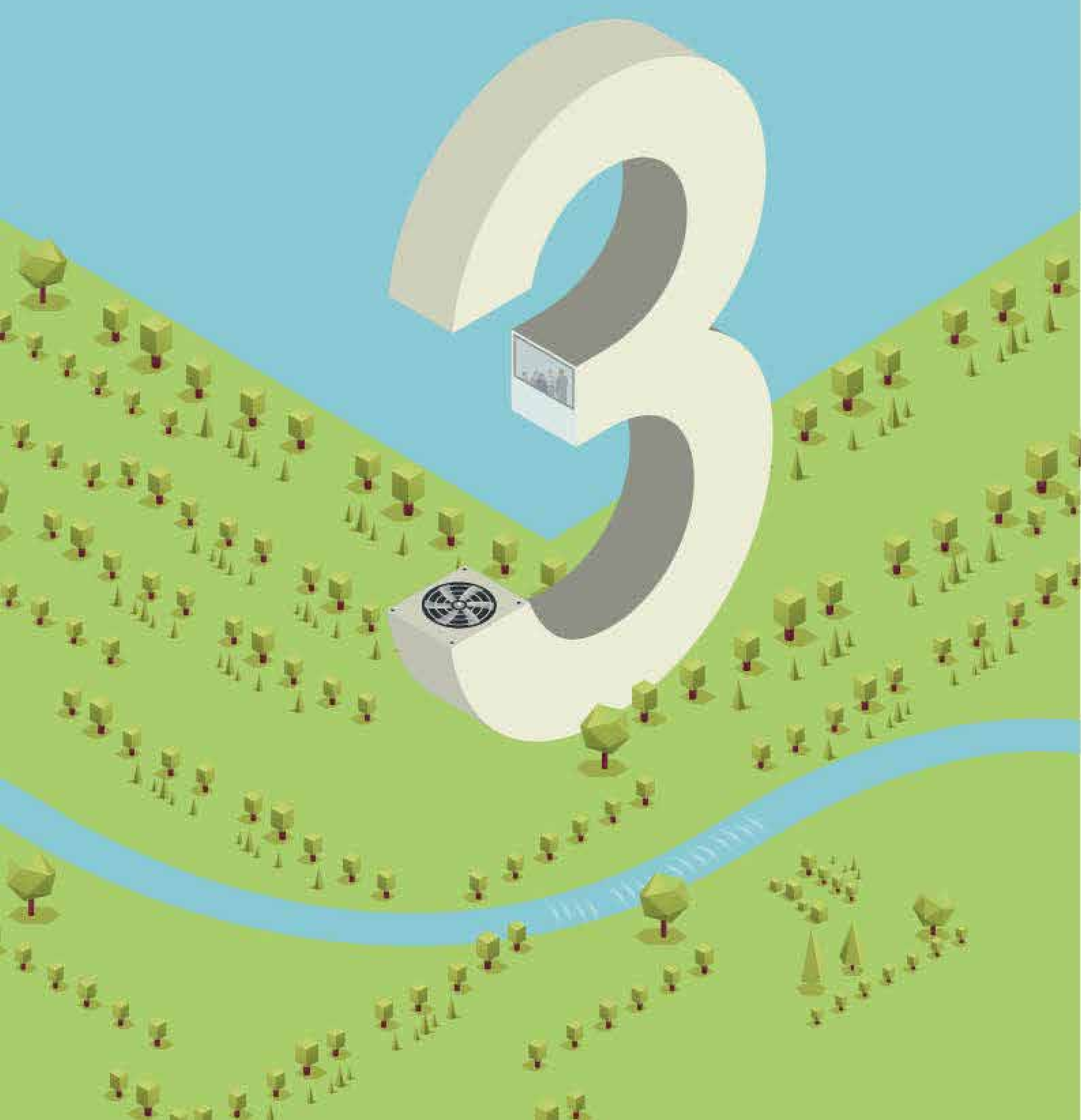
The Municipal Solid Waste data should be based on direct measurements of the incoming flows at each waste collection facility. The measurements should be reported regularly to the regional and national environmental agency in order to process the data further. There is no separate register for waste generation from non-household activities. There should be a register of waste generated by industrial activities of every kind of non-household activity. Related data should contain at least the quantity of waste, its composition, its date of generation and their final destination for disposal.

There is a need to set up a register for waste generated by industrial activities of every kind of non-household activity, and also for waste water quantities, collection and treatment routes.

One of the biggest environmental challenges Albania is facing is to establish a system for the collection and treatment of the waste water. For the time period 2000 to 2009 all waste water emission data were estimated from population figures and the IPCC methodology default values. There is a need to set up a register of waste water quantities, collection and treatment routes. The treatment systems should be reported in detail in order to obtain data on emissions and residues from the treatment process. The register should clearly specify what percentage of the population is served by the respective waste water treatment systems.

Industrial waste water should be reported separately and their treatment systems should be constructed according to the quantities and composition of this waste water. The industrial waste water register should contain data, as a minimum, the quantities, time and location of generation, treatment system technology and respective treatment time and the treated water receiving environment.

GENERAL DESCRIPTION OF STEPS TAKEN OR ENVISAGED TO IMPLEMENT THE CONVENTION



3.1 INTRODUCTION

This chapter presents a short analysis of the UNFCCC, Kyoto Protocol and a number of decisions taken by the CoP of the Convention. Also presented is a summary of best international practices on how to deal with climate change, and a series of recommendations for legislative and institutional reform in Albania in the context of climate change.

As is recognized world-wide, climate change is an emerging governance area that presents a number of challenges for countries and their governments. These challenges are compounded by the struggle faced by many countries to understand climate change science and tools to:

1. Measure greenhouse gas emissions, and identifying corresponding mitigation actions;

2. Assess vulnerability;

3. Evaluate present and future impacts of climate change;

4. Identify the most suitable adaptation options.

Implementation of climate-related legislation can push climate change response up in the political agenda, establish a clear vision and framework for adaption and mitigation mechanisms, as well as putting in place the necessary legal, institutional and financial architecture to translate developed strategies and policies into effective actions. Complicated considerations abound that include how to integrate new institutional structures into existing frameworks, how to ensure any legislation is consistent with and strengthens existing laws, and how to ensure any recommendations fully take account of Albania's current political, social and economic context.

Fortunately, Albania is not alone in grappling with these issues. Accordingly, this chapter provides a summary of available current best practices related to climate change legislation and institutions. Clearly, without a sound legal framework and the necessary institutional architecture to put specific actions into practice, any LEDS or Action Plan on Climate Change cannot with the desired success be translated from paper into practice.

3.2 UNFCCC BACKGROUND

3.2.1 Objectives of the UNFCCC

In 1992, countries joined an international treaty, the United Nations Framework Convention on Climate Change (UNFCCC), to cooperatively consider what they could do to limit average global temperature increases, the resulting climate change, and to cope with whatever impacts were, by then, inevitable. The UNFCCC entered into force on 21 March 1994. Today, it has near-universal membership. One hundred and ninety five countries have already ratified the Convention. The ultimate objective of the UNFCCC, and any other related legal instruments that the Conference of the Parties may adopt, is to achieve, in accordance with the relevant provisions of the Convention, the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. In addition, such level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to inevitable climate change, to ensure that food production is not threatened and to enable sustainable economic development.

The UNFCCC clusters countries into three groups:

- Annex I - Industrialised countries & Economies in Transition (EITs)
- Annex II - Industrialised countries
- Non-Annex I - Developing countries

Based on the group to which any given country is classified, the Convention established different obligations. Albania is a member of Non-Annex I countries, and it is not subject of any mandatory reduction of the GHG emissions.

3.2.2 Kyoto Protocol

The Kyoto Protocol formalized the framework laid out by the UNFCCC and created legally binding individual targets to limit or reduce GHG emissions. In December 1997, 168 countries that were Contracting Parties of the UNFCCC adopted the Kyoto Protocol. The Protocol did not enter into force until February 16, 2005 when the required number of countries representing 55% of GHG emissions ratified the Protocol. The detailed rules for the implementation of the Protocol were adopted at COP 7 in Marrakesh, Morocco in 2001, and are referred to as the "Marrakesh Accords." The first commitment period started in 2008 and ended in 2012.

Although countries subject to obligations for reduction of GHG emissions are encouraged to meet their targets primarily through national measures, the Kyoto Protocol lays out innovative methods for achieving GHG reduction commitments through a number of flexible mechanisms, which include:

- International Emissions Trading.
- Joint implementation (JI).
- Clean Development Mechanism (CDM).

In Doha, Qatar, on 8 December 2012, the "Doha Amendment to the Kyoto Protocol" was adopted. The amendment includes:

- New commitments for Annex I Parties to the Kyoto Protocol who agreed to take on commitments in a second commitment period from 1 January 2013 to 31 December 2020;
- A revised list of greenhouse gases (GHG) to be reported on by Parties in the second commitment period; and
- Amendments to several articles of the Kyoto Protocol that specifically referenced issues pertaining to the first commitment period and which needed to be updated for the second commitment period.

Based on the decision of the Conference of the Parties in Durban in November 2011, the Ad Hoc Working Group on the Durban Platform for Enhanced Action (ADP) was established to develop a protocol, another legal instrument or an agreed outcome with legal force under the Convention, applicable to all Parties that would come into effect and be implemented from 2020.

3.2.3 Bali Road Map

The Bali Road Map was adopted in December 2007 in Bali, Indonesia. The Bali Road Map includes the Bali Action Plan, which charts the course for a new negotiating process designed to tackle climate change. The Bali Action Plan is a comprehensive process to enable the full, effective and sustained implementation of the Convention through long-term cooperative action, up to and beyond 2012, in order to reach an agreed outcome and adopt a decision.
The Bali Action Plan is divided into five main categories:

- Shared vision;
- mitigation;
- adaptation;
- technology; and
- financing.

3.2.4 Cancun Agreements

The agreements, reached on December 11, 2010 in Cancun, Mexico, at the United Nations Climate Change Conference, represented key steps forward in capturing plans to reduce greenhouse gas emissions, and to help developing nations protect themselves from climate impacts and build their own sustainable futures. The Cancun Agreements also included the most comprehensive package ever agreed by governments to help developing nations deal with climate change. It encompassed finance, technology and capacity-building support to help such countries meet urgent needs to adapt to climate change, and to speed up their plans to adopt sustainable paths to low emission economies that could also resist the negative impacts of climate change.

The MoE is the National Focal Point to the UNFCCC and to the Kyoto Protocol as well as tracking the Clean Development Mechanism projects and National Appropriate Mitigation Actions and represents Albania in the Adaptation Fund, Green Climate Fund, etc.

An important decision of the Climate Change Conference in Cancun was to set up a registry to record nationally appropriate mitigation actions (NAMAs) seeking international support to facilitate the matching of finance, technology and capacity-building support with these actions, and to recognize other NAMAs. NAMAs do not represent a legal obligation under the UNFCCC. NAMAs are voluntary actions taken by developing countries to reduce GHG emissions to levels below those of "business as usual" (BAU).

3.2.5 Durban Conference

The UN Climate Change Conference in Durban (November 2011) was a turning point in climate change negotiations. In Durban, governments clearly recognized the need to draw up a blueprint for a fresh universal, legal agreement to deal with climate change beyond 2020 where all will play their part to the best of their ability, and all will be able to reap the benefits of success together.

In short, all governments committed in Durban to a comprehensive plan that would come closer over time to delivering the ultimate objective of the Climate Change Convention: to stabilize greenhouse gas concentrations in the atmosphere at a level that will prevent anthropogenic dangerous interference with the climate system and at the same time preserve the right to sustainable development.

3.2.6 Warsaw Conference

At the UN Climate Change Conference in Warsaw (December 2013) governments took further essential decisions to stay on track towards securing a universal climate change agreement in 2015. The objective of the 2015 agreement is twofold:

- First, to bind nations together into an effective global effort to reduce emissions rapidly enough to chart humanity's longer-term path out of the danger zone of climate change, while building adaptation capacity.
- Second, to immediately stimulate faster and broader action.

Further, the required monitoring, reporting and verification arrangements for domestic action were finalized for implementation, thereby providing a solid foundation for the 2015 agreement.

In addition, the rulebook for reducing emissions from deforestation and forest degradation was agreed, together with measures to bolster forest preservation and a results-based payment system to promote forest protection.

During the Warsaw conference it was decided that the Green Climate Fund, planned to be a major channel of financing for developing world action, would be ready for capitalization in the second half of 2014. Additionally, governments agreed on a mechanism to address loss and damage caused by long term climate change impacts.

3.2.7 Lima Conference

At the UN Climate Change Conference in Lima, which took place in December 2014 (COP20/CMP10), governments decided on the "Lima Call for Climate Action" paving the way to an historic pact in Paris in December 2015 that would for the first time apply to all 195 nations.

The decision consists of three elements: (i) Intended Nationally Determined Contributions (INDCs), (ii) pre-2020 ambition and (iii) an annex with elements that would constitute the 2015 deal.

3.2.8 Paris Conference

At the UN Climate Change Conference in Paris, which took place in December 2015 (COP21/CMP11), the 196 delegations adopted the Paris Agreement, which is a new universal and legally-binding agreement to tackle climate change aiming to strengthen the global response to climate change and combine a temperature goal with a mechanism of achieving it. The global goal is to "hold the increase in global average temperature to well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 degrees Celsius." This goal is to be achieved via low greenhouse gas emissions and climate-resilient development and finance flows consistent with this pathway. The main principle of the implementation is equity and common but differentiated responsibilities and respective capabilities (CBDR&RC) in the light of different national circumstances.

3.2.9 Main issues under the UNFCCC

The UN Framework Convention on Climate Change, Kyoto Protocol and all decisions taken by the COP under this Convention could be considered as part of a soft international law. Whilst this does not establish mandatory targets for reduction of the GHG emissions for non-Annex I countries, including Albania, it does represent an important framework establishing a number of duties and commitments for those countries. Based on the requirements established by the UNFCCC, and the commitments taken by the Albanian Government under this Convention, the following text provides a number of issues that need to be taken in consideration by the Albanian Government and institutions while developing their environment and other sectoral policies having an effect on the climate change.

The UNFCCC, Kyoto Protocol and a number of decisions of the CoP have established several obligations for the Contracting Parties with first of which are the monitoring and reporting of GHG emissions; taking actions for mitigation of GHG emissions in accordance with each country's different responsibilities and capabilities to do so; taking actions for adaptation to the adverse effects of climate change; transparency of any action taken; build-up of global capacity, especially in developing countries, to meet the overall challenge; mobilize the development and transfer of clean technology to boost efforts to address climate change.

Besides the national reports on implementation of the Convention to the Conference of the Parties (COP), in the 17th session of the CoP it was decided that "(f) the non-Annex I Parties shall submit a biennial update report every two years, either as a summary of parts of their national communication in the year in which the national communication is submitted or as a stand-alone update report; the least developed country Parties and small island developing States may submit biennial update reports at their discretion;"

3.3 DEVELOPMENTS ON CLIMATE CHANGE LEGISLATION AND INSTITUTIONAL REFORMS IN ALBANIA

During the last two decades, Albania has paid special attention to environmental protection in general and climate change in particular. The Albanian Constitution itself has included *"a healthy and ecologically adequate environment for present and future generation"*[21] as one of the social objectives that need to be taken into consideration by all state institutions.

Albania is a signatory Party of the UN Framework Convention on Climate Change. The UNFCCC was ratified by the Albanian Parliament in 1994. Albania has also signed the Kyoto Protocol and ratified it, as stated in law no. 9334, dated 16.12.2004, and has actively participated in the Conferences of Parties organized under the UNFCCC. The Albanian Government has expressed a clear political will and commitment to comply with the requirements and obligations embedded in the Convention and other related protocols and documents related to climate change. The Albanian Parliament ratified the Paris Agreement through law no. 75/2016 dated 14.07.2016, as a major step towards its implementation. Ratification of the Paris Agreement came in response to previous actions undertaken in this context such as the delivery ahead of schedule of the Intended Nationally Determined Contributions (INDC) to the UNFCCC Secretariat on 24 September 2015, and the signing of the Paris Agreement on 22 April 2016 in New York. On the other side, Albania is working on the adoption of the EU "acquis communautaire" in the environment and climate change sector.

3.3.1 Institutional aspects

The Ministry of Environment is the highest governmental body responsible for environmental protection and formulation of environmental policy and legislation in the country. The Albanian Government in general and the Ministry of Environment in particular has recently paid great attention to the climate change development at the global level and this has been reflected by a number of important related actions.

In terms of institutions, in the structure of MoE, via the Decision of the Council of Ministers No. 47 of 29.03.2016 "For some amendments in the Order of Prime Minister No.33 of 12.03.2015,

21 Article 59(e) of the Albanian Constitution.

The NAE may be the most appropriate executive agency to create and support the necessary network of institutions aiming at collecting and elaborating data on GHG emissions, mitigation and impacts and adaptation to climate change

"For approval of the structure and organogram of the Ministry of Environment", a new Sector on Air and Climate Change is established comprising of three staff. During the last decade the Ministry of Environment has been strongly supported by the UNDP Climate Change Programme for all climate change activities under the UNFCCC and the Kyoto Protocol, including the preparation of two National Communications and participation in various negotiation forums. However, there is still lack of sufficient human resources to cover the whole range of activities and commitments under the UNFCCC. Also, a proper network for data gathering and analysis is missing, which makes it difficult to comply with the UNFCCC and Kyoto Protocol reporting requirements, including the national communications and the biennial update reports (BURs).

Another organization that may play an important role for climate change is the recently established National Agency of Environment (NAE). This Agency was established based on the new law on environment protection, which became effective in February 2013. The NEA has a specific Sector dedicated to (i) Pollutant Release and Transfer Register (PRTR) under the UNECE Protocol on Pollutant Release and Transfer Registers ratified by the Albanian Parliament with law no. 9548, dated 01.06.2006, (ii) the 1979 Geneva Convention on Long-range Transboundary Air Pollution (CLRTAP) emissions inventory and recently the GHG emissions inventory. Also, NEA is expected to collaborate with international environment organizations complying with their respective reporting obligations. For this, the NAE should be supported by the respective Regional Environment Agencies.

There are a number of other governmental organizations that could have a significant role in the implementation of environmental policy, including implementation of climate change and CDM projects or NAMAs, such as the Ministry of Energy and Industry, Ministry of Agriculture, Rural Development and Water Administration, Ministry of Infrastructure and Transport, and the Ministry of Urban Development and Tourism. These authorities are expected to provide a considerable contribution not only in collecting the necessary data for GHG emission's reporting, but also in developing appropriate actions in their respective fields to mitigate the effects of climate change, including its impacts and adaptation options.

An Inter-ministerial Working Group on Climate Change (IMWGCC) has been set up as a permanent coordinating body regarding climate change issues. It is headed by the Deputy Minister of Environment at the political level, and supported by nominated technical focal points in each and every related institution. This committee may improve stakeholders' coordination for more integrated responses to the challenges of climate change.

3.4 CURRENT CLIMATE CHANGE RELATED LEGISLATION

During recent years Albania has developed and adopted a number of primary and secondary pieces of legislation regarding the environment that have an impact on responses to climate change. Additionally, it should be emphasized that legislation regulating other sectors that have a considerable impact on climate change, such as energy, forest and other sectoral legislation, have also been enacted.

It is worthwhile to mention that recently a number of primary pieces of legislation on environment that are relevant to climate change impact have been adopted, and which transpose a number of EU Environmental Directives. These pieces of environmental legislation include, among others, the following acts:

- Law no. 10431, dated 9.06.2011 "On environmental protection" as amended;
- Law no. 10440, dated 7.07.2011 "On environmental impact assessment";
- Law no.10448, dated 14.07.2011 "On environmental permits" as amended;

- Law no. 8897, date 16.05.2002 "On protection of air from pollution" as amended;
- Law no.27/2016 "On chemicals management";
- Law no.111/2012,"On integrated water resources management";
- Law no.68/2014"On some amendment and changes in the law no. 9587, dated 20.07.2006 "On protection of biodiversity";
- Law No.162 dated 04.12.2014 "On protection of ambient air quality";
- Decision of the CoM no.352, dated 29.04.2015 "For the assessment of ambient air quality and requirements for certain pollutants related with it";
- Decision of the CoM no.1075, dated 23.12.2015 "On measures for the control of Volatile Organic Compound (VOC) emissions resulting from the storage of petrol and its distribution from terminals to service stations";
- Decision of the CoM no.594, dated 10.09.2014 "On approval of National Strategy on Ambient Air";

Nevertheless, it should be emphasized that the concept of climate change and climate change related issues are not widely addressed in Albanian environment legislation. From the above cited legislation, only the law no. 10431, dated 9.06.2011 "On environment protection" as amended, which became effective early February 2012, contains a specific provision related to the climate change phenomenon. Article 20 of this law defines climate change as changes caused by human activities on the climate. The same article stipulates that specific measures for climate change are defined in that law and other specific legislation, while the Council of Ministers is authorized to enact secondary legislation for supporting and promoting:

- Reduction and stabilization of GHG emissions;
- Carbon capture and storage;
- Utilization of renewable energies and efficient use of energy.

Given that the law on environment protection is relatively new, no secondary legislation has been developed and enacted to support and promote the reduction and stabilization of GHG emissions and carbon capture and storage.

3.4.1 Legislation on monitoring of climate change related indicators

Climate change effects are marginally touched by the rules and procedures for development and implementation of the national environment monitoring programme, approved by the CoM decision no.1189, dated 18.11.2009. These rules instructs the Ministry of Environment to prepare the national environment monitoring programme through the National Agency of Environment and to cooperate with other ministries according to their areas of activities, local government units and monitoring institutions to collate and compile monitoring results.

According to these rules, environment indicators related to climate change such as a) air temperature; b) sea level; c) precipitation; and d) level of underground waters are subject to monitoring. These rules include other indicators having a pressure on the environment with respect to climate change: a) the annual emissions of CO_2, NO_x and CH_4; and dispersion of emissions of three gases according to different sectors of the economy, including energy, transport, waste management, agriculture and industry.

The rules do not properly address the responsibilities for monitoring GHG emissions and the accuracy of the monitoring results. Besides, it is not clear how some climate change data/ indicators are gathered and what methodologies are to be used by the responsible government authorities that report such data. Environment monitoring is financially supported by the state budget, and is coordinated by the Ministry of Environment. Funds provided by the state budget, even though they have been increased in recent years, continue to remain insufficient to support an effective environment monitoring network.

Accurate, consistent and internationally comparable data on GHG emissions is essential for Albania, not only for the purpose of reporting to the COP under the Convention and Kyoto Protocol, but also for developing and shaping the effective policies and actions to reduce GHG emissions at the minimum cost.

3.4.2 Clean Development Mechanism (CDM) projects legal framework

Albania, as a party to the UNFCCC and Kyoto Protocol and non-Annex I country, has developed secondary legislation aiming at establishing the legal and institutional framework for the promotion and approval of CDM project activities in the country, which can also serve as a foundation for participation in alternative carbon markets and offset schemes.

For the regulation and functioning of the Designated National Authority (DNA), three legal acts were approved.

Decision of the CoM no. 1553, dated 26.11.2008, on the Establishment of the DNA, designing its structure, the respective roles and the service fees for Letter of Approval for a CDM project proposed by a developer.

Internal Order no. 24 of the MoE, dated 10.02.2009 defining the structure of the DNA Committee and Secretariat, and designating its members. It is important to underline that both the DNA Committee and Secretariat are composed by representatives of the MoE only.

Regulation of the Ministry of Environment no.1, dated 25.03.2009 "On CDM Projects review and approval procedures". This regulation describes in details the procedures of review and approval of a CDM project.

These three pieces of secondary legislation have created the necessary framework for reviewing and approving a number of projects, which due to not a very attractive carbon market have resulted into only one CDM project on forests to pass all the international approval and verification procedures. The Ministry of Environment has recently amended the CDM-related legislation to fit also National Appropriate Mitigation Actions: The proposal is not yet endorsed.

3.4.3 Carbon tax legislation

Albania is one of the countries that has already included in its tax system a specific tax on carbon. Based on the law no.9975, dated 28.07.2008 "On national taxes" as amended by Article 4/6, a specific carbon tax is charged to a number of fossil fuels used in the market. This tax is charged on oil by-products produced domestically or imported. Initially the carbon tax was applied only to diesel and gasoline, but from 2011 the number of fuels subject of this tax increased to include coal, coal coke, heavy and light fuel oil, and kerosene. Currently, the carbon tax is 1.5 lek/liter to gasoline and 3 lek/liter to all other oil by-products and 3 lek/kg to coal and coal coke.

Although the purpose of the carbon tax was to discourage the use of fuel emitting carbon emissions, protect the environment and mitigate climate change, no direct connection between this tax revenues and funds used for environmental protection and mitigation of climate change can be verified.

3.4.4 Other specific sectoral legislation

Although climate change issues are clearly embedded in the working and thinking of environmental institutions, they in fact represent a challenge to all economic sectors and social groups. It is obvious that sectors such as energy, forests, waste treatment, industry, and agriculture have a higher interest in climate change policies due to their contribution in producing GHG emissions. A number of pieces of primary and secondary legislation have been developed and enacted by the Albanian institutions that regulate such sectors. A non-exhaustive list of such legal acts is:

- Law no.10463, dated 22.09.2011 "On integrated management of wastes";
- Law no.985, dated 4.05.2005 "On forests and forestry service" as amended;
- Law no.10304, dated 15.07.2010 "On mining sector in the Republic of Albania";
- Law no.9072, dated 22.05.2003 "On power sector" as amended;
- Law no. 9372, dated 27.04.2005 "On energy efficiency" as amended;
- Law no. 8937, dated 12.09.2002 "On energy saving in buildings";
- Law no. 9876, dated 14.2.2008 "On production, transport and trading of biofuels and other renewable fuels for transport";
- Law no. 10 113, dated 9.4.2009 "On indicators of energy consumption and other resources from household appliances through labelling and standard information of products";
- Law no. 138/2013, dated 2.05.2013 "On renewable energy sources"
- Decision of the CoM no.27, dated 20.01.2016 "On approval the National Plan for Renewable Energy".

Within the country commitments under Energy Community Treaty and INDC, a new Law on Energy Efficiency No 124/2015 has been **adopted in** 12 November 2015 which calls for the establishment of a National Energy Efficiency Fund to provide grants and loans or financial guarantees for the implementation of energy efficiency projects in Albania. The law also contains provisions on the establishment of a government agency to develop, implement and monitor the energy efficiency policies and programs, including the implementation of the National Energy Efficiency Action Plan (NEEAP). First NEEAP is in place, while the 2nd and the 3rd NEEAPs are under finalization with the assistance of EBRD.

A new law on Energy performance on Building is under adoption and will be enacted before September 2016. The Law will produce the energy minimum requirements on building stock and will provide the National Methodology for Calculation of Building's Performance which are going a Certification process through National software on respect of Minimum Requirements.

The RES law is under revision to provide for the support schemes based on FIT and State Aid Directive guidance for e-RES technologies.

A final draft Sustainable Transport Plan (STP) has been prepared (March 2016), to help meet the challenging targets for reducing energy consumption and improve overall sustainability in the transport sector. The sustainability targets for the transport sectors are:

- Reduce air pollution impacting on health, crops etc. (indicator: emissions of air pollutants tons/year)
- De-carbonization, reduction of GHG emissions (indicator: emissions of CO2 tons/year).
- Energy efficiency (indicator: tons of oil equivalents).

It is worthwhile mentioning that these pieces of legislation/policy documents do contain various provisions that are relevant to Albanian institutions for future activities under the UNFCCC. These legal acts may be subject to amendments if a climate change dimension is given to all respective sectors, especially with respect to GHG emission reporting, development of NAMAs, implementation of the INDC, etc.

3.4.5 NAMAs, INDC and Climate Change Strategy

In 2007, the MoEFWM[22] prepared the first Cross-Cutting Environment Strategy as an integral part of the National Strategy for Development and Integration (NSDI), which aimed, among other goals, to the *"reduction of greenhouse gas emission and ozone-depleting substances with the aim to contributing to prevention of climate changes".* In this strategy, policy guidelines and goals for the energy, forestry, waste management, industry and transport sectors were established, but no specific emission reduction or carbon uptake targets were defined for each of these sectors.

The NSDI also foresaw that the most powerful instrument for reducing greenhouse gas emissions effects is mainstreaming climate change issues into the decision-making process at various levels, especially of Government and Industry. Such measures need to be accompanied by amendments to the legal framework and an introduction of economic instruments in order to encourage reduction of greenhouse gas emissions and use of renewable energy resources. However, the NSDI is not tailored specifically for climate change concerns and does not contain the necessary actions for mitigating the adverse effects of climate change and of GHG emissions. The updated 2015 - 2020 Cross-Cutting Environment Strategy does contain climate change indicators, which are to be further strengthened by the Climate Change Strategy and its Action Plan for Mitigation which is under preparation supported by IPA 2013 Project, expected to be adopted by the end of 2016.

Low carbon emission developments generally are supported by other actions including the Nationally Appropriate Mitigation Actions (NAMAs), which represent a valuable opportunity for developing countries such as Albania to address greenhouse gas (GHG) emissions, while remaining true to their sustainable development priorities and needs. Assisted by UNDP, Albania has already identified a list of 11 NAMAs and fully developed two of them.

A formal invitation was put forward for all the Parties of the UNFCCC at the Warsaw COP 19and Lima COP 20 to initiate or intensify domestic preparations for their intended nationally determined contributions (INDCs) towards achieving the objective of the Convention in a manner that facilitates clarity, transparency and understanding of the INDC. In response, the Republic of Albania adopted the INDC document by the Decision of the CoM no. 762, dated 16.09.2015 and submitted it to the UNFCCC Secretariat by 24 September, 2015 It commits to reduce CO_2 emissions compared to the baseline scenario in the period of 2016 to 2030 by 11.5%. Maintaining the low GHG emission content of the electricity generation and decoupling growth from increase of GHG emissions in other sectors are the primary drivers of the country regarding mitigation contribution as its INDC.

For the implementation of the INDC, the Ministry of Environment through the IWGCC is coordinating the work between line ministries, especially the Ministry of Energy and Industry and the Ministry of Transport and Infrastructure, to assure the coherence of the targets identified in the INDC, draft National Strategy on Energy, National Action Plan on Energy Efficiency, National Action Plan for Renewable Energy, draft Sustainable Transport Plan and the relevant legislation on Energy and Climate Change.

Concerning the approximation of relevant EU Climate Change legislation into the national legislation, since November 2015 has started the process of drafting the Law on Climate Change and Decision of the CoM on monitoring and reporting of GHG, to be adopted by 2017.

A schedule for the alignment of remaining *acquis* topics on climate change is prepared and is the integral part of the DCM No.74 of 27.01.2016 "On approval of the National Plan for European Integration 2016 - 2020".

22 MoEFWM:

3.4.6 Climate Change Adaptation

The Inter-Ministerial Working Group on Climate Change (IMWG) is leading the National Adaptation Plan (NAP) process in Albania since February 2015, undertaking a parallel approach:

a. Preparing a NAP document;
b. Mainstreaming of climate change adaptation into relevant development and sectoral strategies.

The NAP process (supported by GIZ and UNDP) is a participatory and a learning approach, to be finalized and get endorsed via a Decision of the CoM by autumn, 2016. In the meantime, and since March, 2016, the NAP implementing mechanism is linked with the process of national and sectorial territorial planning. Climate proofing is included in the Strategic Environmental Assessment methodology for both plans.

Climate change is envisaged and substantially dealt with in the draft strategy for Integrated Water Resource Management (IWRM) so that the resilience of the water sector in insured. Adaptation is mainstreamed in a vertical way from the mission statement and objectives to the concrete measures.

Climate Change adaptation is also included in the Inter-sectoral Strategy for Agriculture and Rural Development in Albania (ISARD) 2015-2020, under the section of "Environment, land, forestry and water management and road infrastructure".

Climate change adaptation and best practices of EU have also become part of regional/local plans, like the Climate Change Adaptation Plan for the Tirana municipality, guided by the EU tool for developing climate-proof cities.

The Ministry of Environment's increased interest in the Climate Change adaptation is formalized through the active participation in the Global Network for Adaptation.

3.5 RECOMMENDATIONS

3.5.1 Enactment of a Standalone Climate Change Legislation

Drafting a legislation that establishes a new institution or strengthens the unit in the MoE responsible for climate change; defines the reporting obligations for GHG emissions; requires mandatory assessment and risk evaluation of climate change effects, etc., is seen as a priority if Albania wants to comply with its commitments under the UNFCCC.

To comply with, the Law on Climate Change and Decision of the CoM on monitoring and reporting of GHG, to be adopted by 2017, should address most of the climate change related institutional and policy issues indicated above. Furthermore, its effective implementation should be further ensured.

However, given the cross-sectoral nature of effective climate change responses, mitigation and adaptation actions may require development of new, or amending other sector specific, legal frameworks for its implementation. Therefore, a series of sector specific legislative and regulatory amendments may need to be adopted to establish the enabling framework for specific climate change mitigation and adaption actions in various sectors.

3.5.2 Implementation of the Climate Change Strategy

Supported by EU IPA funds, the process of formulation of the Climate Change Strategy has started. In order to achieve its effective policy implementation, the involvement of high-level executive positions in climate change coordination mechanisms is a good international practice to be implemented by Albanian institutions responsible for climate change.

This strategy should take into consideration the National Appropriate Mitigation Actions (NAMAs) and Measurement, Reporting and Verification (MRV) tools that would guarantee that the objectives established in the INDC will be achieved.

3.5.3 Establishment of a Technical Advisory Committee

Located under the Climate Change Sector, a body mandated with technical and scientific analysis could be established. Comprised of experts in all areas of mitigation and adaption, the Technical Advisory Committee would provide scientific and technical input into policy development and will undertake specific analysis, for example on clean technologies and technologies to support adaptation to the impacts of climate change, as well as other climate change researches for taking the appropriate climate change response actions.

3.5.4 Secure Capacity Building for the Climate Change Sector and the IMWGCC

The legislative and institutional reform recommended above may require a significant investment in developing the expertise across national and county governments' on climate change law and policy. Furthermore, ensuring that any current and future institutions have sufficient capacity and financial resources to enact, endorse and fully implement the country's policy objectives in the area of climate change, will be a key consideration. Capacity building programmes on climate change should be extended to other institutions and stakeholders involved in addressing climate change.

VULNERABILITY AND ADAPTATION TO CLIMATE CHANGE ASSESSMENT

4.1 BACKGROUND

The climate of Albania is typically Mediterranean. It is characterized by mild winters with abundant precipitation and hot, dry summers. Albania's Territory is divided in four climatic zones: Mediterranean Field Zone, Mediterranean Hilly Zone, Mediterranean Pre Mountain Zone, and Mediterranean Mountain Zone. The study area, which includes the coastal zone of Albania and the capital city, Tirana, falls in the Mediterranean Field Zone. The coast stretches for a total of 450 km from the Ionian Sea in the south to the Adriatic Sea in the north (Figure 1). The coastal zone bordering the Adriatic Sea is predominantly low lying with land elevations rarely exceeding 10 – 20 m above sea level, whilst that bordering the Ionian Sea is dramatically rugged with a steep mountainous landscape. This climate zone is influenced primarily by the marine environment and driven by prevailing western wind conditions leading to hot and dry summers and mild wet winters. To facilitate the impact assessment the coastal area is divided in three parts: northern - from the border with Montenegro south to Durres (yellow), central – from Durres south to Vlora (green), southern - from Vlora south to the border with Greece (beige) for presentation of the report findings

Figure 4.1. **Study area: Coastal zone and Tirana area**

4.1.1 Previous Vulnerability and Adaptation (V&A) assessments

Albania has been implementing the Climate Change Convention since the preparation of its Initial National Communication, submitted in 2002, where an initial assessment of the vulnerability of the country was reported. Table 4.1 shows the different analysis on Vulnerability and Adaptation Assessment (V&A) undertaken to date in Albania.

Table 4.1: Previous V&A assessments in Albania

National Communication/Project	Geographic Areas Covered	Focus
Implications of Climate Change for the Albanian Coast (Coastal Areas Management Program, UNEP/MAP, 1998)	Albanian Coastal Area	Sectors covered: Water, agriculture, forest, energy, biodiversity, health, population and tourism. Climate modelling: future scenarios developed by University of East Anglia for years: 2025, 2050, 2100 Climate impact analysis: empirical models to assess water resources and forestry For the other sectors: analogue studies and expert judgement Adaptation: a set of measures proposed by each sector
Initial National Communication (GEF, 2002)	Entire territory - Albania	Sectors covered: Water, agriculture, forest, energy, biodiversity, health, population and tourism. Climate modelling (MAGGIC/SCENGEN v.2.4) baseline 1961-90; future climate scenarios: 2030, 2050 and 2100. Climate impact analysis: empirical statistical models developed by the team; empirical analogue studies and expert judgment. Adaptation: a set of measures proposed by each sector
Second National Communication of Albania to UNFCCC (GEF, 2009)	Drini River Cascade (area from Kukes to Lezha Plain).	Sectors covered: Water, agriculture, forest, energy, biodiversity, population and tourism. Climate modelling (MAGGIC/SCENGEN v.4.3, TAR IPCC); baseline 1961-90; future climate scenarios: 2030, 2050, 2080 and 2100. Modelling the impacts in water sector (WATBAL), energy (LEAP), Other sectors: empirical statistical models developed by the team; empirical analogue studies and expert judgment. Adaptation: a set of measures proposed by each sector and a list of priority projects on adaptation
Project 'Identification and implementation of adaptation response measures in the Drini-Mati River Deltas' (GEF/GoA/UNDP, 2008-2013)	Protected areas of Kune-Vain and Patoku Lagoon, situated along Drini I Lezhes and Mati Rivers	Sectors covered: biodiversity, water, agriculture, forest, population and tourism. Climate modelling (MAGGIC/SCENGEN v.5.3, AR4 IPCC); baseline 1961-90; future climate scenarios: 2030, 2050, 2080 and 2100. Impact analysis: Carried out a range of studies (23 reports) Build adaptive capacities in the DMRD to ensure resilience of the key ecosystems and local livelihoods to climate change. participatory approach to involve local community in risk assessment and adaptation measures prioritization; mainstreaming of climate change in local development plans Adaptation: developed prioritization criteria for adaptation measures and a list of 11 PIFs on adaptation; policy paper to mainstream adaptation in the Drini-Mati area and beyond.
Albania's Third National Communication to UNFCCC	Entire coastal zone of Albania	Sectors covered: water, agriculture, livestock, forest, crops, biodiversity, tourism & population, health, Climate modelling (MAGGIC/SCENGEN v.5.3, IPCC AR4, baseline 1961-90; and SimClim2013, IPCC AR5, baseline 1985-2005); future climate scenarios: 2025/2030, 2050, and 2100. Impact analysis: Different modelling tools recommended by UNFCCC (WATBAL, WEAP, CROPWAT8.0, DIVA, etc.), empirical statistical models developed by the team; empirical analogue studies and expert judgment. Adaptation: a set of priority measures taking into account ICZM and preparation of Coastal Adaptation Plan

This V&A assessment in the frame of TNC provides a synthesis of existing and new research to identify options that could be forwarded for adaptation planning. Rather than identifying and developing adaptation measures on a sector-by-sector basis, the principles of Integrated Coastal Zone Management (ICZM) have been used. ICZM provides a holistic and integrated approach towards identifying adaptation measures from the outcomes of V&A analysis from individual sectors. Integrated Coastal Zone Management (ICZM) and adaptation share the same general sustainable development objective – the sustainability of human activities and their underlying ecosystems. The concept of preserving the integrity of coastal ecosystems and thus biodiversity, which is one of the main objectives of ICZM, has a major role to play in the field of adaptation. Indeed, efficient coastal ecosystems provide many services which help combat the impacts of climate change (wetlands and availability of water resources, dunes and erosion, etc.).

4.1.2 Why a focus on coastal areas?

The project 'Identification and implementation of adaptation response measures in the Drini-Mati River deltas' already implemented in Albania (financed by GEF/GoA/UNDP,2008 -2013) demonstrated that Albania's northern low-lying coastal areas bordering the Adriatic Sea and in particular around the Drini and Mati River Delta is "critically vulnerable" to climate change and other extreme climatic events (Bruci E., Le Tissier M., et al., 2013). As such the Albanian 'Self-Assessment on Climate Change Activities', performed as the first stage of TNC in 2012, identified the entire coastal area as a priority for vulnerability assessment and adaptation, to replicate the knowledge and the good results of the adaptation project .

Most of the Adriatic coastal area of Albania is flat and low-lying and this makes coastal systems, including human settlements, particularly susceptible to climate change and vulnerable to sea-level rise and changes in intensity and frequency of flooding. According to the Census data of 2011, the narrow coastal belt, which represents only 11.78% of the overall surface of the Republic of Albania, is inhabited by 1/3 of the total population (36.3%). The biodiversity found on the coastal zone of Albania, and in particular areas such as Kune-Vain, Karavasta, Narta and Butrint that have designated protected areas, is of global significance. The analysis of biodiversity is focussed on the coastal zone as this area is expected to be more sensitive and vulnerable to climate change scenarios currently developed. The most important lagoons along the coast of Albania are Karavasta, Narta and Butrinti. Karavasta lagoon and Butrinti lagoon (lake) are designated as Ramsar Sites of Albania, while Narta is a potential Ramsar Site. The coastal zone of Albania is already subject to considerable anthropogenic perturbation and alteration.

Beaches on lower zones of the Adriatic coastal line will be affected by sea level rise and subsidence, and agricultural lands and local and national roads, dwelling centers and rural infrastructure, will be impacted by floods

Houses, hotels, roads and agricultural areas etc., situated in the lower zones of the Adriatic coastal line will be affected because of flooding. The beaches in the areas affected by land subsidence (those of Shëngjin, Kune-Vain, Tale, Patok, Ishëm), and a substantial number of fields (drained in the late 50's and early 60's.) will be swept over by floods. Likewise, these floods will find their way into important segments of the local and national roads (including a part of the new road Fushë Krujë-Lezhë running through the former Lac swamp land), potable water supply sources (located in Lezha and Lac plains), as well as many lodging and tourism structures which have been, and continue to be built along these beaches. Also, the floods will partially affect the agricultural land (in the former swamps of Durrës, Myzeqe, Narta, Vrug etc.) as well as dwelling centres and rural infrastructure, which reach up to 50 cm above the sea level.

Besides the permanent risk of inundation to low-lying coastal areas, due to sea level rise and increased flooding, other expected climate change impacts include increased beach and cliff erosion, and the consequent degradation of coastal ecosystems (particularly, sand dunes, lagoons, wetlands and river deltas), and saltwater intrusion in freshwater systems. These impacts are an exacerbation of changes that are already affecting the coastal zone of Albania as a consequence of anthropogenic activities. The coastal zone has already been shown to be sensitive to the impacts of climate change. Six areas along the coastal zone of Albania were assessed in this TNC as they already exhibit the impacts of climate change:

1. Velipoje–Shkoder area: has flooded systematically in recent years, mainly due to mismanagement of waters in the Drini river cascade. This area is the most important and also the largest in the north-western area of the country.

2. Drini-Mati river deltas: flooding occurs mainly from Mati river flows, in cases of high intensity rainfall and falling over extended periods. In this area coastal erosion is very active and poses a serious threat to coastal areas.

3. Durresi bay: flooding occurs from Erzeni river flows. In the Rrushkull area, coastal erosion is very active.

4. Myzeqe field: is the largest and most important area in the country, in economic terms. Most of the Myzeqe field extends from 0 to 20 m above sea level, but other places like the former marshes of Tėrbuf in Divjake, Hoxhare are below sea level. Flooding occurs in the Divjake – Karavasta area from the Shkumbini and Semani rivers. Divjake-Karavasta is a protected area (National park, second category of IUCN) of great importance. This area contains close to 20% of Albanian agriculture land, 50% of the greenhouses of the country; 15% of the cultivated area of fruit trees, 44% of citrus production; 31% of olive production and 15% of fruit tree production.

5. Vjosa River: the mouth of this river is situated in the northern area of the Narta Lagoon, which is considered one of the most important wetland areas of Albania for its biodiversity and the number of habitats. However, the river system and the uncontrolled man-made built environment around this system poses the highest risk of flooding to the country.

6. Butrinti National Park: comprises a high diversity of natural, semi-natural and artificial habitats that shelters a high diversity of species of global and regional importance. The area around the historic town of Butrinti, given its rich cultural history, has been designated as a UNESCO World Heritage site.

4.2 METHODOLOGY

The methodology used for the V&A assessment is described in *Annex 4.1.*

4.3 ACTUAL CLIMATE CONDITIONS AND CLIMATE CHANGE SCENARIOS

4.3.1 Temperature analysis

Temperatures are driven by the level of solar radiation and sunshine duration. There is a small variation in total annual solar radiation received from north to south where Shkodra city in the north receives 1,426 kWh per m^2, while Xarra situated in the south receives 1,537 kWh per m^2 per year.

Air temperatures follow the pattern of solar radiation, with highest temperatures in July and August (mean 23.6°C) and lowest in January (mean 6.2°C). This temperature range of 17.4°C is lower than that found in hinterland areas as a consequence of the marine influence.

Analysis of mean temperature for the period 1930 to 2006 against the 1961 to 90 average shows that the period 1931 to 1970 had a positive anomaly followed by a negative anomaly between 1971 and 2000 (Figure 4.2). After 2000 there has been a period with a positive anomaly from 2001 to present. This is a consequence of an increase in both maximum and minimum daily temperatures, especially in summer time. Several years after 1990 are characterized by an increasing rate of minimum temperature, higher than that of the maximum temperature in the summer. Further analysis shows that since the turn of the century there has been a positive trend of increasing temperature for all seasons (winter: from +1.60 to +2.5°C; spring: from +2.00 to +3.0°C; summer: +3.0°C; and autumn: +2.0°C). The annual average temperature in 2010 has already reached the values projected for 2020 (See section 4.2.2.1). The northern part of the coastal zone does have lower temperatures in the winter season compared to the middle and southern zones, but summer temperatures are similar across all coastal regions.

Considering maximum air temperatures recorded, the highest recorded has been 40.4°C coupled with an overall increase in the frequency of days with temperatures above 35°C (Figure 4.3). Considering the period 1961-2010, this has resulted in an increase in the recording of heat wave days[23] with only two cases prior to 2001 to 26 days in 2003 recorded at Lezha. In the last decade there has been up to a 4 times increase in the number of heat wave days recorded. This finding is supported by an analysis of the probability of days with maximum temperature more than the 90th percentile, which shows an increase in the number of such days from 20% of the total during 1951-1964 to 30% in the last decade. Conversely, minimum air temperatures show no clear trend, although there is an indication that over the last decade there has been an increase from 0.3 days/year to 0.7 days/year where temperatures ≤-5°C are recorded. The number of days with cold waves (cases when minimally over six consecutive days the air temperature is 5°C lower than the long-term average temperature of the corresponding days) shows no trend over the same period.

Figure 4.2 Anomalies of average temperature and precipitation (Central part)

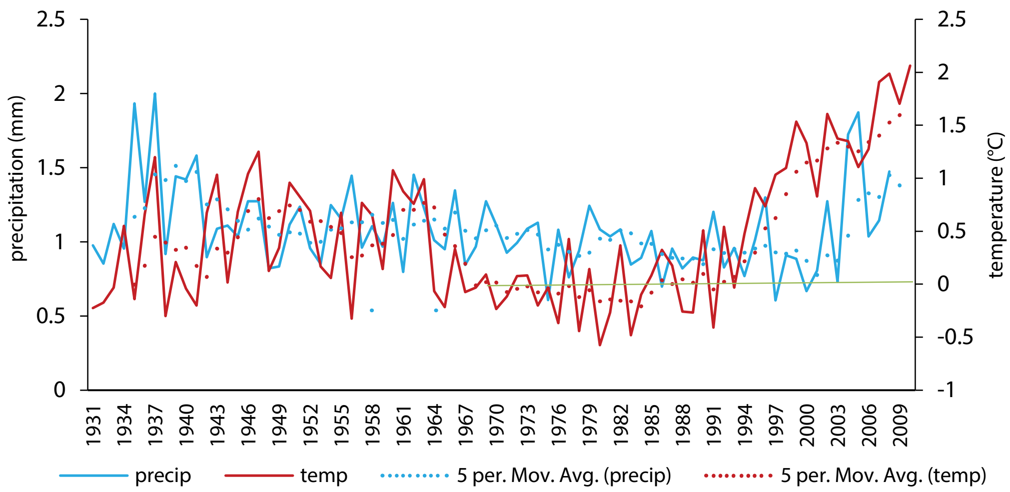
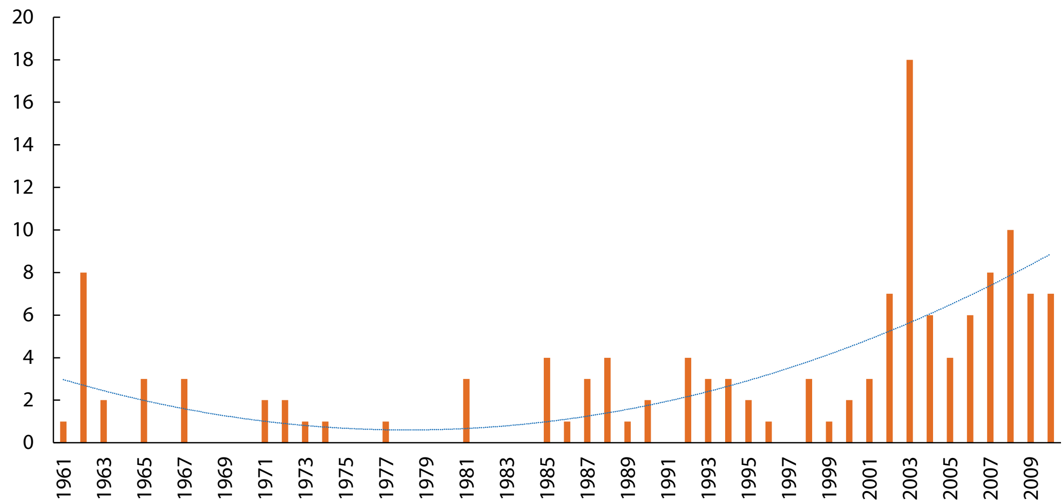


Figure 4.3 The annual distribution of number of days with temperature Tmax ≥35 0C. (Lezhe)



23 cases when minimally over six consecutive days the air temperature is 5°C more than the long-term average temperature for the corresponding days

4.3.2 Precipitation analysis

Analysis of precipitation and anomalies (Figures 4.2, 4.4) shows that the variation around the normal value (1961-1990) can be divided in three sub periods with a wet period between 1951-1980 up to 40% above the normal value, a dry period between 1981-2000 up to 45.3% below the normal value, and since 2000 a period of increasing precipitation. Analysis of seasonal precipitation patterns shows no consistent patterns in variation with periods above and below normal values. A parameter which shows the intensity of precipitation is the number of days with more than 10 mm precipitation: The north part of the coastal zone has more rainy days >10mm around 49 days per year.

The 24 hours maximum amount of precipitation is the most important parameter concerning rainfall intensity. The frequency of occurrence of wet days over the threshold >77 mm is higher in the period 1951-1978 than during the period 1980-2008. Between 1951-1978 75% of the years with the amount of precipitation over than 77 mm can be observed at least once per year. In contrast, during the period 1980-2008, there are 50% of cases that have one day per year with precipitation above 77 mm.

The impact of flood events is not only a consequence of the intensity of the rain event but also the degree of maintenance (or lack thereof) of infrastructure designed to manage flood waters. Rainfall intensity is measured by the 24 hour daily precipitation maximum. Analysis from the Lezhe station does not show any discernible trend – although it does show that 1970 and 2002 were two particularly extreme years (Figure 4.5).

Figure 4.4 Annual distribution of precipitation (mm), Vlore

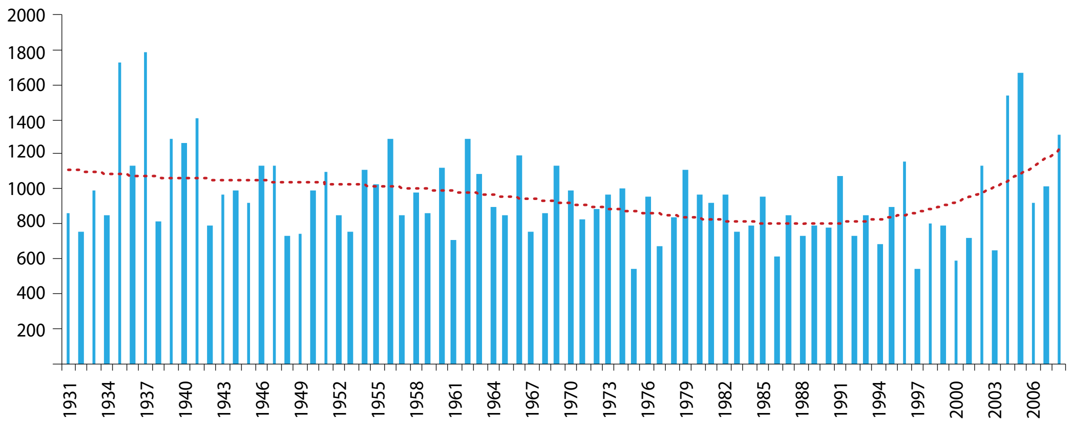
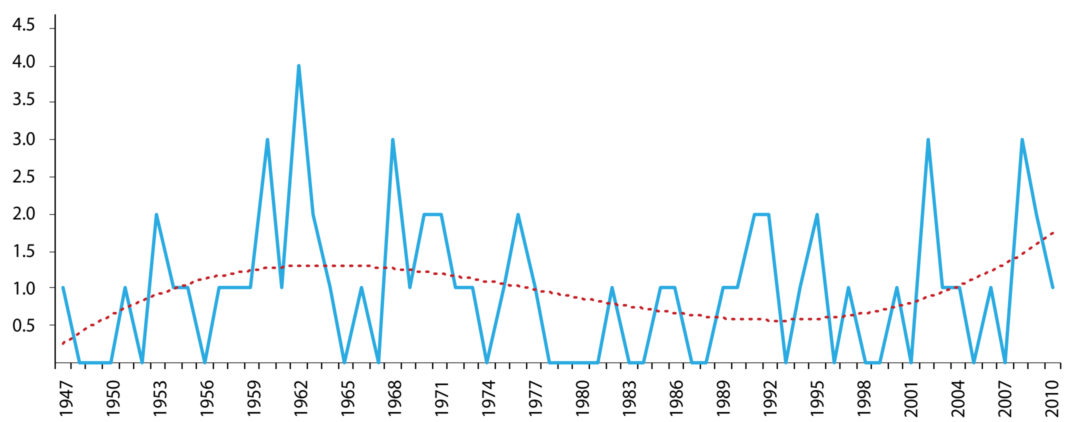


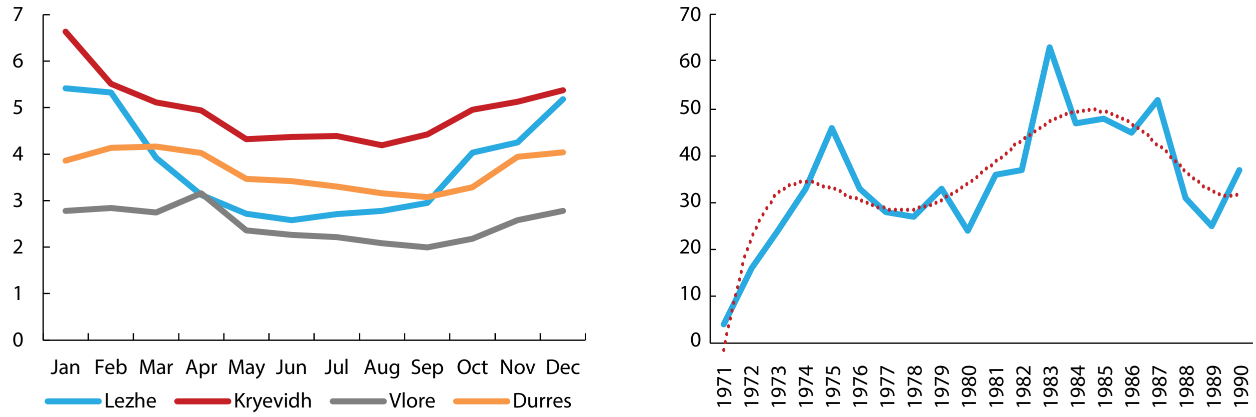
Figure 4.5 Annual number of days with 24h max precipitation (Lezhe)



4.3.3 Wind analysis

Winds and their links to storminess are an important factor in the coastal zone. Wind speeds show a marked seasonality with higher wind speeds recorded during colder months associated with a higher occurrence of cyclonic circulation in the winter period (Figure 4.6-left). Wind speeds in excess of 15 m/s can cause damage to infrastructure and analysis shows that the number of days per year with such conditions shows no discernible trend (Figure 4.6 right).

Figure 4.6 **Annual course of wind speed (m/s), coastal stations (left) and number of days with wind speed more than 15m/s (right).**



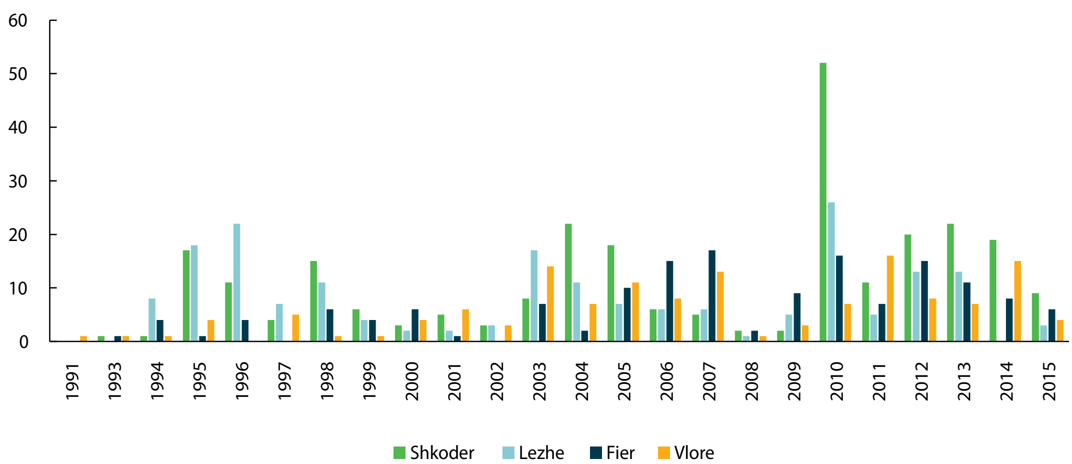
4.3.4 Disaster Risk Related to Climate

Albania is a disaster-prone country and is exposed to the following hazards: geologic (earthquakes, rock falls and landslides); hydro-meteorological (flooding and torrential rains, droughts, snowstorms, high snowfall and windstorms).

There is evidence that the rate of disaster events has been increasing during the period of 1993-2013.

The years with highest recorded incidents of hydro-meteorological disaster correspond with climate extremes in the climate cycle (Figure 4.7). Floods have a huge impact in terms of human life, economy, agriculture and environment. There is a main peak in 2010 in which the losses reaches nearly 0.15 % of the GDP of the country. The average expected losses per year is estimated to be around 370 million of LEK (3.2 million US$), with a maximum of 4 billion LEK (35.2 million US$) arising from the Shkodra flood in 2010.

Figure 4.7 Distribution of number of weather related disasters in different coastal stations



4.4 CLIMATE CHANGE SCENARIOS FOR THE ALBANIAN COAST (TO 2100)

The SRES[24] developed for the Albanian coasts projections are based on the IPCC AR4[25] report by using MAGICC/SCENGEN (version 5.3) package that produces outputs as an average over a number of models. The Global model MAGICC was run using the following scenarios from different SRES families (AR4 of IPCC): A1BAIM, A1F1-MI, A2ASF, B1IMA, B2MES (see Methodology, Annex 4.1).

4.4.1 Temperature

All the scenarios reveal a likely increase in annual temperatures related to 1990 for all time horizons (Figure 4.8). In particular:

- A1F1MI projects the highest average increase in temperature after 2040, likely to reach values up to 4.8°C by 2100 (highest/max. scenario),
- A1BAIM projects an average increase of 1.7 °C by 2050 and to 3.2°C(average scenario), and
- B1IMA projects the lowest increase after 2040 (lowest/min. scenario).

Figure 4.8.1 Annual changes of temperature, average scenario (°C)

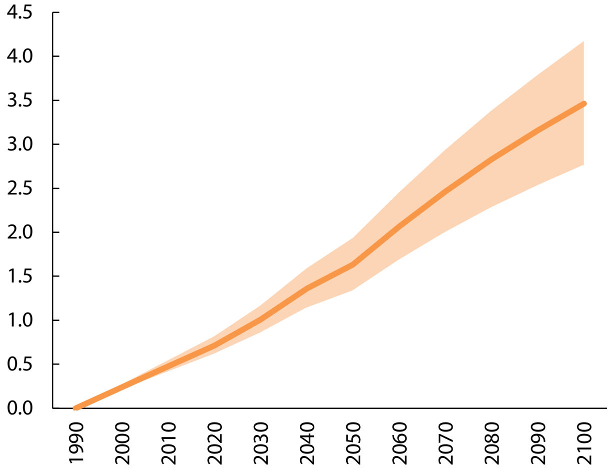


Figure 4.8.2 Summer temperature changes, different scenarios (°C)

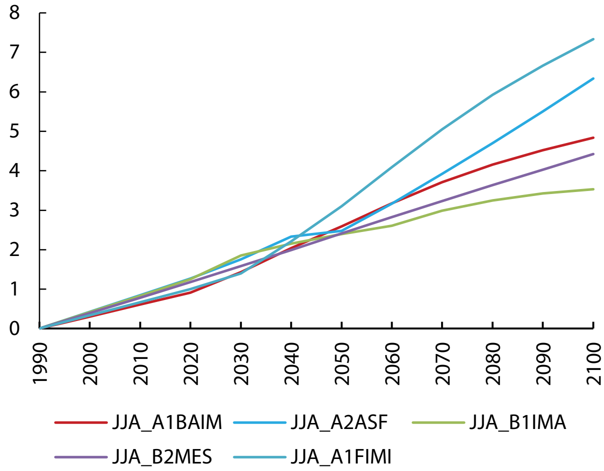


Table 4.3 and Figure 4.8 (left) and 4.9 show the temperature changes projected up to 2100, as the average of outputs of different scenarios.

Table 4.3. Temperature change projections (°C) for different time horizons related to 1990 (average model).

Years	2030	2050	2080	2100
Annual	1.0 (0.7 to 1.2)	1.7 (1.3 to 2.2)	2.8 (2.0 to 3.5)	3.2 (2.4 to 4.1)
Winter	0.8 (0.7 to 0.9)	1.2 (1.1 to 1.4)	2.0 (1.7 to 2.3)	2.4 (1.9 to 2.7)
Spring	1.0 (0.8 to 1.12)	1.5 (1.3 to 1.8)	2.6 (2.2 to 3.0)	3.1 (2.6 to 3.6)
Summer	1.6 (0.5 to 1.8)	2.5 (2.1 to 2.8)	4.3 (3.8 to 4.9)	5.3 (4.6 to 6.0)
Autumn	1.0 (1.0 to 1.1)	1.6 (1.5 to 1.8)	2.8 (2.7 to 3.0)	3.5 (3.2 to 3.7)

Figure 4.10 clearly shows that the Albanian costal area is likely to become warmer. The increased annual temperatures that are expected are up to 15.9°C (15.6-16.1°C) in the north, 16.8°C (16.5-17.1°C) in the centre and 17.9°C (17.6-18.2°C) in the south part by 2050. By 2100 the temperature are expected to increase up to 17.8°C (17.1- 18.5°C) in the north; 18.7(18.0-19.4°C) in the centre and 19.8 (19.1-20.5°C) in south regions.

24 SRES: IPCC Special Report on Emission Scenarios
25 AR4: IPCC Fourth Assessment Report

Figure 4.9 Annual temperature projections (°C) with and without climate change, central part. The red line shows that observations after the year 2000 reached the values projected for 2020 and the trends is continuously increasing. The colored field shows the high temperature variability (5%, 95% quantiles), indicating the likely drought and heat waves frequency increase

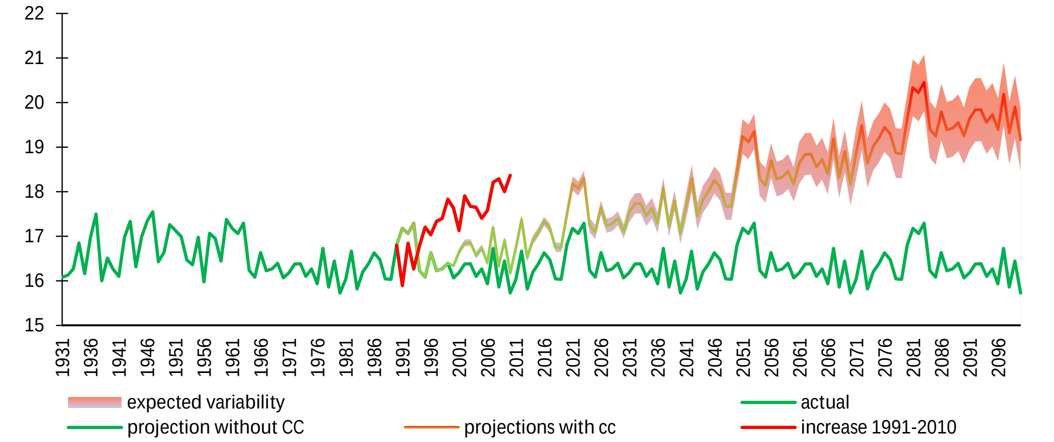


Figure 4.10 Annual temperature, baseline and expected by 2050 and 2100

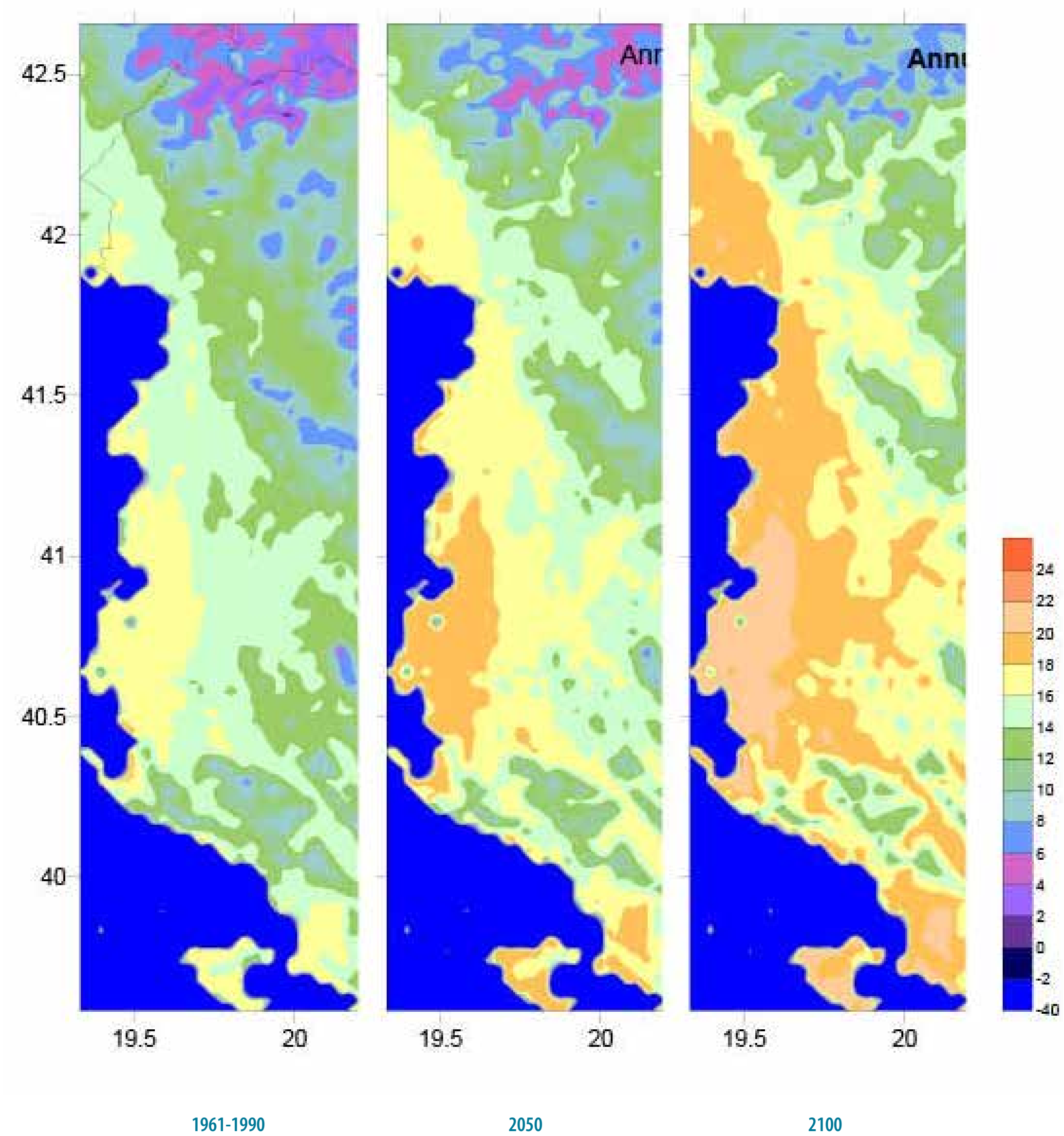
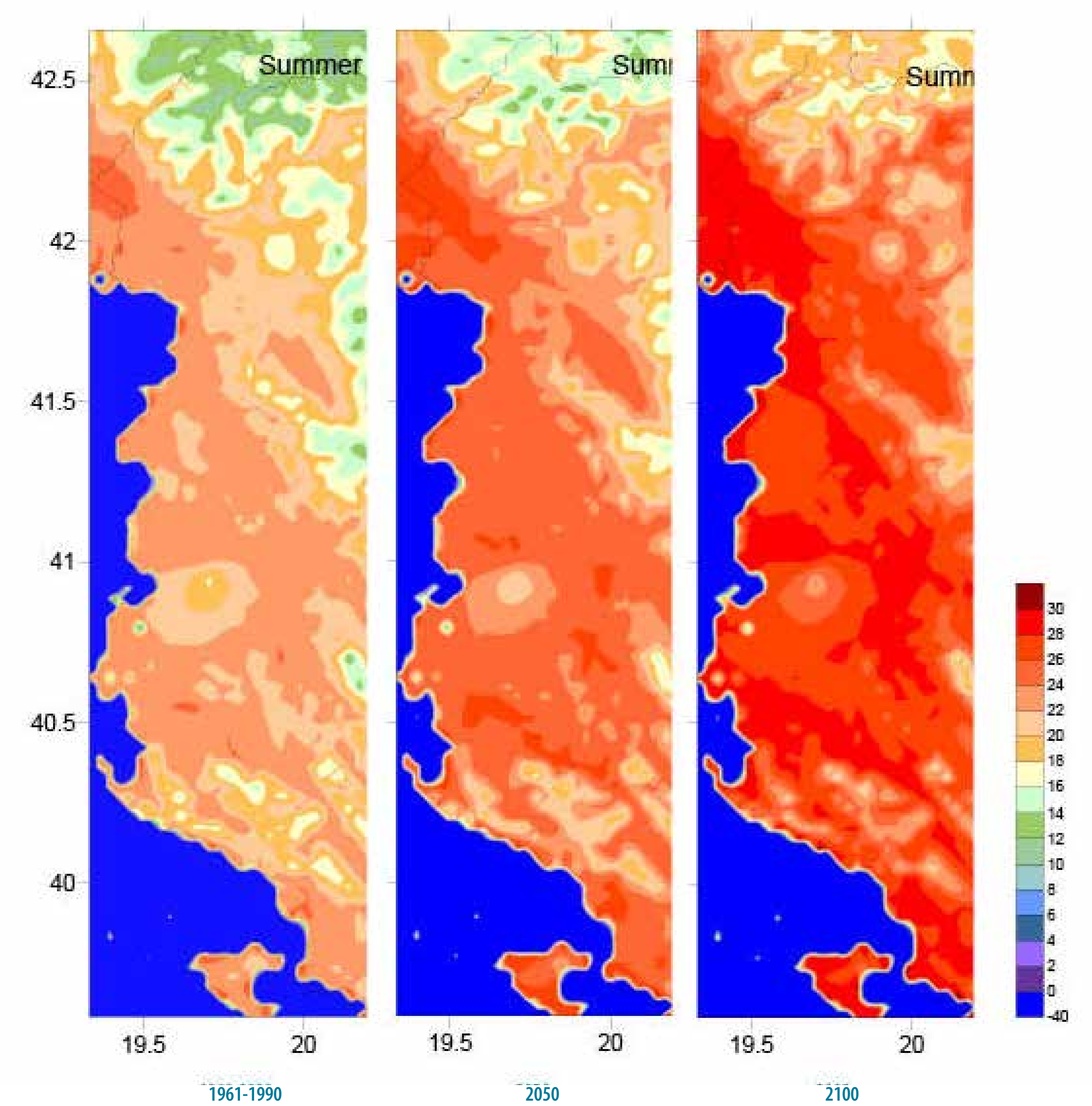


Figure 4.11: Summer temperature, baseline and expected by 2050 and 2100 for the coastal zone



The scenarios project the lowest increase for temperature in winter compared to other seasons and higher increases in spring compared to winter, related to 1990. The average temperature in autumn is likely to increase by up to 1.6°C by 2050, 2.8°C by 2080 and 3.5°C by 2100. For summer, projections of the average temperature change are likely to reach up to 5.3°C by 2100. The coastal zone is unlikely to experience average temperatures less than 25°C by the summer of 2050, and average temperatures up to 30°C by 2100 (Figure 4.11).

A consequence of the predicted temperature changes and precipitation changes are that more hot days and heat waves are very likely over the coastal area. More frequent and severe droughts with a greater fire risk are expected. The increases in the air temperature are also projected to lead to an increase in the "cooling degree days" (Table 4.4).

Table 4.4. The expected number of days with Tmax>35°C; number of days with heat wave and cooling degree days for the three coastal regions.

	Region	Period 61-1990	years[1] 2030	2050	2080	2100
Number of days Tmax>35°C (average)	North	1.7-5.8	5-10	7-14	8-20	10-24
	Centre	0.6 - 4.9	2-9	2-12	3-18	4-21
	South	1.3	4	5	7	8
Number of days with heat wave (decade)	North	19-27	56-60	72-80	95-98	115-120
	Centre	16	29	36	52	60
	South	7	13	16	20	25
Cooling degree days	North	360	550	670	840	930
	Centre	686	780	870	980	1100
		757	860	950	1050	1160

Additionally, minimum temperature levels experienced in the coastal zone are likely to be higher, i.e. there will be less cold days. Frost days are likely to be a very rare phenomenon and less cold waves are very likely over the whole coastal area (Table 4.5).

Table 4.5. The expected number of days with Tmin < 0°C, number of days with cold wave and the heating degree days.

	Region	Period 61-1990	years[8] 2030	2050	2080	2100
Number of days Tmin<0°C(average)	North	10-27	4-15	0-10	0-3	0
	Centre	7-32	3-18	0-11	0-5	0
	South	3	0	0	0	0
Number of days with cold wave (decade)	North	30-48	10-15	6-7	0-6	0
	Centre	32-46	20-32	12-23	6-8	0
	South	7	0	0	0	0
Heating degree days	North	1450	1410	1390	1350	1335
	Centre	1530	1495	1460	1420	1390
	South	1168	1130	1110	1090	1070

More hot days and heat waves are very likely over the study area because the expected changes in surface air temperature will lead to changes in air humidity. This is likely to influence the increases in the heat index (which is a measure of the combined effects of temperature and moisture). Recent investigations show that increasing temperatures will be followed by an increase in the probability of extreme events and a higher intra-annual variability of minimum temperatures.

26 The values refer to ten year averages, e.g. for 2030 refer to period 2025-2035

4.4.2 Precipitation

All the scenarios reveal a likely decrease in annual precipitation related to 1990 for all time horizons (Figure 4.12). In particular:

- A1F1MI projects the highest average decrease in precipitation after 2040, likely to reach values up to -63.6 % by 2100 in the summer season (highest/max. scenario),
- A1BAIM projects an average decrease in precipitation after 2040, likely to reach the value -54.7% by 2100 in the summer season (average scenario),
- A2ASF project a decrease of 47.2% by 2100 always in the summer season.
- B1IMA projects the lowest decrease after 2040, likely to reach the value -43.8% (Lowest/min. scenario).
- B2MES scenarios project the lowest value of precipitation -42.5% by 2100 in the summer season.

By generalizing, the outputs of different scenarios lead to the conclusion that the annual precipitation is likely to decrease up to -8.5% (from 47.4 to -56.0%) by 2050; up to -18.1% (from 94.0 to -89.7%) by 2100 (Table 4.6 & Figures 4.12 & 4.13).

Figure 4.12 Annual precipitation projections (mm) without and with climate change (average scenario), central part. The grey field shows the high precipitation variability (5%, 95% quantiles), indicating the likely frequency increase in heavy precipitation and drought cases

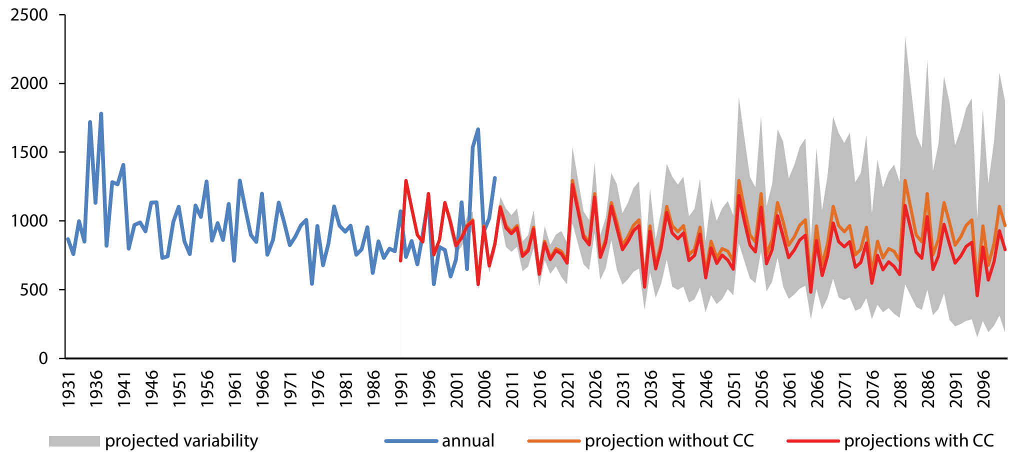
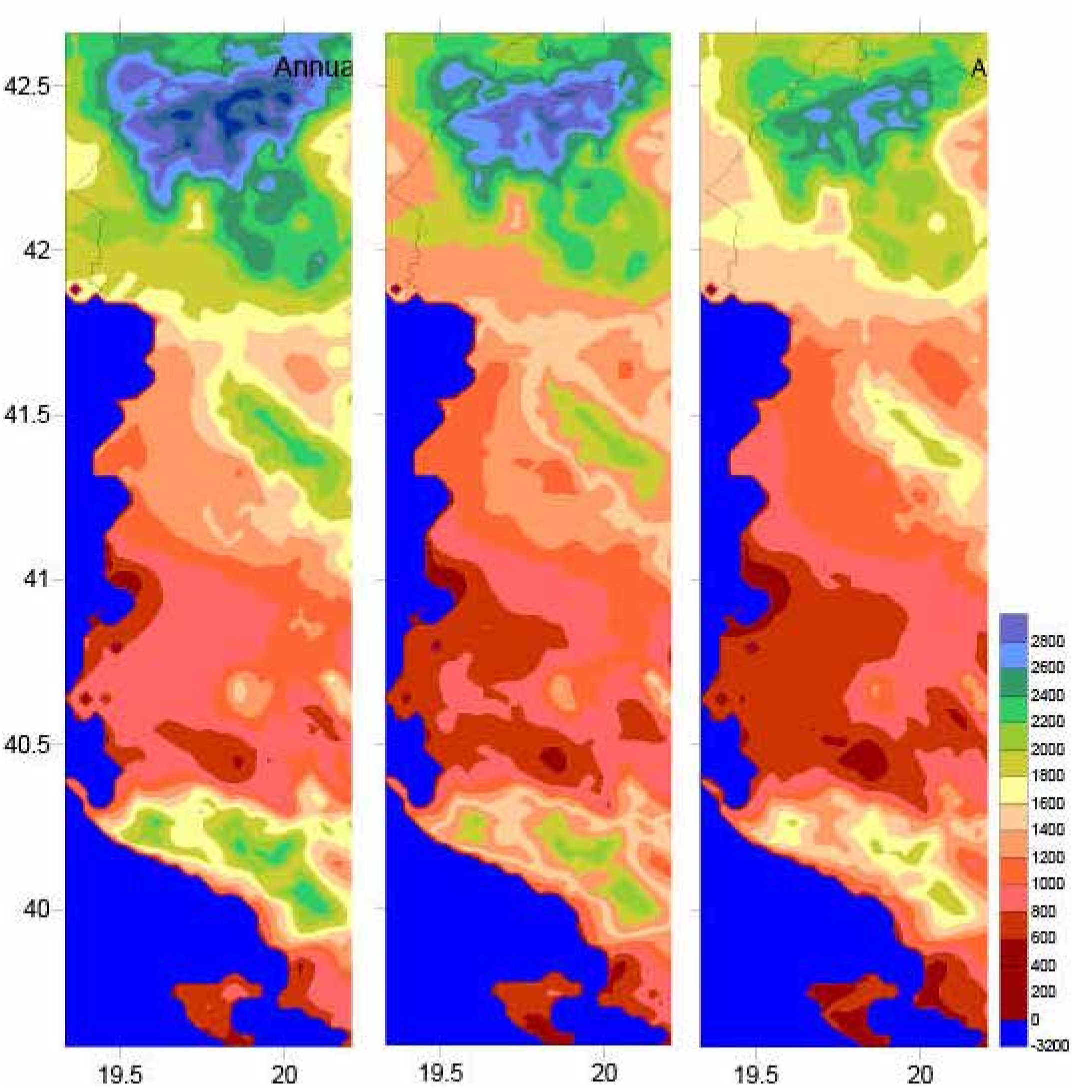


Table 1.6. Precipitation change projections (%) for different time horizons related to 1990.

Years	2030	2050	2080	2100
Annual	-3.84 (-35.4 to 27.7)	-8.46 (-56.0 to 47.4)	-14.37 (-78.6 to 81.1)	-18.13 (-89.7 to 94.9)
Winter	-5.96 (-15.9 to 4.0)	-10 (-27.9 to 7.7)	-14.3 (-44.6 to 16.1)	-18.1 (-55.8 to 19.6)
Spring	-2.45 (-11.9 to 7.0)	-7.26 (-25.3to 10.75)	-14.26 (-45.1to 16.6)	-17.7 (-55.3 to 19.8)
Summer	-10.4 (-12.8 to -7.9)	-19.7(-24.1 to -15.3)	-41.9 (-49.2 to -34.5)	-50.4 (-59.4 to -41.3)
Autumn	0.5 (-10.1 to 11.1)	-2.5 (-21.3 to 16.3)	-6.9 (-38.1 to 25.2)	-9.5 (-48.1 to 29.1)

From Figure 4.13 it can be shown that there will be a decrease of annual precipitation (-8.5%), which varies from 1500mm in the north, 965mm in the centre and 1120mm in the south part by 2050; variation from the north to the south of the entire coastal area is 1400 to 800 mm. By 2100 there will be a decrease in total precipitation (-18.1%). On the north part the total of precipitation is expected to be up to 1300mm, in centre 860mm and in the south up to 1000mm; variation from the north to the south is 1600 to 600mm respectively. Although there is likely to be a decreasing trend in annual precipitation, a high variability is expected (Figure 4.12). The cases of intensive rain (precipitation higher than the threshold) can be expected to intensify. So, it can be expected that there will be an increase in hazardous rainfalls for the north part of about 1-2 days by 2030 related to 1990, about 2-3 days by 2050, 3-4 days by 2080 and about 4-5 days by 2100. In the central part an increase of about 1 day with rainy day by 2030, 2 days by 2050, 3 days by 2080 and 4 days by 2100 is expected. The same situation as the central part is expected to occur for the southern part of coastal area.

Figure 4.13: Annual precipitation, baseline and expected by 2050 and 2100



A further consequence of the predicted changes in precipitation is related to the occurrence of the 24hr maximum precipitation over the threshold that is considered as a hazardous event that might cause economic damages. The time series (period 1957-2010) for the 24hr maximum precipitation for the representative stations are used to calculate the expected levels of precipitation expected in a 24 hour period and the return periods the levels of this magnitude can be expected (Table 4.7).

Table 4.7. The expected 24hours precipitation (mm) for the different return periods for three regions of the coastal zone.

	Return period (year)					
Time	2	5	10	20	50	100
North	93±7	132±11	158±14	182±17	215±21	239±25
Central	79±8	105±11	125±14	145±17	170±22	189±25
South	74±6	97±8	116±11	134±13	157±16	174±19

Table 4.7 shows that the northern coastal region can be expected to experience 239mm precipitation with a return period once in 100 years, 215mm once in 50 years and 182mm once in 20 years, which are classified as dangerous event. In the central coastal region, an amount of 189mm of precipitation can be expected once in 100 years, 170mm once in 50 years and 145mm once in 20 years, are classified as dangerous events too. For the south part these amount of dangerous precipitation are almost the same as those of the central part.

Although the number of extreme precipitation events can be expected to increase in terms of magnitude and frequency, overall the reduced levels of precipitation will also lead to an increase in the number of consecutive days without precipitation (drought). The maximum number of drought days is likely to be higher in the northern part (23 days) and up to 15 days southwards by 2100 compared to the baseline period 1960-1990 (Table 4.8).

Table 4.8. The expected maximum number of consecutive days without precipitation (drought).

	Period	Time horizon			
	1990	2030	2050	2080	2100
North	58	63	69	74	81
Central	73	77	80	84	88
South	83	85	88	94	97

This is also reflected in an increase in the number of cases that can be expected of moderate, severe and extreme of SPI3[27], of about 24 cases in the north, of about 28 in the centre, and 25 cases in the south by 2100 (Table 4.9).

Table 4.9. The expected SPI3 values (for three months period).

	Period	Time horizon			
	1990	2030	2050	2080	2100
North	15.7	18	20	22	24
Central	25.7	23	25	26	28
South	16.8	19	21	23	25

27 Standardized precipitation index (SPI) that quantifies the precipitation deficit on multiple time scales and based only on rainfall data is useful to describe drought conditions in meteorological, agricultural and hydrological applications.

4.4.3 Mean Seal level Pressure

Regarding mean sea level pressure, all GCM scenarios project the mean sea level pressure (MLSP) for the coastal area to have an increasing trend both annually (Figure 4.14) and seasonally, with the exception of summers which project a decreasing trend. Because of this decreasing tendency during summer, an increase in occurrence of the cyclonic circulation is expected, which will lead to an increase in the number of convective stormy days. A correlation between the average pressure values and the number of rainy days (more than 10 mm, which is an indicator of storm events) indicates that the decrease of MSLP is likely to be accompanied by an increase in the number of extreme events.

Figure 4.14 Likely changes in annual mean sea level pressure (hPa)

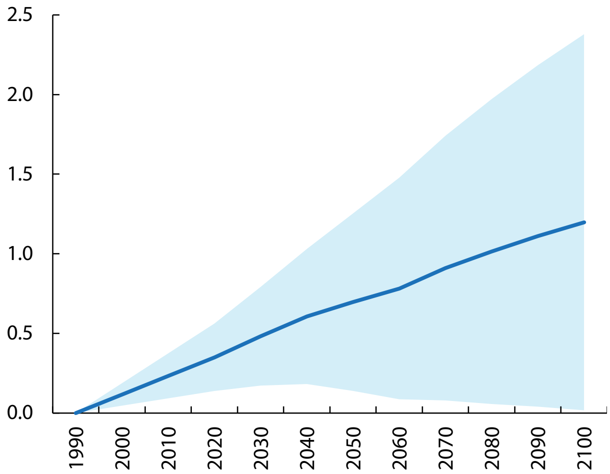
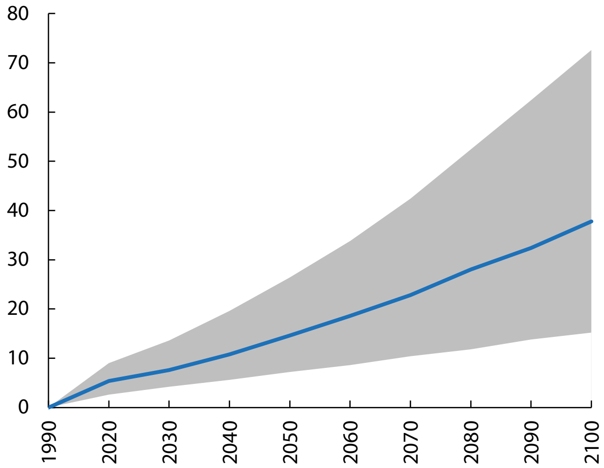


Figure 4.15 Likely changes in annual mean sea level (cm).



4.4.4 Sea Level Rise

Projected sea level rise indicates that most urban areas along Albanian coast will be exposed to higher inundations risks

Between 1985 and 2011 the Adriatic coasts of Albania have changed. Using satellite images it was possible to measure that the coastline had and extension 535 km in 1985 and in 2011 the extension reached 557 km. The global model projections indicate that open coasts and estuaries will experience rising sea levels over the next century. In the next several decades, warming produced by climate model simulations indicates that sea level rise could amplify.The exact global rate of future sea level change is not known and will be location specific. However, as the earth's average temperature increases, a scientific consensus has gradually emerged indicating that there is a serious risk that the rate of sea level rise will accelerate during the 21st century in spite of the international effort for greenhouse-gas emission mitigation.

As a result of sea level rise (Figure 4.15), the level of the rivers is expected to increase in the upper parts of the basin and the flow will decelerate. In total, until 2050, approximately 1082.45 km^2 (32% of the coastal area or 3.76% of the country's surface)[28] will suffer direct consequences from 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. Most coastal habitats, such as sand dunes, fresh and brackish water wetlands, marshes and lagoons, will be lost or further deteriorate. The Adriatic coastline will regress towards the continent, and coastal erosion will intensify, leading to migration of coastal wetlands and other habitats inland where they will be impeded by embankments and drainage schemes constructed as part of the wetland reclamation work that took place during the 50's-60's of the last century.

28 This includes even high territories where settlements are situated, since the calculation is done in most of the cases based on the surface of local units.

A rise or fall of land surface also cause a relative local fall or rise of sea level. The Albanian costal area is prone to subsidence that might intensify the impact of sea level. Sea level rises of up to an average of 40 cm are expected for the Albanian coast, reaching a maximum of 73 cm by 2100 (Table 4.10 and Figure 4.16).

Figure 4.16: Areas expected to be flooded by the average sea level rise of 14.6 cm by 2050 (left) and categorization of areas at risk as a consequence of sea level rise and river flooding (right).

Summary of implications of findings

Changes in temperature, precipitation and sea level will also have implications for the coastal environment and biodiversity. To simulate the effects of climate and socio-economic change and of adaptation on natural and human coastal systems, in parallel with MAGICC, the DIVA software was run for the same climate change scenarios and timescale. The average outputs of the scenarios generated are shown in Tables 4.10.

Table 4.10. Outputs from Diva model (coastal area) for different scenarios for the year 2050.

Year 2050		Scenarios					
Parameters		A1FI	A1B	A2	B1	B2	average
Coastal floodplain area	km²	475.7	474.2	473.1	466.9	464.4	470.9
Coastal floodplain population	thousands	47.61	47.5	51.0	46.8	45.8	47.8
Coastal forest area	km²	11.1	11.8	11.1	12.1	12.3	12.0
Total wetland area	km²	75.6	71.1	75.5	75.5	80.9	75.7
Low unvegetated wetlands area	km²	63.02	58.73	62.88	62.82	67.96	63.08
Low unvegetated wetland monetary value	millions US$	30.19	28.43	8.67	17.17	16.25	20.14
Net loss of wetland area	km²	12.38	16.79	12.46	12.41	7.05	12.22
People actually flooded	thousands/year	0.08	0.08	0.08	0.08	0.08	0.08
Relative sea level change (since 1995)	m	0.20	0.19	0.19	0.17	0.16	0.18
Saltmarsh area	km²	0.59	0.59	0.62	0.65	0.67	0.63
Saltmarsh monetary value	millions US$	0.07	0.07	0.02	0.05	0.04	0.05
Sand loss total	Thousands m³/year	439.2	399.4	392.1	336.4	287.0	370.8

The analysis indicates that significant changes to the coastal environment of Albania can be expected as a result of climate change leading to an increase in the maxima and minima of factors such as temperature and precipitation. These changes can be expected to have a connected impact on the coastal environment and population. Not all changes may lead to a negative impact. For instance, changes in temperature regimes will lead to a lengthening of the growing season. However, the majority of impacts can be expected to lead to negative consequences. For instance, changes in temperature regimes are expected that will also lead to more frequent and severe droughts, with greater fire risk, and more hot days and heat waves are very likely over the study area. These increases are projected to be largest mainly in areas where soil moisture decreases occur. The increases in the air temperature are also projected to lead to an increase in the "cooling degree days" (which is a measure of the amount of cooling required on a given day once the temperature exceeds the threshold 17.5°C). Increases more in daily minimum temperatures, more than maximum temperatures, are likely to occur over nearly all land areas. Frost days and cold waves are very likely to become fewer.

Warming and population growth would increase annual heat-related deaths in those aged over 65 and contribute to the spread of vector-borne, water-borne and food-borne diseases. Warmer average and extreme temperatures will enhance the demand for freshwater and water for irrigation purposes, especially for soils with low water-storage capacities. If precipitation decline, the project area would face substantially increased risks of summer water shortages.

A further implication will be changes to the tourism climatic index (TCI) for Albania's coastal areas that indicate good climate levels of comfort for tourist activity. Referring to the expected changes of this index, the period with good conditions for tourist activities is expected to expand from the end of February to end of November by the end of century.

4.5 SOCIO-ECONOMIC VULNERABILITY AND CLIMATE RISKS

The findings of the socio-economic assessment are used as a baseline to provide context for the assessment of impacts made for each of the individual sector studies.

The economic situation in Albania during the past years has been influenced by internal and external factors. Macro-economic stability has been maintained, as Albania was less affected by adverse regional and global economic conditions. According to official data, although positive, GDP growth decelerated and remained below historical averages: from 3% in 2011 and 3.81% in 2010 to 0.44% in 2013. Socio-economic vulnerability is centered on 4 sectors: agriculture, water, population and tourism. Key indicators have been identified for each sector in Albania (see Table 4.11)

Table 4.11: Key Indicators for each sector

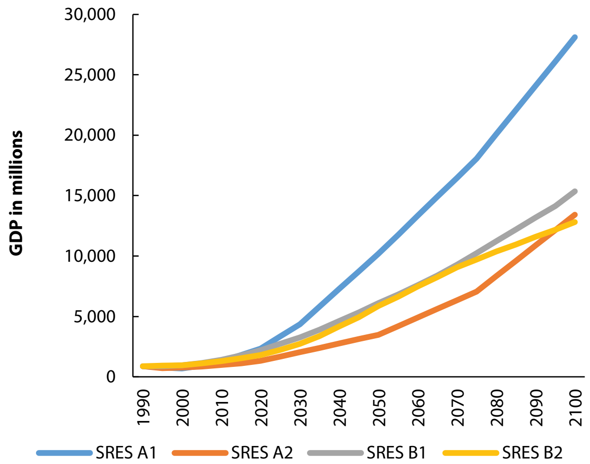
Sector	Indicator	What it is proxy for	Relationship to vulnerability
Agriculture	Agriculture area cultivated with cereals	Labor force, total agricultural production, water demands by the sector, and sector contribution to GDP.	Demand ↑ as population ↑ Sensitivity ↓ as production ↑
Water	Water production and water needs	Water network infrastructure, water supply, population access to water, industry and agriculture sector needs.	Water demand ↑ as population ↑ and economic activity enlarge Sensitivity ↑ as % of water use ↑
Tourism	Number of visitors	Beach quality, waste management, flooding risk.	Sensitivity ↑ as population ↑
Population	Urban Population growth (change) rate	General needs people for infrastructure (e.g., schools, hospitals, housing, roads), resources (e.g., food, water, electricity), and jobs.	Sensitivity ↑ as population ↑

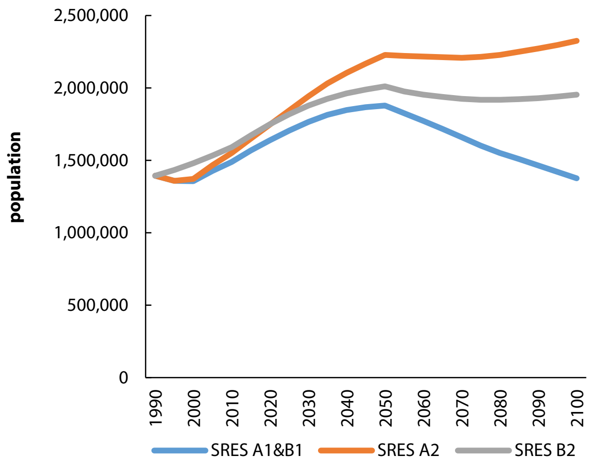
4.5.1 Population and GDP scenarios

IPCC SRES[29] have also been used to estimate GDP and population growth for coastal areas. They indicate that the rate of GDP will continue to remain at low levels until 2020 due to internal and external factors. After 2020 the growth rate will increase to an average of 3%, which corresponds to the general accepted growth rate of developed countries (this assumption is based on the probable admission of Albania to the EU).

The general trend of population change will have specific characteristics in coastal areas, mainly because of patterns of migration within the country. Rural to urban migration, as well as migration from inland and mountain areas to the coastal areas have been key trends during the years of transition, and are expected to characterize the country demographical development for at least the next decade. After this phase internal migration will stabilize and the number of births over deaths will be equal, leading to a natural growth rate of 0%. The subsequent period will be characterized by the current demographical patterns of developed countries with a negative growth rate, meaning that the number of deaths will overcome the number of births. Projections for population made on the basis of SRES scenarios seem to suggest that the most likely baseline scenarios should be developed under the A1 and B1 storylines (Figure 4.17).

Figure 4.17 Coastal area scenarios for GDP (left) and population (right)





4.5.2 Socio Economic Scenarios - Tourism Sector

Tourism is an important sector in the economy providing jobs, incomes and making contributions to Government revenues. Currently tourism infrastructure is not at its full capacity, therefore an overall development and increase in the number of tourists is expected to happen in the next decade. The prospect of joining the EU will also contribute to this projection, as more foreign visitors from Western Europe are expected to visit the country. This will lead to an increasing rate of number of tourist until 2020. Thereafter, the tourism will experience a period of stagnation, with a constant growth rate until 2040. The long-term projection of Albanian and foreigners tourists during 2010-2040 shows that the rate of growth of foreigners will be slightly higher than the rate of growth for Albanians: 4.2 versus 3.6. This means that the majority of tourists' flows arriving in the country in short-term, mid-term and long-term will be foreigners.

29 IPCC Special Report on Emission Scenarios (SRES) storylines: A1 corresponds to economic growth and liberal globalization; A2 to economic growth with greater regional focus; B1 to environmentally sensitive with strong global relationships; and B2 to environmentally sensitive with highly regional focus.

4.5.3 Scenarios for the water sector

Projections suggest that water needs for both domestic and industrial use are within existing capacity and that there is no need to increase water production but to reduce water losses through infrastructure improvement. Vulnerability and risk stems primarily from:

- A non-existing or weak monitoring system for both surface and groundwater in quantity and quality, including calibration of measuring systems and evaluation and management of data;
- Non-existing or weak water infrastructure and poor maintenance, especially in water supply and wastewater management; this has to be seen in the context of the poor implementation of economic instruments, the dramatic increase in construction activity, which has been poorly planned and regulated, fast structural changes and absence of waste collection in rural areas;
- A poor regulatory and financial framework in the water sector together with the lack of a long-term strategy which should act as a schedule for all activities and projects in the water sector.

4.5.4 Scenarios for the agriculture sector

The agricultural sector is one of the main drivers of Albanian economy. In 2011, Agriculture sector employed 54.6% of the total number of employees and its contribution to the national GDP was 19%. Because the circumstances in agricultural sector are favourable for the development in the future, the favourable climate, low cost of labour force, high potential for investments, improving the infrastructure, improvements in the energy and road infrastructure, market demands for agriculture products, etc. makes agriculture one of the most important economic sectors of the country. Under climate change scenarios, yields of cereals, and the area under cultivation are expected to increase to the year 2100.

4.6 SECTORAL VULNERABILITY AND ADAPTATION ANALYSIS

4.6.1 Assessment of the Water Resources Sector

Albania is rich in water resources. The hydrographical basin that feeds the water courses of Albania has a total area of 43,305 km^2 and is about 50 per cent larger than the country's territory. Seven rivers (Buna, Mati, Ishmi, Erzeni, Shkumbini, Semani, and Vjosa) and their tributaries drain towards the Adriatic Sea. The long-term average discharge into the Mediterranean is Q = 1,244 m3/s. The total volume of water flow is W = 39,220 x 106 per year.The mean annual flow of all rivers is 1300 m^3/s, which corresponds to a module of 29 $l/s.km^2$, one of the largest in Europe. The wettest period of the year is winter with 35% of annual precipitation and 39% of runoff. The second highest value of runoff is observed during the spring with its higher temperatures partly from direct precipitation (as rain) and partly from snow melt during this season. The driest period is the summer where the lowest value of both precipitations and runoff occur.

4.6.2 Climate change impacts on hydrology

The main components of the hydrologic cycle are precipitation, evaporation, and transpiration. Changes in climate parameters – solar radiation, wind, temperature, humidity, and cloudiness – will affect evaporation and transpiration. Changes in evapotranspiration and precipitation will affect surface runoff[30]. A decrease in mean annual precipitation produces a decrease in mean annual runoff. However, the maximal values of precipitation have an increasing tendency because an increase in the frequency of the intensive precipitation is expected to occur, and this will cause an increase in flood frequency in autumn, winter and spring (Table 4.9 & Figure 4.18). The predicted

30 Surface runoff is water, from rain, snowmelt, or other sources, that flows over the land surface and is a major component of the water cycle.

values for precipitation minima will lead to an increasing frequency of droughts in summer. Climate change will affect the hydrology of watersheds, the demand for water, and the size and thickness of snow pack. Given the warmer than average temperatures in winter, reduction in the amount of snowfall and earlier melting is expected. This will impact runoff patterns, namely its reduction in spring and a shift of maximum values towards winter months (Figure 4.19).

Figure 4.18: Seasonal runoff changes (%), winter average scenario (left) and seasonal runoff changes (%), spring average scenario (right)

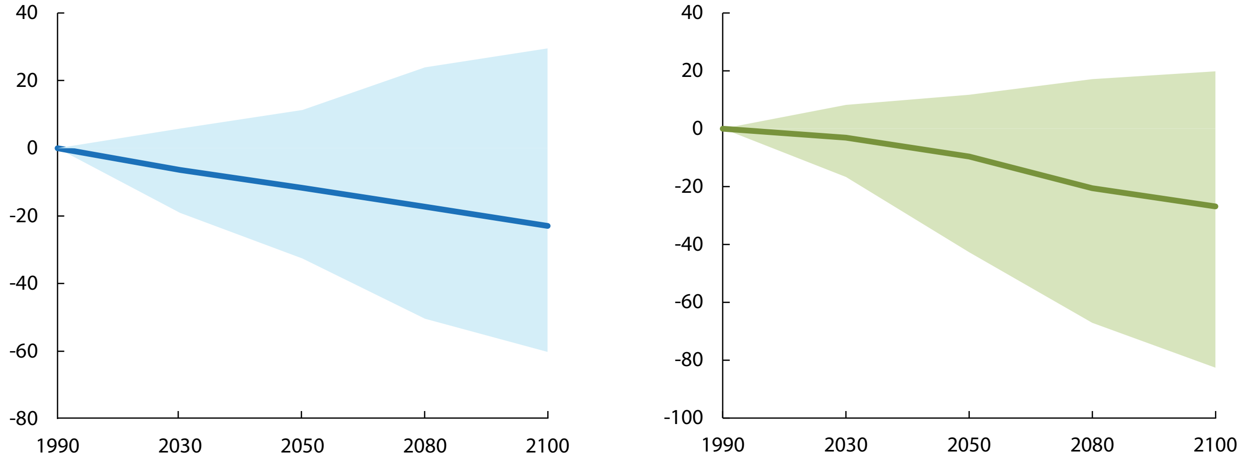
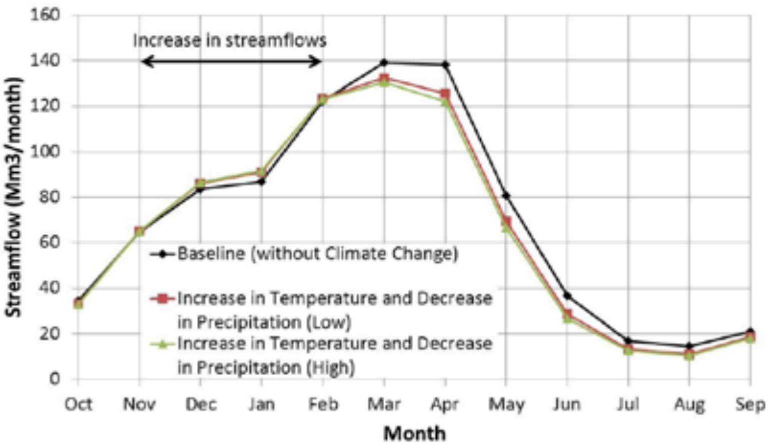


Table 4.9 Project Runoff Changes by Seasons (2030-2100)

	Runoff changes (%)			
	2030	2050	2080	2100
Winter	-6.4 (-19.1 to +5.8)	-11.7 (-32.6 to +11.3)	-17.3 (-50.4 to +23.9)	-23.0 (-60.2 to +29.5)
Spring	-3.1(-16.7 to +8.2)	-9.6(-42.7 to +11.7)	-20.6 (-67.1 to +17.1)	-26.9 (-82.6 to +19.8)
Summer	-14.6 (-22.5 to -10.5)	-27.1 (-58.0 to -22.3)	-54.2 (-78.4 to -45.6)	-63.6 (-82.7 to -63.6)
Autumn	0.7(-14.2 to +10.2)	-3.6 (-29.2 to +12.1)	-9.8 (-49.9 to +16.8)	-13.4 (-61.1 to +23.9)

Figure 4.19: Approximate assessment of Climate Change impact on stream flows in Mati River with WEAP. Increase of streamflow in winter and reduction especially in spring due to reduction of snowfall and earlier melting



4.6.3 Impact of climate on the water supply system

Climate's impact on water demand is driven by water use and electric power consumption. In coastal area, water demand is lowest in the winter, when colder temperatures reduce the use of water[31]. But in late spring, summer and early fall there is a rise in the use of water and in demand for electrical power. During summer periods the demand rises significantly, peak daily demand often rises by a factor of 2 or more times the annual average, and peak hourly demand rises to even higher levels. However, even in the worst case scenario the difference between production and the need of water can be accommodated by technical and policy actions.

4.6.4 Impact of climate on flooding

Albania has a long history of flooding in the western lowlands. Records show that flooding has occurred in all major catchment basins of the country. Climate change will lead to increases in flooding as a consequence of predicted heavier precipitation, and there is already evidence of increasing frequency of high rainfall events. The coastal area is flooded not only from rivers but also by sea water inundation (storm surges). During a flooding event with a mainly of a pluvial origin waters may inundate the floodplain in a matter of hours (flash floods) or for several weeks, as sometimes occurs during the winter period when the period of rainfall is longer or during spring floods caused by snowmelt . The likely increase in frequency and intensity of heavy rains could make the coastal region even more vulnerable, urging the mainstreaming of Disaster Risk Management (DRM) and adaptation into long-term development strategies.

4.6.5 Climate change impacts on groundwater

Groundwater in Albania is the only source of drinking water. The average discharge from groundwater aquifers varies from 200 to 400m^3/day to 800m^3/day. The water is generally fresh and soft. Exploitable reserves of these waters are enormous; flow from wells varies from 10 to 100 l/s. Currently, little is known about the actual availability, and groundwater extraction capacity nationwide. There has been evidence of saltwater intrusion into aquifers of the coast of the Adriatic Sea, near the towns of Laç and Lushnja, probably caused by overexploitation.[32] When considering water resources in coastal zones, coastal aquifers are important sources of freshwater. It can be anticipated that groundwater systems will be affected by changes in recharge, and changes in use related to irrigation where this source is used for this purpose. A link between rising sea level and changes in the water balance is suggested by a general description of the hydraulics of groundwater discharge at the coast.[33]

4.6.6 Vulnerability assessment

The Adriatic Sea has experienced an average sea level increase of about 15 cm and shoreline regression in a century is predicted to be between 7.5 and 15 m. Shoreline retreat causes deterioration of natural coastal defences, such as dune ridges, thus increasing coastal exposure to high-energy waves. A lack of sedimentary supply plays an important role in spatial variability of the extent of inundation in coastal areas.

The main consumer of water is the agriculture sector. According to the draft Water Strategy[34], water for irrigation accounts for 72% of total use while water for industry and domestic purposes

31 Albania's Second National Communication to UNFCCC Report. UNDP 2009
32 Hydrogeology and Recharge in Mat Plain Aquifer, Albanian Geological Survey.
33 Singh, R. D. & Kumar, C. P.
34 National Integrated Water Resources Management (IWRM) Strategy (draft). Preparation and Implementation of an Integrated Water Resources Management (IWRM) Strategy, July 2015, Ministry of Agriculture, Rural Development and Water Administration (MARDWA).

accounts for 28%. However, 50% of agriculture use is dependent on rainfall and surface water. Due to the methods used, the efficiency of water-use for irrigation is very low. The time periods when water demand are highest are the same periods when water supply is most at risk of being inadequate. Furthermore, it is expected that the impacts of climate change on urban water supply will be negative.

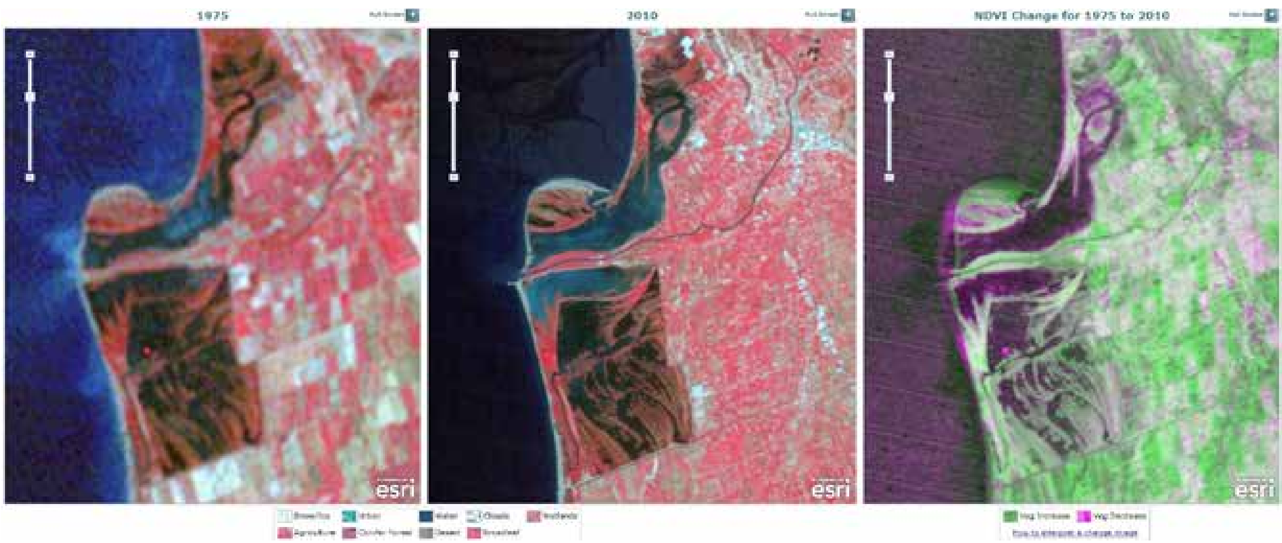
All estuaries are expected to be vulnerable to climate change to some degree. Sea level rise will impact the bedrock coasts of the southern part of the country differently from the sandy barrier shorelines of the middle and north parts. In the northern part of Albania rising sea levels already are submerging low-lying lands, eroding beaches, and converting wetlands to open water, all of which exacerbate coastal flooding and increasing the salinity of freshwater aquifers.

It is likely that most wetlands will not survive acceleration in sea level rise. Wetlands may expand inland where low-lying land is available, but most existing wetlands will not be able to keep pace with sea level rise. There is already evidence of coastline alterations leading to a loss of wetlands. Predictions suggest that there will be an overall loss of wetland area along the coast (Figure 4.20, example in the northern part of the coast line).

Higher sea level provides an elevated base for storm surges to build upon and diminishes the rate at which low-lying areas drain, thereby increasing the risk of flooding from rainstorms. Increases in shore erosion also contribute to greater flood damages by removing protective dunes, beaches, and wetlands and by leaving some properties closer to the water's edge.

Municipality water systems in coastal area will also be impacted by rising sea levels. Sea level rise impacts urban water systems through saltwater intrusion into aquifers, rivers withdrawals mainly for water use in agriculture. Low coastal areas notably those close to river mouths will experience more frequent flood because storm surges will be superimposed on a higher sea level.

Figure 4.20: Actual change of the coastline, Kune-Vaini lagoons, (lilac-loss of vegetation, green-vegetation increase).



Source: https://www.esri.com/software/landsat-imagery/viewer

The quantities of water extracted are much higher than the rate of water consumption per person per day approved by law. For coastal areas the actual amount of water withdrawn per capita is 345 l/d and the real water use per capita is 100 l/d, indicating a rate of water loss of 245 l/d.c. The levels of water used is less than that of water produced (which is higher than the normative 150 l/ d.c -250 l/ d.c).[35]

Despite these changes, in terms of water supply for industry and consumers, it can be concluded that there is no need to increase water production, but there is a need to reduce water losses through sustainable water management policies and investment in the water supply network. The analysis suggests that the available water resources in Albania are sufficient to cover future demand, but there is an urgent need to establish a precise database for the state of water services and water management for indices such as: (i) water consumption measurement, (ii) non-revenue water[36]; (iii) drinking water quality.

4.6.7 Adaptive Capacity

Adaptation options can include both proactive measures to preserve and protect resources in anticipation of climate change impacts (anticipatory options); or reactive measures that are implemented after climate change impacts are observed. There is a lack of scientific consensus regarding likely coastal changes in response to climatic changes. This is in part due to lack of adequate scientific understanding and observational data of the complex processes that contribute to coastal change, but also arising from the impacts from human activity on these area.

While the impacts of climate change on the coastline and on individual estuaries remain uncertain, the implementation of adaptation measures, and the expected responses that will result from these adaptation strategies, is even more uncertain. For Albania implementation of adaptation options is potentially difficult and costly. But on the other hand it is likely that implementation will be easier and more cost effective compared to the costs of inaction. Although more work is needed to evaluate the feasibility of options that have been identified to better define cost-effectiveness and provide additional guidance, a number of initiatives are already underway, these include:

The Flood Risk Management Plan[37] Shkodra Region 2012-2018 aims at improving Flood Risk Management (FRM) especially focusing on non-infrastructure measures, such as warning systems, preparedness and spatial planning. This includes consideration of all adequate types of measures for preparation, disaster management and recovery phases, as well as the development of a regional flood risk management framework that include local flood risk management plans.

National Integrated Water Resources Management (IWRM) Strategy (draft) which considers the country's needs for managing its water resources and guarantee adequate access to water of sufficient quality for human, animal, nature, secure food, energy production and protection against floods, especially while considering the expected impacts of climate change.

35 ERRU- Raporti vjetor 2013.
36 Water that has been produced and is "lost" before it reaches the customer.
37 FRM was prepared with the support of the Federal Ministry for Economic Cooperation and Development (BMZ) through Climate change Adaptation in Western Balkans. Available at http://www.qarkushkoder.gov.al/sq

4.7 ASSESSMENT OF THE AGRICULTURE SECTOR

The agricultural sector is one of the main drivers of the Albanian economy. In 2011, the sector employed 54.6% of the total number of employees, and its contribution to the national GDP was about 20%.

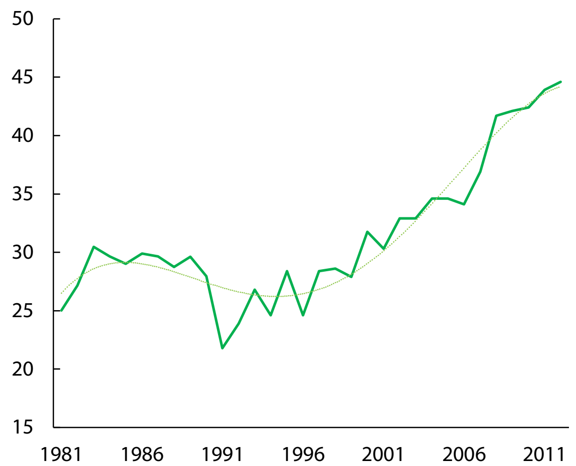
Agriculture is sensitive to short-term changes in weather and to seasonal, annual and longer-term variations in climate, and in particular to temperature and precipitation that are key drivers of agricultural production. These direct impacts on agriculture production are compounded by effects on soil characteristic, seed genetics, pests and disease and agronomic practices that also impact crop yields. Winter temperatures are important for the survival of pest and studies have shown that an increase in temperature accelerates the development of pests in general. Pest-crop interaction will be also directly affected by the rising CO_2 levels through the alteration of host plant attributes.

4.7.1 Crop/cultivation sub-sector

The agriculture sector is characterized by small farms (350,654 in 2010) averaging 1.21 ha in size with small herd sizes.

The main agricultural crops cultivated are corns (maize and wheat) and forages (nearly half of the agricultural cultivated area). Agricultural yields have been increasing; by up to 150 percent for some crops, mainly as a result of mechanization (Figure 4.21).

Figure 4.21 Agriculture yield (yield kV/ha) during years 1981-2012



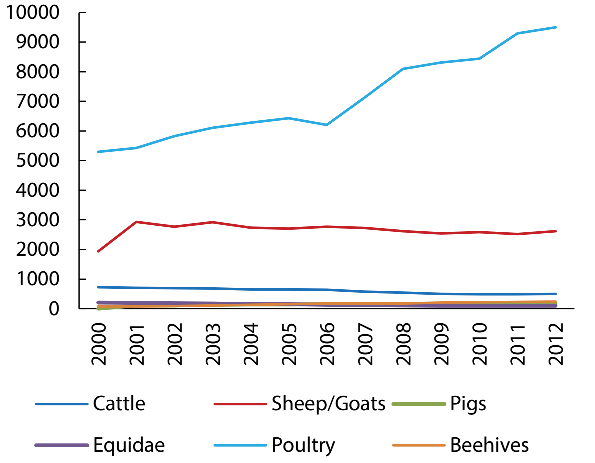
Irrigation and drainage have a direct impact on sustainable growth of agricultural production in the country. With current rainfall patterns it is necessary to provide irrigation of 3,000-5,000 m^3/ha during summer months and drainage during the winter months, with a hydro-module of 4-5 liters/sec/ha. Despite drainage capacity of 390 m^3/second maintained by pumping stations coastal areas remain susceptible to river flooding and sea water flooding, making the coastal plains the most vulnerable to climate change.

4.7.2 Livestock subsector

The value of livestock production has increased from 63,328 million ALL in 2000, to 84,276 million ALL in 2005, which makes 59 % of the total value of agricultural production of Albanian agriculture sector. The pattern of livestock number is presented in Figure 4.22. Most of meat products are consumed locally and only a small portion of meat products are exported.

Livestock products constitute a main source of food, thus being the most important sector of agriculture. The dairy industry is still in the process of modernizing structures and technologies as most small processing units still use traditional craftsmanship technologies. The number of livestock has been almost constant since the year 2000. However, the poultry sector has seen continuously increasing numbers from year to year.

Figure 4.22 Patterns of livestock numbers ('000 heads)



4.7.3 Forest subsector

Forests cover around 36% of the land area of Albania. Nearly four-fifths of the growing stock consists of broad-leaved species, predominantly species of deciduous and evergreen oak and beech. Albania is one of the few European countries where there has been a decline in forest area in recent decades, due to clearance for agriculture, overgrazing and cutting for fuel-wood. Firewood is an important commodity for Albania because it is used for heating (36% of energy demand) by a majority of households, and in rural areas it is also used for cooking (12%). Most of the forests in coastal areas are located in protected areas. They consist of natural forest and those created through plantings. Planted forests are those along coastlines (Mediterranean pine forests), and other species planted in inland of the territory.

4.7.4 Climate Change Impacts on the Agriculture Sector

A consequence of temperature variation is its impact on the growing season for agriculture.[38] Compared to the period 1961-1971, the period 2001-2010 has seen an extension of the growing season by 15 days in the southern region of the coastal zone (Vlore) and by 10 days in the northern region (Lezhe). Taking into consideration seasonal temperature projections, the beginning date of the growing season will shift towards earlier dates in February over the whole coastal area and the ending date will shift towards later dates in December. Consequently, the growing season is expected to lengthen by 37 days, 27-44 days and 22 days from north to south, respectively by 2100 compared to 1990 (Table 4.10).

The largest increase in temperatures is expected to be during the periods of summer and spring, which coincides with the period of plant growth and their fructification, which is expected to lead to negative effects for the majority of agricultural crops. High temperatures will limit yields in many vegetables. Higher daytime temperatures can cause major heat related problems in plants, while higher night temperatures have large negative effects on vegetables, especially fruiting vegetables. A further consequence of elevated temperatures is drought stress

38 The growing season is calculated as the days with persisting temperature >10 ^{0}C, is related with mean temperature of February (beginning day) and November (ending day).

that can lead to crop failure or the inability to plant or harvest a crop in a timely manner. The projected increase in the number of days with temperatures in excess of 35° C will also increase the demand for freshwater for irrigation purposes to alleviate temperature and drought stress.

Table 4.10. The growing season indicators.

		Period 1990	Time horizon			
			2030	2050	2080	2100
		date	date	date	date	date
Beginning	North	14/III	9/III	3/III	26/II	22/II
	centre	2/II I-21/III	28/II -10/III	26/II -5/III	23/II -27/II	20/II-24/II
	South	26/II	23/II	23/II	17/II	14/II
Ending	North	8/XII	15/XII	8/XII	22/XII	25/XII
	Centre	3/XII -8/XII	8/XII-11/XII	12/XII-16/XII	17/XII-22/XII	22/XII -25/XII
	South	20/XII	22/XII	25/XII	28/XII	30/XII
length (days)	North	270	282	291	300	307
	Centre	252 -258	274 -287	283 -294	294 -303	302 -309
	South	297	302	307	314	319

Projected increases in the occurrence of flooding and extreme precipitation events will impact crop productivity where a change in the pattern of precipitation events may be even more important than a change in the annual total. Farmers depend on rain-fed agriculture, which makes the agricultural economy vulnerable to changes of precipitation that also determines water availability. A reduction of rainfall accompanied with increased temperature will have a negative effect in crop yields. Considering the period of plant growth (their phenological stages) some crops are expected to be more influenced by this factor than others (Table 4.11).

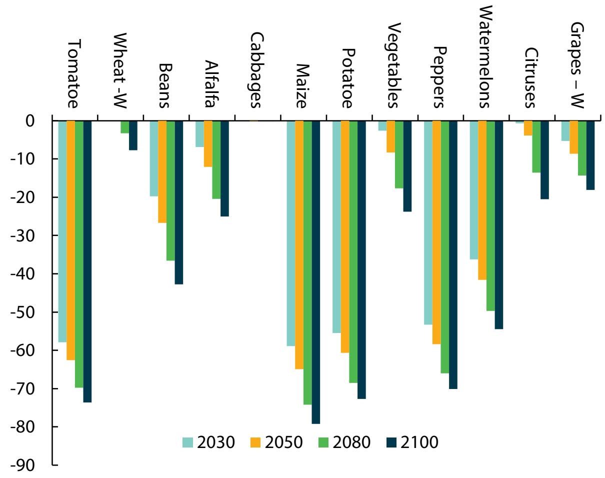
Table 4.11. The length of the total growing period of some agriculture crops, cultivated in Albania. Source: http://www.fao.org/

Crops	Crop development phases				
	Initial	Development	Mid	Late	Total
Wheat - W	30	140	40	30	240
Wheat – S	30	30	40	30	130
Alfalfa	150	30	150	35	365
Barley	15	25	50	30	120
Beans	20	30	40	20	110
Tomatoes	30	40	45	30	145
Cabbage	40	60	50	15	165
Millet	15	25	40	25	105
Maize	30	40	50	30	150
Potatoes	45	30	70	20	165
Onion	15	25	70	40	150
Sorghum	20	35	40	30	125
Soybean	15	15	40	15	85
Pepper	30	35	40	20	125
Sunflower	25	35	45	25	130
Watermelon	20	30	30	30	110

Table 4.11 shows that for many crops the periods of maximum number of consecutive days without precipitation coincides with three quarters of their development stages. This means that periods without rainfall can extend to three of the most important stages of the plant live-cycle. Some crops such as soybean, maize, spring wheat, barley, beans, tomatoes, cabbage, millet, onion, sorghum, pepper, sunflower and watermelon are expected to be affected from the maximum number of days without precipitation, because this will coincide with their development phases. Alfalfa and winter wheat are expected to be less affected, but in general the changes in precipitation are expected to mean that agriculture in Albania becomes almost entirely depended on irrigation.

The software CROPWAT 8.0 was used to calculate crop water and irrigation requirements based on soil, climate and crop data, in terms of expected increased temperatures and reducing precipitation (average scenario). Given that for most agricultural crops the annual amount of effective rainfall is insufficient to meet their water needs, a large number of crops will require increasingly high amounts of water for irrigation. This is because increased temperatures and reduced precipitation coincides with the period of cultivation of agricultural crops (spring-summer) (Figure 4.22). The analysis shows that maize, tomatoes, potatoes, pepper and watermelon will need greater quantity of water for irrigation. Agricultural crops, such as cabbage, alfalfa, citrus and grapes, are less vulnerable to the impacts of climate in changes. Calculations of agricultural yield for crops at different times, using the scenario "without irrigation", shows that in almost in all cases all reduce dramatically their yields. (Figure 4.23). On the other hand, a lengthening of the extent of the growing season can be expected to favour farmers and their crops providing they have the necessary information in time, and agricultural extension services to support their activities.

Figure 4.23 Crop yield reduction (%) under scenario "without irrigation"



In conclusion, agriculture in Albania is very vulnerable to expected climate change. The crops with the largest economic losses because of climate change are: tomatoes, potatoes, peppers and watermelon. Some other crops where less loss can be expected are: wheat, beans, cabbage, alfalfa, small vegetables, citrus and grapes.

4.7.5 Climate change impacts on livestock

The direct effects of climate change on livestock, by contrast, could be much more severe, but the methods available for quantitatively assessing effects on livestock are relatively untested. Livestock are sensitive to temperature, and studies show that climate change will have positive effects on livestock productivity by raising temperatures in winter; however, this effect will be outweighed by the negative effects of hotter summers.[39]

39 Bhavana K. R., Bendapudi R., 2013, Gebreegziabher Z., 2013.

4.7.6 Climate change impacts on forestry

Climate change will affect forests through the following impact factors:

1. Atmospheric CO_2 increase will limit the ability of trees to increase their growth rates,
2. Changes in temperature: production is already limited by low air humidity and soil water, therefore, growth and yield under climate change is expected to decrease,
3. Changes in precipitation and hydrology: extreme events such as extended droughts and hot spells have drastic consequences on tree growth,
4. Abiotic disturbances: fire, wind storm, flooding and drought are expected to increase significantly,
5. Biotic disturbances: climate change will affect herbivores and pathogens directly and indirectly.

4.7.7 Agriculture Sector Vulnerability Assessment

The current assessment indicates that although scenarios suggest the growing season will be extended the agriculture sector will become increasingly challenged by extremes of maxima and minima of precipitation and temperature. The ability of the sector to therefore maintain its growth in contribution to the economic base of Albania is under question. Factors that make coastal agriculture vulnerable are:

- Topography: flooding occurs in lowland areas and close to the rivers and coastal areas,
- Altitude: an important portion of agricultural area are less than 5 meters above sea level,
- Climate factors: in coastal areas precipitation is expected to be reduced much more than for inland areas. Temperatures will increase; potential evapotranspiration (ETo) will be significantly higher due to increases in temperature and wind speed,
- Coastal erosion: Some parts of the coast are eroding at rates of 0.3-20 m/year[40]. Coastal erosion destroys natural barriers (dunes, green belts, etc.), which can bring salt water into inland and agriculture area. It can lead to saltwater intrusion into freshwater aquifers, which can lead to contamination of drinking water sources and water used for irrigation (wells).

4.7.8 Adaptive Capacity

Adaptive capacity is particularly low among smallholder farmers in Albania, who have limited access to financial resources. A key factor in Albania's development of an adaptation plan for agriculture is furthering its work toward European Union (EU) accession. Albania has already developed laws on agriculture land use, land protection, and environment to become compliant with European standards and requirements. Along with these needed reforms, the EU encourages action toward climate change preparedness and adaptation. In order to adapt to the impacts and opportunities presented by climate change there is a need to focus on increasing access of farmers to technology and information, and to improve the dissemination of hydro-meteorological information to farmers.

A National Strategy for Development and Integration 2014-2020 for agriculture development taking into account climate change impacts is currently under preparation. This will focus on sustainable management of natural resources and climate adaptation actions through management of forests and water, and application of environmental-friendly agricultural production methods, including:

- Recover, conserve and enhance ecosystems that depend on agriculture and forestry;

40 http://www.climateadaptation.eu/albania/coastal-erosion.

- Restore and conserve biodiversity to meet the requirements of "Natura 2000,[41]" and improve water and land management;
- Increase the number of certified organic farms from 123 in 2011 to 300 in 2020;
- Increase irrigated agricultural area from 204,396 ha in 2011 to 225,000 ha in 2020;
- Promote resource efficiency and the shift towards a low carbon economy and climate sensitive sectors of agriculture, food and forestry.

4.8 ASSESSMENT OF THE BIODIVERSITY SECTOR

Coastal ecosystems are particularly sensitive to the increase in sea surface temperature, ocean acidification, salt water intrusion, rising water tables and to altered runoff patterns (Figure 4.24). Climate change scenarios for Albania are expected to accelerate the habitat loss and degradation along most part of the coastal zone, as migration of coastal wetlands and other habitats inland is impeded by embankments and drainage schemes constructed as part of the wetland reclamation work in the 1950's-1960's. Human induced impacts along the coastal zone of Albania, especially in the lowland Adriatic coast, may strongly decrease ecosystem resilience and adaptation capacity to climate change.

Figure 4.24: Coastal erosion in Buna River delta (left) and arable land north of Karavasta lagoon invaded by halophytic vegetation due to increased salinity from the salt water intrusion (right).

4.8.1 Climate Change Impacts on Biodiversity

In order to better visualize and quantify the impacts of climate changes in the coastal zone a habitat map of coastal zones sensitive to changes in climate has been prepared for 2050 (Figure 4.25) using CORINE Land cover classification. This map takes into consideration sea level rise projections, decrease of precipitation, increase of drought season, increase of temperature, and increased incidence of fires, especially on the habitats of the rocky limestone coast (southern coast from Vlora to Greek border, and Shengjin-Velipoje in the north Adriatic coast of Albania).

The main habitats of European conservation interest that are expected to be highly impacted by climate change (For more information please see Annex 1) in the time horizon 2050 are:

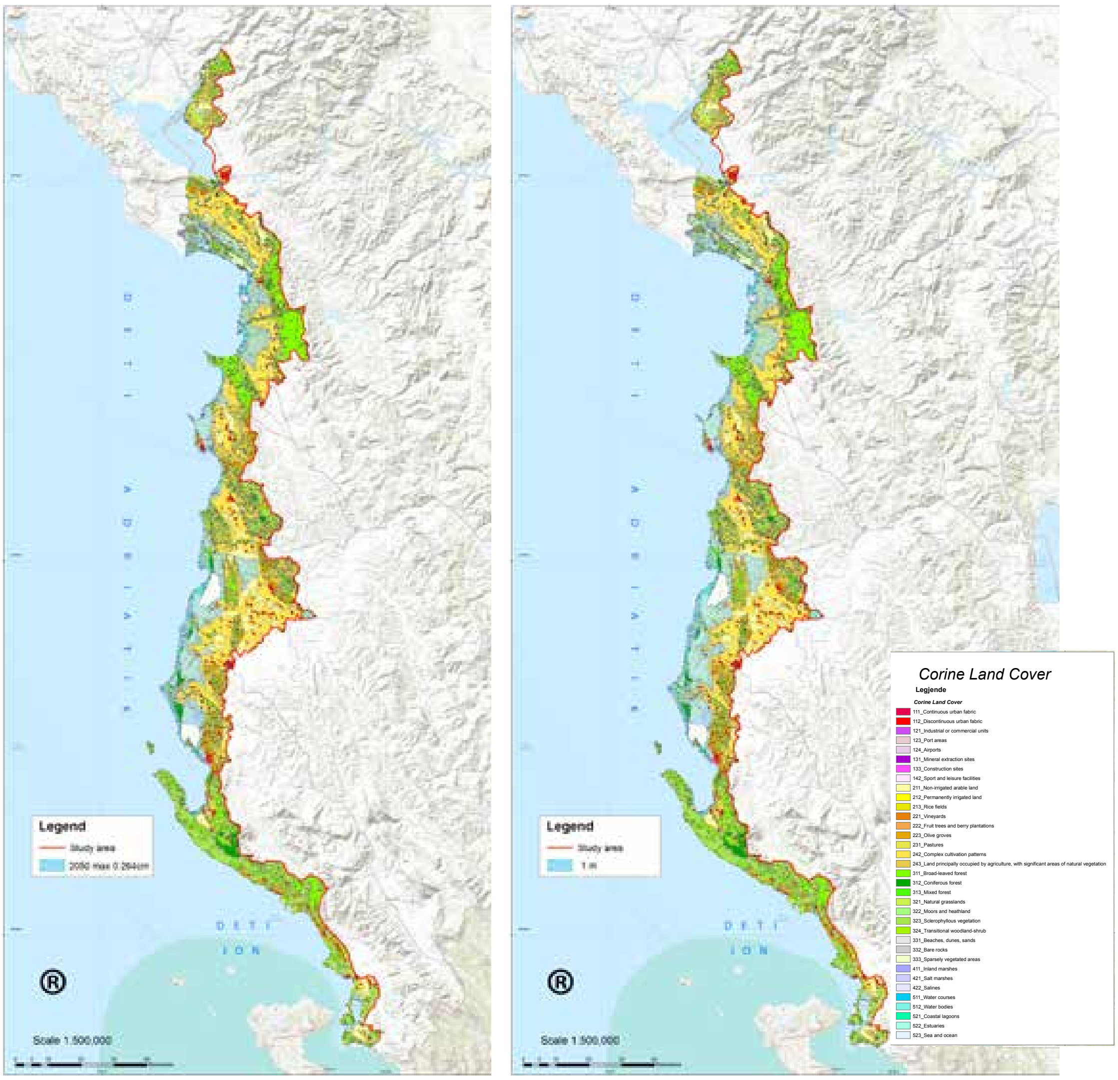
- 1,130[42] Estuaries: those of Ishmi and Erzeni rivers, likewise Buna, Drini (Lezha) and Mati rivers. Also Vjosa, Semani and Shkumbini rivers;
- 1,150: Coastal lagoons;
- 1,210: Annual vegetation of drift lines;
- 1,410: Mediterranean salt meadows;
- 1,420: Mediterranean and thermo-Atlantic halophilous scrubs;

41 NATURA 2000 is an EU network of Nature sites of community interest, composed of SPA (Specially protected Area) sites and SAC (Special Areas of Conservation) sites, established under EU Habitat Directive and EU Bird Directive.
42 the numbers indicate the habitat code according to the NATURA 2000 habitat classification.

- 1,510: Mediterranean salt steppes;
- 2,110: Embryonic shifting dunes;
- 2,120: Shifting dunes along the shoreline;
- 2,190: Humid dune slacks;
- 2,250: Coastal dunes with *Juniperus spp*.;
- 2,270: Wooded dunes with *Pinus pinea* and/or *Pinus pinaster;*
- 91F0: Riparian mixed forests of *Quercus robur, Ulmus laevis* and *Ulmus minor, Fraxinus excelsior* or *Fraxinus angustifolia* along the great rivers;
- *92A0: Salix alba and Populus alba galleries.*

As well as impacting vegetation, a decline in precipitation and resulting water shortages will further deteriorate fresh and brackish water wetlands along the coast and consequently effect ecology and aquatic life, especially breeding water birds. A reduced temperature range, resulting from a higher rate of increase in minimum versus maximum temperatures, is likely to occur over nearly all coastal areas. The number of frost days and cold waves are very likely to become fewer. Under this scenario, the number of species of wintering water birds and waterfowls along Albania's coastal wetlands will markedly reduce. The increased temperature and the increased number of intensive rain events will likely lead to further invasion of alien plant and animal species along the coast and increase their impacts on native plant and animal species and communities.

Figure 4.25: Corine Land Cover Map of the Coastal Zone sensitive to Climate Changes in Albania (26.4cm and 1m sea level rise scenarios).



4.8.2 Vulnerability Assessment

There is already evidence that the impacts of climate change, such as changing precipitation patterns, increased instances of severe weather events including flooding and droughts, sea level rise and ocean acidification are already linked to biodiversity loss, at the level of ecosystems, species, genetic diversity within species and ecological interactions. Aside from climate change impacts, biodiversity is forecast to decrease in the future as a result of multiple stresses, in particular from increased land-use intensity and the associated destruction or conversion of natural and semi-natural habitats. Extreme climate events have and will continue to have major impacts on biodiversity.

Coastal ecosystems are particularly vulnerable to climate change and the magnitude of the impact is dependent on sea level rise rates; if these are more rapid than natural process' rates (e.g. wetland vertical accretion rates), natural ecosystems will not be able to counteract the negative effects induced by sea level rise. The juxtaposition of natural systems of the coastal zone with anthropogenic alterations represents a classic case of coastal squeeze, where existing and future erosional forces that are attempting to realign the shoreline landwards are constrained by the 'fixed' boundary of reclaimed land. As a consequence, threats from flooding are further increased placing at risk existing infrastructure and activity located closest to the beaches, such as agriculture and tourism facilities. For example, the predicted sea level rise will have serious impacts on the saltmarsh ecosystems of the Drini-Mati river delta (DMRD) area. Analysis (performed under TNC) suggests that up to 97% of the saltmarsh habitats could be lost with a sea-level rise of 0.91m. Sea level rise will also lead to coastal squeeze that will exacerbate erosion of the beaches and sand dunes along the DMRD coast.

Building hydropower dams along the main rivers (Drini, Mati, Devolli, Bistrica, etc.), inland artificial water reservoirs for irrigation (500-600 small and big water reservoirs were built during the communist regime) and wetland reclamation work conducted in the 1950s and 60s of the last century are the principle human-induced threats to coastal wetlands and biodiversity of Albania. Climate change will only exacerbate these changes.

4.8.3 Activities Related to Biodiversity

Albania has received international funds designed to increase its National capacity to plan and manage environmental conservation, which will have associated benefits for improving National capacity to design and implement Climate Change Adaptation in the context of the Environment sector. Examples include:

- Project on **Environmental Services** (2014-2019)[43], which aims at building-up Payment of Ecosystem Services (PES) schemes to halt further land and forest degradation and ensure rational use of the country's nature resources;
- the adaptation measures proposed and recommended under the project "**Identification and Implementation of Adaptation Response Measures in the Drini – Mati River Deltas"** which have been taken into consideration and further extended to the entire Albania's coast;
- Project "Building the Resilience of Kune-Vaini Lagoon through EbA"[44], which has as one of its main activities " Increased ecosystem and livelihood resilience from flood and drought risk through pilot Ecosystem-based Adaptation EbA demonstration activities in Kune-Vaini lagoon system", and which started recently;
- Project "**Protecting Albania's Marine and Coastal Biodiversity**"[45], which is supporting

43 Financed by IBRD, WB, Swedish Government and GEF and implemented by the Government of Albania.
44 Financed by GEF/SCCF and the Government of Albania.
45 Financed by UNDP and GEF

the Government's plans to double marine protected areas and improve their overall management. In close cooperation with national partners, this includes:

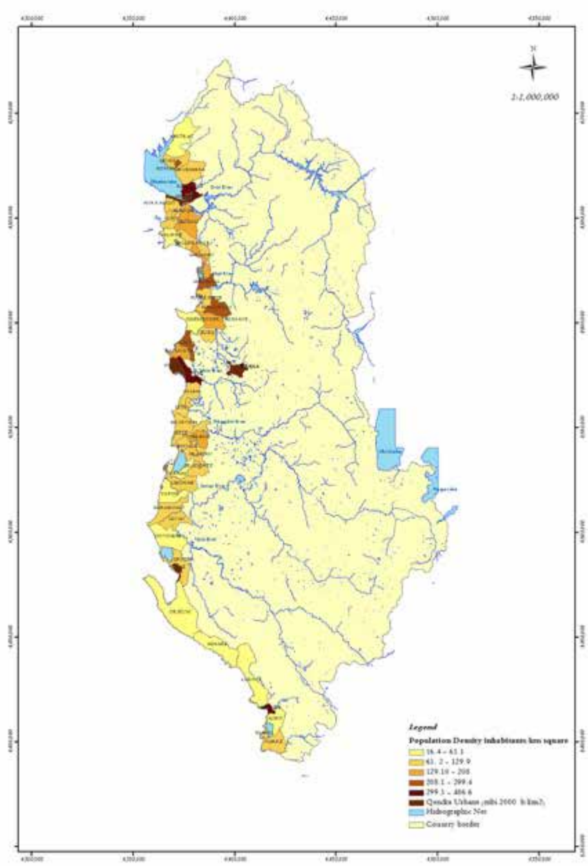
- Improving the legal and regulatory framework that supports setup and management of protected areas;
- Preparing a strategic plan for marine and coastal protected areas;
- Assisting protected area administrations with management and business plans of protected areas, including cost-effective management, conservation approaches, participation with conservationists and local communities;
- Demonstrating management and business planning at the marine protected area of Karaburuni-Sazani;
- Identifying and marking buffer zones for existing coastal protected areas followed by appropriate management scenarios.

• Project **"Establishing Albania's Environmental Information Management and Monitoring System Aligned with the Global Reporting"[46],** which is strengthening the capacities for environmental monitoring and information management in Albania by establishing an operational environmental information management and monitoring system (EIMS).

4.9 COASTAL ZONES POPULATION

A high percentage of the Albanian population is concentrated on the coastal zone (with the sole exception being the capital Tirana). Albania's coastal zone has a population density of 181.1 inhabitants/km^2, and this is growing (see Figure 4.26). Since 1990, when major political, economic and social changes occurred, the population number in coastal areas has increased as a result of relatively high natural growth (11-20 ‰) and population migration. Population density is expected to increase until 2030 after which population density is expected to gradually decrease (averaging 0.1% per year). This is expected to continue during 2050-2080, probably twice as fast as the previous period (averaging 0.2% per year), mainly because of the considerable reduction of population's natural growth and of the reduction of number of emigrants (second and third generation) returning in the country. By 2080 the population of the coastal area is expected to remain around 1.209.540 inhabitants or 41.2% of the country's population. The favourable geographical position and suitable natural conditions for the development of agriculture, tourism, trade, construction, artisanship and industry have all contributed to the increase of migrants from mountainous areas toward the lowland coastal areas of Albania, where they have settled in regions with a high risk to floods.

Figure 4.26. Population density in the local unities of coastal area and capital.



46 Financed by UNDP and GEF

4.9.1 Climate change impacts on population

Climate change will impact inhabitants of the coastal zone and its current primary economic activity – tourism. In addition there will be concomitant risks affecting safety of life (floods, fires, increase of microbes and insects carrying contagious diseases), reserves of potable water, food, firewood and fuels, quality of environment and landscape.

Sea level rise and river flooding will occur in areas of marshlands and former marshlands that are below sea level or at a low elevation above the sea level (up to 2 m). These areas have seen population increases since 1950 when agricultural land became available due to the reclamation of marshland and improvement of wetlands and salty lands. Also affected will be low lying plain lands with a low altitude above sea level, which cover 731.5 km^2 and are expected to have a population of 311,000 inhabitants by 2030. The coastal area's population from 2010 to 2030 will increase at an average rate of 1.5% per year, reaching 1,313,055 inhabitants by the end of 2030.

Besides the impact on population, a considerable number of dwellings built during the last 25 years are expected to be damaged by flooding. Currently there are around 41,625 dwellings situated up to 0.5 m above sea level that are seriously exposed to the risk of flooding due to storm surges by 2030; and around 48,730 dwellings situated up to 1 m above sea level by 2050. By the end of the 21st century flooding is expected to have damaged the historical and cultural heritage of the coastal area. In addition, especially because of damage to protection constructions along banks, social-cultural and economic structures (schools, medical centres, factories, mills, fishing centres, ports, storage facilities, potable water pumping stations etc.), constructed during the second half of 20 century are at risk from flooding.

Excessive humidity and frequent flooding are expected to worsen living conditions of the population, especially related to housing, since most residences have only a ground floor and do not have hydro-isolation. Unexpected flooding, due to sudden intensive rainfalls, storms and high tides (similar to those of the winter of 2009-2010), are expected to cause human losses (deaths), as has happened in recent years in many European and neighbouring countries. Due to continuous flooding and long-lasting humidity, the drinking water supply system in coastal towns is at risk of damage. Electric, telephone, internet and TV cables are exposed to risk when they are placed underground and without necessary hydro-isolation.

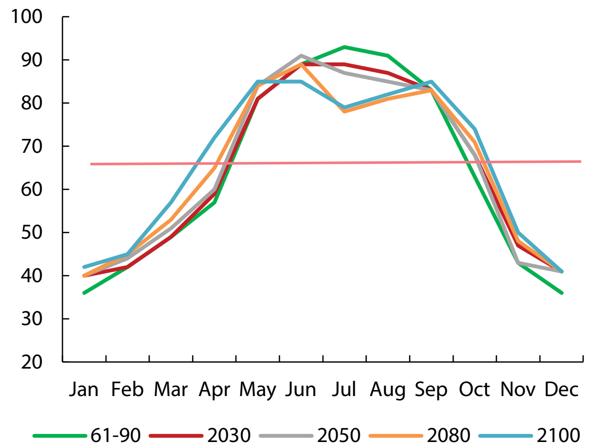
4.9.2 Climate change impacts on tourism sector

The contribution of tourism to GDP in 2009 was about 7.6%[47]. Climate change is already perceived as having an impact on the tourism sector – both positive as well as negative. Up to 2030, the October-May period will remain unsuitable for sun and sea tourism, while the other period of the year will still offer a full comfort levels. Data regarding 2050 defines April as an acceptable month, June as ideal, while May, July, August, September and October as excellent months for tourist activity (Figure 4.27).

The forecast for the suitability of climate conditions regarding tourist activity in the coastal area after 2080 are unclear, but it can be expected that, except of January, February and December, which will still remain unsuitable, the other months will offer good levels of comfort (March, November), very good (April, July, August, October) and excellent (May, June, September)[48]. Tourist numbers are expected to increase.

47 National Circumstances Chapter
48 TCI is evaluated after Mieczkowski (1985)

Figure 4.28 Tourism Comfort Index, current and projected up to the year 2100



Currently approximately 80% of tourists visiting Albania are concentrated in the coastal area and in the capital Tirana. Probably, despite the ongoing climate trends, the same preference and ratios will persist in the future. Although there has been a significant increase in numbers and quality of tourism infrastructure, there are persistent problems associated with potable water, the treatment of wastewaters and the removal of urban wastes. The increase of tourist numbers will lead to higher levels of pollution of water, air and sand. This is even more dangerous (up to epidemic risk levels) because of predicted temperature rises and increases of the number of heat wave days. A considerable increase for the need for water and energy is expected to occur during this century. The water demand will increase because of the increase of tourist numbers and of tourists' water demand.

In coastal areas, tourism is predominantly of the sun and sea type, focused on beaches. However, due to active marine erosion, the shoreline is moving inland destroying each year hundreds of square metres of beach area, and drying and destroying hundreds of pine trees. Although some of this change can be attributed to climate change, its cause is mainly because of the poor management of rivers outlets and coastline. Predictions suggest that:

- *by 2030* Patoku beach is expected to totally disappear while Kune and Seman beaches will only partially remain;
- *by 2050* most parts of Kune and Seman beach is expected to disappear;
- *by 2080* serious consequences are expected to Vlora beach and in most beaches of the Adriatic sea.

Besides the destruction of existing beaches, new beaches will be formed inside the territory, which could be used for tourist purposes, but the existing infrastructure and tourist structures will be out of use and new ones must be constructed. This is expected to lead to higher costs affecting the budget of tourist, communities and the regional economy. Moreover, the disappearance of beaches is expected to coincide with both a growth in population and when tourist numbers are expected to increase as a result of temperature rise (the hot summer days are easier to cope with on the coast).

4.9.3 Coastal Zones - Adaptive Capacity

To date, existing planning has effectively led to development that constitutes maladaptation. For example, construction of tourist infrastructure has been made without considering the potential damages arising from climate change and extreme events (flooding, storms, marine erosion, drought). Therefore, the road, water and electric energy supply infrastructure have suffered constant damage each year, especially due to sea surges (in cases of storms and high tides) and river flooding during periods when rainfall is frequent and often intense. Evidence of the expected consequences of tidal flooding and flooding due to intense rainfalls are the events of 2009-2010 (December-March) and 2012-2013(November-January) where almost the entire coastal area was inundated by water with considerable damages.

To reverse these current maladaptive practices a National Coastal Agency has been established to ensure the protection and sustainable development of future activities, coordination of projects and encourage donor investment in the coastal area. Other developments have been:

- An Integrated Cross Sectorial Coastal Plan by the Albanian National Agency for Territory Planning is under development. It is designed to take into account policies and directives of the European regional conventions for the integrated management of Mediterranean coastal areas, and focuses specifically on their definitions and references for the Albanian coastal region. The document will synthesize the national sectorial strategies, studying research and previous research developed for this region. UNDP has contributed to this plan through providing information on climate change risk and adaptation.

- A draft National Strategy for Development and Integration (NSDI) that considers the tourism sector as one of the main engines of national economic growth. Specific challenges over the 2015-2020 planning horizon include the need: (1) for greater integration of tourism planning and tourist destinations; (2) to tackle weaknesses in the range and quality of tourism products; (3) to develop a more favourable legal and institutional environment for attracting domestic and foreign private investors; (4) to take a more comprehensive and strategic approach to tourism development in Albania, to ensure sustainability as well as the generation of income and employment opportunities;

- Approval and implementation of the "National Cross-cutting Strategy for Tourism 2014-2020".

4.10 ASSESSMENT OF THE HEALTH SECTOR

Climate change can affect human health directly (impacts of thermal stress, death/injury in floods and storms) and indirectly through changes in the ranges of disease vectors (mosquitoes), water-borne pathogens, water quality, air quality, and food availability and quality. The actual health impacts will be strongly influenced by local environmental conditions and socio-economic circumstances, and by the range of social, institutional, technological, and behavioural adaptations taken to reduce the full range of threats to health.

Climate change scenarios suggest that there will be increased heat-related mortality, and greater frequency of infectious disease epidemics following floods and storms. Health effects are expected to be more severe for elderly people and people with pre-existing medical conditions, and groups who are likely to be most susceptible of the increasing risk of diseases including children and the poor, among them especially women.

4.10.1 Impacts from temperature and sun radiation increases

There is some evidence that higher temperatures, registered during summer 2009 compared to 2010, exacerbated the number of cases of arrhythmia, high blood pressure, and coronary artery diseases. During summer months a 3-4 fold increase in the number of diarrhoea cases, requesting assistance from health services, are systematically observed which demonstrates the link between these group of diseases and warmer temperatures. In addition, systematically, years with higher temperatures have higher rates of gastroenteritis.

In the light of climate change scenarios, with summer seasons starting earlier, the level of risk is foreseen to increase. The increase in number of days with temperature ≥35°C and heat waves will cause an increase of cases of cardiovascular diseases (particularly for obese people and those suffering from hypertension), respiratory diseases (asthmatics), and an aggravation of their symptoms, up to death, mostly of the elderly and babies. Increased exposure to ultraviolet radiation can be expected to lead to higher incidences of sun burn and skin cancer. In addition, the intensification of dryness is expected to accelerate the decomposition of organisms and substances that pollute waters and food, favouring the presence of microbes, parasites and insects that cause and spread dangerous diseases, such as diarrhoea.

High temperatures for relatively long periods will lead to an increase of incidences, and extension of the area of occurrence, of epidemic and local diseases and the prolongation of their incubation period. Additionally, an increase to the extent of stagnant water surface is expected in marshland areas of the coast. This will stimulate the presence of carriers and spreaders of epidemic diseases such as malaria, cholera, TBC, etc., which have appeared again in the Mediterranean countries after half a century of absence.

4.10.2 Impacts on vector borne diseases

Due to an increase of coastal migration and an augmentation of the number of tourists visiting beaches, the spread and risk from epidemic diseases will become potential. Mosquitoes, sandflies, ticks and rodents are the main groups of vectors with influence on human health in Albania. The Asian Tiger mosquito, *Aedes albopictus,* is considered one of the world's most invasive species and is a potential vector of at least 24 viruses dangerous to human health (including Yellow fever, Dengue, Chikungunya, and Japanese encephalitis). Today it is well established across the Adriatic coast and in Albania, and the infestation rates of *Ae. albopictus* are estimated to be highest in lowland coastal areas in cities where potential breeding sites, such as car washes without water drainage, piles of car tires left near garages, and the common practice of leaving bowls and tanks of water outside homes.

The coastal wetlands of Albania could be susceptible to *Cx. pipiens* and other *Culex* spp.that are vectors of West Nile and other arboviruses. The West Nile virus is currently very active in several southern European countries and across different ecological conditions.

As in most Mediterranean countries, malaria was a hyper-endemic disease in coastal areas of Albania up until the country was declared free from malaria in 1967. In neighbouring countries (e.g. Greece) malaria cases are being reported sporadically and in some cases in clusters, including cases with indigenous transmission. The impact of climate change on the epidemiology of malaria in Albania remains to be ascertained with specific entomological/ parasitological investigations focused on sites of greatest risk.

Sandfly related diseases are leishmaniasis, affecting humans and dogs, and phleboviruses, affecting humans only. In Albania, leishmaniasis morbidity is 20-40 times higher than in other southern European countries and visceral leishmaniasis cases have almost doubled during the past 10 years. Almost 200 new cases per year are reported with 80% of the cases among children under 10 years old.

4.10.3 Flooding impacts on health

Apart of its immediate threat, floods, and other climate factors such as humidity and temperature, have the potential of creating the conditions for longer term impacts on human health. Data at the Institute of Public Health show an unusual increase of cases with leptospirosis, a life threatening infectious disease, in Shkodra district following the floods of 2010, which was also triggered by the presence of numerous rodents which colonize this area, and by a high density of livestock. This situation seem to have persisted in years following floods (Figure 4.28).

Figure 4.29 Cases of leptospirosis in humans 2005-2012 in Shkodra district, before and after the floods of 2010

The epidemiology of leptospirosis has been modified by changes in climate, in animal husbandry, and human behaviour. There is a direct correlation between the amount of rainfall and cases of leptospirosis making it seasonal in temperate climates and year round in tropical climates. Contact with food contaminated by urine of infected rodents is a typical away for spreading the disease.

4.10.4 Air Quality Impacts on Health

It is estimated that the poor air quality in Tirana and some other large coastal cities adds substantially to levels of disease. If assessments carried out in other parts of Europe were extrapolated to Tirana, the estimated loss of life expectancy of the population of Tirana due to pollution would exceed 1.5–2 years of life. There are indications that higher levels of ground level ozone and particle matter are present in coastal regions. Climate changes could lead to increased incidents of pulmonary effects and an increased prevalence of non-specific respiratory diseases (chronic bronchitis, acute bronchitis, asthma, etc.). Increased levels of pollen and allergies can also be expected from climate change, especially from an increase in atmospheric CO_2 concentration.

4.10.5 Health sector vulnerability assessment

Climate change is expected to trigger, compound and increase disasters and exacerbate existing vulnerabilities. While it is impossible to prevent natural events from occurring, the vulnerability of those living in disaster prone areas should be reduced. To face the increasing health vulnerability arising from heat waves and extreme cold weather, more work is needed to set-up early warning coordination mechanisms between the meteorological and health sectors. To better prepare both professionals and public for the risks, awareness raising and preparedness should be established. The following areas of vulnerability have been identified:

A warmer climate and extended summer seasons will increase rates of infections while the risk of outbreaks and epidemics will remain high for longer periods. Flooding in the medium term will also add to health impacts from waterborne and vector-borne diseases. Some of the diseases with a higher risk include toxic-infections from salmonellosis, leishmaniasis leptospirosis, etc. Children and infants will be the most vulnerable group in the population in relation to this health threat. Locations likely to be affected by floods and sea level rise, as well as socially marginalized groups such as informal areas and Roma populations are especially at risk.

Expanded geographic ranges of tick and parasite vectors due to climate change are already pushing infectious diseases into new territory. Albania being in the Mediterranean area is subject to potential disease outbreaks of tropical origin such as chikungunya, West Nile disease and malaria.

The risk from acute respiratory infections will be increased by the expected warmer winters, but other combined factors related to climate change, including air pollution, cold snaps, or malnutrition could neutralize this effect.

Climate change is expected to bring about more extreme weather events in Albania, with more frequent heat wave,s which can cause an added burden of health emergencies and/ or avoidable deaths, arising from already increasing health problems such as cardiovascular conditions, chronic obstructive pulmonary diseases and some cancers. Older adults and elderly will most likely feel this increasing burden.

Climate change will further aggravate air quality related health problems in the major cities of coastal regions of Albania, and, in particular, in Tirana. A direct and indirect impact on respiratory diseases and preventable deaths from cardiovascular diseases can be expected in the future. Big cities in coastal areas will mostly suffer in this context.

Data shows that some manifestations of climate change are expected to also alter the incidence and severity of allergies such as asthma. Children and young adults will bear the largest impact from this expected trend.

Skin diseases, including very serious health conditions such as skin cancer especially melanoma, are expected to increase as exposure to sun light radiations will intensify.

Climate related emergencies such as droughts, fires, floods and other potentially extreme events will increase the risk of injuries and preventable deaths among the most vulnerable population groups.

The health system will likely feel the burden of additional health conditions with additional resources needed.

4.10.6 Health sector adaptive capacity

The impacts of climate change will be directly manifested through alterations in environment through which indirect impacts will be inflicted on human society, and its wellbeing and health. A number of steps have been taken in Albania to ensure a strong linkage between adaption measures focused on environmental protection and conservation and the maintenance of human wellbeing.

The 1998 Constitution of the Republic of Albania represents the most important legislative step in the realization of the environmental legal framework. It includes specific articles that sanctions the goal of the government for "...healthy environment and proper ecology for today's and future generations...for ...rational use of forests, waters, pastures and other natural resources on the basis of sustainable development principle...as well as the right of everyone ...to be informed about environment and its protection...". The Albanian Government has been involved in a number of international declarations focused on climate change and health. These include the resolution issued by the Sixty-first World Health Assembly, which urges Member States to take decisive action to address health impacts from climate change, warning of its potential risks on human health. The resolution calls on the health sector to scale-up actions in adaptation projects to limit the impacts of climate change on health. Capacities should be enhanced in different sectors to support better data on air quality, including indoor air quality and influence clean air policies in communal infrastructure, transport, heating and energy management sectors. Professional capacities in primary health care should be increased for early detection of diseases related to changing patterns of ultraviolet radiation and pollens in the air, while the awareness of public should be improved. Such needs have recently led to the development of a National-level Strategy on Health and Climate Change.

Within the context of protecting health, the need to integrate across sectors is recognized. For instance, within the health and climate change strategy, the Ministry of Health promises to provide leadership in order to assure sustainability and long term implementation of the strategy, while coordinating with other relevant Ministries, local governments, Universities and other implementing agencies. The strategy acknowledges that a range of systems and routine activities are already in place that can contribute to the challenge of climate change and its health consequences, such as communicable diseases' surveillance, monitoring of drinking water and air in urban areas, specific public health communication structures, etc. Many parts of the strategy build upon these tools adapting them and adding new measures as necessary or to meet the needs of different communities. On the other hand the strategy allows the timing and prioritization of activities to begin with measures that bring immediate health benefits, or that promote long-term ecological and economic sustainability, irrespective of their contribution to adaptation.

4.11. ADAPTATION MEASURES AND PLANS

Climate change adaptation requires three parallel processes of contingency: understanding (what to do), optimization (thinking strategically to ensure that the best options are taken in terms of wishes and resources) and heuristics or social learning (achieving cognitive appreciation and gains through participating in a stimulating and creative exercise). The need and requirements for climate change adaptation do not exist in a vacuum: responses to the changes and impacts expected from climate change – climate change adaptation – should be integrated to responses that are designed to accommodate other changes and impacts that originate from other drivers of change on society. In relation to climate change, policy responses to disaster risks are one of the principle areas where integration of adaptation measures is required.

Although in general disaster risk responses are designed to meet short term and acute perturbations while those for climate change are designed to address medium to long term chronic perturbations, they can have significant impact on the effectiveness of each other.

4.11.1 Adaptive capacities on DRR and CCA

Adaptation measures regarding DRR and CCA can take many forms, from building barriers to protect infrastructure from a predicted increase in flooding, reinforcing Early Warning Systems, to increasing investment into scientific research on the impacts of climate change. Selecting which adaptation measures to pursue when there still remains considerable uncertainty is challenging. However, it is important that climate change and disaster risk reduction are mainstreamed into existing procedures of policy and planning so that adaptation is part of a planned process, rather than a reactive one to change. In this context it is necessary to evaluate existing adaptive capacities to determine whether procedures are able to accommodate risk analysis and information as it becomes available.

A key to successful disaster risk management and climate change adaptation that has been identified is to bring them into planning stages, and include them in development strategies in order to "climate-proof" development. A tool that is used to 'bridge' between policy, planning and management for coastal zones is Integrated Coastal Zone Management (ICZM).

4.11.2 Integrated Coastal Management as a tool for climate change adaptation

The challenge of climate change needs to be addressed *inter alia* through integrated and ecosystem-based approaches and instruments, such as integrated coastal zone management (ICZM). These are crucial to build the foundations for sustainable coastal management and development, supporting socio-economic development, biodiversity and ecosystem services. ICZM is widely recognized and promoted as the most appropriate process to deal with climate change, sea-level rise and other current and long-term coastal challenges, and offers advantages over purely sectoral approaches. Principles of ICZM foster responses to sea-level rise and climate change that encourage implementation in a broader context, and with wider objectives of coastal planning and management, with a focus on integrating and balancing multiple objectives in the planning process.

An ICZM approach facilitates the design of adaptive measures for the:

- Generation of equitably distributed social and environmental benefits;
- Development of legal and institutional frameworks that support integrative planning on local and national scales;
- Reconciliation between different social groups who may have contrasting, and often conflicting views on the relative priorities to be given to development, the environment and social considerations, as well as short and long-term perspectives.

4.12 ADAPTATION PLAN

The main task for V&A analysis has been to prioritize the adaptation measures proposed by sectors in an integrated way and develop an Adaptation Plan for the Coastal Area.

A mechanism for the prioritization of individual defined measures was developed to provide integrated approaches towards adaptation to overcome sector specific approaches that can lead to maladaptation. The prioritization system was based on criteria developed in close cooperation with important stakeholders and taking their concerns and interests into account. It is a cross cutting task that is related to all aspects defined already and to the project developed reports from experts. The prioritization carried out encompasses measures that aim at the following:

- The implementation of defined measures, based on the prioritization system to avoid piecemeal and ad hoc decisions;
- The defined measures are results of having investigated alternative investment scenarios, governed by: climate change project considerations, targets (environmental, economic or social) and timeline (readiness to start, rapid "no regret" measures);
- The measures have further addressed the question of either integrated or separate priorities for: coastline protection, biodiversity and community wealthy investments;

The defined measures are built up in ways that allow for continuous updating, e.g. in accordance with the rolling Albanian Environmental Planning process. The sector specific reports identified 67 proposed adaptation measures. These measures were screened with the criteria of potential partnership, time frame, principle of additionality, financial indicative cost and 'Win-Win' Solutions. After extracting the measures from the individual reports of the respective fields/sectors experts, the classification of the measures are presented according to the adaption measure categories (i.e. Green, Grey, Soft and Fiscal – Table 4.5.1). The largest group of proposed adaptive measures is that of Grey Adaption options (27 ranked measures), followed by Soft Adaptation options (21 measures) and then the Green Adaptive options (18 measures). The smallest in options is the Fiscal Adaption group of options with only one measure (extracted from the Grey group of options).

Table 4.12: Prioritization Adaptation Categories and Description.

Green adaptation options	Measures aiming at raising the resilience of ecosystems and their services.
Grey adaptation options	Invasive and/or energy intensive technical and construction measures aiming mainly at the protection of infrastructures or people.
Soft adaptations enhancing capacity building	Non-invasive spatial planning measures and measures to enhance knowledge transfer/raising adaptive capacity.
Fiscal adaptation measures	Measures aiming at saving critical resources/protect values by adaptation (e.g. water or public/private infrastructures) by introducing measures like payment for ecosystem services (PES) or risk transfer mechanisms (e.g. insurances).

The outcome of the application of ICZM principles was to rationalize measures proposed from individual sectors and integrate across sectors to produce the adaptation plan, consisting of a series of integrated adaptation measures and actions (Annex 4.1: Table 4). Applying principles of ICZM also allowed a distinction to be made between how sectors had articulated measures which for other sectors could be considered adaptation actions. This allowed the identification of integrated adaptation measures for which individual sectors would be able to design adaption actions in order to realize the goal of each adaptation measure.

In addition to Table 4.13, a set of schematic adaptation maps for the coast were prepared. To make the information of the maps more visible, the coast is divided in 5 sectors: a) Drini-Mati; b) Rodon Cape – Turra Castle; c) Shkumbin-Seman discharges; d) South coast and e) Butrinti areas (Figures 4.27-4.32).

Another task of the V&A group was to prepare at least three proposals for adaptation projects. Eleven Project Identification Forms (PIF) developed under the "Identification and implementation of adaptation response measures in the Drini-Mati River deltas" project, are listed in Annex 4.4.

Table 4.13 Adaptation plan

Green | Grey | Soft | Fiscal

SHORT TERM MEASURES (years: up to 2020)

Category	No	Measures Identified from sector reports	Actions	Location
SOFT	59	Support research and monitoring on data collection and assessment for physical, biological and social environment, with regard to ecosystems and biodiversity	• Design and application of models to estimate the impact of past or future climate hazards on crops, livestock, ecosystems and biodiversity Provide modern devices to measure and monitor: - sea level - progression of the sea toward the land (marine erosion) - difference between tides and ebb –tides - quantity and quality of depositions	Coastal area/ entire country
SOFT	66	Develop and enforce relevant legislation and policies on hydrological regime and water resources	• Promote engagement to facilitate enforcement of existing legislation • Political measures (advisory panels, decrees, rules, laws, norms) enforcing the long term sustainable implementation of the adaptation measured proposed • Restrict or prohibit development in erosion zones • Development of an insurance sector to promptly mitigate losses • Develop a water information database and monitoring network for coastal zone and river systems • Incorporate sea level rise into planning for new infrastructure (e.g., sewage systems) • Integrate climate change scenarios into water supply system	Coastal area/ entire country
SOFT	33	Enforcement of legislation on the exploitation of aggregates in riverbeds	• Eliminate the exploitation of riverbeds for construction aggregates	Coastal area especially river deltas flowing out at Adriatic Sea (Drini, Mati, Vjosa etc.) /entire country
SOFT	41	Orientation of constructions in areas protected by floods and marine erosion	• Complete and officially approve of the ICZM Plan	Coastal area/ entire country
SOFT	65	Public information, education and awareness raising on climate change and the associated effects on water resources and energy	• Climate change education • Interactions of population and environment • First aid, medical preparedness, disease control • Energy-saving • Strengthen awareness for the value of ecosystems • Encourage or promote information sharing • Promote resource efficient behavior low-energy/low-carbon, etc.	Coastal area/ entire country
SOFT	21	Low-cost measures for preventing the consumption of uncontrolled food and drinks	• Enforce the legal obligation of producers to clearly indicate the production and expiration dates of all food and drink products • Strengthen the control of traders related to the conditions of keeping and selling food, water and other beverages • Legally prohibit selling of uncontrolled and uncertified agricultural and livestock products • Legally prohibit selling of agricultural and livestock products in the street or in other places exposed to sun, dust, insects or other damaging or polluting factors • Create of conditions for citizens to press charge to abusive producers or traders • Apply fines and other punishments for producers and traders that do not respect the laws and the rules of production for selling of food, water and other beverages.	Coastal area
SOFT	20	Periodic monitoring and controlling of drinking water and food quality	• Modernize the quality of water and food monitoring process through providing advances devices, techniques and technologies • Increase staff qualification • Conduct more frequent analysis on potable water and foods, especially during summertime	coastal area
SOFT	4	Develop and/or improve Information Systems related to crop cultivation and prices, new technologies for plantation, conservation and processing, establishment of communication networks	• Estimate future crop prices – to plan crop cultivation • Improve monitoring, communication and distribution of information • Gather information about available water resources • Gather information on new technologies available (plantation, conservation, processing etc.) • Gather information on cooling rooms • Periodical information (brochure, leaflets, web, e-mail, etc.) • Create network of farmers in the country and abroad)	Velipoje-Shkoder, Drini-Mati, Durresi Bay, Myzeqe Field, Vjosa River Mouth
SOFT	6	Informative and educational measures on agriculture activities involving Universities and other Research Institutions	• Provide information about the weather and early warning on time • Provide the information about crop and breed suitability to the farm • Provide and offer research in techniques and crop varieties • Provide soil and water analyzes and give proper recommendations • Provide monitoring system covering all the area • Provide information about crop phenology	Velipoje-Shkoder, Drini-Mati, Durresi Bay, Myzeqe Field, Vjosa River Mouth

SOFT	12	Public information and awareness on risks caused by heat due to climate change	• Organize seminars, round tables, trainings and meetings with medical sector and citizens concerning the impact of high temperatures in human health with responsible institutions at national and regional level • Public information and awareness raising (mass communication institutions and means: electronic and written media, through spots, notifications and news) • Prepare and distribute informative leaflets and direct communication with citizens in order to transmit rapidly and efficiently the necessary information on risks caused by heat	coastal area and beyond
SOFT	13	Environmental education on measures undertaken for the minimization of heat's negative effects	• Update education curricula (green package, textbooks)	coastal area and beyond
SOFT	15	Offering of low cost alternatives for heat protection, providing useful and practical advises	• Medical institutions can use local media, leaflets, awareness raising at schools, etc. to present to the citizens low cost alternatives for the protection from the heat such as: - avoiding sun exposure during the hours of maximum temperature; - avoiding to stay in closed environments and those of major concentration of people (stadiums, theatres, cinemas, train and bus stations, markets); - limitation of travelling to high temperature areas; - consumption of the necessary water quantity; - consumption of fresh and light foods; - wearing of light clothes, with light colors, possibly made of cotton, linen or other natural materials; - avoiding unnecessary physical activity, etc.	coastal area
SOFT	27	Public education on fire risks and protection	• Education at school through teaching, discussions with specialists of FP units, order employees, environment and health inspectors, leaflets and manuals with instructions on fire prevention, protection and management, etc. • Public information through media, leaflets, manuals, meetings of heads and specialists of the FP units with the local population	coastal area
SOFT	7	Policy Level Measures in the agriculture sector	• Provide the necessary legal basis, general or sectorial strategies, action plans, etc. which will include the appropriate policies and measures • Introduce and support crop insurance • Subsidies and/or supplying modern equipment • Develop sustainable integrated pesticide strategies • Improvements in water allocation laws and regulations • Introduce the water charging or tradable permit schemes • Market development via improving the proper logistic • Support local and national strategies dealing with climate change • Prepare a sectorial strategy taking in consideration climate issues • Cooperate with other sectors for synergies in agriculture sector • Improve and increase the role of agriculture extension service • Prepare a specific strategy for erosion control • Implement actions and strategies related to the climate change	Velipoje-Shkoder, Drini-Mati, Durresi Bay, Myzeqe Field, Vjosa River Mouth
Combined (GREEN& Soft)	10	Measures in the Protected Areas (PAs)	• Improve management of coastal protected areas • Forest fires prevention and warning systems • Introduce monitoring system • Improve the water exchange in lagoons • Biodiversity restoration activities • Improve the lagoon systems • Implement monitoring plans	Velipoje-Shkoder, Drini-Mati, Durresi Bay, Myzeqe Field, Vjosa River Mouth
SOFT	11	Policy Level Measures in the forestry sector	• Prepare a national strategy to combat desertification • National strategy for forestation and reforestation • National strategy to combat erosion • Improve monitoring system efficiency • Improve forest cadastre • Improve the management of forests in the country • Prepare a new law in forestry sector • Prepare a sectoral strategy for forestry sector	Velipoje-Shkoder, Drini-Mati, Durresi Bay, Myzeqe Field, Vjosa River Mouth
SOFT	40	Enforcement of legislation related to the constructions in the coastal area	• Improve the law on constructions in protected areas and those risked by floods • Increase the efforts for the rigorous implementation of the law	Coastal area/ entire country
SOFT	52	Update the Legislation on CC adaptation	• Introduce and adapt the EU instruments and policies relevant to coastal areas ecosystems and biodiversity	Coastal area/ entire country
SOFT	53	Policy preparation for climate adaptation by developing and implementing a National Adaptation Strategy (NAS)	• Develop policy measures towards infrastructure adaptation facilities • Develop policy measures on adaptation of conservation management of ecosystems and their services • Develop policy measures on adaptation of agriculture and water management • Develop policy measures on integration of climate change into spatial and urban planning, implementation of beach nourishment schemes	Coastal area/ entire country
Combined (GREY & Soft)	26	Improve fire protection systems in building structures	• Equip the houses, social-cultural structures (especially schools, communal buildings, power stations, sub-stations and cabins, churches and mosques, health centers, etc.), as well as economic, trade and tourist structures with fire extinguishing equipment/gear and water deposits and pumps. • Provide training on the use of fire extinguishing equipment	Coastal area

GREY	29	Provide new water reserves	• Exploitation of the water of artificial lakes and rivers • Construct of sea water desalinization plants • Manage of the fresh water of rivers and lakes	Coastal area
GREY	45	Accommodate the Increase requests for Potable Water and Energy as a result of changes in the temperature regime	• Economization of water use and application of water-saving techniques and technologies • Maximum energy saving from consumers and to the use of energy-saving devices • Rational use of all the actual electric energy sources; • Exploitation of new energy sources, mainly renewable (eolic, solar, water, geothermal)	coastal area
GREY	47	Prevent flooding risk at settlements due to extreme rainfall events and trends	• Stationing of auto-tourism in places protected from floods • Equipment of accommodation structures with lifeboats and other similar means, and pumps for water evacuation in case of flooding • Equipment of tourist complexes with fast means for the evacuation of tourists in case of floods	Coastal area especially mouths of rives Buna, Drini, Mati, Vjosa
GREY	48	Prevent drought risk at settlements due to extreme drought trends	• Better management of artesian wells • Establish strict rules for the consumption of potable water by legally prohibiting its use for irrigation, car washing, etc. • Exploitation of artificial lakes and rivers' water • Construct sea water desalinization plants • Manage the fresh water from rivers and lakes	coastal area
SOFT	58	Increase adaptive capacity and livelihood support of the coastal human communities	• Improve access to electricity, and water supply • Attain high education level • Establish mechanisms for subsidizing agricultural households impacted by climate change	coastal area
GREEN	28	Rational use of potable water	• Better management of artesian wells • Establish strict rules for the consumption of potable water	coastal area
SOFT	16	Prevention of contamination of water and food resources	• Continuous monitoring of environment's quality (soil, water, air) • Periodic disinfection of the coastal area • Periodic vaccination of people and livestock • Periodic monitoring and control of water and food quality • Amelioration/enlargement of hygiene and epidemiology services net • Strengthen the role of hygiene subjects and inspectors • Strengthen the role of subjects protecting the consumers	coastal area
SOFT	24	Policy level measures on buildings	• Prepare a legal framework, according to European standards, which should be obligatory to all construction s • Train and qualify specialists on the use of techniques, technologies and thermo-isolating materials • Monitor and control the construction sector by the National Territory Council and the respective regional authorities	coastal area
SOFT	25	Reorganization, strengthening, completion and modernization of Fire Protection (FP) units	• Increase the number and qualification of staff • Purchase new firefighter devices and equipment/gear • Create FP units in the most exposed areas such as forests and settlements	coastal area

MID-TERM Measures (years: 2020-2030)

Category	No	Measures Identified from sector reports	Actions	Location
GREY	2	Improve Livestock Management	• Increase shelter and water points for animals • Windbreak planting to provide shelter for animals • Fodder banks • Livestock management (breed choice, heat tolerant etc.) • Match stocking densities to forage production • Pasture management (rotational grazing, etc.) and improvement • Rangeland rehabilitation and management • Supplemental feed • Vaccinate livestock	Velipoje-Shkoder, Drini-Mati, Durresi Bay, Myzeqe Field, Vjosa River Mouth
GREY	3	Improve Water Management	• Improve irrigation and drainage systems • Optimize water usage for irrigation • Enhance flood plain management (wetland management) • Drop irrigation systems and use water-efficient crop varieties • Construct levees • Water harvesting and efficiency improvements • Intercropping to maximize use of moisture	Velipoje-Shkoder, Drini-Mati, Durresi Bay, Myzeqe Field, Vjosa River Mouth
GREY	5	Pest and Fire Management in agriculture sector	• Fire management for agricultural and shrub lands • Integrated Pest Management • Introduce natural predators • Introduce new technologies in pest and fire management	Velipoje-Shkoder, Drini-Mati, Durresi Bay, Myzeqe Field, Vjosa River Mouth

SOFT	14	Strengthening of medical assistance, especially during summertime	• Establish groups of voluntary doctors, which would spend a part of their free time monitoring and assisting the medical situation of the population exposed to high temperatures. • Establish centers for provisory medical assistance (only for summertime)	Coastal area
GREY	22	Adaptation of buildings in order to cope with high temperatures (covering of buildings' walls and roofs with thermo-isolating materials, the using of double-glass windows and doors etc.)	• Cover the buildings' walls and roofs with thermo-isolating materials • Use of double-glass windows and doors etc. • Prevent fire risk at settlements due to consequences of temperature rising trends	Coastal area
GREY	50	Provide appropriate tourist Infrastructure in response to the changes of the sea level	• Periodic management, adjustment and cleaning of riverbeds • Continue monitoring and maintenance of embankments along the riverside through the establishment of units with qualified experts and provision of efficient monitoring devices • Continuous monitoring of river debits • Create Regional Centers for Forecasting and Prevention of Flood, which will coordinate the field work of the local units with the regional and central responsible institutions. • Install devices signalizing the risk from humidity (floods) in the public structures of major importance. • Construct hydro-technical protecting walls around sites and objects of historical and cultural heritage. • Define the areas for the construction of new houses, strengthening of legislation regarding the construction and their orientation in areas protected by floods. • The displacing of population and settlements from flooding risk areas to other safe areas (hills or mountains) • The use of hydro-isolating construction materials. • Periodic monitoring of the situation and prevention of illegal interferences in the underground infrastructure.	Coastal area
GREY	51	Preserve the Quality of ground water in response to the changes of the sea level	• Maintain existing coastal dams and embankments • Engineer design and works for strengthening the existing dams and embankments • Construct new structures / segments • Engineering design and works for strengthening the marine water evacuating system/ network	coastal area
GREY	63	Maintain water availability	• Rehabilitate existing infrastructure • Extend existing infrastructure • Create complete new systems • Manage water demand through water reuse, recycling, rainwater harvesting, desalination, etc. • Integrate climate change scenarios into water supply system	Coastal area
GREY	23	Adaptation of construction techniques and building models that minimize the negative effect of high temperatures	• Choose construction area (possibly far from sources of heat and dust such as: thermo-power plants, fuel depositions, cement factories, urban wastes gathering places etc.) • Orientation (in order to avoid maximally the exposure to sun and hot winds) • Apply construction techniques, shapes of building and colors of walls and roofs which do not allow the penetration of excessive heat • Designs, which must find the optimal solution for the composition of dwellings, in order that each compartment gets the right amount of heat (from natural or artificial sources) according to its function (kitchen, living room, bedroom, toilet etc.)	Coastal area
GREY	1	Measures related to the protection of Farming Ventures/ Protective Efforts/ Technological Processes	• Hail protection systems (cloud seeding, nets) • Install plant protection belts • Lime dust on greenhouses to reduce heat • Vegetative barriers, fences, windbreaks • Move crops to greenhouses • Smoke curtains to address late spring and early fall frosts • Build or rehabilitate forest belts • Improve input supply (seeds, fertilizers etc.) • Change fallow and mulching practices • Change in cultivation techniques • Conservation tillage • Crop diversification • Crop rotation • Heat- and drought-tolerant crops/varieties/hybrids • Increased input of organic matter to maintain yield • Manual weeding • More turning over of the soil • Strip cropping, contour bounding (or ploughing) and farming • Switch to crops, varieties appropriate to temp, precipitation • Optimize timing of operations (planting, inputs, irrigation, harvest) • Mixed farming systems (crops, livestock, and trees) • Shift crops from areas that are vulnerable to drought • Protect the field using agro-forestry practices • Demonstration plots and/or knowledge sharing opportunities	Velipoje-Shkoder, Drini-Mati, Durresi Bay, Myzeqe Field, Vjosa River Mouth

GREY	31	Management of floods and water evacuation	• Maintain efficiency of water evacuation systems. • Deepen and manage Drin, Mat and Ishëm river flow so that their waters run liberally to the sea; • Clean, deepen, and maintain primary, secondary and tertiary collectors (canals) and of the draining systems so that waters run fast to the hydrovores; • Install and maintain hydrovores during the entire rainfall season. • Guarantee continuous supply of hydrovores with electric energy. • Install special pumps (with high power and efficiency) for the evacuation of waters from particularly important structures. • Continuously monitor canals and pipes for the evacuation of communal and industrial waters. • Increase in professionalism and efficiency of searching -saving units. The implementation of this measure is possible through the training of existing staff and through the preparation of new individuals, not only in military schools, but also in classes and programs on searching -saving and emergency, up to the level of Professional Masters. • Strengthen the role of subjects related to Regional Emergency and Civil Protection Units.	Historic memorials, archaeologic sites (in Lezha town, Bashtova castle, Butrinti), cult objects (mosques, churches) and shrines, cemeteries, traditional houses ("tower" type), objects of cultural heritage, etc.

LONG TERM Measures (years: 2030-2050)

Category	No	Measures Identified from sector reports	Actions	Location
GREY	43	Strengthening and modernization of evacuating system of salty waters, in order to impede their penetration deep in the land and their mixing with fresh waters	• Engineer design and works for strengthening the marine water evacuating system/ network	Coastal area
GREEN	8	Protection of existing forest/vegetation, reforestation	• Grazing control in forestry areas • Fire prevention in forestry areas • Introducing agro-forestry practices in Forest Areas • Forestation in the bare lands • Support forest regeneration (seeds, increase plant densities etc.) • Support mixed forest systems • Implement silvicultural treatment in forest and shrub lands • Pests and diseases management • Promoting site-adapted species composition • Programmes for combating desertification • Integrated fire management • Plantation along river beds • Monitoring of shifting in forest belt vegetation • Plantation along all coastal area with suitable trees • Plantation and dune stabilization	Velipoje-Shkoder, Drini-Mati, Durresi Bay, Myzeqe Field, Vjosa River Mouth
GREEN	60	Maintaining/restoring Coastal Wetlands	• Design and implement wetland restoration projects along the lowland coast in abandoned/refused lands obtained from the reclamation work of the last century • Facilitating wetland migration through changes in legislation and regulations • Promotion of wetland accretion	Velipoje-Shkoder, Drini-Mati, Durresi Bay, Myzeqe Field, Vjosa River Mouth
Fiscal	67	Development of an insurance sector to promptly mitigate losses by serving as "ecosystem payment service"	• Insert a specific programme at the insurance system related with this measure	coastal area
GREEN	35	Reforesting of riversides	• Reforesting with vegetation resistant to high temperatures and humidity, such as forest belts of poplar, sallow, acacia etc. in the riversides, especially near the embankments	Coastal area along river deltas : Drini, Mati, Vjosa etc.
GREY	42	Improve the flood protection system from sea surges	• Maintenance of existing coastal dams and embankments • Engineering design and works for strengthening the existing dams and embankments • Construction building the new structures / segments	coastal area
GREEN	34	Limiting of the exploitation of river environments for pasture	• Limit the use of riversides for grazing	Coastal area along river deltas : Drini, Mati, Vjosa etc.
GREEN	55	Adaptation for Coastal Protection through Management of coastal erosion	Coastal Erosion Management through: • Removal of the Breakwaters • Beach Nourishment to Ameliorate Erosion • Usage of Structural Methods of Sand Retention Water Exchange Management through: • Construction of Structures to Restrict Sediment Accumulation in the Coastal Lagoons Tidal Inlets • Regular Maintenance Dredging of the Coastal Lagoons Tidal Inlets	Viluni, Merxhani, Ceka, Karavasta, Narta, Orikumi and Butrinti lagoons, Drini, Mati, Ishmi and Bistrica rivers

GREEN	56	Management of coastline through increasing the sediments' release from the hydropower dams	• Management of sediment release from the hydropower dams	Viluni, Merxhani, Ceka, Karavasta, Narta, Orikumi and Butrinti lagoons, Drini, Mati, Ishmi and Bistrica rivers
GREEN	36	Flood protective ecosystem based constructions along coasts and continental shelf	• Infrastructure maintenance or restoration of wetlands, marshlands and dune systems ("Building with nature") (along the low coast from the delta of Drin up to the one of Ishmi, delta of Seman etc). • Protection of sandy dunes and dune management (beaches of Shëngjin, Tale, Divjakë, and Nartë). • Beaches refilling to hinder the further erosion (Shëngjin, Seman).	Beach of Shëngjin and Seman, Viluni valley, Low coast from the delta of Drin up to the one of Ishmi, delta of Seman, Beaches of Tale, Divjakë, Nartë
GREY	37	Constant maintenance of engineering protective constructions in the coastal areas	• Take over periodic maintenance • Find and/or provide adequate funds for the maintenance works • Construction of a series of dams parallel to the coastal line (especially for the beach of Shëngjin and Seman) as well as the intensive refilling of the beaches through a temporary bypassing. • Construction of dams parallel to the coast (from the valley of Viluni till to the beach of Shëngjin, especially at the so-called "Rana e Hjedhun" and the residence area). • Construction of a system of dams parallel to the coastal line above and under the sea level and the refilling of the beach with sand retrieved from the sea (Shëngjin and Semani beach). • Supplying to the sea the sediment amounts needed for the creation of beaches in places where they used to be. This measure requires the compensation of the effects of the sea abrasion with carryovers of new material along the coast (Shëngjin and Semani beach). • Protective constructions in ports and inhabited areas. Constructing parallel dams that are perpendicular to the coastal line, traps and walls aiming at reducing and scattering the energy of waves. • Constructing and reconstructing the road and railway network along the coastal line. It should be build up on high levels to cope with the envisaged increase of the sea level (at the whole field area along the coastline)	Beach of Shëngjin and Seman, Viluni valley, Low coast from the delta of Drin up to the one of Ishmi, delta of Seman, Beaches of Tale, Divjakë, Nartë
GREEN	54	Protect/adapt agriculture against Sea-Level Rise	• Restoration of Agricultural Areas and Wetlands • Maintenance and Upgrade of Flood Embankments	East of Kune-Vaine, N and S of Shkumbini outlet, SE and S of Karavasta lagoon, N and S of Semani river outlet, N and S of Vjosa river outlet, N of Narta lagoon, S and E of Orikumi, and N and S of Butrint lagoon.

Figure 4.27 The coastal area is divided in five regions from north to south: 1 Drini-Mati 2 Rodon Cape – Turra Castle 3 Shkumbin-Seman discharges 4 South coast and 5 Butrinti areas

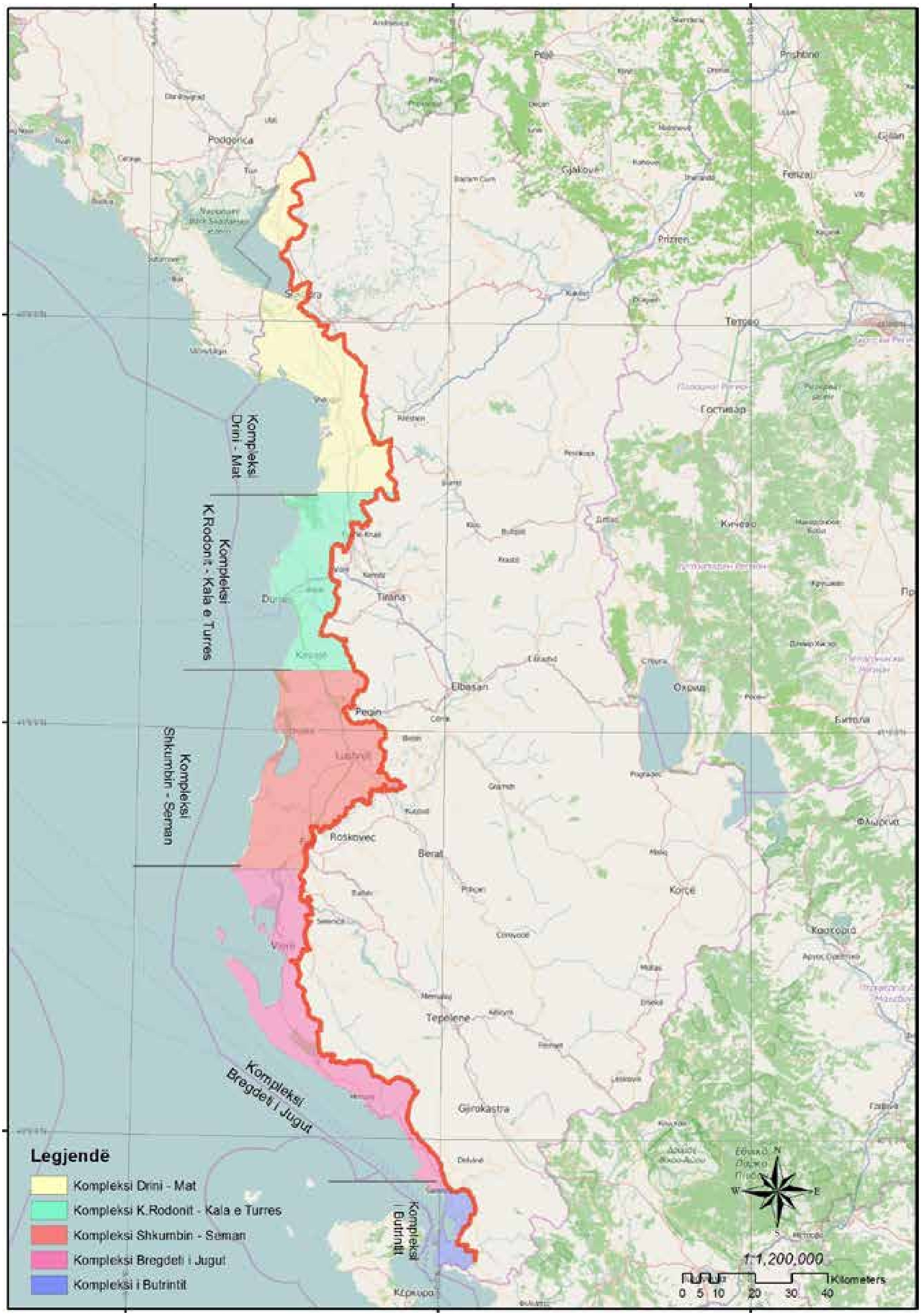


Figure 4.28 Schematic adaptation map, Drini-Mati area

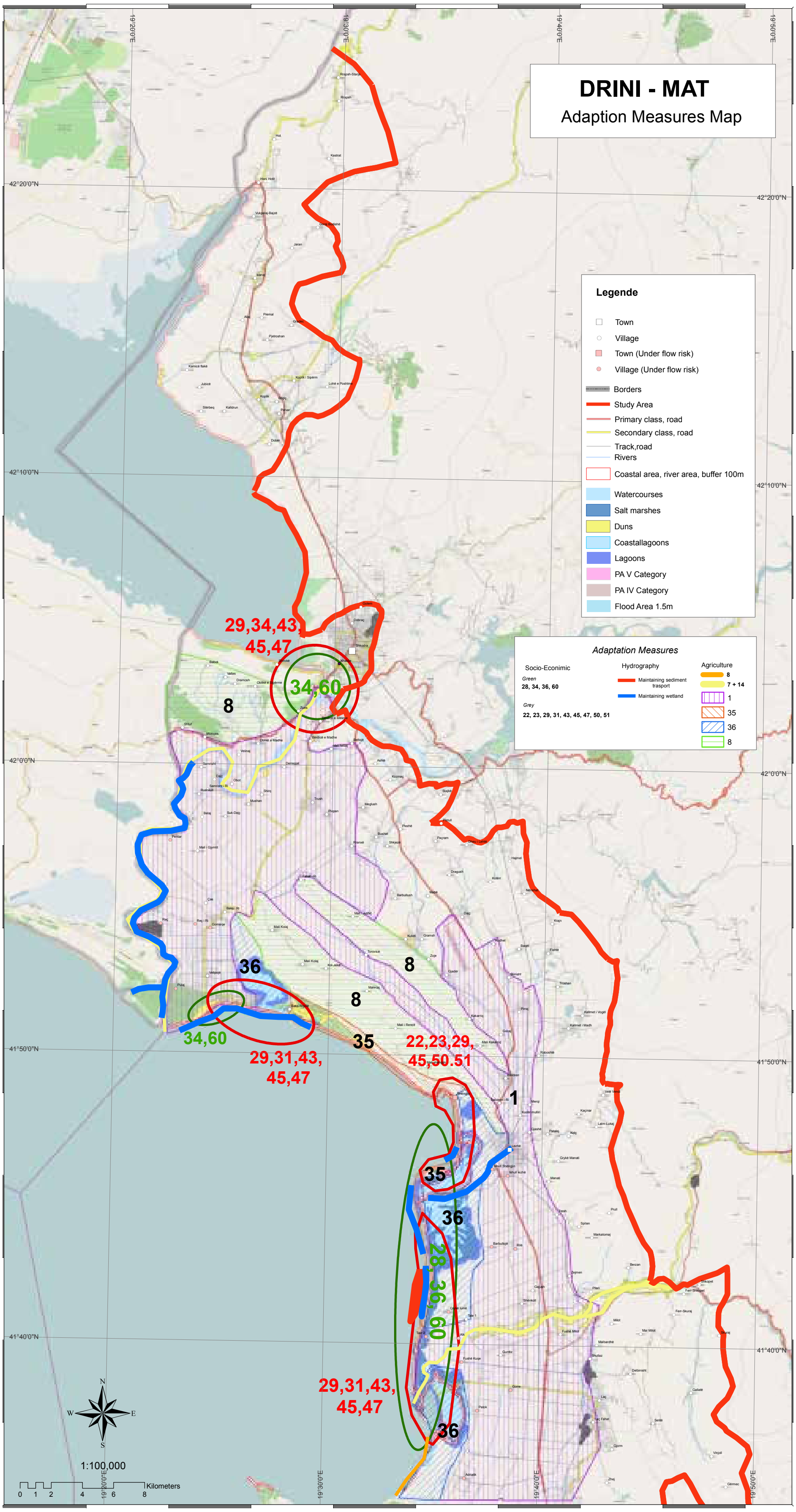


Figure 4.29 Rodon Cape-Turra Castle area

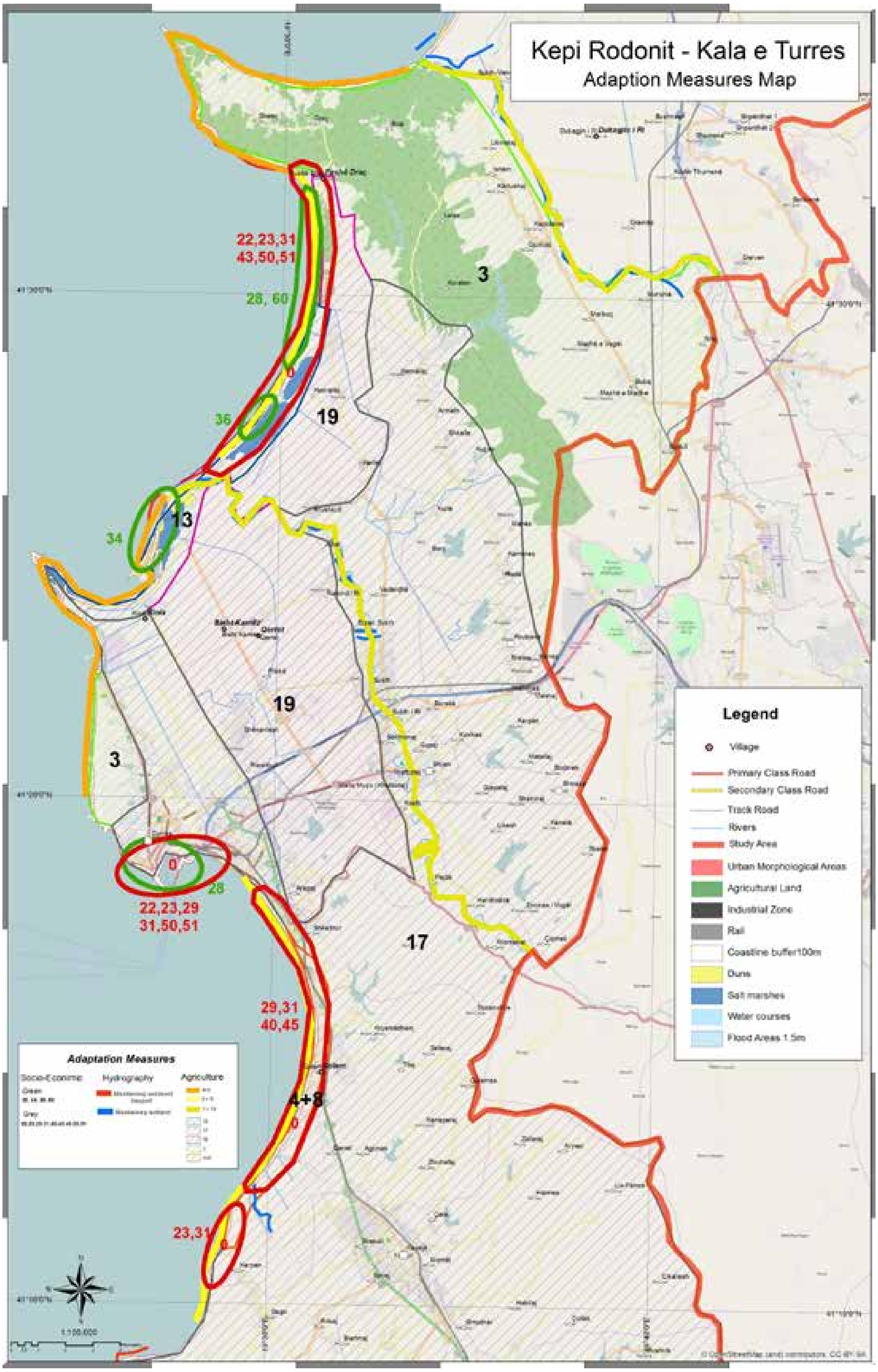


Figure 4.30 Shkumbin-Seman discharges areas

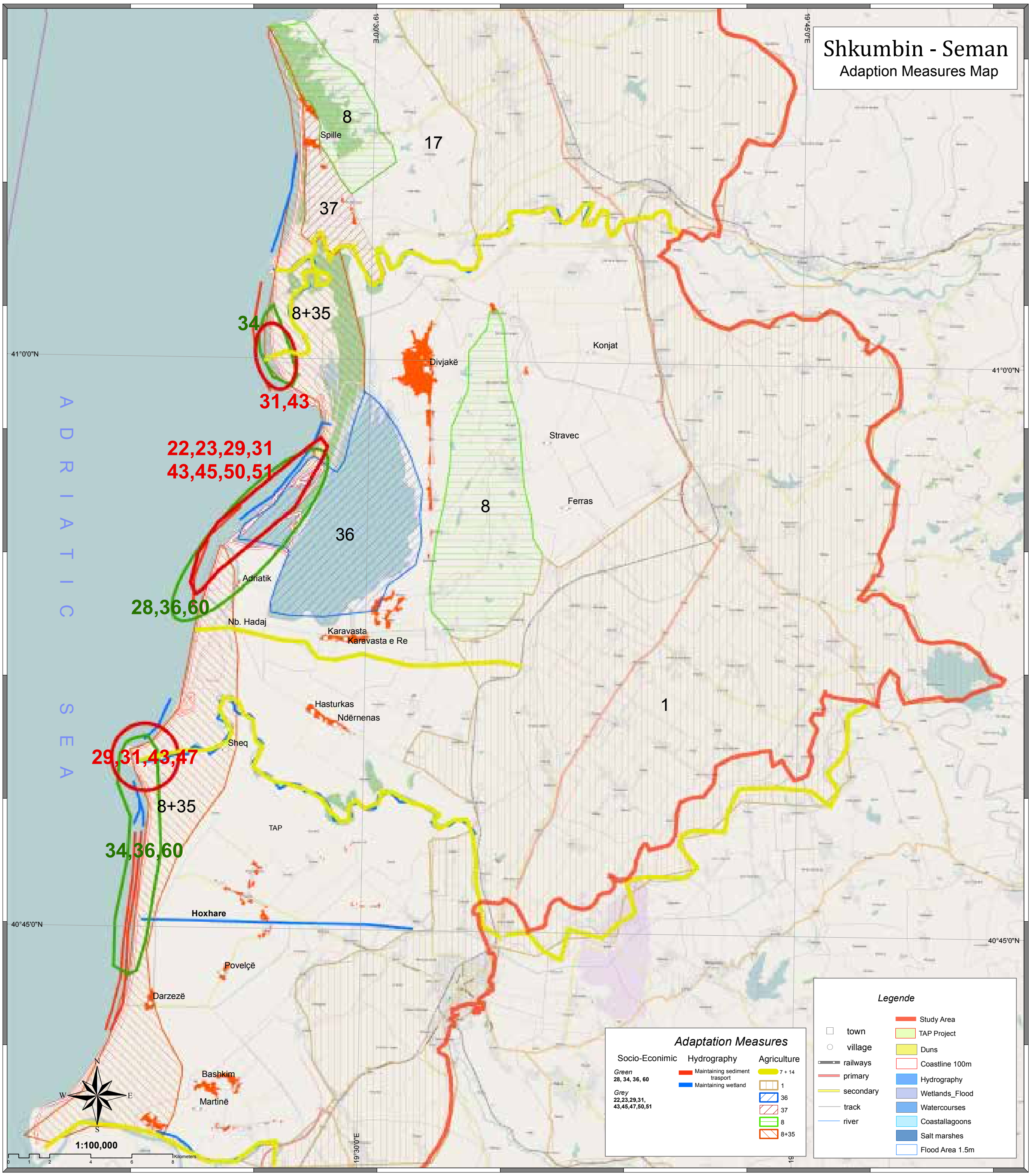


Figure 4.31 South coast area

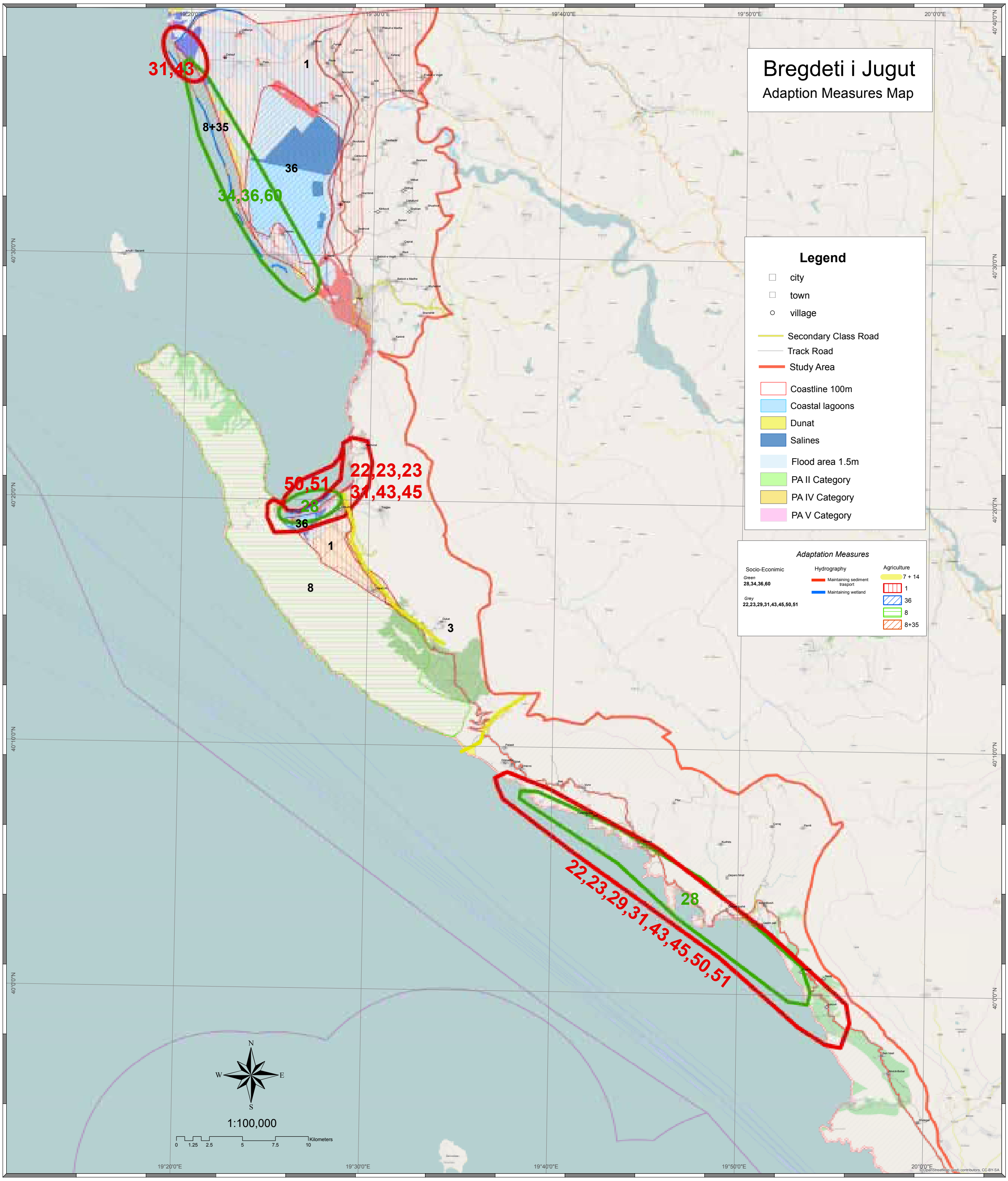
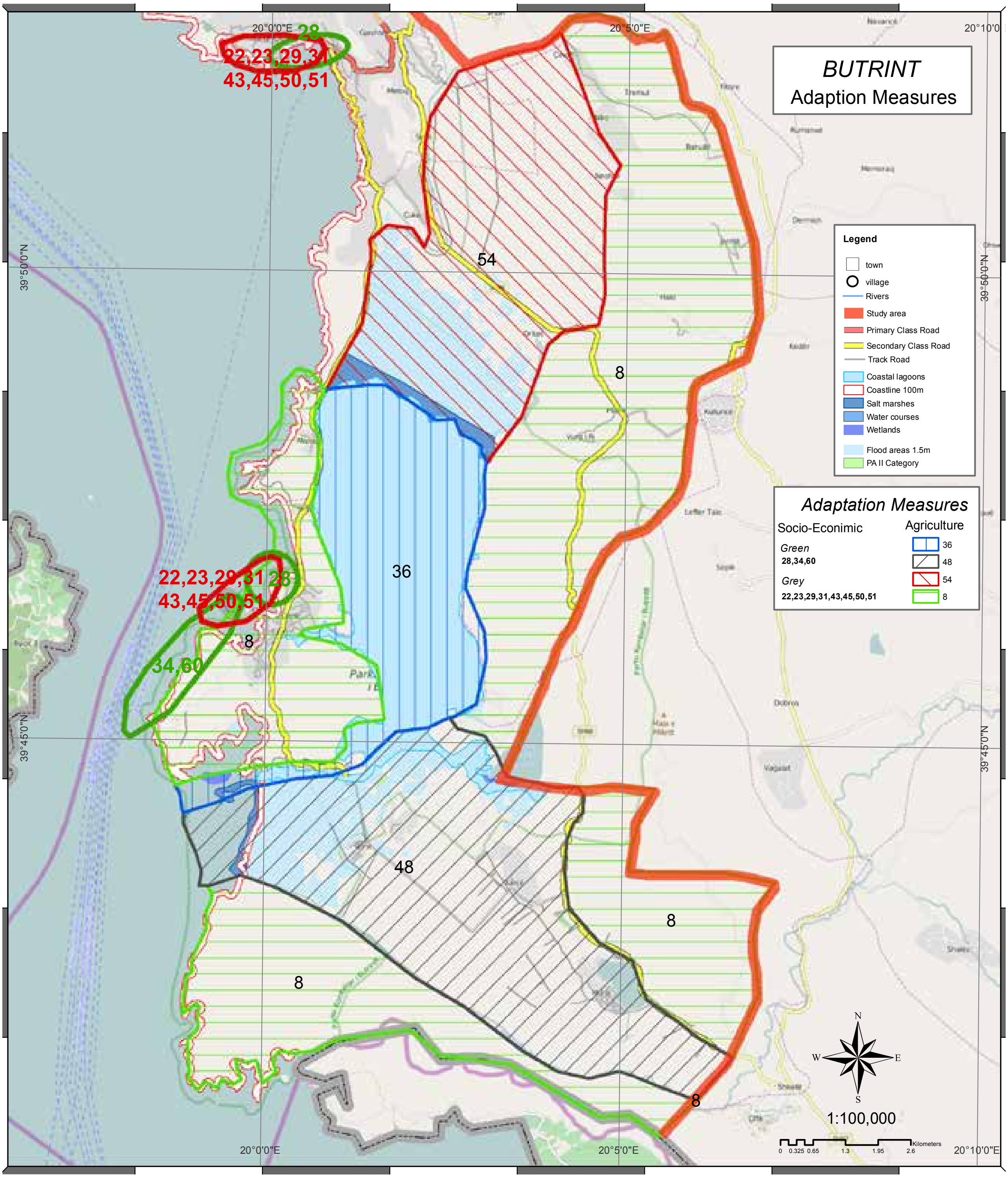


Figure 4.32 Butrinti area



4.13 CONSTRAINTS AND GAPS IN VULNERABILITY ASSESSMENTS

Analysing climate risk in Albania is one of the most problematic parts of this study regarding different natural hazards, because constraints remain from the lack of different historical data. The procedure can pass through an analytical process of existing historical data in different sectors, maps, events, different indicators each of which can be an important role in the risk characterization and vulnerability assessment in the country.

Analysing the vulnerability assessment of climate disaster risk in Albania is a challenge because more than 90% of all natural events that have happened in Albania in the last two decades (1993-2014) come from meteorological conditions. There is a close link between climate change and disaster risk reduction given that climate change is expected to increase the incidents of extreme events. This requires a multi-disciplinary framework to build resilience to disasters and adaptation to climate change. In addition to the fields of natural resource management and coastal hazards research, plans and policy must carefully measure and develop socioeconomic, or social, cultural, livelihood, and other related factors alongside the communities affected. Disasters are already costing billions of Leks to Albania's economy and are rapidly increasing in terms of frequency of events, impact on human life, economic losses and environmental impacts. The capacity of the national system (ministries, prefectures, and communes) is insufficient to manage the growing number of emergencies in order to recover rapidly.

Although the types and trends of change that will increase vulnerability are known, there remains considerable uncertainty as to the exact magnitude of the changes that can be expected for any given time horizon, often because of non-climatic aspects. For instance, it is difficult to predict the exact effects of sea level rise along the Adriatic coast due to the fact that the area is tectonically highly active, and local uplift or subsidence could have a greater influence on coastal dynamics than climate induced sea level rise. Another example is the conclusion that most flooding events, especially in the last 15 years, are caused not only by heavy rain but also by bad management of the cities or communes infrastructure in the northern coastal zone and/or mismanagement of hydropower electric dams located in the Drini and Mati rivers, etc.

4.14 OPPORTUNITIES AND CONSTRAINTS IN THE IMPLEMENTATION OF ADAPTATION MEASURES

The ability of the legislative systems to keep pace with identifying and implementing adaptive measures is a challenge – this is evidenced by the National Strategy for DRR, which is waiting to be approved by the Parliament together with the new law of Civil Emergency.

Current constraints are aligned on how to:

- Incorporate disaster risk reduction concerns into future planning and development;
- Develop effective national Early Warning Systems for emergency plans for climate change risks;
- Raising awareness of all the risks from extreme weather and climate change;
- Enacting and enforcing legislation;
- Increasing the capacity of adaptation and protection systems

Selecting which adaptation measures to pursue when considerable uncertainty exists regarding how future changes will affect society remains a challenge. The most important measure is the incorporation of climate change and disaster risk reduction considerations into all aspects of policy planning and development.

Current constraints are linked to the lack of capacity and experience to:

- Develop a comprehensive national adaptation plan[49] for climate change and its integration in national, local and crosscutting strategies;
- Upgrading the existing national early warning systems with new and updated infrastructure (hardware and software) and developing emergency plans for the most critical hazards in the country;
- Improve coordination between government ministries responsible for CC and DRR;
- Improve data availability and accessibility for all national entities; Institute of Geosciences, Energy, Water and Environment (hydrometeorological data), Albanian Geographical Survey, etc.;
- Build capacity to engage in policy dialogue and ensure participation of vulnerable groups in decision-making;
- Bring DRR and climate change adaptation into educational system at all levels (Awareness-raising and engaging the media);
- Mainstream climate change considerations into all activities;
- Strengthen regional and international cooperation on the DRM and CCA initiatives.

It is important to mention that there are projects in progress, with international funding, that should increase data accessibility and capacity to utilize such data. Their results will contribute to making the planning process more effective for adaptation to climate change in the country.

49 Albania started the process for development of the National Adaptation Plan (NAP) document in close cooperation of relevant line ministries under the lead function of the Ministry of Environment (MoE) within the framework of the Inter-Ministerial Working Group on Climate Change in 2015, with support of GIZ, UNDP and EU

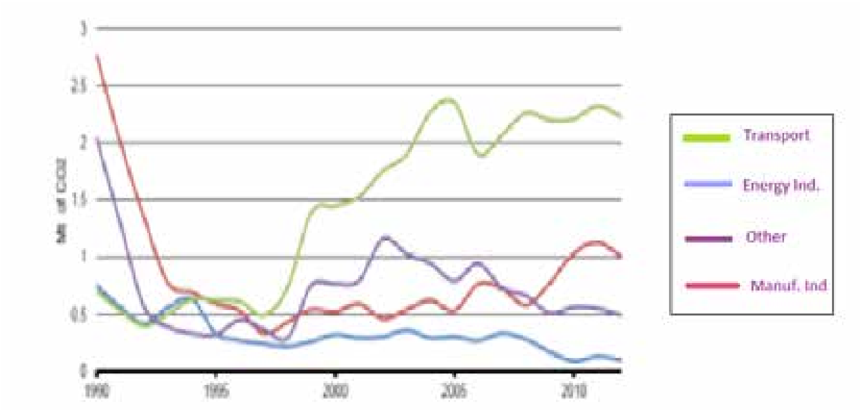
MITIGATION ASSESSMENT

5.1 INTRODUCTION

Albania's National Strategy for Development and Integration (NSDI I) 2007-2013 (DCM No. 342) of 12/03/2008 was a key national strategic document that states Albania is a small actor in the global environment due to its low per capita GHG emissions. Nevertheless, the strategy outlined measures for mitigation and adaptation to climate change, although the overall goal of these measures is not explicitly related to climate change. The NSDI focused on energy efficiency improvement in all sectors, with a view to reduce energy consumption and GHG emissions.

In the context of the EU Accession process and the Energy Community Treaty, and in line with the EU 20-20-20 objectives, Albania has already set Quantified Objectives related to energy efficiency (9%) and renewable energy sources (38%) in 2018 and 2020 respectively compared to 2009. Measures such as energy market liberalization, combined with significant investments for the development of energy transmission infrastructure and privatization of the electricity distribution sector, have resulted in an uninterrupted electricity supply to consumers.

Figure5.1: Albania's CO_2 emission trends 1990-2012 (Gg)



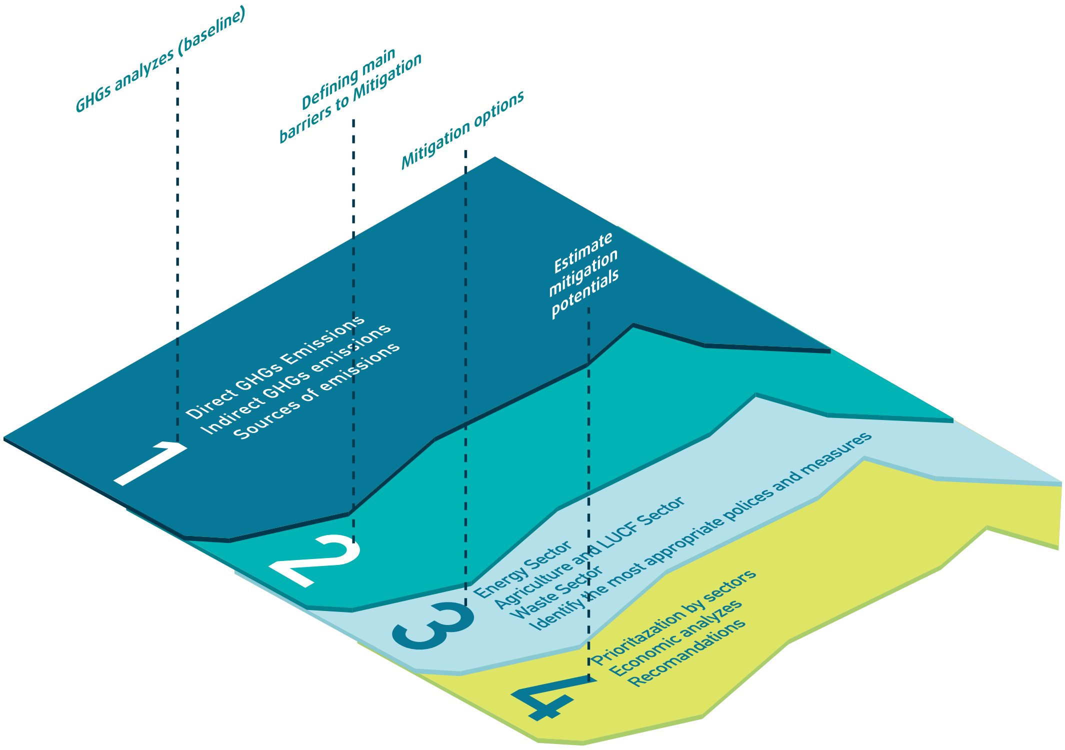
Transportation and energy industry followed by agriculture and waste sector are the main contributor categories to the Albanian GHG emission.

Albania has taken clear mitigation commitments: the Albanian Parliament ratified the Paris Agreement through law no. 75/2016 dated 14.07.2016, as a major step towards its implementation. Ratification of the Paris Agreement came in response to previous actions undertaken in this context such as the delivery ahead of schedule of the Intended Nationally Determined Contributions (INDC) to the UNFCCC Secretariat on 24 September 2015, and the signing of the Paris Agreement on 22 April 2016 in New York. On the other side, Albania is working on the adoption of the EU "acquis communautaire" in the environment and climate change sector.

5.2 METHODOLOGY

To assess different mitigation measures the TNC study has followed the steps presented in Figure 5.2 focusing on the main sources of GHG emissions.

Figure 5.2: Steps followed for the mitigation assessment



The mitigation analysis included in this report is based on analysis of the GHG inventory, emission trends and also development priorities. The sectors considered for the analysis of the present report were: Energy, Agriculture, LUCF and Waste. The GHG considered were CO_2, N_2O and CH_4. Table 5.1 lists the evolution of the mitigation analysis starting with the Initial National Communication.

Table 5.1: Evolution of mitigation analysis

	Methodology	Sectors considered
INC	LEAP GACMO Time horizons 2000-2010-2020 Considered the following gases: CO_2, N_2O and CH_4.	Energy, Industry, LUCF and Waste. One scenario for the following sectors: Energy and transport, Industry, LUCF and Waste
SNC	LEAP, MARKAL and GACMO	Sectors: Energy, Industry, Agriculture and Waste. Two scenarios: Baseline and one mitigation scenarios.
TNC	LEAP and multi-criteria methodology. Considered the following gases: CO_2, N_2O and CH_4. CO_2, N_2O and CH_4. Time horizons : 2030	Sectors: Energy, Agriculture, LUCF and Waste. Two scenarios for the Energy LUCF and Agriculture sectors and three for the Waste sector.

To analyse mitigation options for the energy sector proposed measures were assessed by applying a multi-criteria methodology and by taking into consideration the cost per unit of emission reduction.

5.3 INTENDED NATIONALLY DETERMINED CONTRIBUTIONS (INDCs) AND NATIONAL APPROPRIATE MITIGATION MEASURES (NAMAs)

The Republic of Albania adopted the INDC document by the Decision of Council of Ministers No.762 of 16.09.2015 in September 2015 and submitted it to the UNFCCC Secretariat on 24 September, 2015. Furthermore Albania signed the Paris Agreement on 22 April, 2016. The INDC of Albania is a baseline scenario target: it commits to reduce its CO_2 emissions by 11.5 % as compared to the baseline scenario for the period 2016 to 2030. This reduction is equivalent to a CO_2 emission reduction of 708 Gg by 2030. The emission trajectory of Albania allows a smooth trend for achieving 2 tons of GHG emissions per capita by 2050, which can be taken as a target for global contraction and convergence of greenhouse gas emissions. In the following additional information is provided regarding the INDC in order to facilitate clarity, transparency and understanding.

Albania presented its INDC in September 2015 and commits to reduce its CO_2 emissions by 11.5 % or 708 Gg by 2030.

Table 5.2 INDC of Albania

	MITIGATION CONTRIBUTION OF GHG EMISSIONS
Type	Baseline scenario target: a reduction in GHG emissions relative projected future emissions
Gases covered	Carbon Dioxide (CO_2)
Target year	2030
Baseline	Business As Usual scenario of emissions projections based on economic growth in the absence of climate change policies, starting from 2016
Sectors covered	The INDC covers the following sectors of the greenhouse gas inventory: Energy Industrial processes
Planning process	Planning process of the INDC included the review of available data and modelling work applicable to greenhouse gas reduction pathway as well as consultations with government stakeholders as well as with the public. The scenarios for the INDC were developed taking into consideration draft of the 3rd National Communication of Albania and all available scenario development work related to greenhouse gas emissions.
Participation in international market mechanism	Albania intends to sell carbon credits during the period until 2030 to contribute to cost-effective implementation of the low emission development pathway and its sustainable development. Albania foresees that for the utilization of international market mechanism is conditional on having effective accounting rules developed under the UNFCCC to ensure the environmental integrity of the mechanisms.
	FAIRNESS, EQUITY, AMBITION AND MEANS OF IMPLEMENTATION
Fairness, equity and ambition	Albania is a developing country, highly vulnerable to the effects of the climate change. National emissions of the greenhouse gases represent only 0,017 % of global emissions and the net per capita GHG emissions Albania was 2.76 tCO_2e which is less the a quarter of emissions of high-income countries. . Albania will take into account the ultimate objective of the UNFCCC in its future development and committed to decouple greenhouse gas emissions from its economic growth and embarks on a low emission development pathway. The INDC submitted by Albania is fair and ambitious because it aims to secure limited increase of its greenhouse gas emissions while it the country pursues a strong economic development pathway. Moreover, the pathway allows on long term for the convergence of Albania's per capita emissions to the 2 ton/capita level.
Means of implementation	The results of the preparation of the INDC are reflected in the Third National Communication of Albania and also will form the basis of the Environmental and Climate Change strategy which is in preparation. Development of the strategic directions for energy and transport sectors will take into consideration the INDC. Coordination of activities in relation to the strategy is foreseen to be coordinated by the Ministry of Environment which is the chair of the inter-ministerial body on Climate Change. Albania also transposes and implements parts of the EU legislation, including legislation on climate change and builds capacity for its implementation which supports its ability to reduce greenhouse gas emissions. Albania is a contracting party of the Energy Community Treaty which aims to extend the EU internal energy market to South East Europe and beyond on the basis of a legally binding framework. The overall objective of the Energy Community Treaty is to create a stable regulatory and market framework which also includes legislation aiming to reduce greenhouse gas emissions.
	KEY ASSUMPTIONS
Metric Applied	The metric used for the GHG emissions is the Global Warming Potential on a 100 year timescale in accordance with the IPCC's 2nd Assessment Report
Inventory methodology	IPCC 2006 Guidelines
Approach to accounting for agriculture, forestry and other land uses	Greenhouse gas emissions and removals from agriculture, forestry and other land uses are currently not included in the accounting. Emissions and removals from these sectors can be included in the INDC at a later stage when technical conditions allow for that.

The concept of Low-Emission Development under United Nations Framework Convention on Climate Change (UNFCCC) provides a framework for countries to formulate their approaches to sustaining long-term national growth in the context of mitigation of greenhouse gas emissions. A special support mechanism for developing and implementing Nationally Appropriate Mitigation Actions (NAMAs) is established under UNFCCC, including a new Green Climate Fund.

NAMAs are mitigation actions, programmes or policies voluntarily undertaken by developing countries in the context of sustainable development, supported and enabled wholly or in part by technology, financing and capacity building from developed countries. An initial inventory of potential NAMAs in Albania was established with UNDP support (2013-2014). On the basis of a multi-criteria analysis, considering the benefits for a range of sustainable development areas, priorities were established, and two NAMAs were fully developed respectively on (i) Supporting the implementation on the National Energy Efficiency Action Plan (NEEAP) in the residential, public and commercial sector and (ii) Replacing fossil fuels with non-hazardous waste in the Albanian cement industry.
Information on Albania's NAMAs is presented in Annex I.

5.4 GHG MITIGATION ASSESSMENT FOR ENERGY AND TRANSPORT SECTORS

5.4.1 Mitigation Measures in national strategies and action plans

Albania as one of the Contracting Parties of the Energy Community Treaty is obliged to transpose and comply with the EU Directive 2009/28/EC "On the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC". One of the requirements of this Directive is the preparation and adoption of a National Renewable Energy Plan (NREAP), adopted by the Governmental Decree no.27, dated 20.01.2016, which sets a binding national target of 38% of renewables in the final total energy consumption of the country in the year 2020 compared to 2009 together with support measures for achieving these targets.

In the same time, the Albanian Government considers the promotion of renewable energy use as an important energy policy tool for increasing the security of energy supply, economic development, energy sector sustainability and environmental protection.

Even though Albania gets over 95% of its electricity from hydro, there are still considerable imports of energy which vary – depending on yearly conditions - between 30 and 60% of TPES. Renewable energy can be a solution for reducing this strategic dependence on imports and improve not only security of energy supply but also country's economic and political macro security by decreasing country's budget deficit.

Based on these facts which provide the context for possible RES role in Albanian current energy and economic situation, and based on the principals of energy security and economic value added to local economy, the following RES policy objectives are adopted:

- Reduction of electricity imports;
- Diversification of primary energy sources for electricity supply;
- Reduction of transmission and distribution losses by promotion of distributed generation;
- Creation of local business and employment opportunities by installing and producing parts/components/systems of RES plants by Albanian industrial sector;
- Utilisation of local energy sources especially in remote areas bringing jobs and improving life standard;

- Increasing share of biofuels and other fuels from renewable energy sources contribution to 10% of total fuel consumption at transport sector by 2020.

Increasing utilization of the RES technologies is a vital step towards a more sustainable society in general and with strong benefits for Albanian industry in particular. The updated law on RES is under final preparation to adopt the support schemes based on FiT and State Aid Directive guidance.

Within the country commitments under the Energy Community Treaty and INDC, a new law on Energy Efficiency No. 124, dated 12.11.2015 has been adopted, containing a number of important provisions, like (i) obligation schemes for big consumers above 3 mil. kWh (or equivalent); (ii) establishing a new Energy Efficiency Agency; (iii) establishing a ne Energy Efficiency Fund independent by budget and also with the state budget as main contributor; (iv) creating ESCOs and asking for Energy Audit of buildings, processes and transport, and also (v) the energy managers to the big consumers. The Energy Efficiency Fund as per the law will provide grants and loans or financial guarantees for the implementation of the energy efficiency projects in Albania, while the Energy Efficiency Agency will be in charge to develop, implement and monitor the energy efficiency policies and programs, including the implementation of the National Energy Efficiency Action Plan (NEEAP).

A new law on Energy Performance in Buildings is under the last stage of its endorsement, calling for the energy minimum requirements on building stock and the National Methodology for Calculation of Buildings' Performance which are going a Certification process through a national software on respect of Minimum Requirements.

2nd and 3rd drafts of the National Energy Efficiency Plan will get finalised soon, while the 1st endorsed NEEAP which sets a binding national target of 9% of energy efficiency in 2018 compared to the year 2009 contains several measures that have GHG mitigation effect:

- Thermal insulation of existing stock of public buildings and a new energy building code for new public ones;
- Encouragement for using efficient bulbs in residential, service and industry sectors;
- Energy Efficiency Promotion Programme for the power sector (improvement and extension of electricity supply, strengthened of grid stability, reduced system losses, energy saving);
- Substitution of fossil fuels (coal, oil coke, RFO) with light fuel oil efficient boilers in industry & service sector;
- Increasing Energy Efficiency of boilers/furnaces in industry & services sector.
- Increase of power factor (cosj) in industrial companies.
- Improving energy efficiency of vehicle stock, etc.

Currently Albania is updating the National Strategy of Energy, looking at the diversification of the energy sector through its gasification/utilization of Natural Gas vial TAP project in economic sectors of Albania.

The final draft of the Sustainable Transport Plan (STP) has been prepared (March, 2016) to help meet the following challenging targets for reducing energy consumption and improving the overall sustainability in the transport sector:

- Reduce air pollution impacts on health, crops, etc. (indicator: emissions of air pollutants tons/year);
- De-carbonisation, reduction of GHG emissions (indicator: emissions of CO_2 tons/year);
- Energy efficiency (indicator: tons of oil equivalent).

5.4.2 Baseline Scenario and Development Methodology

The baseline scenario extended to the year 2030 assumes the following:

i. Current structure of energy supply and demand in all economic sectors.
ii. A continuous prevalent use of electrical energy for heating and warm water in residential and the service sector.
iii. A considerable portion of future demand for electricity shall be covered through the extension of the thermal generating capacities (based on imported natural gas) and hydro energy.
iv. The planned short-term measures from 1st NEAAP and NREAP are not going to be strictly implemented.
v. National energy intensity will get not significantly decreased during period 2009-2030, compared to mitigation scenario.

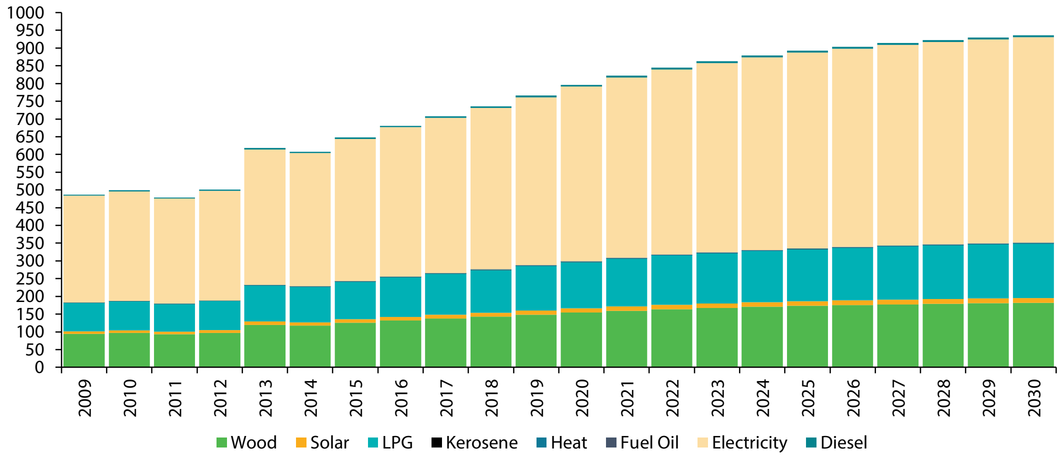
The generation of baseline scenario (and later of the mitigation scenario) for the energy and transport sectors has been carried out using the LEAP model that ensures the appropriate analysis and provides close to reality recommendations on energy strategies, adjusted to the conditions of Albania. Markal-Optimization Software was also used to evaluate the penetration rate for different technologies, GACMO (the GHG costing tool) and GHG emission time series (for the years 2000-2009) calculated under the present GHG inventory chapter were also utilized.

The forecast of energy demand for the economic sectors is based on historic values for the period 2009-2014 (calibrated real values), while for the period 2015-2020 it is based on the forecasted figures according to the NREAP.

5.4.2.1 Forecast of the Energy GHG Emissions from the Residential Sector

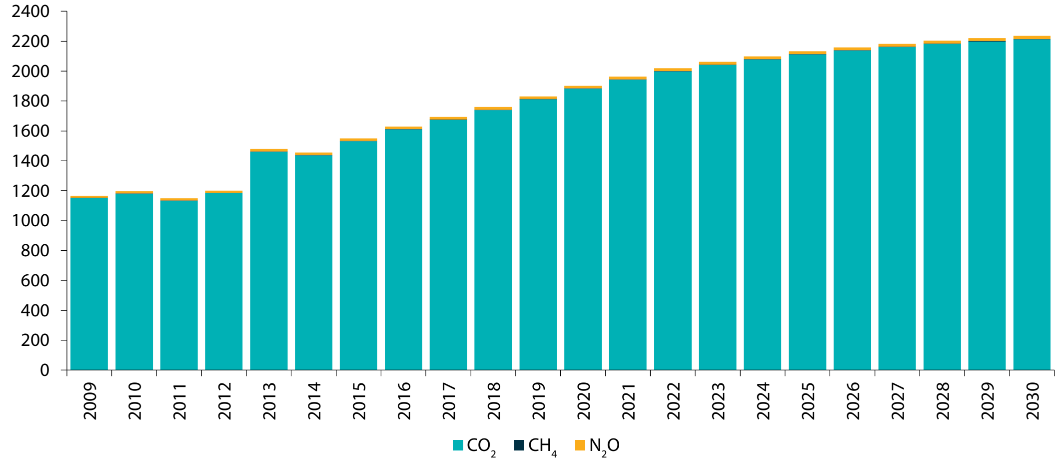
The residential sector is highly significant since it consumes more than one fourth of the total energy, while it also represents a major pressure for the overloaded electric distribution system in Albania. The main parameter used for the residential sub sector energy needs calculation is the number of apartments for the baseline year (2005) and its increase based on a forecasted growth rate of 37% up to the year 2030. A more detailed analysis, involving classifying this parameter according to the climate zones and those in urban or rural zones, has assisted in forecasting the needs for energy in the Residential Sector. On the other hand, the demand for heating in the residential (and sector services) is going to increase from heating of just one room to heating of all rooms without any efficiency improvement. The forecast of the energy demand for the residential sector is shown in Figure 5.4.

Figure 5.4 Energy consumption and demand for the residential sector (kTOE)



The forecasted GHG emissions from the energy consumption in the Residential Sector (expressed as CO_2 equivalent) are shown in figure 5.5 for the years 2009 to 2030.

Figure 5.5 Projected GHG emissions from the residential sector (Gg of CO_2 eq.)



The projections anticipates an increase of GHG emissions from the residential sector by approximately 192% from 2009 to 2030.

5.4.2.2 Forecast of the Energy GHG Emissions from the Service Sector

The services sector is one of the most dynamic sectors of the Albanian economy, accounting for more than 60% of value added to the economy. Also, according to the National Bank of Albania, most economic growth over the years has been attributed to the development of this sector. The progress of this sector is evaluated through the index of corporate sales, including trade companies, hotels and restaurants, transportation, telecommunication and other services. The main activity of the Services sector is commercial activity. In 2010, the value added generated by the sector contributed to 3.2 percent of the GDP annual growth. In order to calculate the energy needs and GHG emitted from this sector, it has been divided into two branches:

- Public services; and
- Private services.

Public service sector consumes 32.5% of the total energy consumed in the service sector as a whole, while the private one the remaining 67.5%. The Public Services Sector includes primarily Health, Education, Culture and Administration. The main energy consumption in the service sector is linked to space heating/air conditioning in private service buildings, mainly modern

Figure 5.6 Trend of energy consumptionfor the service sector (kTOE)

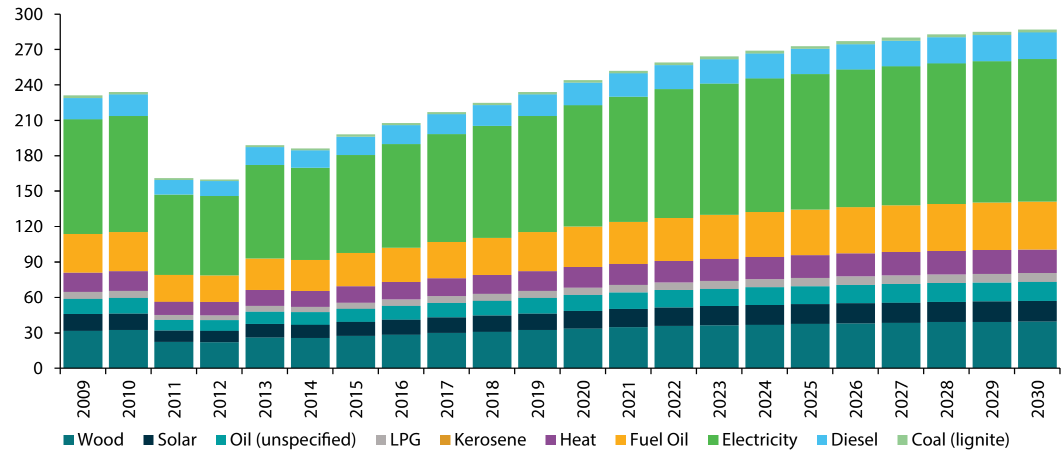
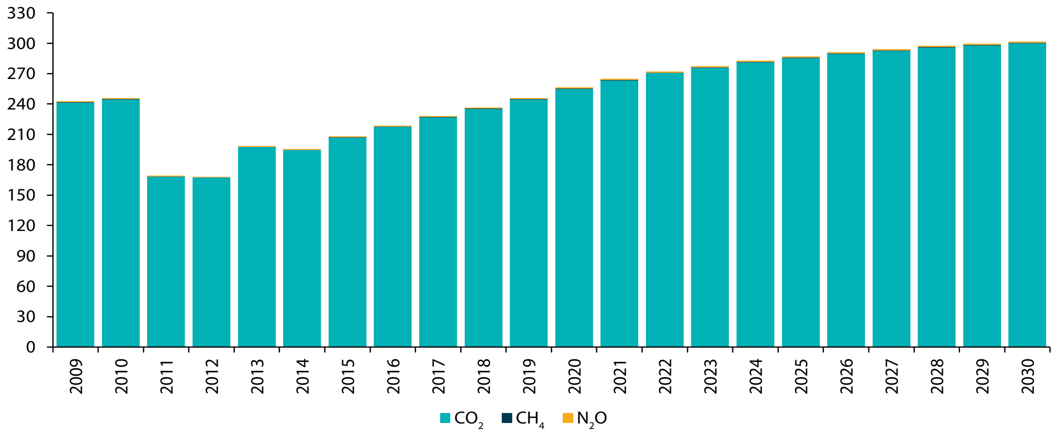


Figure 5.7 GHG emissions from the service sector (in Gg of CO_2 eq.)



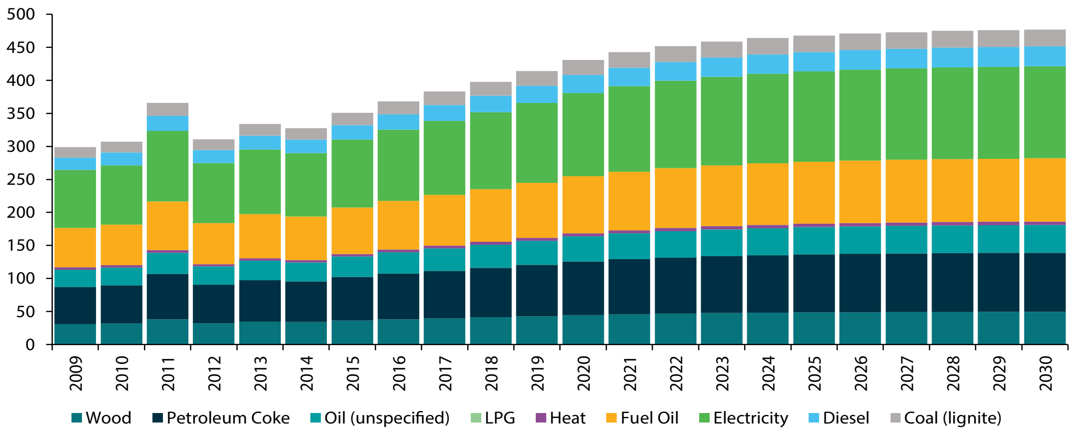
buildings, except those that provide traditional services such as repair shops and small trade business that cannot afford or do not require heating/air-conditioning. It is expected that the private service sector will modernize their energy systems. The Baseline scenario foresees a significant reduction of unheated areas in public buildings from 65% (current) to 5% in 2030. The services sector energy demand is expected to increase by 10% due to improved service quality. The trend of energy consumption for the service sector is shown in Figure 5.6.

The forecasted emissions of the main GHG gases (CO_2, CH_4, and N_2O, expressed as CO_2 equivalent) are shown in Figure 5.7. The projection anticipates approximately a 1.24 times increase of GHG emissions from the service sector from 2009 to 2030.

5.4.2.3 Forecast of Energy GHG Emissions from the Industry Sector

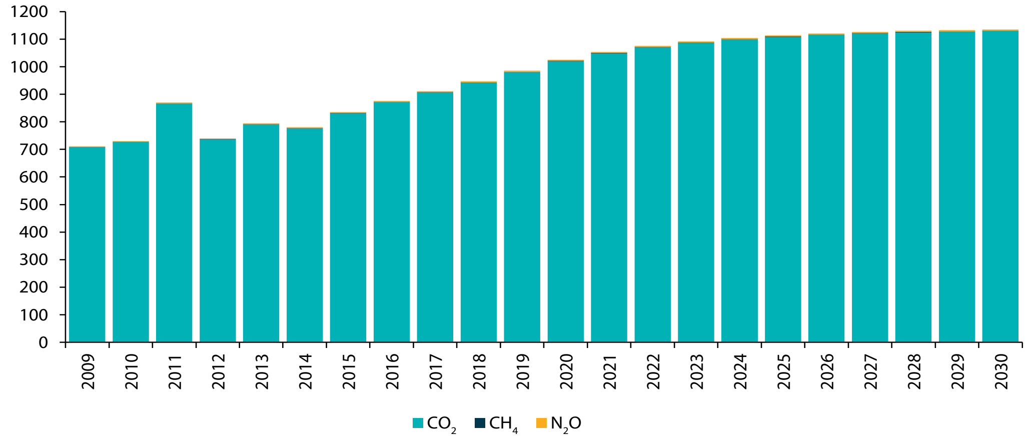
The Industry sector has been split into several sub-sectors: Metallurgical, Chemical, Construction Materials, Mines, Food/Drinks/Tobacco, Textile/Leather/Shoes, Wood/Paper/Printing/Mechanic industry. The industry sector has recorded very positive developments during the last decade. Its sales in 2006 accounted for about a quarter of total sales of economic enterprises, making the industry sector second in importance after the service sector. This increase is mainly due to accelerated growth of sales in the extractive industry sector. Electricity production rose by 48.0% during 2010. Good performance of the industry sector has been associated with an increase in the number of employees in this sector[1]. The main factor used to forecast the industrial sector energy demand is the contribution of Industry to GDP. The forecasted energy demand is shown in Figure 5.8.

Figure 5.8 Industry's sector energy demand trend (in kTOE)



1 BoA (2006), BoA (2008), BoA (2010) and BoA (2013)

Figure 5.9 GHG emissions from the Industry Sector (in Gg of CO_2 eq.)



The forecasted emissions of the main GHG gases (CO_2, CH_4, and N_2O, expressed as CO_2 equivalent) are shown in Figure 5.9 for the years 2009 to 2030.

The projection predicts that GHG emissions from the industry sector will increase 1.6 times from 2009 to 2030.

5.4.2.4 Forecast of Energy GHG Emissions from the Transport Sector

For the transport sector, two main indicators measure the demand for passenger and freight transport: Passenger-km and ton-km. It is forecasted that ton-km will increase by 85% in 2030 compared to 2005, while passenger-km will increase by 37%. The vast majority of transport is undertaken by road vehicles.

Albania's transport sector has been increasing rapidly since 2000. The number of vehicles in circulation has increased and infrastructure being improved which leads to an ever increasing total traffic load. The transport sector consumes significant quantities of energy (mostly in the form of petroleum and gasoline). To calculate the future energy needs, this sector has been divided into two sub sectors: transport of goods and transport of passengers. The trend of energy consumption for the transport sector is shown in Figure 5.10.

The forecasted emissions of the main GHG gases (CO_2, CH_4, and N_2O, expressed as CO_2 equivalent) are shown in Figure 5.11 for the years 2009 to 2030. The projection predicts an approximately 1.5 times increase of transport GHG emissions from 2009 to 2030.

Figure 5.10 Trend of energy consumption for the trasnport sector (in kTOE)

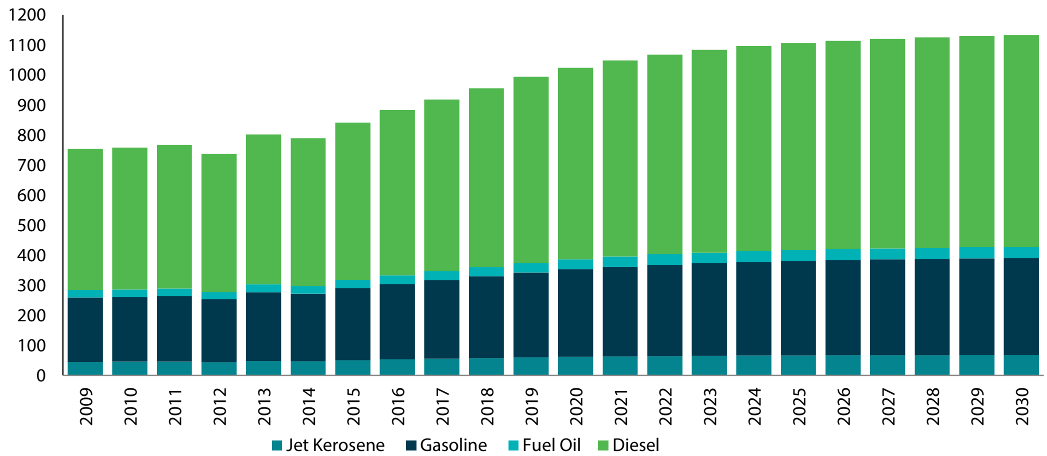
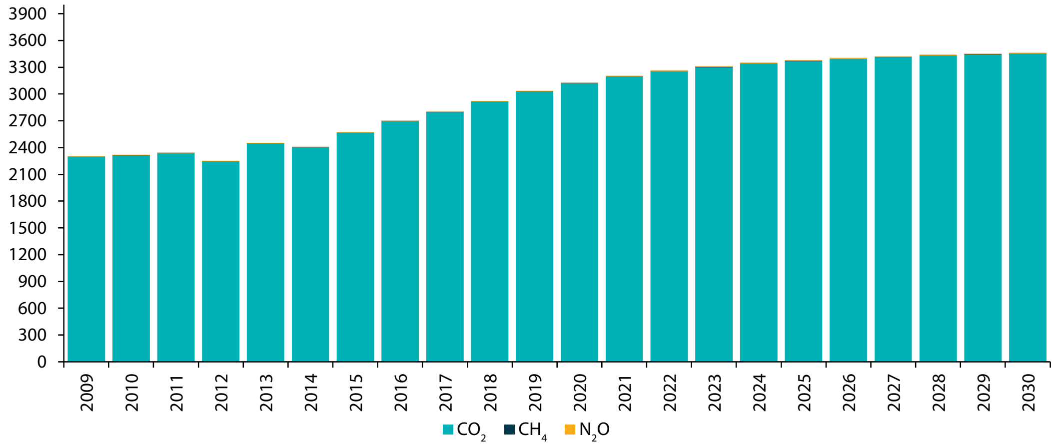


Figure 5.11 GHG emissions from the transport Sector (in Gg of CO_2 eq.)

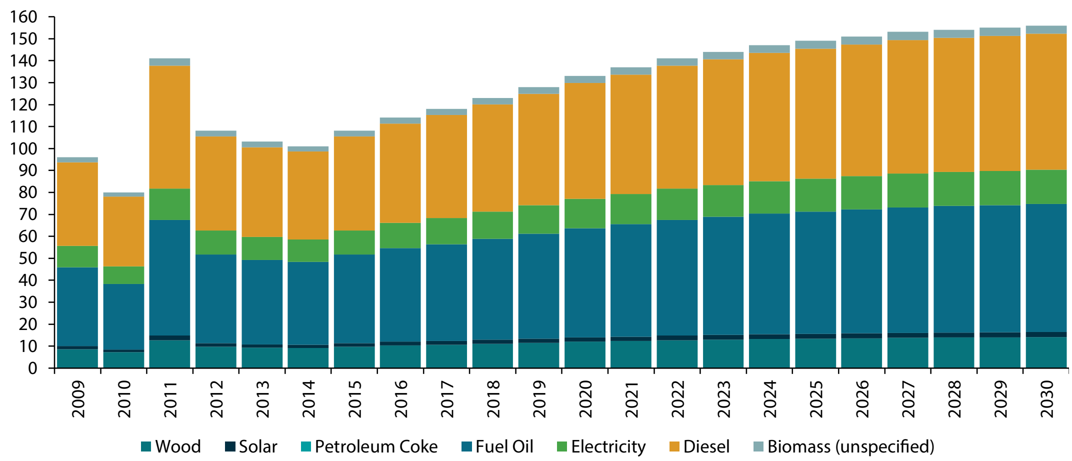


5.4.2.5 Forecast of Energy GHG Emissions from the Agriculture Sector

Agriculture is one of the main economic sectors in Albania, contributing to approximately 20% of the value added to the economy. Over the last decade, from 2006, the sector has experienced moderate growth. However, development of the sector is highly affected by several structural problems. The relatively underdeveloped infrastructure in rural areas holds back the emergence of agricultural products onto the market. Agricultural land fragmentation hinders the effective organization of production, reduces productivity and increases the cost of using agricultural mechanics. Additionally, agricultural land is not utilized at full capacity as a result of external and internal migration movements of population. This phenomenon, together with ownership problems, has limited investments in the agricultural sector. Agriculture therefore uses little energy and it has low energy intensity.

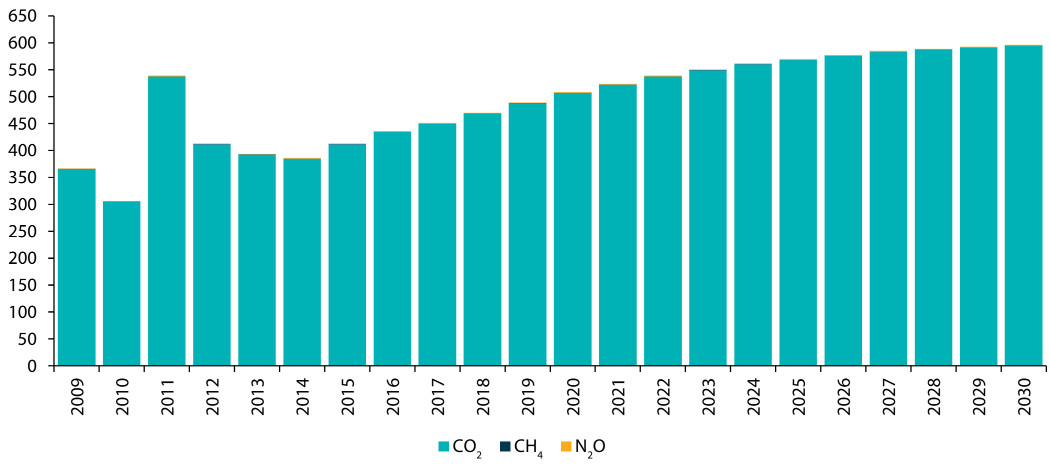
The trend of agriculture energy consumption is shown in Figure 5.12. The forecast takes into consideration the energy demand for livestock, fishery, forestry and agriculture sub sectors. In the baseline scenario it is projected that the energy intensity will increase, but not to a level that characterises intensive agriculture. Projected growth for the sector is approximately 1.6 times in the period 2009-2030.

Figure 5.12 Trend of energy consumption for agriculture sector (in kTOE)



The forecasted emissions of the main GHG gases (CO_2, CH_4, and N_2O, expressed as CO_2 equivalent) are shown in Figure 5.13. The projection anticipates an approximately 1.63 times increase of agriculture GHG emissions from 2009 to 2030.

Figure 5.13 GHG emissions from the agriculture sector (in Gg of CO_2 eq.)



5.4.2.6 Forecast of Energy GHG Emissions from All Consumption Sectors

A forecast for the energy demand and the related GHG emissions from all energy consumption sectors was made based on the baseline scenarios for each considered subsector using LEAP. The energy demand and the emissions forecast are shown in Figure 5.14 and 5.15 respectively. While all sub sectors will increase absolute GHG emissions, their relative contribution will change as follows:

- share of the residential sector will increase from 24.35% in the year 2009 to 28.90% in the year 2030;
- share of the service sector will be reduced from 5.06% in the year 2009 to 3.90% in the year 2030;
- share of the industry sector will increase from 14.84% in the year 2009 to 14.64% in the year 2030;
- share of the transport sector will be reduce slightly from 48.08% in the year 2009 to 44.80% in the year 2030;
- share of the agriculture sector will increase slightly from 7.66% in the year 2009 to 7.72% in the year 2030.

Figure 5.14 Trend of energy for all consumption sectors (in kTOE)

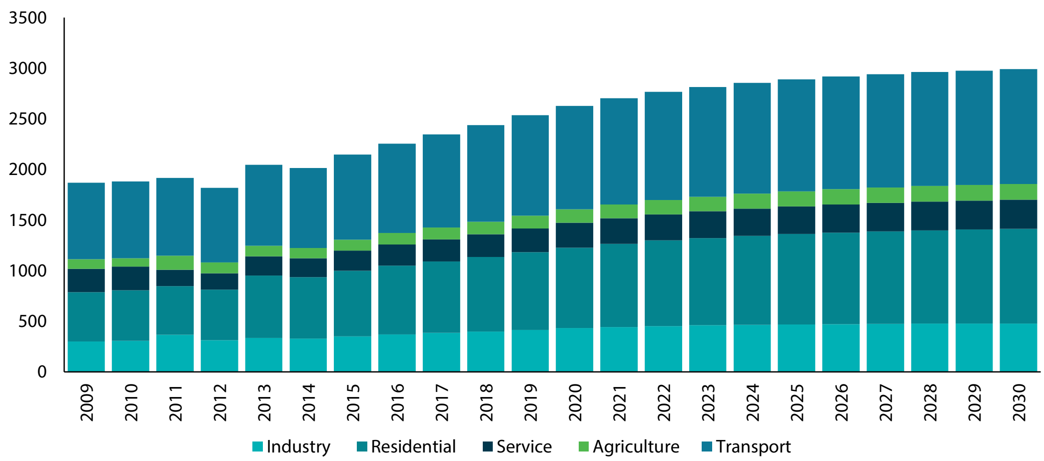
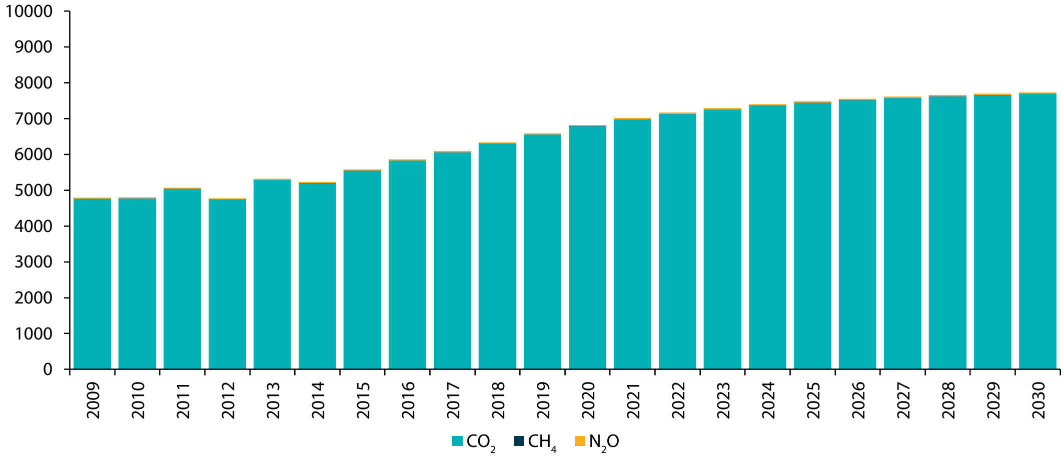


Figure 5.15 GHG emissions from all sectors (in Gg of CO_2 eq.)



The projection anticipates approximately a two times increase in GHG emissions from all energy consumption sectors from 4793.8 Gg in 2009 to 7731.2 Gg in 2030.

5.4.2.7 Forecast of Energy GHG Emissions from Energy Industry (Power Sector)

Electrical energy production is driven by demand, thus the Baseline Scenario is based on projected demand for electrical energy. The scenario does not take into account the current electrical grid overload that may results in power cuts. It assumes that necessary investments will be in place to cover all electrical energy needs. The forecasts of energy demand and resulting GHG emissions were calculated using LEAP software calibrated with the results of the GHG inventory and the NREAP for the years 2009-2014. The demand forecast has taken into account the effects of increasing electricity tariffs as well as addressing the problem of non-technical losses. According to the developed model, Albania's electrical energy demand will grow fast to support economic development (Figure 5.16).

New power plants needed to address increasing power demand and are planned to operate on a least cost basis. Significant investment needs to be made to the transmission and distribution systems to reduce transmission losses from 3.2% in 2009 to 2.5% in 2030. The baseline scenario assumes a gradual improvement of distribution efficiency leading to a reduction of distribution losses from 18.5% in 2009 to 10% of distribution losses in 2030. Estimated annual electricity demand in 2030 will be 12,000 GWh.

Figure 5.16 Albania's Power Generation Master Plan (GWh)

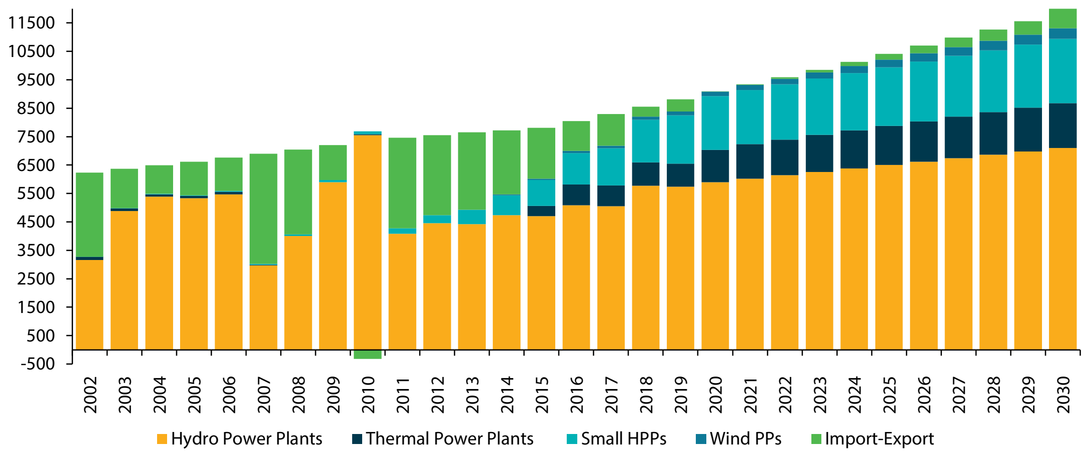
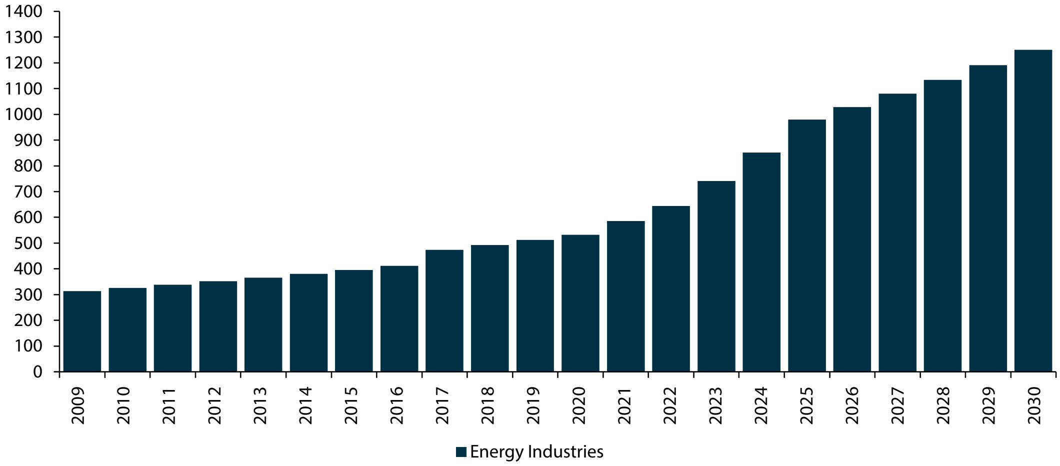


Figure 5.17 GHG emisions from the energy industries (including the power sector) (in Gg of CO_2 eq.)



The projection anticipates an approximately 3.99 times increase in GHG emissions from the energy industries (including the power sector) from 312.8 Gg in 2009 to 1250.7 Gg in 2030 as it is shown at the figure 5.17. The country is planning to address this need by acquiring higher efficiency thermal power plants.

5.4.2.8 Total GHG Emissions according to Baseline Scenario for Demand and Supply Side

The total GHG emissions from demand and supply sectors are shown in Figures 5.18 and 5.19.

Figure 5.18 GHG emissions from all sectors (in Gg of CO_2 eq.)

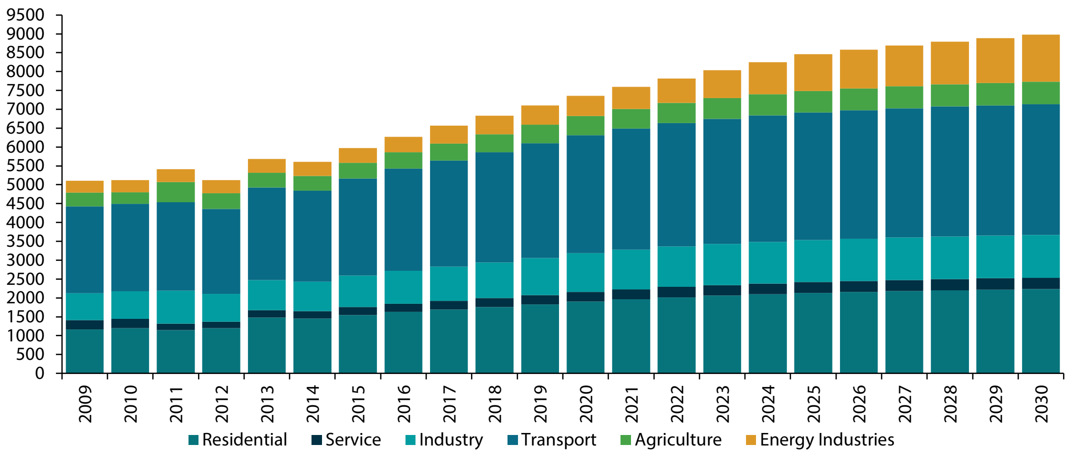
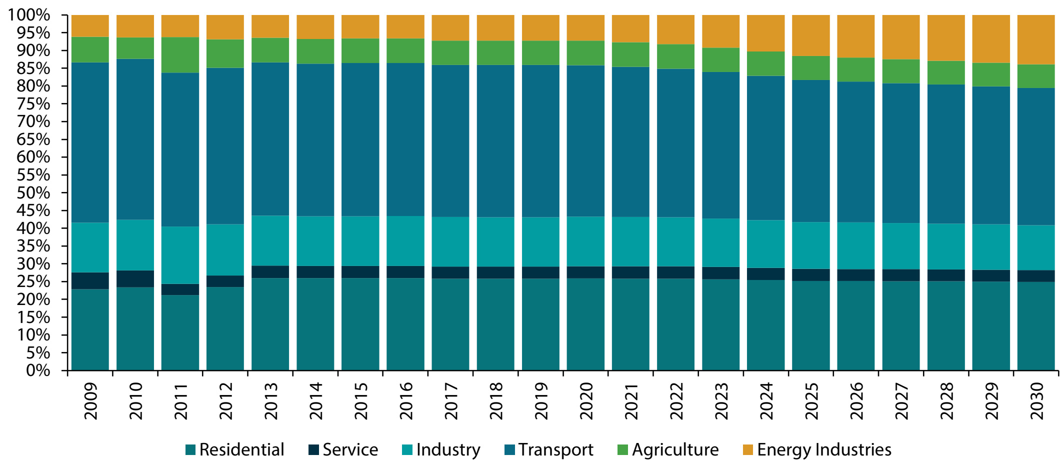


Figure 5.19 Share of GHG emissions by sectors (in %)



The total emissions forecast predicts an increase in absolute GHG emissions, while the share of the energy industries (including the power sector) will increase from 6.13% (312.8 Gg) in 2009 to 13.92% (1250.7 Gg) in 2030.

5.4.3 Energy Sector Proposed Mitigation Measures and Mitigation Scenario

5.4.3.1 Residential and Service Sectors

The following measures have been identified as offering potential for Albania's residential sub sector:

1. Implementation of EE Targets based on 1st NEEAP and the draft 2nd and the 3rd NEEAP, expected to get endorsed within June, 2016.
2. Implementation of RES Targets based on the endorsed NREAP.
3. Thermal insulation of existing stock buildings.
4. Implementation of the improved Energy Building Code according to the EU Directive of EPB.
5. Use of efficient refrigerators.
6. Use of efficient lighting.
7. Introduction of Prepayment Meters.
8. Solar Water Heaters for substitution of electric boilers in private buildings, public institutions, hotels, restaurants, hospitals, etc.
9. Improving of energy management in the service sector to reduce the energy intensity.

The following measures do not reduce the demand but reduce GHG emissions:

1. Introduction of Central Heating Systems for substituting individual heaters in multi- story buildings.
2. Introduction of District Heating Schemes in new districts in urban areas.
3. Introduction of Small Scale CHP and District Heating Schemes in new districts in urban areas.
4. Introduction of Total Energy Supply Schemes (Hydro/Solar Energy and Small Scale CHP based in Diesel Generators) for meeting electricity and heat demand in tourist villages.

5.4.3.2 Industry Sector

The following potential measures are selected for introduction in the industrial sector in order to reduce GHG emissions:

1. Implementation of EE Targets based on 1st NEEAP and the draft 2nd and the 3rd NEEAP, expected to get endorsed within June, 2016.
2. Implementation of RES Targets based on the endorsed NREAP.
3. Introduction of Efficient Heavy Fuel Oil fired Boilers for industrial consumers.
4. Introduction of Efficient Coal fired Boilers for industrial consumers.
5. Introduction of Efficient Electrical Motors for industrial consumers.
6. Improvements of Power Factor for industrial consumers.
7. Introduction of Efficient Lighting for industrial consumers.
8. Better management to reduce energy consumption.
9. Introduction of District Heating Schemes in Industrial Zones.
10. Introduction of CHP and District Heating Schemes in Industrial Zones.

5.4.3.3 Transport Sector

Both the GHG Emissions Baseline Scenario and projections of the sector itself assume that the energy demand for the transport sector will increase at the same rate as it has been increasing since 2000. The potential measures for increasing energy efficiency (reduction of fuel consumption) are:

1. Implementation of EE Targets based on 1st NEEAP and the draft 2nd and the 3rd NEEAP, expected to get endorsed within June, 2016.
2. Implementation of RES Targets based on the endorsed NREAP with special focus on the

on bio fuels to be consumed in the sector.

3. Reconstruction of existing poor quality roads and construction of new roads.
4. Increasing the share of public transport for passengers and freight transport (road, rail and waterways).
5. Increasing taxes for second hand cars (newly registered) in order to reduce their introduction to the Albanian market.
6. Promotion of an integrated intermodal transport system, which includes infrastructure/ transportation by land and sea.
7. Road maintenance through public and private sector cooperation.
8. Further restructuring of the railway system, including the reorganization of the Albanian Railways through total separation of operating activities from management activities and infrastructure maintenance;

5.4.3.4 Energy Transformation

The total electricity supply for the year 2014 was 7791 GWh/year (670 ktoe/year) and imports amounted to 3067 GWh/year (263 ktoe/year), which corresponds to 39% of total supply and its costs was approximately 169 Million €/year. Sixty percent of electricity supply comes from hydro power plants (equal to 100% of internal generation).

The estimated hydro potential for construction of new small/medium/large HPPs provides for some 2700 MW (almost 40-45% of this capacity are part of SHPPs with installed capacity lower than 15 MW) capacity with an annual electricity generation potential at 10.5-11 TWh/year (903-946 ktoe/year).

It is important to note that the country has the potential to generate electricity from alternative sources, for example, the potential of forest biomass is approximately 1,500,000-1,700,000 m3/year, which can provide approximately 2,700-3,000 GWhth/year (232-258 ktoe/year) by utilization of modern and efficient wood boilers and stoves.

Other sources such as biomass (generated from the wood processing industry and food processing industry) has a potential of 85-100 ktoe/year.

The proven wind potential based on licenses issued in Albania up to the end of December 2014 amounts approximately to 2000 MW with an energy generation potential of approximately 4 TWh/year (344 ktoe/year).

The capacity of Albania's power system to dispatch and absorb wind energy is assessed to be approximately 180-200 MW.

The following measures are identified to reduce GHG emissions in the energy transformation sector (supply side). The main focus of the proposed measures for the power sector is the utilization of renewable energy resources. The proposed measures are:

1. Implementation of RES Targets based on the endorsed NREAP
2. Hydro Power Plants instead of Heavy Fuel Oil Plants.
3. Gas Power Plants instead of Heavy Fuel Oil Power Plants.
4. Mini-hydro-s versus diesel generators.
5. Wind Turbines versus diesel generators.
6. Solar PV versus diesel generator.

5.4.3.5 Evaluation of identified measures

The financial efficiency of identified measures was evaluated by estimating the cost of reduction of CO_2 emissions. Considering specific rates of penetration for each measure, the results are shown in Tables 5.3 and 5.4 and in Figures 5.20 and 5.21.

Table 5.3: Cost of emissions reduction and rate of penetration for each proposed technology (year 2020)

Reduction option	US$/ton$CO_2$	Unit Type	Emission / reduction t CO2/unit	Units penetrating in 2020	Emission reduction in 2020 per option in Gg/year
Thermal insulation of residential-wood	-30.95	apartments	0.49	10,000	3.06
Thermal insulation of residential-LPG	-78.91	apartments	1.6	10,000	9.91
Power factor correction	-32.49	MVAR	499.61	0	0
Thermal insulation of residential-electric	-19.93	apartments	0.55	10,000	3.39
Thermal insulation of residential-kerosene	-81.07	apartments	1.64	0	0
Gas taxies	-321.65	1 taxi	11.14	2,000	13.81
Efficient lighting	-153.79	1000 Bulbs	0.15	600	0.06
Efficient boilers fuel oil-diesel	-85.7	boiler	492.56	100	30.54
Methane from sewage	-69.94	plant	820.52	0	0
Efficient boilers coal	-68.47	boiler	929.39	20	11.52
Thermal time switches	-68.28	units	1.18	10,000	7.32
Prepayment meters	-54.87	apartments	1.06	20,000	13.1
Wind turbines	-21.74	kW	1.37	20,000	16.96
Small, Medium Hydro power	-184.22	kW	1.56	200,000	193.96
Thermal insulation of residential-DH	-48.21	apartments	1.67	0	0
Efficient motors	-28.01	kW	4.33	10,000	26.85
Efficient refrigerators	-47.59	refrigerators	0.84	10,000	5.23
Solar Hot Water Systems	-59.12	units	2.59	20,000	32.05
Micro hydro power	-214.57	kW	5.61		0
Landfill gas plant with 70% recovery	29.9	Landfill plant	24,019.17	15,000	52.19
Gas power plant	-85.12	kW	2.43	0	0
Cogeneration-CHP	-114.75	kW	2.65	97,000	146.23
District Heating-DH	-77.42	kW	5.59	3,000	4.94
Central Heating- CH	-64.64	kW	3.36	4,000	13.86
Pine afforestation	10.56	ha	29.42	4,000	8.34
Biogas for rural residential	28.28	digesters	8.84		0
Climatiseur	60.43	Climatiseur	2.12	0	0
PV electricity 1	70.76	kW	0.77	700	3.84
Solar PV water pumps	114.87	kW	0.19	0	0
Total					608
Final CO_2 eq. reduction					8.26%

Table 5.4 Cost of emissions reduction and rate of penetration for each proposed technology (year 2030)

Reduction option	US$/ton$CO_2$	Unit Type	Emission / reduction t CO2/unit	Units penetrating in 2030	Emission reduction in 2030 per option in Gg/ year
Thermal insulation of residential-wood	-30.95	apartments	0.49	20,000	5.13
Thermal insulation of residential-LPG	-78.91	apartments	1.6	20,000	16.62
Power factor correction	-32.49	MVAR	499.61	50	12.98
Thermal insulation of residential-electric	-19.93	apartments	0.55	20,000	5.67
Thermal insulation of residential-kerosene	-81.07	apartments	1.64	0	0
Gas taxies	-321.65	1 taxi	11.14	5,000	28.96
Efficient lighting	-153.79	1000 Bulbs	0.15	3,570	0.28
Efficient boilers fuel oil-diesel	-85.7	boiler	492.56	400	102.45
Methane from sewage	-69.94	plant	820.52	3	1.28
Efficient boilers coal	-68.47	boiler	929.39	60	28.99
Thermal time switches	-68.28	units	1.18	30,000	18.40
Prepayment meters	-54.87	apartments	1.06	30,000	16.48
Wind turbines	-21.74	kW	1.37	40,000	28.45
Small, Medium Hydro power	-184.22	kW	1.56	600,000	488.04
Thermal insulation of residential-DH	-48.21	apartments	1.67	300	0.26
Efficient motors	-28.01	kW	4.33	30,000	67.55
Eff. Refrigerators	-47.59	fridge	0.84	30,000	13.15
Solar Hot Water Systems	-59.12	units	2.59	30,000	40.32
Micro hydro power	-214.57	kW	5.61		0
Landfill gas plant with 70% recovery	29.9	Landfill plant	24,019.17	40,000	116.71
Gas power plant	-85.12	kW	2.43	2	24.97
Co-generation-CHP	-114.75	kW	2.65	150,000	189.66
District Heating-DH	-77.42	kW	5.59	14,000	19.32
Central Heating- CH	-64.64	kW	3.36	13,000	37.77
Biogas for rural residential	28.28	digesters	8.84	15,000	26.24
PV electricity 1	70.76	kW	0.77		0
Solar PV water pumps	114.87	kW	0.19	0	0
Total Emission in 2030:					1,339
Final CO_2 eq. reduction					**14.91%**

Through the application of agro-forestry practices, the agricultural sector can increase its GHG absorption capacity by about 275 Gg, equivalent to a reduction of 30% CO_2 emissions, by 2050.

Figure 5.20 Comparison of selected GHG mitigation measures, based on thir cost of emission reduction (USD/CO_2 eq.)

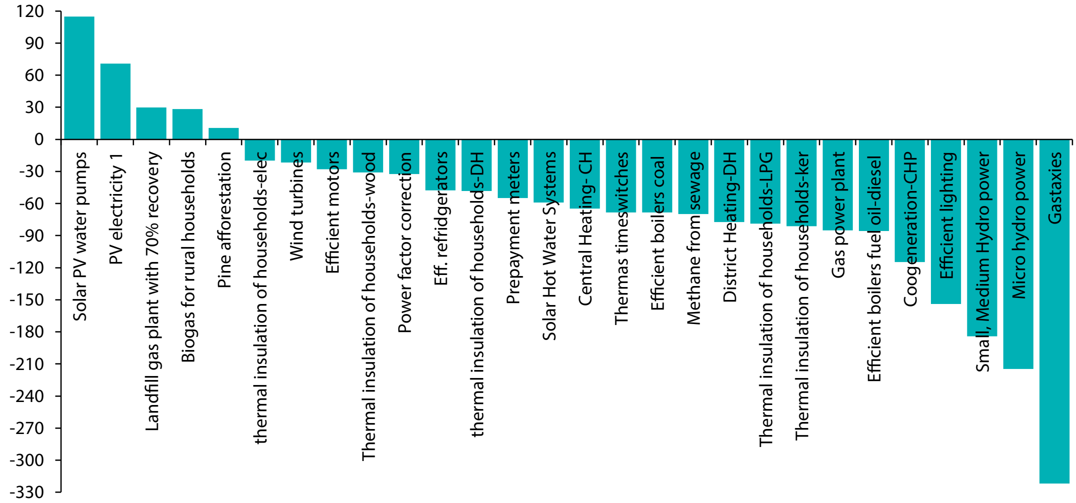


Figure 5.21 GHG emissions mitigated by introducing different mitigation measures in the energy and transport sector (as shown in tables 5.5 and 5.6 (in Gg of CO_2 eq.))

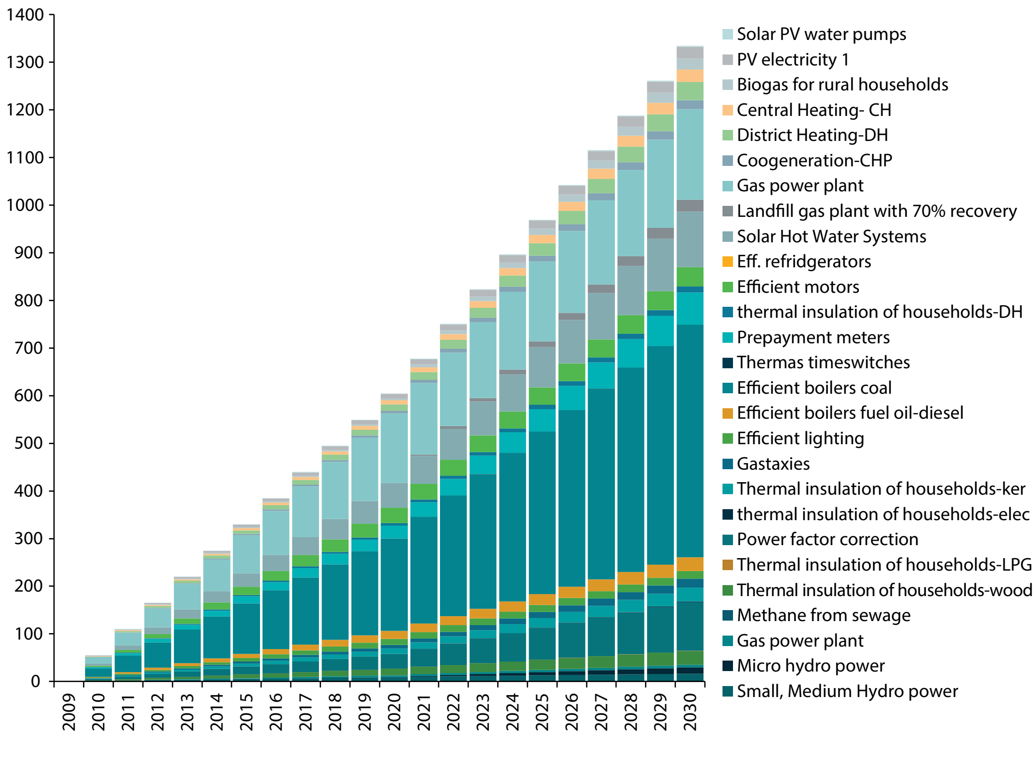


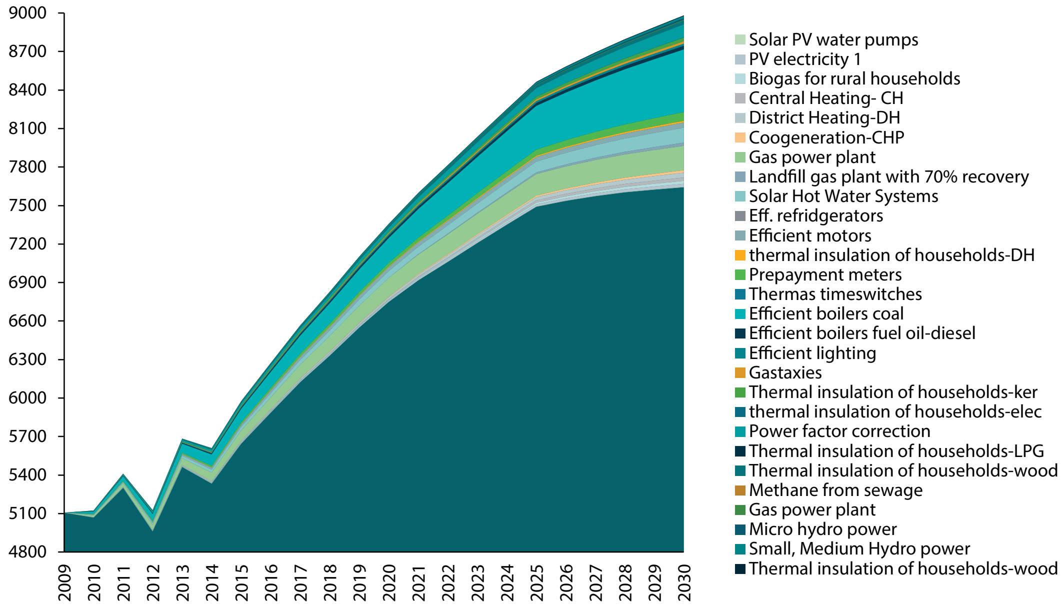
Table 5.5 presents the GHG emissions (in Gg CO_2 eq.) mitigated by introducing different mitigation measures in the energy and transport sector for the years 2009 to 2030.

Table 5.5: GHG emissions mitigated by introducing different mitigation measures in the energy - transport sector (in Gg CO_2 eq.)

GHG reduction measures	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Thermal insulation of households-wood	0	0.28	0.56	0.84	1.11	1.39	1.67	1.95	2.23	2.51	2.78	3.06	3.27	3.48	3.69	3.89	4.10	4.31	4.52	4.72	4.93	5.14
Small, Medium Hydro power	0	0.90	1.80	2.70	3.60	4.51	5.41	6.31	7.21	8.11	9.01	9.91	10.59	11.26	11.93	12.60	13.27	13.94	14.61	15.29	15.96	16.63
Micro hydro power	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.30	2.60	3.90	5.20	6.49	7.79	9.09	10.39	11.69	12.99
Gas power plant	0	0.31	0.62	0.92	1.23	1.54	1.85	2.15	2.46	2.77	3.08	3.39	3.61	3.84	4.07	4.30	4.53	4.76	4.99	5.22	5.45	5.68
Methane from sewage	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Thermal insulation of households-wood	0	1.26	2.51	3.77	5.02	6.28	7.53	8.79	10.05	11.30	12.56	13.81	15.33	16.84	18.36	19.87	21.39	22.90	24.42	25.93	27.45	28.96
Thermal insulation of households-LPG	0	0.01	0.01	0.02	0.02	0.03	0.03	0.04	0.04	0.05	0.05	0.06	0.08	0.10	0.12	0.15	0.17	0.19	0.22	0.24	0.26	0.28
Power factor correction	0	2.78	5.55	8.33	11.10	13.88	16.66	19.43	22.21	24.99	27.76	30.54	37.73	44.92	52.11	59.30	66.50	73.69	80.88	88.07	95.26	102.45
Thermal insulation of households-elec	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.26	0.38	0.51	0.64	0.77	0.90	1.02	1.15	1.28
Thermal insulation of households-ker	0	1.05	2.10	3.14	4.19	5.24	6.29	7.33	8.38	9.43	10.48	11.52	13.27	15.02	16.77	18.51	20.26	22.01	23.76	25.50	27.25	29.00
Gastaxies	0	0.67	1.33	2.00	2.66	3.33	3.99	4.66	5.32	5.99	6.65	7.32	8.43	9.54	10.64	11.75	12.86	13.97	15.08	16.19	17.30	18.41
Efficient lighting	0	1.19	2.38	3.57	4.76	5.96	7.15	8.34	9.53	10.72	11.91	13.10	13.44	13.78	14.12	14.45	14.79	15.13	15.47	15.81	16.14	16.48
Efficient boilers fuel oil-diesel	0	1.54	3.08	4.63	6.17	7.71	9.25	10.79	12.34	13.88	15.42	16.96	18.11	19.26	20.41	21.56	22.71	23.86	25.01	26.15	27.30	28.45
Efficient boilers coal	0	17.63	35.27	52.90	70.53	88.17	105.80	123.43	141.07	158.70	176.33	193.96	223.37	252.78	282.19	311.60	341.00	370.41	399.82	429.23	458.63	488.04
Thermas timeswitches	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.05	0.08	0.10	0.13	0.16	0.18	0.21	0.23	0.26
Prepayment meters	0	2.44	4.88	7.32	9.76	12.20	14.64	17.08	19.53	21.97	24.41	26.85	30.92	34.99	39.06	43.13	47.20	51.27	55.34	59.41	63.48	67.55
Thermal insulation of households-DH	0	0.48	0.95	1.43	1.90	2.38	2.85	3.33	3.80	4.28	4.75	5.23	6.02	6.81	7.61	8.40	9.19	9.98	10.78	11.57	12.36	13.15
Efficient motors	0	2.91	5.83	8.74	11.66	14.57	17.48	20.40	23.31	26.23	29.14	32.05	32.88	33.71	34.54	35.36	36.19	37.02	37.84	38.67	39.50	40.33
Eff. Refridgerators	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Solar Hot Water Systems	0	4.74	9.49	14.23	18.98	23.72	28.47	33.21	37.95	42.70	47.44	52.19	58.64	65.09	71.55	78.00	84.45	90.90	97.36	103.81	110.26	116.72
Landfill gas plant with 70% recovery	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	5.00	7.49	9.99	12.49	14.99	17.49	19.98	22.48	24.98
Gas power plant	0	13.29	26.59	39.88	53.18	66.47	79.76	93.06	106.35	119.65	132.94	146.23	150.58	154.92	159.26	163.61	167.95	172.29	176.63	180.98	185.32	189.66
Coogeneration-CHP	0	0.45	0.90	1.35	1.80	2.24	2.69	3.14	3.59	4.04	4.49	4.94	6.38	7.82	9.26	10.69	12.13	13.57	15.01	16.45	17.89	19.33
District Heating-DH	0	1.26	2.52	3.78	5.04	6.30	7.56	8.82	10.08	11.34	12.60	13.86	16.25	18.64	21.03	23.43	25.82	28.21	30.60	32.99	35.39	37.78
Central Heating- CH	0	0.76	1.52	2.28	3.03	3.79	4.55	5.31	6.07	6.83	7.59	8.34	10.13	11.92	13.71	15.50	17.29	19.08	20.87	22.66	24.45	26.24
Biogas for rural households		0.35	0.70	1.05	1.40	1.74	2.09	2.44	2.79	3.14	3.49	3.84	5.75	7.67	9.58	11.50	13.41	15.33	17.24	19.16	21.07	22.99
PV electricity 1		0.86	1.73	2.59	3.45	4.32	5.18	6.04	6.90	7.77	8.63	9.49	11.01	12.53	14.05	15.57	17.09	18.61	20.13	21.65	23.17	24.69
Solar PV water pumps		0.11	0.21	0.32	0.42	0.53	0.63	0.74	0.84	0.95	1.05	1.16	1.24	1.31	1.39	1.47	1.55	1.63	1.71	1.78	1.86	1.94
Total	**0.00**	**55.26**	**110.51**	**165.77**	**221.03**	**276.28**	**331.54**	**386.80**	**442.05**	**497.31**	**552.56**	**607.82**	**680.98**	**754.14**	**827.30**	**900.46**	**973.62**	**1,046.78**	**1,119.94**	**1,193.09**	**1,266.25**	**1,339.41**

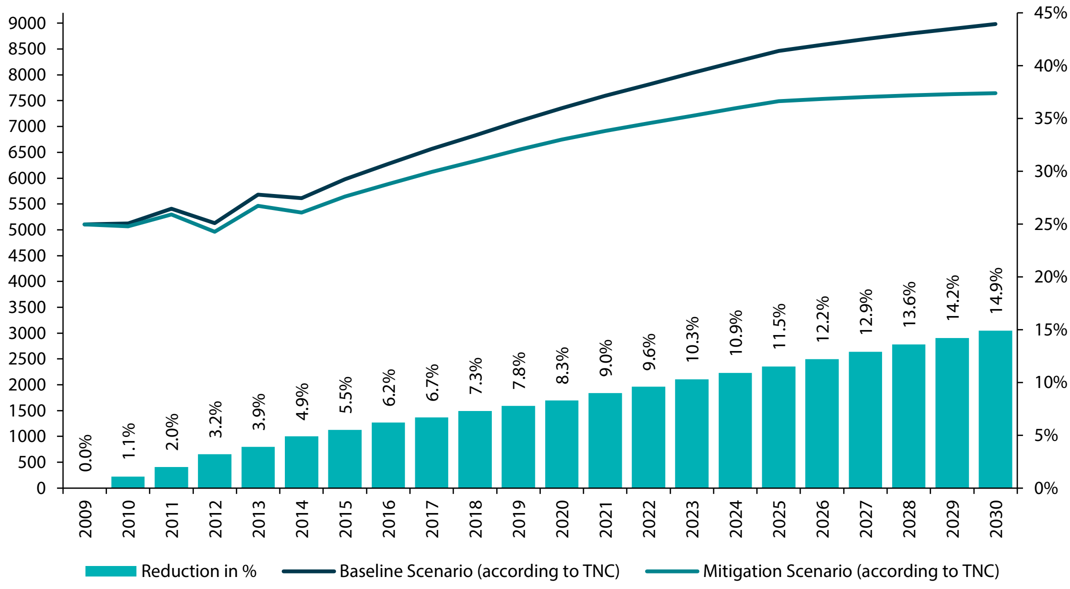
Introduction of natural gas power plants, mini hydro power plants and large hydropower plants have the biggest impact on the reduction of GHG emissions. Figure 5.22 shows the amount of GHG to be mitigated by introducing mitigation measures in both supply and demand side of the energy sector. It can also be observed that introducing GHG mitigation measures in the energy industry sector have the highest impact, among all sectors, on reduction of GHG emissions. They are followed by the measures in the household sector and thirdly the energy transformation sector.

Figure 5.22 GHG mitigation measures for the energy sector (Gg of CO_2 eq.)



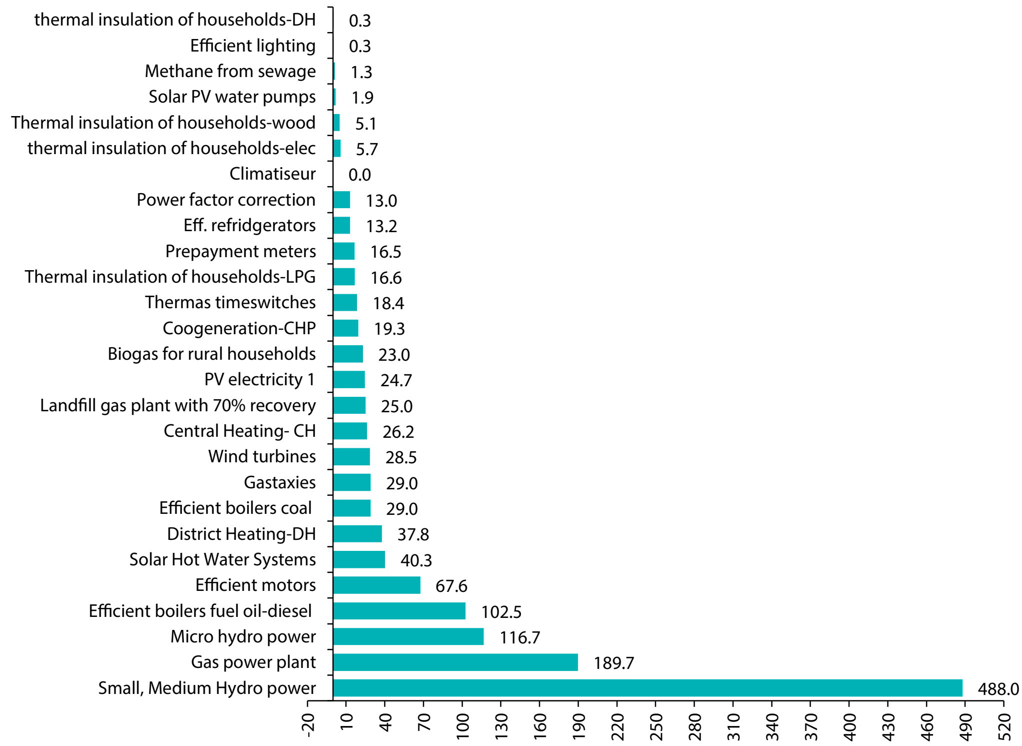
Regarding the reduction costs per unit CO_2, the demand side management is more effective compared to the supply side (energy transformation sector). Both Baseline and Mitigation scenarios are shown in Figure 5.23.

Figure 5.23 Baseline Scenario, Mitigation Scenario and the evaluated reduction potential of GHG emissions (in Gg of CO_2 eq.) from the energy&transport sector



The total effect of proposed measures that represent approx. 95% of anticipated GHG emissions reduction is shown in Figure 5.24.

Figure 5.24 Cumulative effect of energy and transport mitigation measures by the year 2030 (in Gg of CO_2 eq.)



5.5 GHG MITIGATION ASSESSMENT FOR AGRICULTURE SECTOR

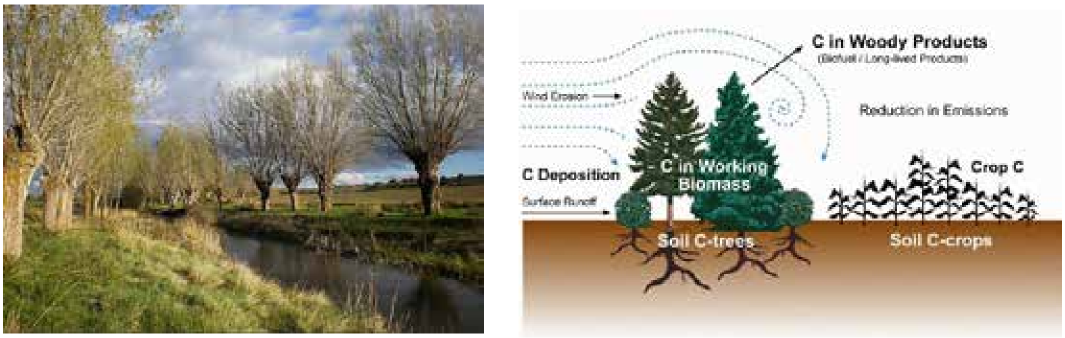
5.5.1 GHG Mitigation Analysis for Agriculture

Agriculture activities release significant amounts of CO_2, CH_4 and N_2O to the atmosphere. The fluxes of these gases can be reduced by managing more efficiently the flows of carbon and nitrogen in agricultural ecosystems. For example, practices that deliver added N more efficiently to crops often suppress the emission of N_2O, and managing livestock to make the most efficient use of feeds often suppresses the amount of CH_4 produced.

The approaches that best reduce emissions depend on specific conditions and therefore vary from case to case. The proposed mitigation measures to reduce emissions in the agricultural sector are:

1. Enhancing removals: Agricultural ecosystems hold large reserves of C (IPCC, 2001), mostly in soil organic matter. Any practice that increases the photosynthetic input of C or slows the return of stored C via respiration or fire will increase stored C, thereby 'sequestering' C or building C 'sinks'. Significant amounts of soil C can be stored in this way, through a range of practices suited to local conditions. Significant amounts of vegetative C can also be stored in agro-forestry systems or other perennial plantings on agricultural lands. Agricultural lands also remove CH_4 from the atmosphere by oxidation, but this effect is small when compared with other GHG fluxes. Agro-forestry is a method and system of land management involving the simultaneous cultivation of farm crops and trees; or agricultural activities that incorporate growing of trees. It refers to a system of land use in which harvestable trees or shrubs are grown among or around crops or on pastureland, as a means of preserving or enhancing the land productivity. It is plausible to apply this method in Albania and its implementation has started during the year 2015. Planting trees in agricultural lands will reduce GHG's emissions.

Figure 5.25: Examples of Agro-Forestry systems



Besides the mitigation effect on GHGs emissions, the conversion of agricultural lands will bring additional benefits such as improvement of biodiversity in the area, ecosystem services, protection of infrastructure, and ensuring that raw wood materials are available for farmers. Examples of agro-forestry systems are shown in figure 5.25.

Figure 5.26 Potential CO_2 sequestration by adopting agro-forestry practices 2015-2050 (in Gg)

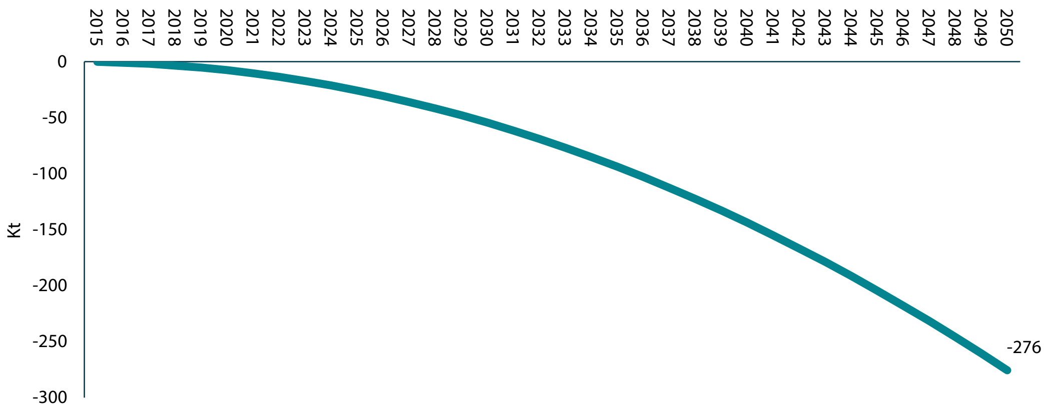


Figure 5.26 presents the potential sequestration capacity of the agricultural sector if agro-forestry practices are applied. It can be seen that up to the year 2050, the agricultural sector could absorbed about 276 Gg of CO_2, or a reduction of 20% of their total GHGs emissions, compared with the emissions of the base year (2005). It is estimated that the average tree growth in one hectare is $2m^3$/ha/year, or it has the capacity to absorb 2,128 tons of CO_2 for 2500 trees planted in one hectare.

2. Avoiding (or displacing) emissions: Crops and residues from agricultural lands can be used as a source of fuel, either directly or after conversion to fuels such as ethanol or diesel. These bioenergy feed stocks still release CO_2 upon combustion, but the C will be of recent atmospheric origin (via photosynthesis), rather than from fossil C. The net benefit of these bio-energy feed stocks to the atmosphere is equal to the fossil-derived emissions displaced minus any emissions from their production, transport and processing. Emissions of GHGs, notably CO_2, can also be avoided by agricultural management practices of new lands now under forest, grassland or other non-agricultural vegetation.

Many practices have been advocated to mitigate emissions through the mechanisms cited above. Often a practice will affect more than one gas and by more than one mechanism, sometimes in opposite ways, so that the net benefit depends on the combined effects on all gases. In addition, the temporal pattern of influence may vary among practices or among gases for a given practice; some emissions are reduced indefinitely, other reductions are temporary.

The impacts of various mitigation options considered are summarized below:

I. *Cropland management*: Croplands, because they are often intensively managed, offer many opportunities to develop practices that reduce net GHGs emissions. Mitigation practices in cropland management include the following, partly overlapping, categories:
   - *Agronomic practices*: Improved agronomic practices that increase yields and generate higher inputs of residue C, which can lead to increased soil C storage.
   - *Nutrient management*: Improving the efficiency of fertilizers and manures can reduce emissions of N_2O generated by soil microbes largely from surplus N, and it can indirectly reduce emissions of CO_2 from N fertilizer.
   - *Tillage/residue management*: Since soil disturbance tends to stimulate soil C losses through enhanced decomposition and erosion, reduced or no-till agriculture often results in soil C gain.
   - *Water management*: Using more effective irrigation measures can enhance C storage in soils through enhanced yields and residue returns.
   - *Agro-forestry*: Agro-forestry includes the production of livestock or food crops on land that also grows trees, either for timber, firewood or other tree products. It includes shelter belts and riparian zones/buffer strips with woody species. The standing stock of carbon above ground is usually higher than the equivalent land use without trees, and planting trees may also increase the soil carbon sequestration.

II. *Grazing land management and pasture improvement:* Grazing lands are usually managed less intensively. The following options provide some examples of practices to reduce GHG emissions and enhance removals:
   - *Grazing intensity:* The intensity and timing of grazing can influence the growth, C allocation and flora of grasslands, thereby affecting the amount of C accrual in soils.
   - *Increased productivity (including fertilization):* As for croplands, C storage in grazing lands can be improved by a variety of measures that promote productivity. For instance, alleviating nutrient deficiencies by fertilizer or organic amendments increases plant litter returns and, hence, soil C storage.
   - *Nutrient management*: Practices that tailor nutrient additions to plant uptake, such as those described for croplands, can reduce emissions of N_2O.
   - *Fire management*: Biomass burning contributes to climate change in several ways. Firstly, it releases GHGs, notably CH_4, and to a lesser extent, N_2O. Secondly, it generates hydrocarbon and reactive nitrogen emissions, which react to form troposphere ozone. Smoke contains a range of aerosols which can have either warming or cooling effects on the atmosphere, though the net effect is thought to be positive radiant forcing.
   - *Species introduction*: Introducing grass species with higher productivity or C allocation to deeper roots has been shown to increase soil C.

III. *Management of organic soils:* Albania's coastal zone has the greatest extent of surface organic soils in the country. They are mostly localized in the Lushnje (Divjaka) area. Organic soils contain high densities of C, accumulated over many centuries, because decomposition is suppressed by absence of oxygen under flooded conditions.
   - *Livestock management*: Livestock, predominantly ruminants such as cattle and sheep, are important sources of CH_4. The following options provide some examples of practices to reduce GHG emissions:
   - *Improved feeding practices*: The net benefit, however, depends on reduced animal numbers or younger age at slaughter for beef animals and on how the practice affects emissions when producing and transporting the concentrates.
   - *Longer term management changes and animal breeding*: Increasing productivity

through breeding and better management practices spreads the energy cost of maintenance across a greater feed intake, often reducing methane output per kilogram of animal product.[2] In other words, by feeding livestock with more concentrates and replacing forages (Blaxter & Clapperton 1965; Johnson & Johnson 1995; Lovett et al. 2003; Beauchemin & McGinn 2005). Other practices that can reduce CH_4 emissions include adding oils to the diet (e.g. Machmulller et al. 2000; Jordan et al. 2004); improving pasture quality, especially in less developed regions in order to improve animal productivity and reduce the proportion of energy lost as CH_4 (Leng 1991; McCrabb et al. 1998; Alcock & Hegarty 2005); and optimizing protein intake to reduce N excretion and N_2O emissions (Clark et al. 2005).

- *Specific agents and dietary additives*: A wide range of specific agents, mostly aimed at suppressing methanogenesis, have been proposed as dietary additives to reduce CH_4 emissions, such as Ionophores, Halogenated, Propionate precursors, Vaccines against methanogenic bacteria, etc.
- *Longer term management changes and animal breeding:* Increasing productivity through breeding and better management practices spreads the energy cost of maintenance across a greater feed intake, often reducing methane output per kilogram of animal product (Boadi et al. 2004).

IV. *Manure management:* Animal manures can release significant amounts of N_2O and CH_4 during storage, but the magnitude of these emissions varies. Methane emissions from manure stored in lagoons or tanks can be reduced by cooling or covering the sources, or by capturing the CH_4 emitted.

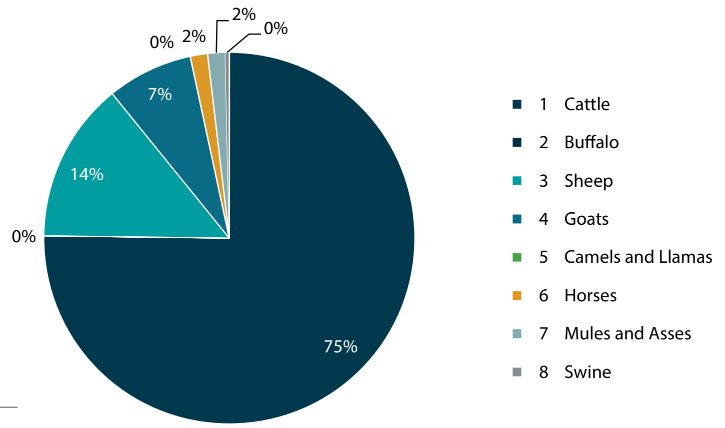
V. *Bioenergy:* Agricultural crops and residues are seen as sources of feedstock for energy to displace fossil fuels. A wide range of materials have been proposed for use, including grain, crop residue, cellulosic crops (e.g. sugarcane) and various tree species.

5.5.2 GHG Mitigation Analysis for Livestock

The main source of GHG emissions for the agriculture sector is methane from livestock, which represents around 94% of the total. Hence, measures for mitigation of emissions from this source will be mainly focused on cattle rearing.

Figure 5.27 shows that cattle (raised for both beef and milk, as well as for inedible outputs such as manure and draft power) are responsible for most of the emissions, about 75% of the livestock sector's emissions, while14% of the emissions come from rearing sheep, 7% from goats and about 4% from mules and horses. Enteric fermentation emissions and feed production (including manure deposition on pasture) dominate emissions from ruminant production.

Figure 5.27 GHGs (CH_4) emissions (%) from livestock in 2005



2 Boadi et al. 2004

Based on the composition of livestock-type for the period 2000-2012, the projection of animal number was built by reducing the livestock for the period 2010-2050. The projection of animal numbers is presented in Table 5.6.

Table 5.8: Projection in the number of livestock for the period 2010-2050 (in 000 heads)

Livestock	2010	2020	2030	2040	2050
Cattle	526.3	467	435	414	398
Sheep	1790.6	1760	1742	1730	1720
Goats	814.7	749	713	689	671
Equidae	106.2	85	75	68	63
Swine	164.0	184	199	210	218
Poultry	8245.4	9659	10596	11315	11907

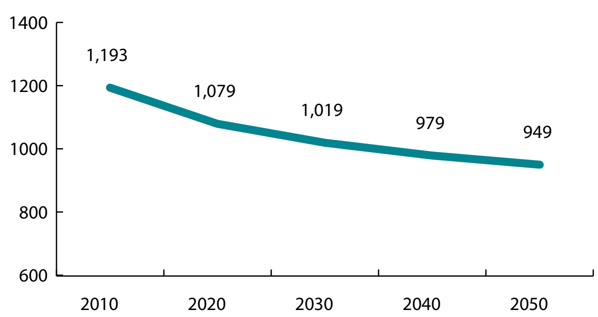
Based on this number of animals, the projection of GHG emissions is estimated for the same period where a reduction of the emissions can be seen (Table 5.9). Figure 5.33 presents the baseline scenario of GHG emissions from livestock in CO_2 *eq.* for the period 2010-2050.

Table 5.9: Baseline scenario of GHGs (CO_2 eq) emissions from livestock in Gg

Livestock	2010	2020	2030	2040	2050
Cattle	844.2	748.8	698.1	664.2	639.06
Sheep	195.9	192.5	190.6	189.2	188.18
Goats	89.3	82.1	78.2	75.5	73.51
Equidae	49.9	40.0	35.1	32.0	29.74
Swine	8.6	9.7	10.4	11.0	11.46
Poultry	5.1	6.0	6.6	7.0	7.39
	1193.1	**1079.1**	**1019.0**	**978.9**	**949.3**

Reducing emissions of GHGs from livestock is a result of the decreasing trend in the number of livestock. Referring to the study "Green House Gas Mitigation in Agriculture"[3] the effects of various measures in the agriculture and livestock sector were analysed. Given that a major contributor to GHG emissions is livestock, the mitigation actions and scenarios are mainly focused in this sector. Practices for reducing CH_4 emissions from livestock fall into three general categories:

Figure 5.28 Baseline scenario of GHGs emissions from livestock in Gg of CO_2 eq., for the period 2020-2050



3 Pete Smith, Daniel Martino, Zucong Cai, Daniel Gwary, Henry Janzen,
Pushpam Kumar, Bruce McCarl, Stephen Ogle, Frank O'Mara, Charles Rice, Bob Scholes, Oleg Sirotenko, Mark Howden, Tim McAllister, Genxing Pan, Vladimir Romanenkov, Uwe Schneider, Sirintornthep Towprayoon, Martin Wattenbach and Jo Smith.

- Improved feeding practices,
- Use of specific agents or dietary additives, and
- Longer term management changes and animal breeding, already described above.

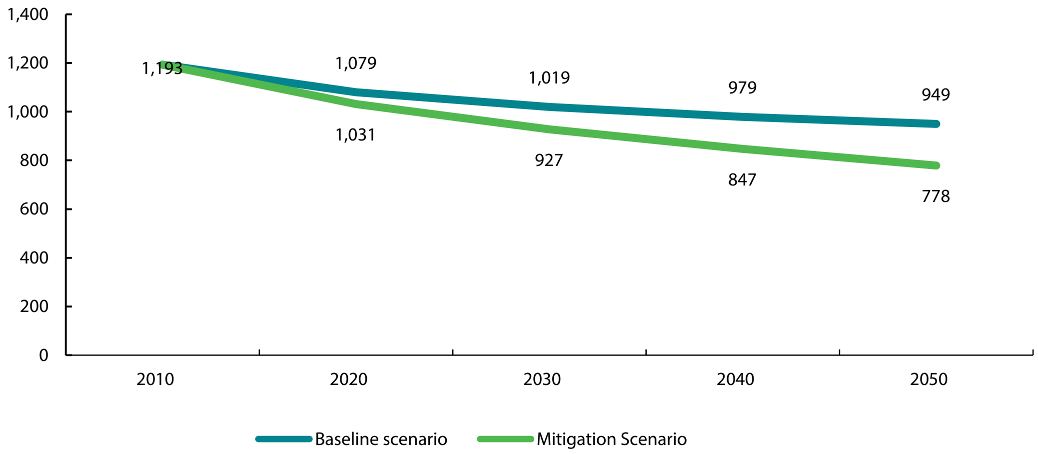
Based on the above mentioned study, Table 5.10 shows a summary of biophysical reduction potential (proportion of an animal's enteric methane production) for enteric methane emissions due to (i) improved feeding practices, (ii) specific agents and dietary additives and (iii) longer term structural/management change and animal breeding.

Table 5.10: Weight of mitigation actions for reducing emissions in the livestock sector

Actions	Dairy cows	Beef Cattle	Sheep
Improved feeding practices	0.11	0.06	0.03
Specific agents and dietary additives	0.04	0.01	0.002
Management change and animal breeding	0.03	0.07	0.003
Total weight	**0.18**	**0.14**	**0.035**

Assuming that the implementation of concrete measures requires a long time, a timeline of a period of 40 years (2010-2050) is estimated, with an annual technology improvement of 2.5%.

Figure 5.29 Mitigation scenario of GHGs emissions (in Gg of CO_2 eq.) from livestock, for 2010-2050

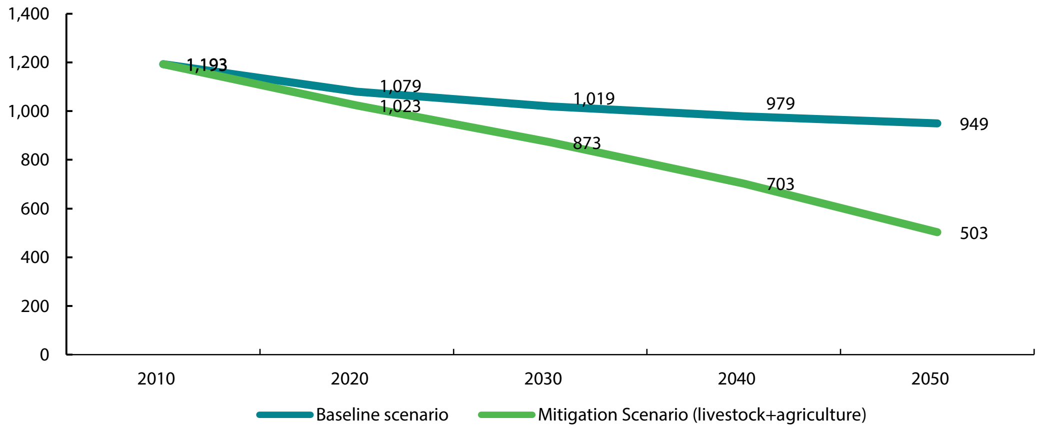


As can be seen in Figure 5.29, the implementation of the above measures will cause a reduction of 200 Gg of CO_2eq. by the year 2050 or a 20% reduction of current GHG emissions.

5.5.3 Mitigation Scenario of the GHGs emissions from the overall Agriculture Sector (agriculture + livestock)

Taking into consideration the mitigation measures to be introduced in both agriculture and livestock activities, a reduction of 47.01% of the agricultural sector emissions can be projected to year 2050. Figure 5.30 presents these results.

Figure 5.30 Mitigation Scenario of GHGs emission (in Gg of CO_2 eq.) from agriculture sector (agriculture + livestock), for 2010-2050.



The following conclusions can be drawn by the mitigation analysis:

The agricultural sector represents a sector with considerable potential for reducing GHG emissions by implementing suitable mitigation measures.

The practice of planting trees in agricultural lands should be re-introduced. In addition to the ecosystem services they perform, they can also reduce significant amounts of GHGs.

In order to achieve the desired mitigation results, a reorganization of agricultural farms, their unions and cooperatives will offer better options to implement the mitigation measures proposed here.

Introducing anaerobic digestion as an unique treatment since it can deliver positive benefits related to multiple issues, including; renewable energy, water pollution and GHG emissions.

In addition to the above measures, which are included in the calculation of mitigation options, there are other measures that could be included in these calculations (e.g. the amount of agricultural land surface and biomass that is burned every year, cultivating organic soils, etc.

5.6 GHG MITIGATION ASSESSMENT FOR LUCF SECTOR

5.6.1 Mitigation measures for the LUCF Sector

The main CO_2 emissions from the LUCF sector originate from carbon stock changes. Other GHGs include nitrous oxide (N_2O), from cultivation of organic soils and soil organic matter mineralization (e.g. due to land use conversion and drainage of forest soils) and methane (CH_4). As further examples, CO_2 and N_2O are also emitted during forest fires and from anaerobic decomposition of organic material in wetlands. Non-CO_2 GHG emissions from agricultural land are covered by the inventory sector ‘agriculture’ and are therefore not part of the LUCF sector.

The main sources of GHGs emissions from the LUCF are:

- Wood Removal.
- Fuel wood removal.
- Harvested wood products.
- Biomass burning.
- Site preparation for forest plantations.
- Shifting cultivation.
- Deforestation.

The following mitigation measures are considered:

1. *Improve utilization of technology in forest harvesting*: Currently, forest exploitation in Albania continues to occur in the almost complete absence of modern technologies. These technologies could assist in maximizing the use of wood which is exploited in forests. Because of the lack of technological equipment, at least 20% of the biomass from exploited trees remains in the forest. So, for example, from 1 m^3 of timber from forests only 80% of that volume or 0.8 m^3 is exploited. Another aspect of the efficiency of the use of wood is its combustion. By various estimates the efficiency process of firewood, during heating and cooking, does not exceed 50%, which means that 50% of firewood is burned in an inefficient way, or wasted. This is due to the lack of utilization of high efficiency modern stoves, which means that from 1 m^3 of firewood only 0.4 $m^{3,}$ or 40 % is used efficiently. Thus, the maximization of wood energy efficiency should be a national priority. Actions in this regard include improving wood technologies in forest exploitation and wood combustion.
2. *Restoration of degraded lands*: A large fraction of land has been degraded by erosion, excessive disturbance, organic matter loss, salinization, acidification, or other processes that curtail productivity. These lands are located inland, have steep slopes and are under climatic conditions different from those in the coastal zone. Often the C storage in these soils can be at least partially restored by practices that reclaim productivity, including re-vegetation (e.g. planting grasses); improving fertility by nutrient additions; applying organic substrates such as manures and composts; reducing tillage and retaining crop residues; and conserving water.
3. *Sustainable protection and management of existing forests*: This approach includes, among others, lengthening of forest rotation cycles, low impact harvesting methods to reduce carbon emissions, reduced impact logging, controlling stand density and reducing regeneration delays.
4. *Agro-forestry*: The intentional growing of trees along with crops, pasture, and/or animals is an alternative to standard agricultural practices. It requires less energy intensive operations, sequesters more carbon than traditional agriculture, and provides a wide range of environmental benefits.
5. *Short rotation of woody biomass plantations*: Refers to the growing of tree crops on croplands for wood fibre and other biomass to generate energy.
6. *LUCF*: One of the most effective methods for reducing emissions is to allow or encourage the reversion of cropland to another kind of land cover, typically one similar to the native vegetation. The conversion can occur over the entire land area or in localized areas such as river beds, coastal sand belts, field margins or shelterbelts, etc.

In practical terms, the types of activities that can be undertaken in the forestry sector to achieve reduced emissions include:

- Afforestation/Reforestation of large timber forests in conjunction with natural regeneration.
- Avoid deforestation.
- Forest management i.e. forest regeneration, fertilization, choice of species, uneven-aged stand management, reduced forest degradation, longer forest rotations.

- Avoid wildfires.
- Insect and disease management programmes.
- Extending carbon retention in harvested wood products.
- Improve utilization of technology in forest harvesting.

Figure 5.31 presents the volume of timber cut for firewood consumption during the 2000-2009 period. Based on this graph a scenario of wood demand is built for the period 2015-2050, but which shows only a part of the volume of forest that is exploited by private companies or villagers. If the data given by the forest cadastre is considered, the result would show that the forest exploitation almost doubles the amount of this figure. Figure 5.32 presents the comparison between forest annual growth and forest annual exploitation during the period 2000-2050.

Figure 5.31 Firewood consumption during 2000-2009 (in 000 m^3)

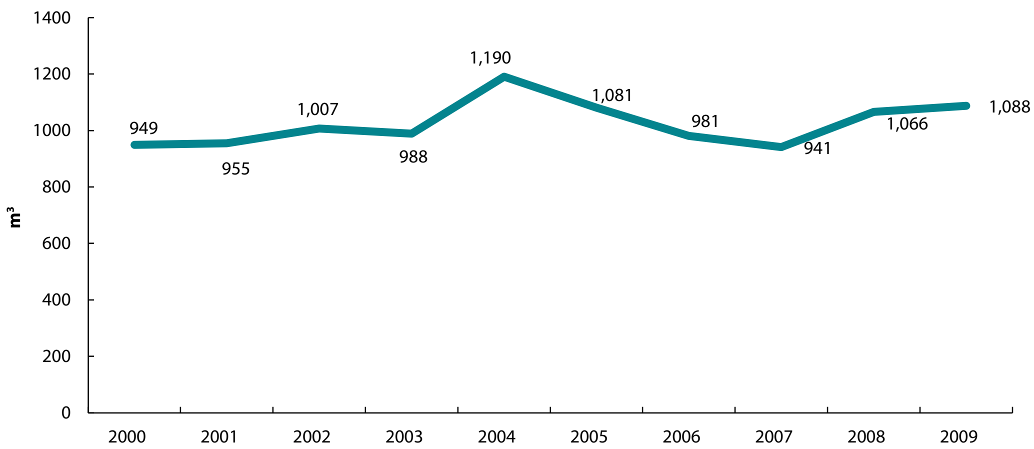
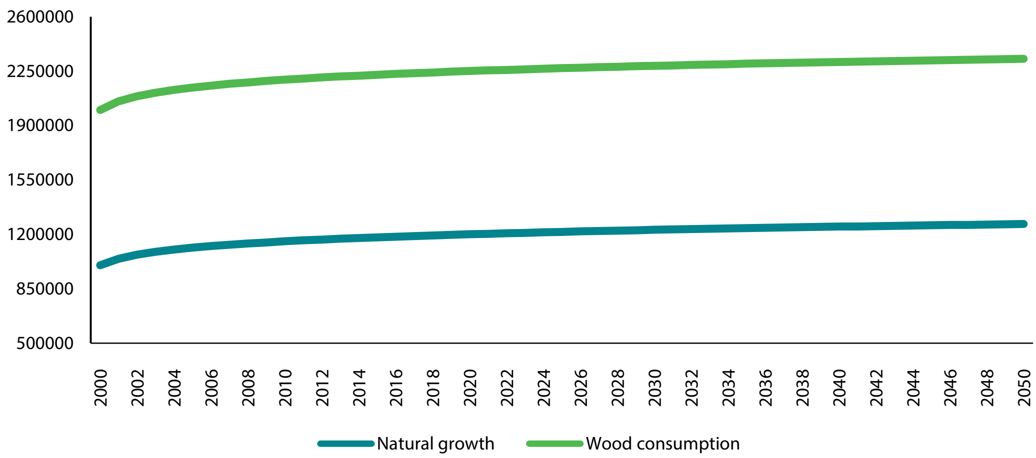


Figure 5.32 Projection of wood consumption and natural growth of forest (in m^3) for period 2000-2050



As can be seen in Figure 5.32, there is no sustainable use of forest resources in Albania. Wood demand is approximately two times larger than for natural forest growth. Even during the period 2010-2050, the demand for wood will continue to be higher than natural forest growth, and the lack of technological measures or investments in the sector will aggravate the issue. It is clear that the forests are managed and continue to be managed in a *non-sustainable way*. For this reason, the increase in forested areas through plantations and improvement of technological process of forests exploitation and wood burning should be a priority. Figure 5.32 also shows that the amount of timber volume to be consumed will increase slightly by about 15% until 2050 compared to year 2000.

5.6.2 Forestry Sector Baseline and Mitigation Scenarios

Mitigation measures in the forestry sector should be considered as a national priority

The forest sector appears to be a net emitter of GHGs, due to the fact that the level of annual forest cutting is higher that the forest's natural growth. For this reason, the sector is considered as an emission source.

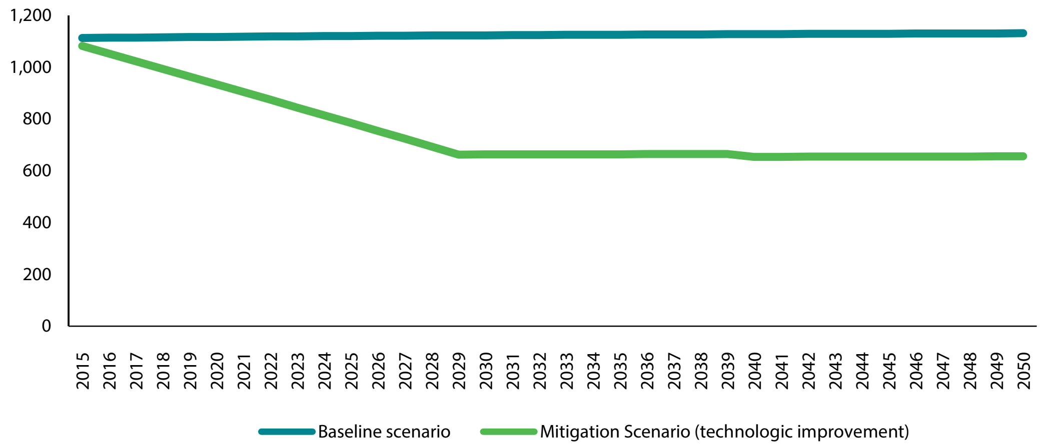
Technological measures for existing forests

It is anticipated that the following technological improvement would bring the reduction of CO_2 emissions from the exploitation of the existing forests:

1. Improving forest exploitation technology.
2. Improving the efficiency of wood combustion in order to decrease the amount of wood consumption. As stated before, combustion efficiency is only 40%. Actions taken in this regard, aim at increasing the efficiency of wood utilization up to 81%, for a period of 15 years (2015-2030). The technology to be introduced doesn't cost too much and it is easy to use;

Figure 5.33 presents the GHGs emissions baseline and the mitigation scenario with technological improvement (TI) for the Forestry Sector for the period 2015-2050.

Figure 5.33 Projected CO_2 emissions from forests (in Gg), during the period 2015-2050



As shown in Figure 5.33, adopting the selected mitigation measures can reduce the amount of emissions from forests from 1,130.7 Gg of CO_2 in 2015 to 663.2 Gg in 2030. Thus, a reduction of GHGs emissions by almost 60% for a period of 15 years can be achieved. On the other hand, the proposed technological measures do not provide any further reduction between 2030-2050, since their efficiency will peak in the year 2030, and the forest sector will continue to be an emitter of GHGs.

Increase of the Forested Area

In order to use forests in a sustainable manner it will be very important to invest in new forests plantation. Based on the national circumstances of Albania's forestry sector, the amount of forest area to be planted each year ranges from 500 to 1,000 ha. Considering the fact that in the last 25 years there has been no significant investment in this direction, increasing the national forests fund through afforestation/reforestation should be considered as a national priority. This would represent a significant action, because forests offer many other environmental, social, economic services, as well as other services such as protecting land from degradation, etc. besides their role in sequestering GHGs.

Two relevant scenarios are considered, a first that includes increasing forest area by 500 ha/year and a second by 1,000 ha/year, both for a period of 35 years (up to the year 2050). Figure 5.34 presents the CO_2 sequestered in Gg during 2015-2050 by rates of afforestation by 500 and 1000 ha/yr (AFF 500 ha/yr and AFF 1000 ha/yr).

Figure 5.34 CO_2 sequestered (in Gg), during 2015-2050, AFF 500 and 1000 ha/yr

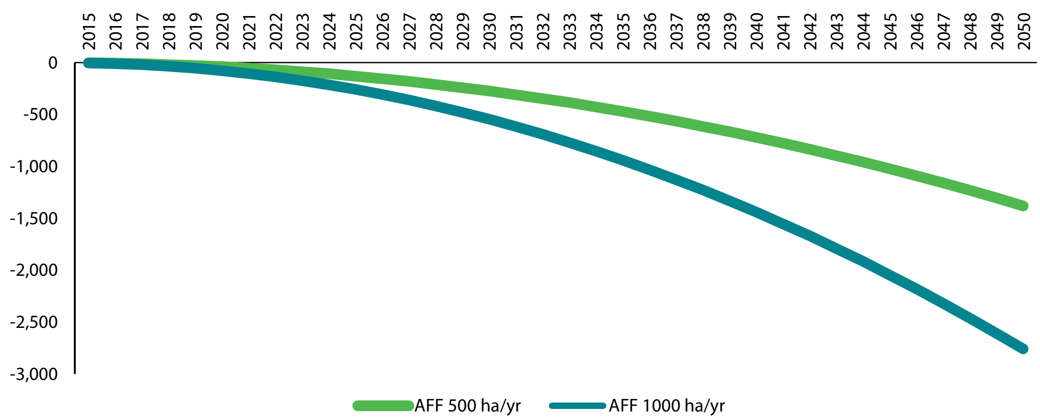
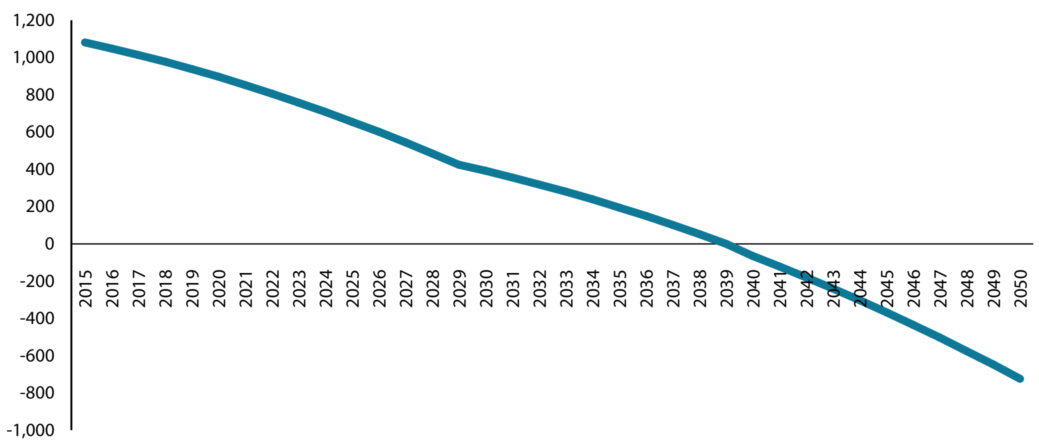


Figure 5.34 shows that planting 500 hectares per year will produce a total surface of about 18,000 hectares by the year 2050, mitigating approximately 1,379 Gg of CO_2 by 2050. Increasing the forested area by 1,000 hectares per year will increase the forest area to 36,000 hectares by the year 2050, mitigating up to 2,758 Gg of CO_2 during this period of time. Based on the above two scenarios and the application of technological measures, forestry emissions would be reduced and the sector would became a net sink of emissions.

Figures 5.35 and 5.36 show that with the application of the technological improvement (ITI) measures proposed, as well as afforestation (AFF) of 500 ha/year, Albanian forests would reach their sustainable management level by the year 2040, or 25 years from now.

Figure 5.35 CO_2 balance for the period 2015-2050 (in Gg), mitigation scenario with (TI+AFF 500 ha/yr)



In comparison, Figures 5.37 and 5.38 show that with the application of the technological improvement (ITI) measures proposed, as well as the afforestation (AFF) of a surface of 1,000 ha/year, Albanian forests the time to reach their sustainable management level would reduce to be reached by the year 2033, or 17 years from now.

Figure 5.36 CO_2 balance for period 2015-2050 (in Gg), under the Baseline and Mitigation Scenario (TI+AFF 500 ha/yr)

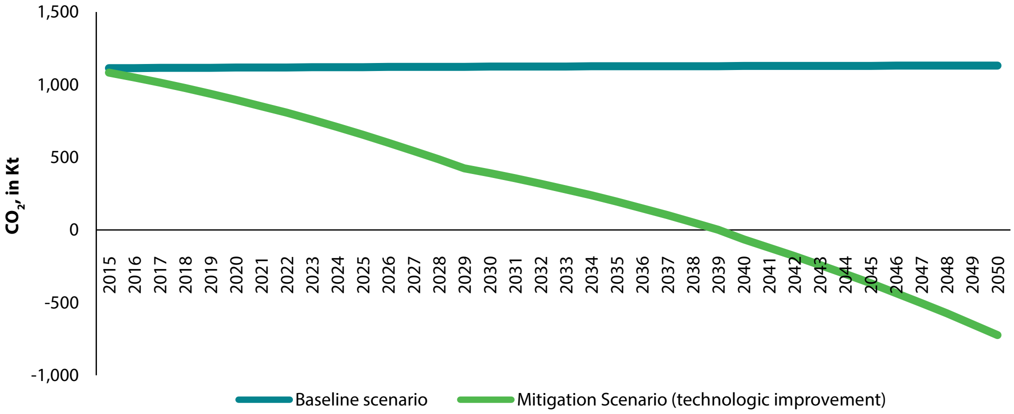


Figure 5.37 CO_2 balance for period 2015-2050 (in Gg), mitigation scenario (TI+AFF 1,000 ha/yr)

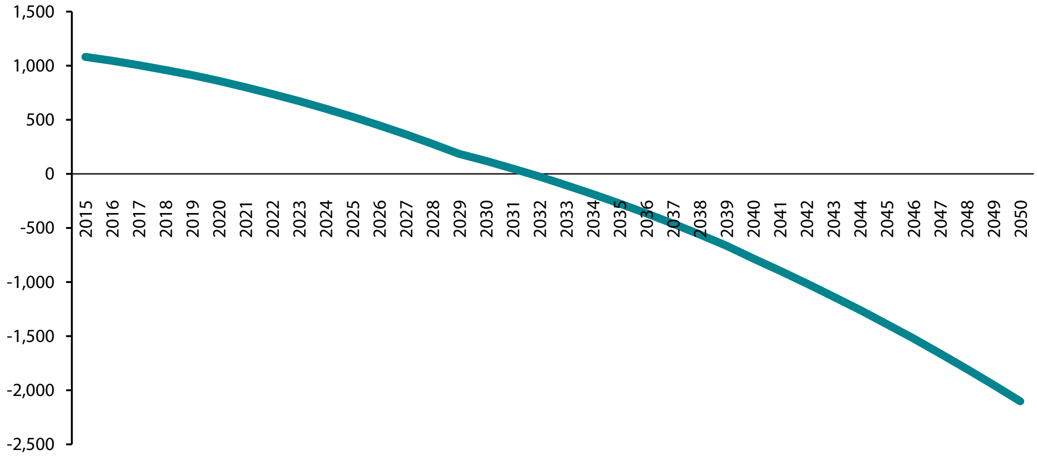
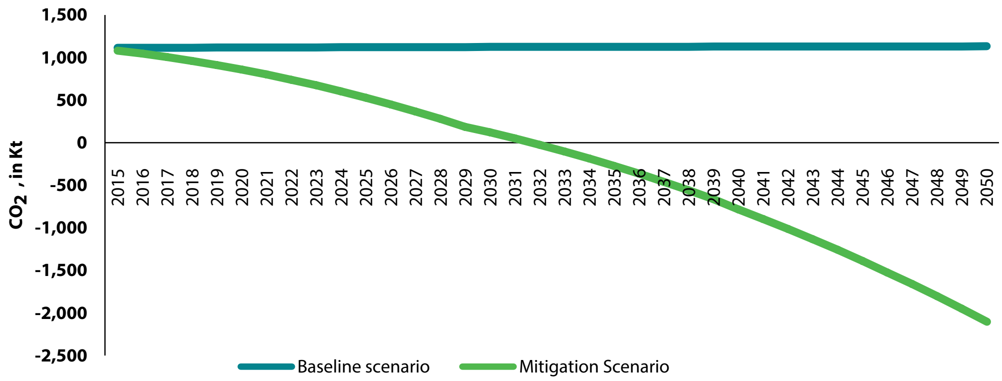


Figure 5.38 CO_2 balance for period 2015-2050 (in Gg), under the Baseline and Mitigation Scenario (TI+AFF 1,000 ha/yr)



CONCLUSIONS

- The forestry sector is currently managed in a non-sustainable manner, largely as a result of a lack of investment as well as a lack of technological improvement applied to this sector.
- Implementation of technological measures for forest exploitation and wood combustion are two very important mitigation measures that could be introduced to the forestry sec-

tor. These measures could be easily implemented in the next 15 years (2015- 2030).

- Technological improvements to forest exploitation could improve the efficiency of wood utilization up to 95% from the current 80% level.

- Application of technological improvement (TI) measures proposed, as well as afforestation (AFF) of 500 ha/year, for the exploitation of Albanian forest would lead to the forest sector reaching its sustainable management level by the year 2040, or 25 years from now.

- Application of mitigation measures such as the technological improvement (TI) as well as the afforestation (AFF) of a surface of 1,000 ha/year, for the exploitation of Albanian forest would lead to the forest sector reaching its sustainable management level by 2033, or 17 years from now.

- Afforestation of 500 ha /year, without technological improvements, would result in the forestry sector reaching sustainable management by the year 2047, or 38 years from now.

- Afforestation of 1000 ha /year, without technological improvements, would result in the forestry sector reaching sustainable management by the year 2038, or 23 years from now

- Implementation of all measures recommended above for the forestry sector (planting of 1000 hectares/year to 2050, technological improvements, etc.) would result in an increased sequestration capacity of around 3,233 Gg of CO_2 by 2050.

- Implementation of all measures does not take into consideration the potential damage to forests from fires or other extreme events.

- It is necessary to improve policies related to the use of wood for energy, because the current policies do not support sustainable management.

- It is also necessary to prepare a national plan that includes afforestation for the forestry sector in order to progress from unsustainable management to sustainable management.

5.7 MITIGATION ANALYSIS FOR THE WASTE SECTOR

5.7.1 Background and methodology

Municipal solid waste management in Albania requires improvements, although there have been recent advances through the implementation of the National Waste Strategy and the National Waste Management Plan 2010-2025. The recycling industry has started to become operational during the last five years, though the number of companies remains low and these are facing challenges to secure sufficient quantities of raw materials as municipalities do not separate collection and handling of different types of waste. An energy recovery alternative to complement recycling has attracted private sector interest.

However, the major concern for management of Albania's waste is not the lack of proper legislation rather than its proper implementation due to lack of institutional, technical and human capacities to ensure a proper management and planning; lack of financial resources, infrastructure and investment; experience/tradition for up-to-date management practices of this sector; economic instruments; cooperation between central and local levels, and between public and private organizations on waste management issues; weak enforcement structures (inspectorates); awareness of the economic value of waste as a resource; waste monitoring, indicators and statistics, as well as of the necessary networks to collect and process data.

Waste collection fees, known as the "cleaning tariff", are set by local government under the Law on Local Taxes. These fees differ between municipalities. These fees are usually very low, with few exceptions, and only cover the cleaning of cities as well as collection, transport and disposal of urban waste to dump sites. They do not cover any recovery, supervision, or maintenance of disposal sites. There is no integrated or adequate network of waste disposal installations or installations for waste recovery from mixed municipal waste collected from private households.

Albania has a significant number of dump sites that may have already exceeded their carrying capacities and moreover do not comply with the requirements of the EU Landfill Directive. The existing transport network is in itself a significant barrier to good waste management as movements of waste from source to landfill/dumpsites are hampered by poor road and rail infrastructure and/or safety. Improvement and/or maintenance of the railway system offers a good potential to improve waste transportation and management in the country, since all the coastal plain, where the overwhelming part of the population lives and where tourism is based, is linked to the network. Use of the railway system for waste transportation, wherever possible, would decrease the transport load, and therefore the traffic in the inter-urban roads.

Baseline and Mitigation scenarios for the waste sector are built following the methodology of the "Approach to perform waste mitigation analysis". The GHG emissions in these scenarios were calculated using the IPCC Good Practice Guidance. Population growth was derived from the INSTAT population projections for the period 2010–2025. The amount of waste per day per habitant was based on the assumption that by 2025 the entire population will have reached the actual rates of waste generation of the Tirana region. This variable will be a function of the linear progression from the average value (0.7 kg/person/day) of 2009 to 1.5 kg/person/day in 2025. The fractions of treated MSW and waste water, and the emission factors of these waste streams, vary in each scenario according to the assumptions and values advised by the IPCC Good Practice Guidance and its Reference Manual.

5.7.2. GHG Emissions Baseline Scenario for the Waste Sector

This scenario estimates GHG emissions based on the following assumptions:

1. In general, there remains a poor waste management system.
2. The main waste treatment technology is open landfills and dumpsites; although there are a number of improvements in the waste management industry.
3. The waste treatment industry shows some improvements mainly moving from dumpsites to landfills and serving an increasing percentage of population progressively from 2009-2025.
4. Proper disposal of waste remains difficult due to the increasing service cost that directly affects fee levels, and also due to the difficulty of identifying adequate landfill sites and acquiring the investment funding needed for projects.
5. The recycling industry will not differ much from the current rates of collection and diversion from landfill, due to the lack of segregation at source and poor collection systems. The waste stream proportions will remain constant.
6. The waste streams proportions will remain constant.
7. The objectives of the Governmental Decree for the reduction of biodegradable waste will not be fully meet by as there is no diversion of this stream from landfills or dumpsites. There are no plans yet for appropriate biodegradable waste treatment systems construction.
8. The waste water treatment systems will be considered starting from 2009. It is assumed that by 2025 they will be serving an increasing population.

The Tirana area, the biggest generator of waste in the country, has an operating landfill since 2009. This was built on an old dumpsite and some basic operations were functional from 2009 to 2014 mainly focused on waterproofing its floor and sides. The used section of the landfill is also covered with a layer of soil. A new cell, operational since 2012, is a proper impermeable cell. However it does not have in place any leachate treatment facility or a landfill gas capturing system. The emissions from the existing landfill are relatively high due to the high percentage of biodegradable waste mass. There is a new project for an additional section of the landfill, to be executed by the Municipality, which should be operational by the end of 2016. The project foresees a proper engineered landfill cell and also includes a leachate treatment system and a landfill gas capturing system.

The Shkoder and Lezhe areas are served by a regional landfill, which has been operational since 2010. This is a proper engineered landfill with enough capacity to serve these regions with their actual rate of waste generation for a maximum of 10 years. The landfill has a functional leachate treatment system and is planned to have a gas capturing system, when enough mass of waste is present to make possible its assembly into the mass. This landfill is only partially used by these regions due to disagreement on the gate fee that the municipalities of Shkoder and Lezhe have to pay to the landfill operator. As a consequence, most of the Municipal Solid Waste (MSW) from these two regions is still going into old dumpsites.

The region of Korca is been served by a regional landfill since 2014. To-date, the landfill is not a proper engineered landfill but a permeable dumpsite. The local authorities struggle for funds to finalise the landfill. The landfill project foresees a proper leachate treatment facility and landfill gas capturing system

Other up-coming developments include:

- The region of Saranda and neighbouring communities also have a proper engineered landfill project but it is not yet operational.

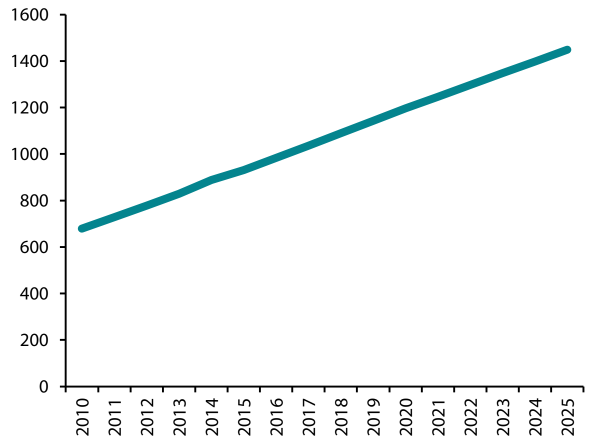
- The region of Durres has plans for the construction of a landfill, which should have started in 2015 and will serve the region of Durres and its communes.

- The region of Elbasan will be served by a new incinerator whose construction began in 2015 and is expected to be operational in eraly 2017.

- In 2014 only three waste water treatment plants were operating in the country serving the cities of Korce, Pogradec and Kavaje. There are a number of projects to construct waste water treatment plants in Shkoder, Durres, Tirane, Vlore, Sarande, Fier and Elbasan.

Based on the above assumptions, Figure 5.39 show the GHG emissions in CO2 eq. from the Municipal Solid Waste (MSW)sector as per the Baseline Scenario. In this Baseline scenario, methane and CO_2eq. emissions from the MSW sector will exhibit an almost constant increase due to growing population and waste generation rates until 2025. These two factors are somewhat mitigated by some improvements in the waste management sector, such as introduction of better treatment technologies including landfills and incinerators, and the diversion of biodegradable waste streams from landfills will also mitigate methane emissions. However still not considerable in terms of the GHG emissions from the MSW sector.

Figure 5.39 Projection of emissions from waste disposal (in Gg of CO_2 eq.)



On the other hand, the CO_2eq. emissions from the waste water handling sector (CH_4 and N_2O emissions) will increase with population growth and consequent waste generation rates, while expected to get decreased after 2020 as a result of the operation of larger scale waste water treatment plants as shown in Figure 5.40.

Figure 5.40 Projection of emissions from wastewater handling (in Gg of CO_2 eq.)

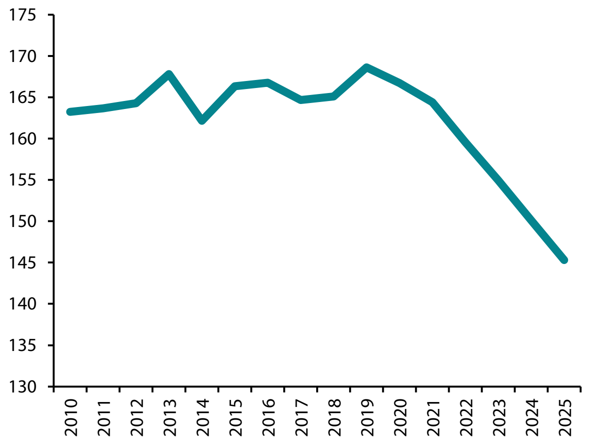
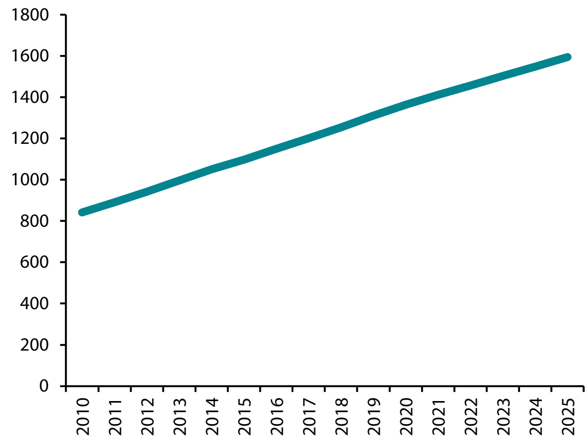


Figure 5.41 Waste sector projections of CO_2 eq. emissions (in Gg)



The CO_2eq. emissions from the entire waste sector as per the Baseline Scenario will continue to increase until 2025 as a consequence of population increase and consumption. Methane emission from waste disposal on land will also increase. The increase of population and consumption will overcome the mitigation effects of improvements in treatment technologies leading to a net growth of GHG emissions in this sector, as presented in Figure 5.41.

5.7.3. Waste Sector Mitigation Scenario 1
Good environmental performance scenario for the period 2010 – 2025

This scenario was built considering the following assumptions:

1. The landfill Governmental Decree is fully implemented during 2016–2025.
2. Again in this scenario there are no waste treatment systems other than properly engineered landfills which will become operative within the deadlines foreseen in plans with the exception of the Elbasan incinerator. The cities of Tirana, Durres, Korce, Sarande, Shkoder, Lezhe and some of the surrounding communes of these cities will be served by these new landfills.

3. The region of Elbasan will be served by an incinerator by early 2017. The landfill gas emissions will be significantly reduced as a result of a proper functioning landfill capturing systems and diversion from biodegradable mass landfills.
4. Waste water treatment systems started functioning gradually since 2010 in the cities of Pogradec, Korce, Kavaje, and it is expected that waste water treatment plants will start functioning in Durres, Shkoder, Tirane, Vlore, Sarande, Fier and Elbasan by early 2017.
5. By 2025, 70% of waste water will be treated before release into the environment. This will happen in a linear progression having started in 2010.
6. Recycling will increase, reaching 30 percent of all mass recyclables by 2025 as a result of segregation at source in some major cities starting in 2016, and also due to improvements in the collection and treatment systems.

The total GHG emissions from MSW and waste water handling systems will be reduced in comparison to the baseline scenario due to the sum of these environmental improvements. There will also be put in place successful awareness raising campaigns that will increase the sensitivity of the public towards the environment in general, and also as a result of the government's development strategy which aims at increasing the tourism industry substantially. These leads to a huge improvement of actual waste and waste water handling practices.

Methane emissions from waste disposal on land will decrease from the previous trend as a consequence of measures applied in this sector. The most influential measures to be introduced are the operation of landfills, the diversion of biodegradable waste streams from landfills and the closure of dumpsites. Even in this scenario the total mass of MSW will increase as a result of population growth and waste generation per capita, but the total methane emissions will decrease as a result of the introduced mitigation measures, as can be seen in Figure 5.42.

Figure 5.42 Waste sector Mitigation Scenario 1- Emissions from waste disposal on land (in Gg of CO_2 eq.)

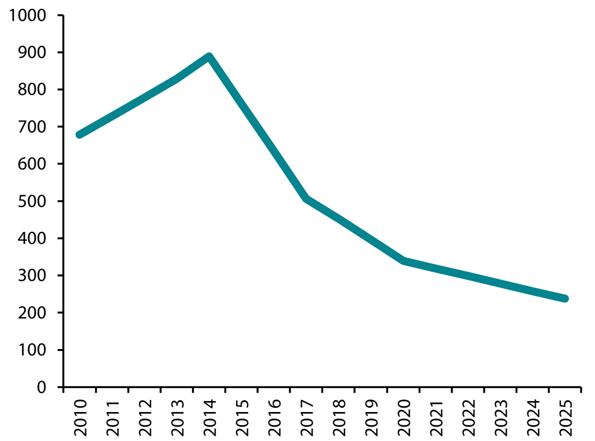
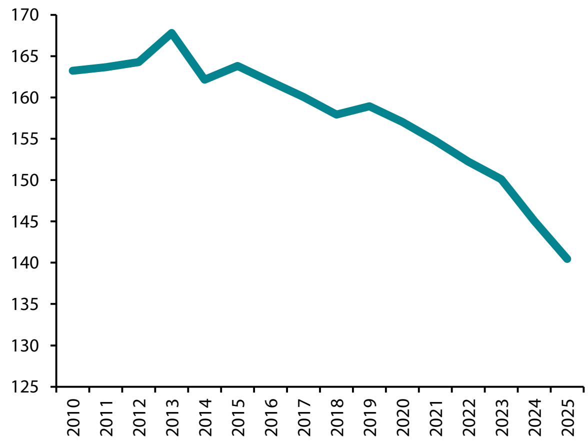


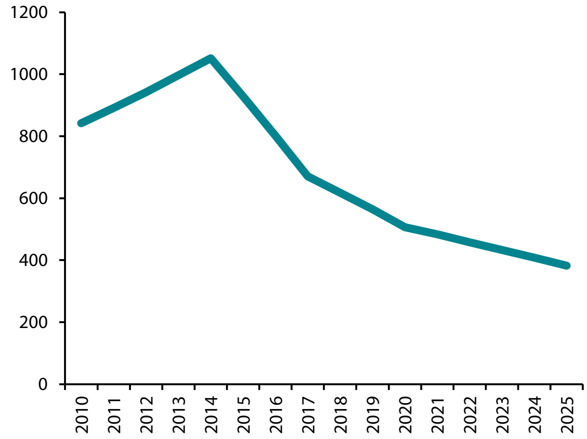
Figure 5.43 Waste sector Mitigation Scenario 1- Emissions from wastewater handling (in Gg of CO_2 eq.)



The CO_2eq. emissions from wastewater treatment sector have gradually decreased since 2013. Emitted gases are mainly CH_4 and N_2O. The population growth and the increase of consumption tend to increase these emissions but the introduction of waste water treatment facilities have assisted in decreasing them, as it can be seen in Figure 5.43.

CO_2eq. emissions from the whole waste sector have gradually decreased since 2014, as presented in Figure 5.44. Population growth and the increase of MSW generation per capita tend to increase GHG emissions. The main contributors to CO_2eq. emissions for the whole waste sector are the methane emissions from waste disposal on land. These methane emissions will

Figure 5.44 Waste sector Mitigation Scenario 1- Emissions from waste sector (in Gg of CO_2 eq.)



see a decrease as waste treatment options improve over time. Higher fractions of biodegradable waste are diverted from landfills. The dumpsites are less frequently used as a result of the construction and operation of new landfills.

5.7.4 Mitigation Scenario 2

Waste-Cement Industry (NAMA Scenario) for the period 2010 – 2025

This scenario was built considering the following assumptions:

The Waste – Cement Industry National Appropriate Mitigation Action (NAMA) is implemented (look at Annex 1).

A large quantity of MSW is processed to RDF (Refuse Derived Fuel) or PEF (Processed Engineered Fuel) to fit the process of clinker production. Not all waste streams within the MSW are suitable for RDF or PEF, but the actual composition of the waste makes it suitable for production of RDF or PEF. The waste treatment hierarchy established by the national strategy on waste, and by the plan for the integrated waste management, places this process as fourth (incineration with energy recovery), one step lower than recycling.

The recycling systems will improve under the hypothesis that a segregation of MSW will occur at source.

There will be an improvement to the rate and collection systems.

Waste streams that are suitable for both recycling and incineration with energy recovery are plastic and paper. For this reason 25% of these two waste streams will be considered as passing through the recycling processes and will not be considered for the calculations of the NAMA scenario for the period 2009-2025. In practice, the recycled percentage of these waste streams is lower, so the assumption is that by 2025 the recycling percentage goal will be reached.

Methane emissions from waste disposal on land have decreased since 2014, but it is expected that when the NAMA is in place reductions will be larger, as presented in Figure 5.45. Diversion from landfills of biodegradable waste streams and diversion of a higher fraction of waste streams from the waste sector to the cement industry sector significantly reduces methane emissions from waste disposal on land. It is still expected that some methane emissions will be

Figure 5.45 Waste Sector Mitigation Scenario 2- CH_4 emissions from waste disposal on land (Gg)

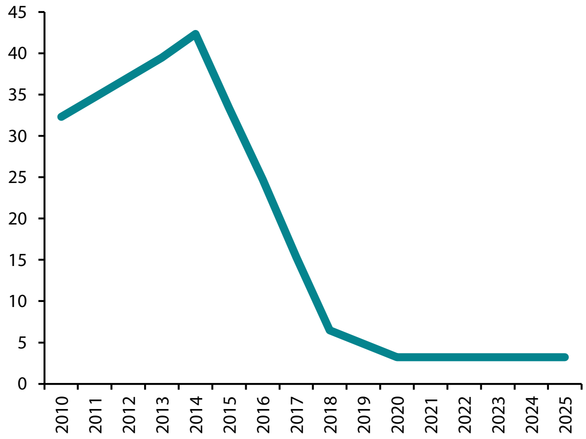
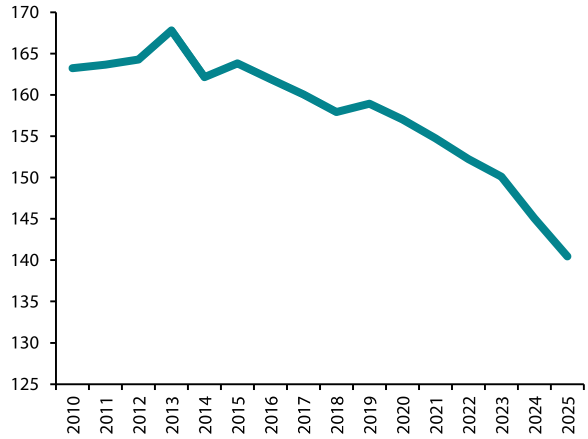


Figure 5.46 Waste Sector Mitigation Scenario 2 CO_2 eq. emissions from wastewater handling (Gg)

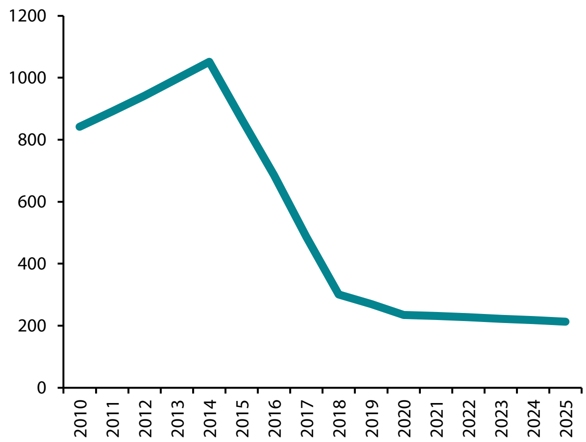


generated because of a low fraction of biodegradable waste that might escape the routes of collection and treatment.

The CO_2eq. emissions from waste water handling are projected to be the same as in the second scenario, because the NAMA does not include waste water treatment systems, but only the MSW treatment sector (Figure 5.46).

The CO_2eq. emissions from the entire waste sector are reduced over time mainly because of the reduction in methane emissions from the waste disposal sector. With the NAMA in place the CO_2eq. emissions will be significantly reduced, as presented in Figure 5.47.

Figure 5.47 Waste Sector Mitigation Scenario 2 - CO_2 eq. Total emissions from Waste Sector (Gg)



5.7.5 Waste Sector Scenarios Comparison

The three scenarios' projections show a decrease of emissions when several measures are applied to the whole waste sector. The best results in terms of CH_4 emissions come from Mitigation Scenario 2, which considers the implementation of the developed NAMA waste-to-energy-cement industry (NAMA Scenario): methane emissions will decrease as a result of measures taken in the waste treatment sector and significantly decrease as a result of the NAMA implementation. With a good collection system in place and total territory coverage, these emissions can be reduced almost to zero, as presented in Figure 5.48.

Figure 5.48 Waste Sector Scenarios Comparison-Methane emissions from waste disposal on land (Gg)

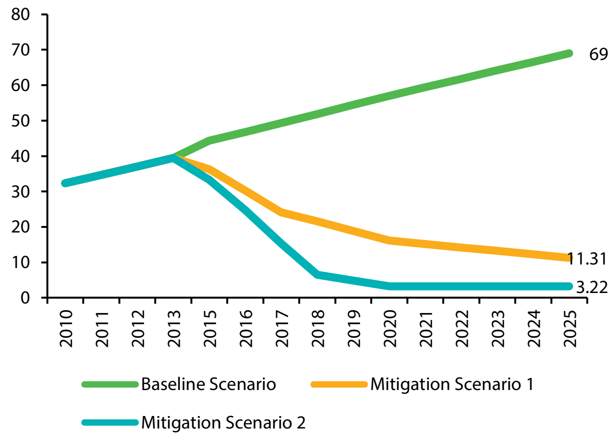
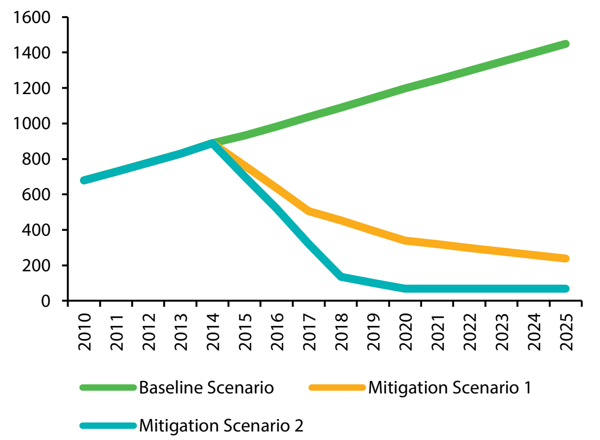


Figure 5.49 Waste Sector Scenarios Comparison - CO_2 eq. emissions from waste disposal on land (Gg)



CO_2eq. emissions from waste disposal on land follow the same trend as methane emissions, as the only contributor to CO_2eq. values in the IPCC methodology are methane emissions from waste disposal on land operations as shown in Figure 5.49.

An analysis of the scenarios shows that CO_2eq. emissions from the waste water treatment sector are the same for the first and the second mitigation scenarios (Figure 5.50). The NAMA will not affect emissions from this sub- sector. Both mitigation scenarios here have lower emissions overtime due to the fact that higher fractions of waste water are being treated by appropriate waste water treatment plants. CH_4 emissions from the waste water handling sector will decrease as more treatment plants became operational. On the other hand, these emissions are much lower compared to the ones emitted from the waste disposal and treatment sector; however, they will still contribute to the total emissions figures.

The main contributors to GHG emissions for the whole waste sector are methane emissions from waste disposal operations. The total CO_2eq. emissions from the waste sector (including both waste and waste water subsectors) are lower for the mitigation scenario 1 and significantly lower for the mitigation scenario 2 compared to the Baseline Scenario. These emissions are reduced in the scenario implying Good environmental performance and reduced further if the NAMA scenario becomes operational (Figure 5.51). Emissions from the waste water treatment sector are the same under the mitigation scenarios 1 and 2, and the difference between them is related to the different emissions factors from the waste treatment sector.

Figure 5.50 Emission Scenario of Waste treatment sector CO_2 eq. wastewater handling

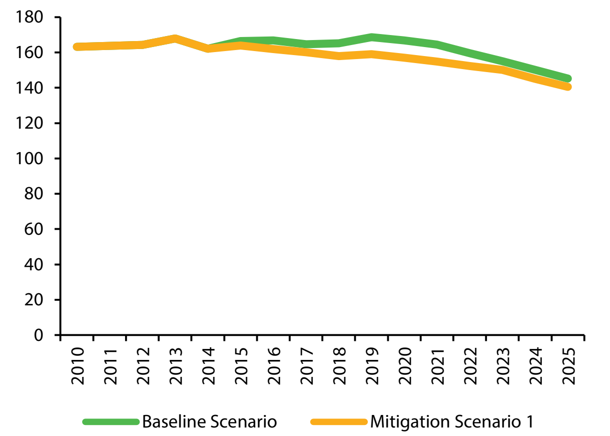
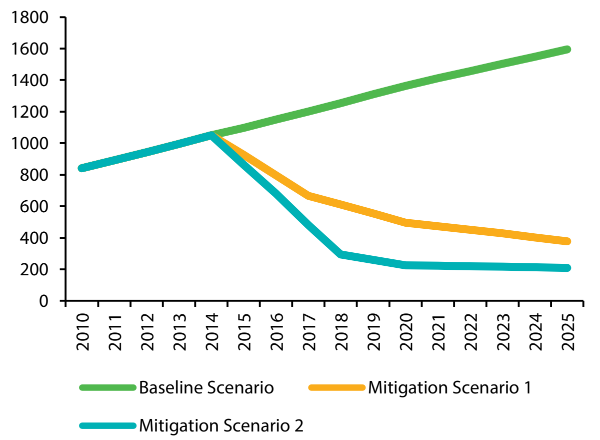
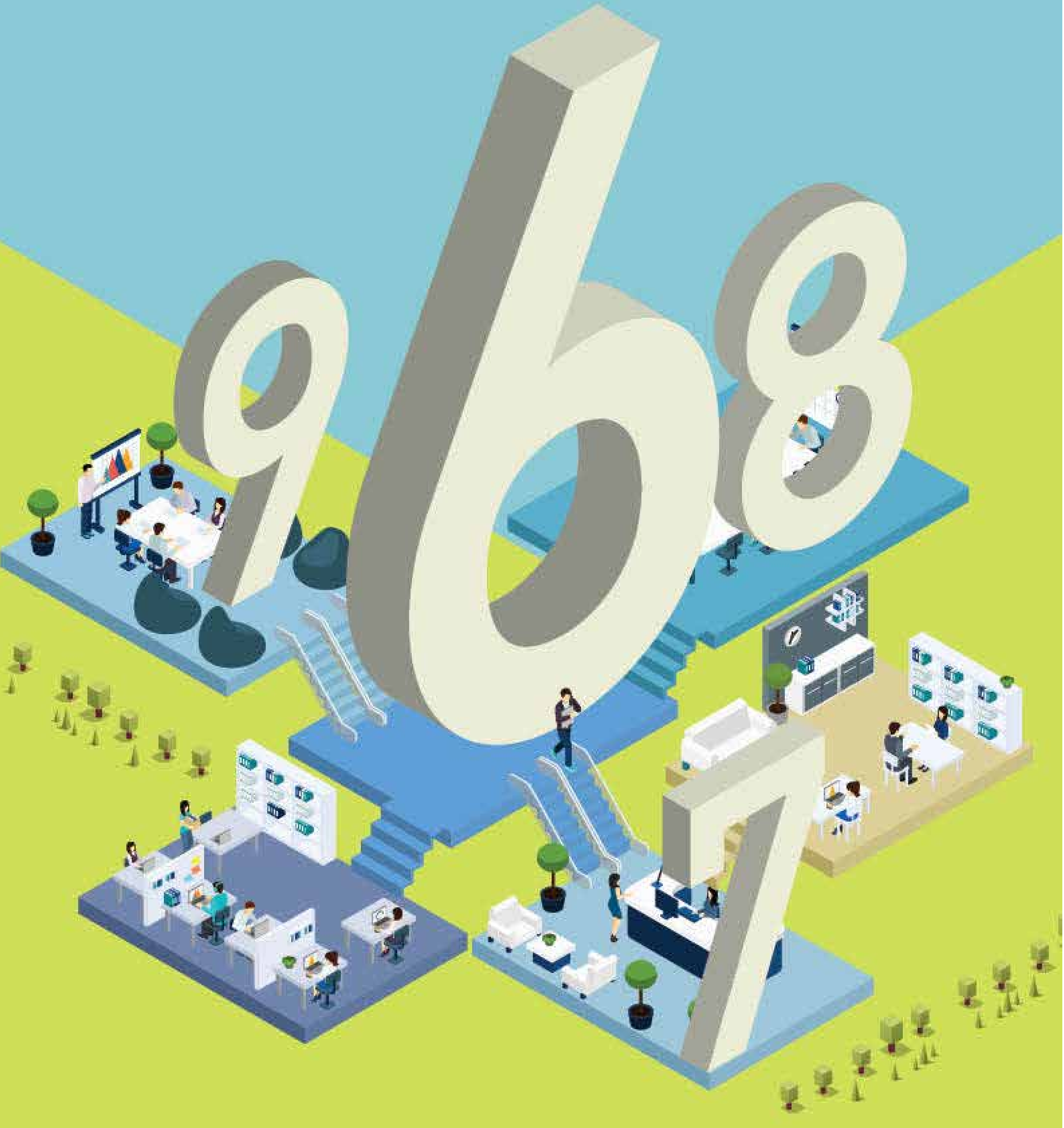


Figure 5.51 Waste Sector-Comparison of the GHG Baseline Scenario with two GHG mitigation scenarios (in CO_2 eq.)



OTHER RELEVANT INFORMATION



6 CLIMATE CHANGE COMMUNICATION ACTIVITIES

This chapter describes the completed and ongoing activities in regard with communication of climate change issues with a broad range of stakeholders. The Albania's SNC to UNFCCC has highlighted the need for communicating climate change related issues: "The communication strategy aims at generating awareness on the climate change issues in Albania with a special emphasis on the Kyoto Protocol benefits and obligations. Its goal is not only to raise visibility in this direction, but also to mobilize new partnerships in order to achieve a higher degree of general awareness and encourage actions to be taken by all stakeholders".

6.1. INFORMATION AND NETWORKING

During the preparation of the TNC, the Climate Change Project team in cooperation with UNDP launched and regularly updated the web page http://www.ccalb.org (2011-2014). This webpage was aimed at information exchange with different stakeholder groups, including the general public, regarding ongoing activities and the research results achieved. Since 2014 the information related to climate change activities has been available from the UNDP Albania webpage. The relevant information is also available on the webpage of the Ministry of the Environment, Regional Environmental Agency, etc.

The Institute for Geosciences, Energy, Water and Environment provides hydrometeorological services and information exchange at a national level but also regional and global through its participation in the WMO. The National Environmental Agency (AKM), under the Ministry of Environment, provides information exchange to EIONET/EEA for environmental indicators. In addition, there are a number of NGO networks with communication activities related to environment, such as REC, EDEN, Ekolevizja, Millieucontact, etc.

Examples of networking activities that took place over the reporting period are listed below:

- **Regional Environmental Network for Accession (RENA):** The project was financed by the EU and managed by the European Commission to assist beneficiary countries in exchange of information and experience related to preparation for accession. The MoE, TNC team and the National Environmental Agency took part in some RENA workshops, trainings and meetings (2011).

- **Sharing lessons learned from the National Communications between non-Annex I countries** - National Communications Support Programme workshop, Istanbul 2012: The workshop shared experiences among non-Annex I countries during the preparation of their National Communications and for transfer of knowledge and cooperation among countries.

- **Donor coordination in climate change area:** Active coordination was established between donors working in areas of mutual interest, including the World Bank and USAID, in order to enable consistency of results and recommendations related to creating sustainability of the process for preparation of National Communications, and integrating climate change priorities into country development strategies and relevant sector programs, (May 2013).

- A group of Balkan NGOs, including Albanians, has started to promote a more sustainable energy system in South East Europe, aligned with key EU Policies and Directives and the targets set by the Roadmap for moving to a competitive low carbon economy in 2050, through an ongoing project **Sustainable Energy Policies in South East Europe.**

- **The efficiency of energy in residential sector–Workshop,** organized by Co-PLAN, Institute for Habitat Development, in cooperation with POLIS University, as part of the EU financed "Development of the ENV.net in West Balkan and Turkey" aimed at giving citizens a voice to influence the environmental process reforms for closer EU integration. (December 12, 2013)

- **The United Nations Office for Disaster Risk Reduction (UNISDR)** is supporting the Albanian Government to empower decision makers in taking better informed decisions to reduce the country's overall disaster risk. Throughout implementation of the project 'Disaster Inventory Management System: DesInventar' **(**supported by UNISDR and CIMA Research Foundation, 2013), the General Directorate for Civil Emergency, Ministry of Interior of Albania has made significant progress on collecting data on disaster losses that are publically available**.**

- The project **IASON - Fostering Sustainability and uptake of research results through networking activities in Black Sea and Mediterranean areas** (June 2013 - June 2015), implemented by CIMA Foundation (Albania), has the ultimate goal to establish a permanent and sustainable Network of scientific and non-scientific institutions, stakeholders and private sector enterprises belonging in the EU and third countries located in the Mediterranean and the Black Sea regions.

- **Environment and Climate Regional Accession Network (ECRAN):** In the framework of Environment and Climate Regional Accession Network**,** several specialists have been participating in training activities such as mitigation (seven) and adaptation (four) from the Ministry of Environment and other line Ministries, in order to strengthen their capacities, during 2014 and 2015.

- GIZ has initiated and supported the participation of **Tirana Municipality at the Climate Change Adaptation (CCA)-cities-network of the EU**. GIZ supported the participation at the first meeting held in Brussels 29-30 January 2014.

- REC Albania, in the frame of SENIOR-a Programme has supported the **Environmental Communication-Information Ecosystem,** implemented by Milieu Contact Albania.

6.2 PUBLIC AWARENESS AND OUTREACH

As a follow up of activities planned by the Communication strategy developed in the frame of SNC, the UNDP Climate Change Programme has played an effective role in raising awareness about climate change through the two important projects listed below:

- Different marketing and awareness raising campaigns have been implemented throughout the UNDP/GEF Solar Water Heating Project such as organization of seminars; preparing leaflets, reports and articles, organizing the "solar shower" campaign, which has travelled from North to South of the Albanian Seaside, etc. A documentary prepared by the Albanian Public Television (TVSH) and presented on May 10, 2014 on the achievements and challenges of the project in transforming the SWH market in Albania, and the experiences from pilot solar thermal systems installed in the public/private sectors, represents one of the highlights of the Albanian project public relations activities from 2012 onwards;

- The communication strategy and its action plan, implemented in the framework of the 'Identification and implementation of the adaptation response measures in the Drini-Mati River deltas' (DMRD) project, has increased the awareness of local communities in the Lezha region and beyond regarding potential climate impacts, focusing their support in enhancing the adaptive capacity of natural ecosystems and local livelihoods. The public campaign entitled 'It's time to act,' consisted of different activities including meetings with school children, local communities, local NGO and media, 'Climate Change Day', exhibitions, painting competitions, media trainings, distribution of leaflets and brochures on the climate change impacts to local communities over the coastal area, etc., and has played an important role in the process of increasing awareness to climate change risk and adaptation.

There have also been activities supported by bilateral and multilateral donors that include some public outreach as a component of a larger climate change related program. For instance, USAID has sponsored the Municipal Climate Change Strategies project to prepare municipal stakeholders for managing local climate change challenges.

In addition, other activities related to climate change awareness issues have been organized by the Government and different active national and international NGOs operating in Albania, such as:

- REC Albania in the frame of projects:

  - "Climate reality project reaches Albania" (2014) held a series of presentations about climate change in 20 schools of 4 regions of Albania with approx. 1200 students combined with one dedicated day to students' activities such as performances, drawing exhibitions, planting trees, etc.

  - "24 hours of Climate Reality" (2014): Approximately 50 university students followed live from Tirana the global audience of Al Gore projects. By the end of the event individual commitments are recorded and posted on the web for further awareness.

  - Prepared and distributed to approx. 1,200 high school students in 5 regions of Albania the "Climate Change" brochure (2010), a coloured 20 page booklet, which aims at supporting teachers with additional illustrative and up to date factual based data on the impact of climate change on health, agriculture, ecosystems, etc.

- Since 2006, support is given on Education for Sustainable Development, by introducing and running the teachers' qualification for Green Pack cross curricula program. There is a special course in the program dedicated to climate change. Over 10 years, approximately 500 secondary schools (out of 1700 country wide) have implemented the programme. REC has trained approximately 400 teachers of Biology, Chemistry, Geography and other subjects. Sectoral cross cutting issues are implemented through individual or class practical works such as saving energy, energy efficiency, environmental friendly transport, etc.

- The Albanian Media Institute has organized a Seminar on 'Global Warming' (2009) to inform the media, journalists and editors on the main trends of climate change and especially global warming. Since 2009 the Institute for Environmental Policies has organized several awareness raising activities with students of public and private universities on the issue of climate change.

- The National Conference on 'Climate change and health', organized in 2012 by the Ministry of Health, Institute of Public Health and World Health Organization in Tirana, was preceded by some other events and awareness raising campaigns.

- In the framework of the World Bank study "Reducing the Vulnerability of Albania's Agricultural Systems to Climate Change" (Impact Assessment and Adaptation option, 2013) the National Awareness Raising and Consultation process, aimed at the awareness rising of farmers and local experts to climate change to agriculture has taken place.

- The activity 'Celebrating Earth day', celebrated for the 12 consecutive year, is organized by Environmental Centre for Development Education and Networking (EDEN).

The survey performed in the frame of the study on "Public Perception on environmental issues in Albania" (commissioned by REC Albania and implemented by CRCD, September 2015) at the national scale, segregated data for 61 municipalities, and found that 83 percent of the respondents believe that climate change is a reality. 99.9% of the respondents linked natural disaster as a consequence of climate change, resulting in more intense weather phenomena (storm and floods). 60% of respondents believed that climate change effects will considerably impact their way of living.

7 OTHER RELEVANT INFORMATION

7.1 ACTIVITIES RELATED TO TECHNOLOGY TRANSFER

At the governmental level, two important Decisions related to technology development have been promulgated by the Council of Ministries:

- Decision No 303 (31.03.2011) which charges line Ministries and their institutions to create the **Units of Information Technology and Communication**, and

- A Decision dated 17.09.2014, regarding additions and changes to Decision No 903 (26.08.2009) which included the creation of the **Agency of Research, Technology and Innovation (AKTI)**.

In addition, the Republic of Albania has received new equipment related to meteorological monitoring through implementation of the projects:

- **Albania - Disaster Risk Mitigation and Adaptation Project (Al-DRMAP) (2009- 2013),** funded by the World Bank and implemented by IGEWE Institute and Ministry of Interior**.** Through this project 40 automatic meteorological stations have been added to the National Meteorological Network.

- A weather radar to predict extreme weather in the Western Lowland areas of the Republic of Albania and the Adriatic Sea has been installed through "ADRIATIC integrated RADAR-based and web-oriented information processing system NETWORK to support hydro-meteorological monitoring and civil protection decision" (**ADRIARadNet)**, 2013- 2015.

7.2 SYSTEMATIC OBSERVATION NETWORKS

The first organized hydrometeorological network was established in Albania in the early 1930's, although the first meteorological data had been recorded in October 1868 at the Durrës Station and in 1888 at Shkodra station. In 1949 the Directorate of Hydrometeorological Service was created under the jurisdiction of the Institute of Sciences, followed by the Hydrometeorological Institute (HMI), under the Albanian Academy of Sciences. Since 2011 the monitoring task has been held by the Institute of Geosciences, Energy, Water and Environment (IGEWE) under the Polytechnic University of Tirana, which was created through the merger of some research institution as described in chapter 7.4.

The national meteorological network in the Republic of Albania consists of 120 meteorological stations, of which 23 are climatological stations, 23 pluviometric posts, 74 thermometric posts, and a simple meteorological radar center. 13 phenological stations measure periodic biological phenomena. In recent years the monitoring system has been upgraded with the addition of 29 automated meteorological stations. In addition the hydrometeorological archive contains around 480 long term meteorological and hydrological series, a part of which is still in analogue form and not digitized.

Several types of constraints and gaps have been noted in the observation and monitoring system. It is critical to perform comparative analysis of the existing institutional and legislative arrangements for hydrometeorological services, and upgrade and modernize hydro-meteorological observation networks, data management and forecasting systems, as well as providing sustainable organizational, human and technical resources to maintain and operate them. To support risk assessment and early warning systems, and promote operational monitoring, warning, forecasting and mapping of meteorological, hydrological and climate-related hazards, there is a need to establish and invest in fully operational 24/7 hydrometeorological services (technical and human resources). It is also necessary to strengthen the early warning capacity with a multi-hazard approach and engender enhanced cooperation with the Ministry of Interior, General Directorate of Civil Emergencies and other key stakeholders and the National Civil Emergencies Plan, to include contributions by the hydrometeorological services.

The National Environment Agency (AKM) laboratory has been fully renovated in accordance to the required standards of the ISO 170 25 quality manual. The number of air monitoring stations has been increased to 6 stations in 2014 enabling provision of a better picture of air quality across the country. The number of employees has been increased from 42 to 62 employees.

Through the project **Climate change adaptation in the Western Balkans (2012-2018)** 9 Hydro-meteorological stations have been purchased and installed in the Albanian part of the Drin Basin to enable early flood warning in the Drin-Buna catchment area.

7. 3 RELEVANT INSTITUTIONS

In 2006, the Albanian Government undertook a deep reform of the scientific research system. The Academy of Sciences was re-organized according to the model of many other European countries: it now operates through a selected community of scientists organized in sections. The research institutes of the Academy have been integrated into the higher education system; some institutions are now affiliated to line ministries, others to the universities. The institutions that were established or re-affiliated are as follows:

- Three inter-disciplinary **research centres or institutes**: the Inter-university Centre of Albanologic Studies, and the Institute of Geoscience, Energy, Water and Environment, and the Polytechnic University of Tirana.

- Two new faculties: Faculty of Information Technology at the Polytechnic University of Tirana, and the Faculty of Biotechnology and Food at the Agricultural University of Tirana.

- A new Applied and Nuclear Physics Centre and a new Biotechnology Department at the Faculty of Natural Science of the University of Tirana.

Research Institutes (RIs) belonging to line ministries were re-organized and twelve Technology Transfer Centres and Agencies were created having as their main mission the transfer of technologies and knowledge with technical support to policy-making in the relevant fields, there are two types:

- **The national research centres** are research-oriented academic institutions whose mission is to carry out scientific research, to educate and deepen university education in the second and tertiary circle of studies, to develop and transfer knowledge and technology.

- **Public Centres/Agencies of development and technology transfer** have the mission of carrying out studies and development projects and of transferring knowledge and technologies.

The following centres/agencies operate within relevant line ministries:

- Six centres/agencies at the Ministry of Agriculture, Rural Agriculture and Water Administration. The activities are carried out by five Centres for Transferring Agricultural Technologies (QTTB) in the cities of Fushe- Kruje, Lushnje, Vlore, Korçe, and Shkoder and the Institute of Food Safety and Veterinary (ISUV).

- The National Environmental Agency (AKM) at the Ministry of Environment.

- The National Tourism Agency at the Ministry of Economic Development, Tourism, Trade and Entrepreneurship

- The National Agency of Natural Resources (AKBMN) at the Ministry of Energy and Industry.

- The Institute of Public Health at the Ministry of Health, with its own research agenda related to the improvement of health services.

- The Institute of Transport and two centres at the Ministry of Transport and Infrastructure.

In January 2014 the **State Inspectorate of Environment, Forests and Water** was created. This is a public institution under the Ministry of Environment, which will guarantee the implementation and enforcement of law in the fields of environment, forest and water.

Currently, 'research policy' is administered by the Directorate of Science at the Ministry of Education and Sport (MES). The financing of R&D activity is conducted through institutional funding by the government, programme financing through MES, programme financing in the framework of bilateral programmes, and international collaboration. Government research funding may also be sourced through a number of other line ministries and public organizations, directly or indirectly involved in research and innovation policies or activities. These, in particular, include the following:

The Agency for Research, Technology and Innovation (ARTI), under the Prime Ministry Office is the responsible Institution for scientific research and funding. ARTI supports monitoring and evaluates programmes and projects on science, technology and innovation (STI) nationwide. It is funded by the state budget, international programs, and the private sector.

The European Union has given special importance to regional research and the widening of the European Research Area, through programmes such as Horizon 2020, the Joint Research Centres (JRC) and the Euraxess Network. Currently, Horizon 2020 is the most important European scientific programme in which Albania will participate and where the Agency for Research, Technology and Innovation has an important role in its promotion. From October 2012 ARTI is responsible for the presentation of all available scientific programmes to the scientific institutions and universities, such as the Academy of Sciences, Faculty of Natural Sciences in Tirana, Centre of Transfer of Agricultural Technologies in Vlora, other public universities, Institute of Public Health, Agricultural University of Tirana, Centre of Transfer of Agricultural Technologies Fushë-Krujë, National Centre of Biomedical Engineering, Albanian Geologic Service, the Institute of Geosciences, Energy, Water and Environment, private universities, etc.

Some similar private units also exist in the form of institutes or NGOs with a clear profile of competencies in different fields. One such is the **International Centre on Environmental Monitoring (CIMA)**, which is a non-profit research organization committed to the promotion and support of scientific research, technological development and training within the fields of hydro-meteorological risk reduction, forest fires and marine environmental monitoring. The Foundation's aim is to promote scientific research and technical development, high profile engineering and environmental science education. This mission is accomplished through scientific research, technology transfer and high level training services.

7.4 INFORMATION ON RESEARCH AND DEVELOPMENT (R&D) PROGRAMS

Many technology projects in Albania have been supported by the EU Framework Programmes and other EU financing mechanisms. There are two projects financed through the 7th Framework Programmes for Research (FP7), 12 IPA, and 3 Tempus, Erasmus Programme.

Other complementary areas, such as nature protection and climate change, have also received IPA support. Overall, EU assistance over the period 2007-13 amounts to more than EUR 126 million. Various donors provided assistance to the sector; among them IFIs with loans from the World Bank, the EIB 13, multi-beneficiary assistance or TAIEX 22 the EBRD, and other donors such as Germany, Italy, Japan, Austria, Sweden, Switzerland and the United Nations.

Albanian universities have also supported research relevant to climate change. In addition, national and International NGOs have influenced the establishment of the national innovation, technology transfer and R&D infrastructure through awareness raising in climate change and sustainable development.

Following are summarized a number of climate change-related research projects implemented during the reporting period.

FP7 programme:

- IASON - Fostering sustainability and uptake of research results through networking activities in Black Sea and Mediterranean areas implemented by CIMA, Albania (2013-2015).

- Knowledge transfer and research needs for preparing mitigation/adaptation policy portfolios (PROMITHEAS-4), implemented by Faculty of Mechanics Engineering, Tirana Polytechnic University (2011-2013).

EU pre-Accession Instrument (IPA):

- ADRIARadNet project implemented by CIMA, Albania (2012-2014).

- KMS Survey results - IPA/2013/UNISDR implemented by CIMA, Albania (2013-2014).

- IPA Flood implemented by CIMA, Albania (2015-2017).

- Energetic Support to Small Communities of the Adriatic Area - IPA Cross-Border Programme (2007-2013) implemented by the Ministry of Energy (2011-2015).

- The "Powered" Project or the project of research, experimentation and development of wind energy in coastal areas – IPA Cross-Border Programme (2007-2013) implemented by Ministry of Energy, 2011-2014.

- GREECE/ ALBANIA ENERGY TOURISM (G.AL.E.T) – IPA Cross-Border Programme (2007-

2013) implemented by the Ministry of Energy, 2014-2016.

- The Carbon Reduction in South-East Europe-LOSCEE implemented by the Ministry of Environment, 2012-2014.
- Adriatic Forest Model - IPA Adriatic program, implemented by the Agricultural University of Tirana, 2012-2014.
- Consolidation of the Environmental Monitoring System in Albania (CEMSA), implemented by the Faculty of Natural Sciences, Biology Department, University of Tirana, 2010-2013.
- Capacity strengthening of MoE for designing laws and for National environmental legislation application-SELEA - IPA 2010, implemented by the Ministry of Environment, 2012-2014.
- Rural Development Programme IPARD, implemented by the Ministry of Agriculture, 2007-2013.

EU TEMPUS, ERASMUS Programmes:

- RESI Renewable Energy Studies in Western Balkan Countries, implemented by the Faculty of Mechanics Engineering, Polytechnic University of Tirana, 2013- ongoing.
- E-learning Innovation and Sustainable Albanian Agriculture, implemented by the Agricultural University of Tirana, 2012- ongoing.
- Green-Tech-WB: Smart and Green technologies for innovative and sustainable societies in Western Balkans, implemented by the Agricultural University of Tirana, 2014- ongoing.

7.5. EDUCATION

The concept of education on climate change and sustainable development is relatively new in Albania. While the sustainable development is a concept more widely incorporated in various areas in the educational system, the concept of climate change remains inadequately incorporated into different levels of the educational system.

According to the National Strategy for Development and Integration 2016-2020 endorsed on 11th of May, 2016, improvements have been achieved in the legal and institutional framework with the adoption of the Law on Higher Education and the revision of the Law on the Academy of Sciences. Reforming the Academy of Sciences enabled the integration of research institutes of the Academy of Sciences and of line ministries into public universities. The higher education system was integrated with the research system by creating a modern institutional framework for rapid development of research and technology and knowledge transfer. Progress has been made in the strategic and operational management of research and technological development (RTD) programmes through the establishment of the National Agency for Research, Technology and Innovation (ARTI).

There are several faculties at public universities or private system that have graduate, post graduate level and/or PhD programs related to climate change, energy and sustainable development. Some specific examples are:

1. The University of Agriculture, Tirana, Faculty of Economy and Agro Business has at a Doctoral Level (PhD) on Conservation biology, subjects on global warming; sustainable development, etc.

2. The University of Tirana, Faculty of History and Philology, Department of Geography, under the Curriculum on Climato-geography, at undergraduate level (BS), under the Curriculum on Evaluation and management of natural risks at the Master Level (MS) and under the Curriculum on Climatology and under the Curriculum on Applied Hydrology, at Doctorate level (PhD) has subjects related specifically to climate change.

7.6 CAPACITY STRENGTHENING DURING THE NATIONAL COMMUNICATIONS PROCESS

The Ministry of Environment is responsible for national environmental policy and is the National Focal Point for the United Nations Framework Convention on Climate Change (UNFCCC), and has served as the National Executing Agency for the preparation of national communications. The Ministry has been placed in charge of facilitating the coordination of project activities with other government institutions and decision makers, including the Ministries in charge with Economy, Energy, Trade, Agriculture, Public Works, Transport, Health, Tourism, EU Integration, the INSTAT, the Academia and the University institutions, the General Directory of Civil Emergencies and interested NGOs. The UNDP Climate Change Programme in Albania has operated as the principal country level liaison with the government and private sector participants, ensuring effectiveness and cost-efficiency. UNDP-GEF NCSP are closely linked so as to have technical/administrative assistance on hand when required. Technical assistance has also been provided by the UNFCCC Secretariat, mainly through workshops and trainings.

The Government of Albania has taken the processes of preparation of UNFCCC National Communications (NC) very seriously, as these were considered highly valuable exercises. The government has put substantial resources and efforts into past/present NCs. Many institutions and specialists have been trained and institutional capacity has been built and sustained. NC projects were approached through large stakeholder consultations during both stocktaking exercises and implementation processes, which ensure that NC goals and objectives are consistent with national sustainable development priorities.

The NC process in Albania has been extremely important in mainstreaming and integrating NC findings into other developmental, sectoral strategies/policies. It has also been the main source for mobilizing other funds/projects in the area of climate change. The Second National Communication (SNC) built on the results of the first and the 2004 Technology Needs Assessment (TNA). The TNA identified technology transfer needs for climate change mitigation and adaptation. The Third National Communication (TNC) builds on the results of the SNC. This TNC is trying to include gender issues in the elaboration of the report. Overall it tries to integrate different perspectives and knowledge into the national communication process. At a first step it designs a comprehensive guideline on mainstreaming gender into climate change adaptation and mitigation programmes and plans in Albania, using the UNDP Toolkit on Gender Responsive National Communications and other relevant UN tools and methodologies on gender equality.

The daily functions of climate change analysis at the MoE are being gradually transferred to the Agency of Environment, where a new sector was created recently with tasks related to GHG inventories. The TNC project is helping to build the capacity of the Agency of Environment in the areas of GHG emissions inventory, mitigation analysis and vulnerability and adaptation. An Inter-ministerial Committee on Climate Change has been set up as a permanent coordinating body regarding climate change issues. It is headed by the Deputy Minister of Environment at the political level, and supported by the nominated technical focal points in each and every related institution. This committee improves the stakeholders' coordination.

7.6.1 Through the NC activities

The Third National Communication project implementation included a variety of investment and technical assistance activities to strengthen the capacities of Albania to address climate change impacts. In several interventions, capacity strengthening is the primary focus of the project. Some of them are:

- "Albanian Country Programme under the Global Solar Water Heating Market Transformation and Strengthening Initiative", financed by GEF/UNDP/MoEI/MoE, 2010-2015.

- 'Identification and implementation of the adaptation response measures in the Drini-Mati River deltas' which has built the local capacities in Lezha County to introduce climate change adaptation measures in their development plans, financed by GEF/UNDP/MoE.

- Support for the development of Nationally Appropriate Mitigation Actions (NAMAs) including strengthening the analytical and institutional capacity of key national institutions, a comprehensive assessment of NAMAs for key sources, and support for the identification, prioritisation and development of specific NAMAs;

- Support for the development of the Intended National Determined Contribution (INDC) of Albania.

7.6.2 Through other activities

- Roadmap for introduction of Monitoring, Reporting and Verification (MRV) of GHG emissions under EU ETS in the Republic of Albania.

- Green Growth Program and Climate Change Analytic and Advisory Support Program; supported by the World Bank.

- Project for Strengthening the Administrative Capacity of the Energy Department at the Ministry of Energy and Industry and the National Agency for Natural Resources.

- Energy Efficiency Capacity Building Program in South East Europe (SEE) being implemented by the World Bank Institute of Climate Change Practice: to address some of the barriers in EE and on the use of carbon market mechanism.

- Climate Change adaptation in Western Balkans (CCAWB): To support five countries respectively, Albania, FYROM, Montenegro, Kosovo and Serbia on capacity strengthening; supported by The Federal Ministry of Germany for Economical Collaboration, 2012-2018.

- Ozone related project, Institutional Strengthening, financed by UNEP/UNIDO, 2011-2014.

- Transboundary Biospheric Park of Prespa, Support for Prespa National Park, Albania, Financed by the German Government, KfW Bank, 2011-2015.

- Disaster Risk Preparedness and Management of the heritage cultural sites, in the frame of the programme One UN in Albania, 2011, implemented by the Ministry of Culture.

- Program for the Prediction, Prevention and Mitigation of Forest Fire and Flood Risk in Albania; supported by the Italian Civil Protection Department, 2010-2012.

- The Municipal Climate Change Strategies project sponsored by USAID to prepare municipal stakeholders for managing local climate change challenges.

7.6.3 Nationally Assigned Technical Teams

In order to maintain the capacity built during previous NC processes, Albania has kept intact the core members of the respective technical teams, while at the same time expanding the group size. This has maintained institutional memory and will alleviate previous limitations, obstacles, and challenges associated with, among others, the GHG inventory development. The detailed experience form past efforts will also ensure coherence, continuity, stakeholder participation, and pertinent synergies. There are three teams (climate change policy, inventory & mitigation and adaptation) each consisting of 5-8 experts from several universities both public and private, the Institute of Geoscience, Energy, Water and Environment, and freelance experts falling under the areas of (i) institutional capacity and legal framework; (ii) GHG inventory and mitigation analysis; and (iii) Vulnerability and adaptation. These experts have managed to remain in the climate change experts roaster since the INC, and who upon receiving several significant trainings have, in turn, served as trainers for other interested experts/group of experts, including ones in charge of related activities from the Ministry of Environment, Agency of Environment and other line ministries. The knowledge gained has assisted the country in mainstreaming climate change into development policies.

7.6.4 TNC Preparation Process

The TNC preparation process in Albania is undertaken in a way that allows consultation with a broad range of stakeholders' at all stages: stock-taking, inception and implementation. The major stakeholders consulted under the leadership of the Ministry of Environment are those working within Ministries responsible for energy, transport, agriculture, tourism, health, education, urban development, civil emergencies and interior; Institute of Statistics; academia institutions and civil society. The roles/viewpoints of each have been very important in consultations especially with regards to (i) priorities selected for the national communications both in the areas of GHG abatement analysis and adaptation; (ii) data collection and their quality control/quality assessment; and (iii) NC findings, recommendations and concept ideas/mitigation/adaptation plans included in the respective reports. The process also helped to build capacities in the area of climate change, for example:

1. The Stock-taking process helps stakeholders:

    a. Understand the rationale behind TNC preparation and other general issues and trends occurring in the country.

    b. Strengthen capacity on climate change and environment issues.

c. Increase data quality and availability.

d. Understand the preferred economical sectoral focus.

2. The Inception process was crucial in helping all partners to fully understand and take ownership of the process. Discussing the roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines, and establishing conflict resolution mechanisms.

3. The Implementation process consultations usually produced sound and accepted results. Broad stakeholder involvement helped not only to promote appropriate policy proposals, it also generated improved knowledge, methodologies, and human and institutional capacities that are necessary for the continued success of the NC process.

To address the lack of specific legislation to underpin the basis for climate change issues, especially on future updates to the GHG inventory, a legal document was drafted under the auspices of the TNC based on an analysis of the legal/institutional framework to implement the UNFCCC. Upon endorsement, this legal act will principally regulate the flow of information to prepare the GHG emissions inventory on a continuous basis. The obligations under the UNFCCC and the EU integration process are the most important incentives to keep the country's intention to improve the inventory process alongside with other environment related priorities.

The TNC team organized 13 different workshops delivered by the TNC experts' team which were directed towards development of institutional capacity for the preparation of technical chapters of NC: e.g. through GHG Inventory, LEAP, WEAP, V&A, GHG Mitigation, NAMAs, GENDER and MEDIA workshops.

The INDC process has also contributed to raising awareness on climate change by carrying out a series of activities between September 2015 and February 2016, using a range of tools. In the course of the TNC preparation, continuous assistance was given to the national delegations to the 19th, 20th, and 21st Conference of Parties to the United Nations Convention on Climate Change.

8 CONSTRAINTS AND GAPS AND RELATED FINANCIAL TECHNICAL AND CAPACITY NEEDS

8.1 CONSTRAINTS

8.1.1 GHG Inventory and mitigation

There are still constraints related to the activity data as per different sectors involved in the GHG emissions inventory and mitigation analysis. Furthermore, the official activity data either are not fully compliant with the needs of the GHG emissions inventory or do not always match, like for example, there have been a slight differences in data with regards to the population figures registered by the Institute of Statistics (INSTAT) and figures declared by Municipalities and/or other international organisations.

Policy priorities directly related to mitigation efforts include:

- Continuing to promote market reforms, such as more realistic market pricing in energy and transportation sector, that can accelerate economic growth while reducing growth in emissions;

- Working together with other developing countries (Non-Annex 1 countries) through bilateral and multilateral programs aiming to improve investment environments and create stronger incentives for joint climate-friendly investments;

- Creating cross-sector strategies between climate mitigation and other development priorities that will support policies which address both climate and local environmental needs.

- Improving and supporting renewable energy and energy efficiency strategies.

While formulating such policy strategies, it has to be taken into account that technologies may be developed in the future that could significantly alter the costs of mitigation policies. The growth of the industry sector, implies the identification of special mitigation measures. There are examples where policy has been effective, for instance, policy efforts to eliminate deforestation and boost reforestation are considered to contribute significantly to achieving the required mitigation goals. However, there is still much uncertainty regarding both the costs and the impacts of such policies and, therefore, the success of such policy efforts are difficult to quantify and evaluate, even in studies related to other countries[4].

Finally, it has been found that suggested requirements for mitigation policies should comprise the following characteristics[5]:

1. Comprehensiveness, both in terms of addressing all GHG gases and in engaging the largest possible number of sectors;

2. The formulated strategy has to be both credible and flexible;

Finally, and when endorsed, the mitigation related strategy needs to be implemented as soon as possible.

4 OECD, 2008
5 OECD, 2008

8.1. 2 Vulnerability and Adaptation Assessment

One of the main challenges found during the preparation of the TNC was assessing climate risks in Albania. Issues such as the lack of historical data for different sectors, lack of indicators and data regarding different hazards and disaster events obstruct a comprehensive and a cross cutting vulnerability and risk assessment.

Analysing climate change risk in Albania is a significant challenge because more than 90% of all natural events that have taken place in Albanian over the last two decades (1993-2014) were caused by hydro-meteorological hazards. There is a very close link between climate change and disaster risk reduction given that climate change is expected to increase the incidents of extreme events. This requires a multi-disciplinary framework and a cross cutting analyses that will allow the country to adopt the best adaptation options.

Disasters are causing economic losses in Albania and the number of events is increasing in frequency leading to ever greater economic losses and environmental impact, as well as stretching the capacity of the national system (ministries, prefectures, and communes) to manage the growing number of emergencies, especially flooding events. It is known that heavy precipitation events cause flooding, but most floods, especially in the last 15 years, are exacerbated by bad management of infrastructure in cities or and/or mismanagement of hydropower electric dams located in the Drini and Mati rivers, etc. This makes it difficult to determine the exact extent of the impact that can be attributed solely to the impacts of climate change. It is also a challenge to predict the impacts of sea level rise along the Adriatic coast due to the fact that the area is tectonically very active, and local uplift or subsidence could have a greater influence on coastal dynamics than climate induced sea level rise in itself.

The ability of the legislative systems to keep pace with identifying and implementing adaptive measures is a challenge. This is evidenced by the National Strategy for DRR, which is waiting to be approved by the Parliament together with the new law of Civil Emergency. Current constraints centre on how to:

- Incorporate disaster risk reduction concerns into future planning and development.
- Develop effective national Early Warning Systems for emergency plans for health risks of climate change.
- Raise awareness of the health risks from extreme weather and climate change.
- Enact and enforce legislation.
- Increase the capacity of adaptation and protection systems.

Another challenge is identifying the most appropriate adaptation measures due to the considerable uncertainty regarding future climate change impacts. One important aspect that the government should take into account is the incorporation of climate change and disaster risk reduction considerations into all aspects of policy planning and development.

- During our study we found that there is a lack of capacity, experience and resources to:
- Develop a comprehensive climate change national adaptation plan[6] and also integrate

6 National Adaptation Plan will be drafted in the frame of the project 'Climate Change in Western Balkan countries' supported by GIZ

such a plan at all levels and identify strategies at national, local levels.

- Upgrade the existing national early warning systems with new and updated infrastructure (hardware and software). It is also imperative to develop emergency plans according to accurate assessment of the national hazards.
- Improve coordination between government ministries responsible for CC and DRR.
- Improve data availability and accessibility for all national institutes; Institute of Geosciences, Energy, Water and Environment (hydrometer logical data), Albanian Geographical Survey, etc.
- Build capacity to engage in policy dialogue and ensure participation of vulnerable groups in decision-making.
- Bring DRR and climate change adaptation into the educational system at all levels (Awareness-raising (engaging with the media))
- Mainstream climate change considerations into all economic activities
- Strengthen regional and international cooperation on DRM and CCA initiatives.

8.2 CAPACITY STRENGTHENING NEEDS

The capacity strengthening needs for various sectors were reported under each chapter of this National Communication. Additional capacity needs have been identified in the area of innovation, R&D and technology transfer related to climate change. Due to Albania's pressing social and developmental needs, resources for climate change related activities remain scarce. Furthermore, ensuring the sustainability of the NC process remains a challenge mainly due to a lack of:

i. A strong and efficient coordinating body on climate change issues;

ii. Specific legislation to address the basis for climate change issues, which leads to difficulties regarding concrete institutional support/inputs to the NC preparation by a diverse set of economic sectors; and

iii. Qualified personnel within public institutions to undertake analysis related to the preparation of NC.

According to the Public Environmental Expenditure Review - PEEx - prepared for Albania in July 2013, supported by the Government of Albania, World Bank and SIDA, Albania is dominated by investments and donor funding compared to direct domestic financing. Over the period 2007 to 2012 investments accounted for 85-94% of the total PEEx. In total, the PEEx (in million Euros) ranged from 16,401 in 2007 to 23,486 in 2012.

The use of the PEEx for sewage and wastewater treatment dominates over other sectors in Albania. As a mean over the period 2007 to 2012 sewage and wastewater treatment accounted for 67 % of the total PEEx. Other uses included management of solid waste (14 %), protection of biodiversity (5%), followed by administrative costs (4%) and other environmental costs (4%). The use of PEEx to address climate change was (2 %), followed by its use to improve air quality at only 1%.

The efficiency of PEEx suffers from a range of issues including:

- Low level of environmental awareness in the population;
- Unrealistic strategic priorities in the environmental sector;
- Limited inter-institutional cooperation;
- Low public trust in the working of institutions;
- Low willingness among citizens to pay for public services in the environmental sector.

9 THE GUIDELINES TO MAINSTREAMING GENDER IN CLIMATE CHANGE ADAPTATION AND MITIGATION PROGRAMMES AND PLANS IN ALBANIA

9.1 BACKGROUND AND METHODOLOGY

These guidelines are based on a UNDP initiative to support Albania abide by UNFCCC's reporting requirements regarding gender equality issues. The guidelines were developed on the basis of a small desk research analysis carried-out on Albania's gender situation, and on information acquired during the process of drafting the Third National Communication to the UNFCCC. Furthermore, it utilises results of stakeholder interviews undertaken between 18 January and 19 February 2016and from the validation workshop with local and national governmental institutions, academia and CSOs on 23 February 2016 in Tirana organised by UNDP Albania. The Gender Responsive National Communications Toolkit (2015) by UNDP provides a systematic approach for the development of these guidelines.

Aim

The aim of these guidelines is to establish an understanding of the importance of gender mainstreaming in climate change adaptation and mitigation programmes and plans in Albania, and to highlight key principles and prerequisites for its effective implementation.

Scope and target audience

The guidelines are intended to be user friendly so that they are applicable for any future planning and programming of climate change mitigation and adaptation activities in Albania. The background analysis helps to set the scene providing valuable information, while demonstrating at the same time that there is a lack of data. The guidelines identify, entry points for gender within a planning process and provides examples that can be applied accordingly. At the same time the guidelines are flexible to allow further adaptation in order to serve for replication by other sectors on gender mainstreaming in climate action in Albania. The target audience are policy makers and implementation staff of ministries, regional and local authorities and co-operation partners involved in climate change adaptation and mitigation.

9.2 LINKS BETWEEN GENDER AND CLIMATE CHANGE

The links between climate change and gender are revealed by analysing gender dimensions as part of the social context and conditions of various human activity fields being affected by/or contributing to climate change. This list of dimensions helps to identify the key topics to look at in more detail during subsequent further stages:

Socio-economic dimension

The gender division of labour and of access to resources, such as income (with its persisting gender pay gap), land, assets, information and education play a crucial role within the assessment of climate impacts and of human patterns that contribute to climate change. Programmes and projects mitigating contributions to climate change, or adapting to climate change impacts, have to reflect the different roles and the varying resulting needs of women and men. The impact of climate change might also be different for women and men, and responses need to take this into account.

Socio-cultural dimension

Cultural, religious and traditional patterns and norms towards women and men differ from society to society. Mitigation and adaptation activities have to take into account these different gender patterns and norms based on cultural and ethnic backgrounds. For example, mobility (cultural constraints, safety issues) and energy (gender segregation of the labour markets, with consequences for participation and power)).

Legal dimension

The legal status of women and men differs; women and men do not always enjoy the same rights, such as inheritance rights which in many countries favour men. If laws are not implemented or enforced correctly, or if laws fail to address any obstacles that impede the equal treatment of women and men before the law, they could have an indirect discriminatory effect. Measures therefore need to take into consideration underlying factors which disproportionally affect individuals' equal treatment before the law.

Political dimension

Access to participation in decision-making processes and access to leading positions/power is not gender neutral. The consequences are that women's voices are not equally represented in political and other decision-making structures, which is reflected in climate policies and practices. Moreover, gender mainstreaming efforts in mitigation and adaptation policies and programmes can enhance gender equality having a general transforming effect. On the other hand, ignoring gender differences within these decision-making processes can increase existing gender inequalities.

Physiological and biological dimension

Obvious physiological and biological differences between the sexes can be exacerbated by socio-cultural stereotypes. Stereotypes can be harmful, lead to wrongful discrimination, and affect individuals' access to their rights. In times of crisis, such as climate change disasters, it is common that women and men get pushed back into stereotypical gender roles. This results in increased sexual and gender-based violence towards women and girls.[1] It is therefore very important to implement safeguards against gender harm and address root causes leading to increased violence.[2]

These gender dimensions consequently lead to discrepancies in knowledge, skills and practical needs and strategic interests. Of particular interest are:

- Women's and men's roles in natural and productive resource management;
- Women's and men's roles in the production and the use of energy;
- The gendered impacts of climate change;
- Women's and men's roles in climate policies/plans and programmes.

1 Asian Pacific Institute on Gender-Based Violence. Gender-Informed Disaster Planning & Response. See http://www.api-gbv.org/issues/disasterplanning.php (accessed on 13 February 2016).

2 UN Women. 2014. *Climate Change, Disasters and Gender-Based Violence in the Pacific.*

9.3 CURRENT SITUATION

a) International binding and non-binding obligations

Albania has ratified the Council of Europe's 2011 Convention on Preventing and Combating Violence Against Women and Domestic Violence ("The Istanbul Convention")[3] and the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW). However, it currently lacks full monitoring on the harmonisation of CEDAW within its domestic law.[4]

Albania also has non-binding obligations to ensure gender is mainstreamed in climate change policies as a non-annex party I to the United Nations Framework Convention on Climate Change (UNFCCC); as well as to other agreements, such as to the Beijing Platform for Action, the Kyoto Protocol, the Copenhagen Accord, the Paris Agreement, and the 2030 Agenda for Sustainable Development (SDGs). Goal 5 of the SDGs imposes a non-binding moral obligation on Albania in "providing women and girls with equal access to education, health care, decent work, and representation in political and economic decision-making" to fuel sustainable development.[5] Albania has not yet shown commitment to the Sendai Framework for Disaster Risk Reduction 2015-2030.

b) National de jure and de facto situation of Albanian women's rights

Women in Albania are equal before the law, but face many obstacles in realising their rights translated into a gender equal society. Access to assets lead to an inferior economic position of women, as demonstrated by the gender pay gap, extremely low level of property ownership, differences in pensions, as well as to inheritance and land,. More women than men hold informal employment and vulnerable jobs that are generally lower paid. Furthermore their low representation amongst owners of "hard sector" and economic powerful companies, such as in the transport or energy sector, confirms the assumption of Albanian women's low economic status. Women make up the majority of the workforce in agriculture, but usually do not own farms; however, any deterioration in the agricultural sector makes them vulnerable, economically when losing their job and the basis of their subsistence farming opportunities. Even though women in Albania tend to be well educated, there are less young women than men studying the technical subjects that are key when looking for solutions in mitigation climate change. The low representation of women in parliament (20%) is a key indicator for obstacles women face in society to actively take part in decision-making processes. The emergence of son preference and a skewed sex ratio show how disadvantaged the status of women in Albania is.

Only one recent study (UN Women Albania[6]) highlights the negative effects of climate change related flooding on rural women in the area of Ura Vajgurore, Otllak, Kozare, Morave, Akerni, Fitore and Novosele. The data were acquired from a quantitative survey conducted in approximately 130 households and during focus group discussions in the affected areas. More sex-disaggregated data on the issue are not available, therefore the results of this study are an important indication for gender inequality and floods. But overall this is indicative that there is a lack of sex-disaggregated data.

3 *CoE. Chart of signatures and ratifications of Treaty 210. See http://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/210/signatures (accessed on 2 March 2016).*

4 CEDAW. 2014. *Fourth periodic report of States parties due in 2014 – Albania*, para. 18.

5 *UN SDGs. Goal 5: "Achieve gender equality and empower all women and girls", see http://www.un.org/sustainabledevelopment/gender-equality/ (accessed on 29 January 2016).*

6 UN Women. 2015. *Gender Inequality and Floods Impacts in Albania*.

9.4 KEY CLIMATE CHANGE ISSUES IN ALBANIA

Key trends become apparent through the analysis of the Third National Communication and related research. The three key areas are:

Vulnerability and adaptation

Most of the Adriatic coastal area of Albania is flat and low-lying, and this makes coastal systems particularly susceptible to climate change. A climate change related increase in temperature leads to sea-level rises and makes coastal areas vulnerable for flooding. Maxima and minima of precipitation increase intensity and frequency of floods which have impacts on various sectors, such as tourism, water, agriculture, biodiversity conservation and health.

Greenhouse gas inventory

Albania's CO_2 emissions are not high compared to other countries, but they are expected to increase with higher living standards. The main contributors are the energy sector, in particular by fuel wood consumption, industry (in particular the cement industry) and transport.

Mitigation analysis

Albania's GHG abatement potential is mainly seen in the energy, waste and agriculture sectors (see TNC). The vast majority of Albania's electricity generation comes from large and medium-sized hydropower plants, which are prone to be affected by climate change leading to an increased dependency on energy import. This affects the energy sector as well as the highly energy dependant waste sector.

The various climate change-related reports (NC), policies and programmes (e.g. the NAMAs "*Supporting the implementation on the National Energy Efficiency Action Plan (NEEAP) in the residential, public and commercial sector"* and "*Replacing fossil fuels with non-hazardous waste in the Albanian cement industry";* as well as the NAP)[7] do not include a gender analysis as such. Vulnerability and adaptation assessments take social factors (e.g. the participation of vulnerable groups) into account, but do not provide proper sex-disaggregated data and gender analyses.

Due to Albania's pressing social and developmental needs, resources for climate change related activities are scarce. A result of the process of the drafting process of the TNC is the identification of the following climate change related gaps:

- A permanent coordinating body on climate change issues;
- Specific legislation to address the basis for climate change issues, its absence creates difficulties regarding concrete institutional support/inputs to the NC preparation by a diverse set of economic sectors; and
- Qualified personnel within public institutions to undertake analysis related to the preparation of NC.

7 Other Programmes related to awareness raising and capacity-building: (1) *New National Strategy for Development and Integration (NSDI), 2014-2020;* (2) *Flood risk management Plan (Shkodra Region), 2012-2018;* (3) *2030 Policy Framework on Climate and Energy*; (4) *NORMAK Sustainable Energy*; (5) *Climate change adaptation in the Western Balkans, 2012-2018*; (6) *IPA Flood (Programme for Prevention, Preparedness and Response to Floods in the Western Balkans and Turkey), 2015-2017*.

Integrating gender into climate change programmes and policies presents an additional task and further need of resources and capacity. However, there are positive examples from other sectors, such as the Inter-ministerial Working Group responsible for drafting the Gender Equality Strategy 2016 – 2020, and the Working Group responsible for the drafting of the Report on the Implementation of the Beijing Declaration and Platform for Action, taking social factors into account. The Ministry of Environment (MoE) is a member of these working groups and could thus build on this experience. It is recommended that the MoE includes, amongst others, representatives of the Ministry of Social Welfare and Youth (MSWY) in committees and expert working groups who are developing climate change related policies and programmes. There is evidence that effective coordination produces high levels of added value for further policy processes.

9.5 IDENTIFICATION OF KEY GENDER AND CLIMATE CHANGE ISSUES, DILEMMAS AND OPPORTUNITIES

The gender profile of Albania as well as the main climate change trends and policies and programmes in Albania provides a set of data for each sector, but little to no nexus is made by either of the sectors. The analysis of these data and available information leads to the conclusion that the understanding of the link between environmental sustainability and gender equality, and their relation to cultural and social norms, is low. There is a need to develop clear evidence about the benefits of such data, the real cost of environmental exploitation and gender inequality, and how they are connected to climate change[8].

Taking specific needs and experiences, and knowledge of women and men into account for an effective and efficient programming and planning of mitigation and adaptation activities, as well as responding to specific gendered variations in vulnerability is not yet part of the sector working on climate change. This conclusion can also be drawn from the results of stakeholder interviews undertaken between 18 January and 19 February 2016and from a validation workshop with ministries, academia and CSOs on 23 February 2016 in Tirana organised by UNDP Albania.

a) Interviews and workshops conducted for the purpose of the creation of these guidelines

40 parties were interviewed between 18 January and 19 February 2016. All interviewed parties were then invited to a workshop on "How to mainstream gender into climate change programmes?" organised by UNDP Albania held on 23 February 2016 in Tirana. On the one hand the workshop aimed at introducing a tool developed to provide a step-by-step approach to mainstream gender into climate change mitigation and adaptation programmes and policies (see below), and at validating the concept. In addition, the intention of the workshop was to bring together different stakeholders and to raise their awareness of Albania's commitments to integrate gender into climate change activities. However, the Ministry of Social Welfare and Youth (MSYW), which has primary responsible for gender equality issues, was not represented despite the major role it ought to play in this context. But staff from a subordinate structure of the MSWY, the State Social Service (National Shelter for the Treatment of the Victims of Domestic Violence), took part in the workshop and contributed with valuable gender expertise.

The results of the interviews and the workshop confirm what had already emerged from desk research showing that not much sex-disaggregated data on climate change is available. This is not only due to a lack of understanding of the links between these issues and general co-oper-

8 UNDP. 2015. *Gender Responsive National Communications Toolkit*, p. 32.

ation between the sectors. Gender mainstreaming, a principle enshrined in the National Strategy on Gender Equality, is used in some places, but in these instances mainly due to obligations imposed by international donors or other agencies. Generally, it is not a commonly used tool. A reason for this might be that most ministries are not employing a gender officer or focal point, and are thus without gender expertise thereby facing major challenges working on gender equality as a cross-cutting issue. This also applies to NGOs who are not aware of the benefits of sharing gender expertise with other sectors and the need to mainstream gender widely.

b) Outcomes of the workshop and suggested follow-up actions:

- Use of the Guidelines to ensure integration of gender into national climate change policies, programmes and plans (adaptation and mitigation policies/ programmes/plans);
- Strengthening capacities of relevant institutions and civil society in order to integrate gender into national climate change policies, programmes and plans;
- Promote inter-institutional cooperation for addressing gender and climate change issues;
- Stronger involvement of NGOs (gender and environmental/climate change);
- Raising awareness regarding gender and climate change adaptation and mitigation, following measures already undertaken to build institutional capacity (activities related to climate change education, capacity building and awareness) for implementing UNFCCC in Albania;
- Revision of the Inter-ministerial Committees, Working Groups' composition (inclusion of gender representatives in the Climate Change committees/groups and environmental/climate change representatives in the gender ones); extension of the UNFCCC Committee with a representative from the Ministry of Economic Development, Tourism, Trade and Entrepreneurship etc.;
- Establishment of a database, segregation of data by sex and exchange of information between main institutions (MoE and MSWY) and others;
- Institutional arrangements, such as appointment of gender staff at the MoE and within other ministries;
- Necessity to set gender-sensitive indicators to monitor implementation.

9.6 APPLYING GENDER MAINSTREAMING – STEP BY STEP APPROACH

a) General background

Gender mainstreaming is a tool for achieving gender equality, which itself is a human rights obligation enshrined in many international treaties and declarations, inter alia in the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW). This means that gender appropriate policies and programmatic responses have to be in line with human rights principles[9]. These principles include equality and equity, non-discrimination, **participation**, **empowerment** and **accountability**.

Most prominent is **participation,** including two main aspects:

i. Focussing on ways of working that enable women, men, girls and boys to be actively involved and encouraging the participation of marginalised, disempowered and discriminated against groups of women and men in decisions.

ii. Focussing on processes of decision-making, referring to issues such as *how* decisions are taken, *at what stage* of programming and project cycles and *how views* of men and women are *taken into consideration*.

9 UN Women. 2014. *Guidance Note: Gender Mainstreaming in Development Programming*, p. 15.

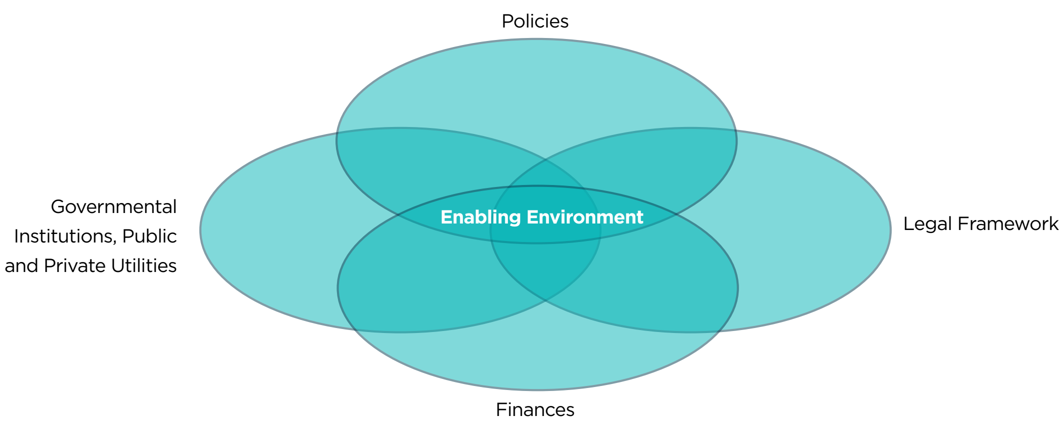
The principle of **empowerment** has a political and an economic component. Empowering women in climate change mitigation and adaptation programmes and policies has an additional significance, since in particular the mitigation sector with its economic orientation in order to establish a centralised technical infrastructure is deemed to be a traditionally "hard" sector. This category of planning centralised systems attracts a lot of funds, however, being very technical it is often male dominated and lacks gender-responsive approaches.

Accountability is crucial to achieve long-term results in mainstreaming gender. This includes the adoption of gender indicators which should be the basis of any monitoring. The principle of mutual accountability supports the development or improvement of accountability mechanisms to hold all stakeholders such as donors or governments to account for their work to reduce gender gaps and empower women. The following step-by-step approach shall serve as guidelines for ministries, regional and local authorities and co-operation partners involved in climate change adaptation and mitigation to conduct gender-responsive designing, planning, implementing and monitoring of such programmes and plans.

b) Prerequisites

The enabling environment is the given framework of a country encompassing the political system as a whole as well as other related internal and external circumstance. An active civil society with NGOs, being capable and financially well equipped, is a determining factor of a balanced political system. See the Guidelines for detailed explanation of the issues that should be identified when analysing the prerequisites.

Figure 9.1: The four elements of an enabling environment



- ### Legal Framework

In general, the national legislation and the regional legislation (laws and regulations) need to address discrimination based on the grounds of gender and should aim for gender equality (as such obligations under international treaties, such as CEDAW). A further developed legal framework would require mainstreaming to a level where laws and regulations governing climate change adaptation and mitigation already address gender-based discrimination and gender equality. When assessing the legal situation in a respective country and a specific sector it is at the same time important to evaluate how advanced the implementation of the legislation is at the national and regional level. This does not only include administrative procedures and regulations, but also the judiciary and the question of access to justice (legal aid).

- **Policies**

A gender policy or a national gender action plan is an indicator of a certain level of awareness of tackling gender issues at the national level as well as a parameter of how to handle it on sub-national levels. However, without proper implementation, including a sufficient allocation of budget for gender-related activities, any policy is meaningless. Furthermore, the collection of sex-disaggregated data goes hand-in-hand with developing proper gender policies. National policies on climate change need to incorporate gender issues and should mainstream gender. Mitigation and adaptation approaches require a concerted effort bringing together all policies, therefore it is important to look beyond standalone policies. Policy areas (such as environmental policy, industrial policy, etc.) have to be informed by gender equity and climate mitigation/adaptation policies and programmes.

- **Governmental institutions**

The proper implementation of legislation and policies requires gender awareness and capable as well as committed management and staff in relevant governmental positions. Thus, gender mainstreaming in decision-making is key as well as awareness raising and training on gender issues within ministries and subsequent departments' needs to be implemented. A determining factor is also the ratio of men and women working in the relevant ministries/departments.

- **Finances**

Budgeting policies referring to public revenues but also pertaining to economic policy – in particular to climate change mitigation and adaptation - should be gender equitable and enhance gender equality.

c) Integrating gender into climate change adaptation and mitigation programmes and plans

In the "Shared Vision"of Cancun in 2010[10], the Parties to the UNFCCC stated that "gender equality and women's participation are necessary for effective action on all aspects of climate change". Since then UNFCCC Parties have recognised gender equality as a concept by integrating it in many decision on nearly every UNFCCC thematic area[11]. More specifically in Durban in 2011 the Decision 5/CP.17 on Guidelines for National Adaptation Plans was adopted. In paragraph I on the "framing" of a NAP it recommends to States Parties to follow a "gender-sensitive, participatory and fully transparent approach"[12] when designing a NAP. For NAMAs there exists no specific international guidance on how to design them in a gender-responsive manner[13]. See the Guidelines for more descriptive assessment and advice on gender responsive entry points.

- **Stakeholders**

A first step for establishing climate change programmes and plans is the management of relevant stakeholder engagement. When developing NAMAs and NAPs engaging relevant stakeholders will be up to the department coordinating the planning. The team needs to be aware of gender equality issues, should reflect a certain gender balance, and should have opportunities

10 UNFCCC. 2011. Report of the Conference of the Parties on its seventeenth session, held in Durban from 28 November to 11 December 2011. Addendum. UN Doc FCCC/CP/2010/7/Add.1.

11 More in Aguilar, L. et al. 2015. Roots for the Future, p. 67 et seqq.

12 UNFCCC. 2011. *Report of the Conference of the Parties on its seventeenth session, held in Durban from 28 November to 11 December 2011. Addendum.* UN Doc FCCC/CP/2011/9/Add.1.

13 Aguilar, L. et al. 2015. *Roots for the Future*, p. 223.

to build on external expertise (gender experts) as well as to build their own capacity. For this as well as for the process itself an adequate budget has to be allocated (gender budgeting).

The **mapping** of stakeholders serves the identification of groups, institutions, governmental bodies and NGOs that will be impacted by or can affect climate change outcomes. Additionally, for the purpose of gender mainstreaming it is useful to refer to gender experts who may initially have no experience on climate change and no prior involvement in these issues.

The **analysis** of stakeholders aims at identifying which stakeholders can contribute to the discussion of a programme and/or plan and how they can facilitate the development of such action. Information on gender issues in climate change has to be shared via mainstream media, social media, outreach and preliminary meetings with key groups of stakeholders. Generally, the messaging should emphasise the relevance of climate change to men and women, how women and men can be equal actors and agents of change in adapting to and mitigating climate change. The value of both men's and women's contributions in submitting information and taking part in the consultation needs to be highlighted. Information relevant to the planned programme has to be made available in an easily accessible and understandable way (language/illiteracy issues/internet access?).

The process of engaging stakeholders is more than an initial phase as it is aimed at building long-lasting partnerships and initiated in order to facilitate sustainable cross-sector cooperation. Effective co-operation is key for the successful implementation of a gender equitable climate change programme or plan.

- **Stocktaking through gender analysis**

Stocktaking is carried out in order to collect and document information, data, institutions and situations relevant to the planned climate change programme or plan. This exercise of describing the national circumstances is also undertaken for the National Communication (NC) or Biennial Update Report (BC) and as such part of a chapter with the same title.

For the purpose of developing adaptation and mitigation programmes and plans one should undertake a general participatory gender analysis[14] before looking at the specific topics related to adaptation and mitigation. Sex-disaggregated data are the basis for the analysis which can be conducted quantitatively and qualitatively including anecdotal evidence. Often gaps in sex-disaggregated data become visible; which have to be highlighted. New ways of collecting relevant data should be developed and responsible institutions, such as the national statistics office, have to be made aware of available data.

Vulnerability, adaptation and resilience – When developing adaption plans and programmes, vulnerability, including poverty levels, and capacity of the targeted region and community has to be examined. This approach analyses the relations between a community and their environment, whereby vulnerability and associated risks are largely social constructs that relate to development processes, structural (in)equalities, and sustainable resource management[15]. Social, economic and political dimensions have to be taken into consideration since they can result in a greater vulnerability of women and can be obstacles in building the necessary resilience of a community. But the knowledge and recognition of these gendered dimensions benefit the successful implementation of adaptation activities. Before starting an assessment it should be

14 For more information on various approaches for gender analysis see March, C. et. al. 1999. A Guide to Gender-Analysis Frameworks; also European Institute for Gender Equality. Gender Equality Index. See http://eige.europa.eu/gender-statistics/gender-equality-index/about .

15 Aguilar, L. et al. 2015. *Roots for the Future*, p. 134.

identified how much time, what kind of human resources and what budget is available.

Mitigation (NAMA) – No guidance exists for integrating gender into mitigation programmes and plans. Mitigation activities fall mainly within two categories: the reduction of GHG emission and carbon capture, fixing and sequestration. Most approaches to mitigating climate change impacts are based on technical and scientific solutions, often of large scale, ignoring social concerns including gender dimensions. Mitigation activities can also be targeted to household-level changes in water and energy use. Ignoring women's and men's different needs for and uses of resources, such as energy and water, as well as not recognising their different contributions to emissions and to their reduction can exacerbate gender inequality and poverty.

Technology needs assessment – Plans and programmes of adaptation and mitigation activities include the development, adoption and diffusion of technical solutions for emission to offset and reduce emissions, risks and vulnerabilities. In line with the national development goals of the National Strategy for Development and Integration 2015-2016 for socio-economic and environmental sustainability a technology needs assessment examines the introduction of relevant and appropriate technologies

- **Monitoring and indicators**

Integration of gender mainstreaming requires employing a thorough gender analysis as well as gender-sensitive monitoring. Measuring the implementation of commitments to integrate gender equality concerns into adaptation and mitigation plans and programmes deserve robust monitoring and accountability instruments.

The development of a gender-sensitive monitoring framework is part of the initial phase when setting up a programme or plan. Terms of references to guide women's participation in the monitoring process have to be drafted. Key is the definition and agreement of gender-sensitive indicators. A gender-sensitive indicator helps to track changes of the impact on women and men, e.g. women's empowerment and gender equality, via the programme's or plan's implementation[16]. See guidelines for recommended criteria for the selection of gender and climate change indicators.

16 UNDP. 2006. *Measuring Democratic Governance*, p. 17.

ANNEXES

ANNEX 4.1

Methodology

A.4.1.1 Climate modelling

The climate change scenarios for the Albanian coast, and the related impact analysis, are based on IPCC AR4 recommendations. Referring to the fact that IPCC recently moved away from SRES (TAR, ar4) and switched to using a new set of scenarios – called 'Representative Concentration Pathways' (RCPs) for the climate science assessment ('Working Group I') of the Fifth Assessment Report (IPCC AR5, 2014), the new climate change scenarios for the Albanian coast are produced (by using SimClim2013[50]), without making a reassessment of the individual sectorial climate impact studies.

The Climate Change scenarios for temperature, precipitation, mean sea level pressure and sea level rise are developed by using the model MAGICC/SCENGEN (v. 5.3, v 2).[51] As in vulnerability assessment it is recommended to use a range of SRES scenarios with a variety of assumptions to capture the range of uncertainties associated with driving forces and emissions, the global model MAGICC is run by using the following scenarios from different SRES families: A1BAIM, A2ASF, B1IMA, B2MES, A1FI-MI[52].

To develop the climate scenarios the change fields, scaled in SCENGEN by the global-mean temperature change derived from MAGICC, are used. The changes are generated for each emission scenario up to the year 2100, by using a multi-model average (see 4.2.2). The justification for use of a multi-model average is two-fold. First, multi-model averages are less spatially noisy. Second, by many measures of skill, multi-model averages are often better than any individual model at simulating present-day climate.

A climate change projection is the change between a model simulation of present climate[53] and the model climate projection for a period in the future under a specific emissions scenario. The changes in annual and seasonal patterns of temperature, precipitation and mean sea level pressure are generated for every ten years starting with 2020 up to 2100. It is to be noted that the time horizon means that the model is run for a period of 30 years, e.g. for the year 2050 the running time is from 2035 to 2065. The likely changes temperature, precipitation and mean sea level pressure are calculated. For the impact analysis mainly projections for temperature and precipitation for the time horizons 2030, 2050, 2080 and 2100 are considered. In order to facilitate the impact assessment the likely changes in temperature and precipitation are mapped through downscaling of the mentioned GCMs outputs for Europe to a grid of 1x1 km.

To evaluate the expected impacts of sea level rise, the model DIVA[54] is run in parallel with MAGICC (with the same scenarios as in MAGICC) for Albanian coastal regions.[55]

- **Model validation**

The General Circulation Models (GCMs) used to run SCENGEN are selected on the basis of their ability to accurately represent current climate, for Europe and Balkan as well as for the globe. In the Albanian case annual precipitation is used as the validation variable. Precipitation is more difficult to model than temperature and models do less well in simulating precipitation

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50 http://www.climsystems.com/simclim
51 http://www.cgd.ucar.edu/cas/wigley/magicc/
52 Albania's SNC to UNFCCC, DMRD synthesis report
53 In this report period 1961-90 is considered as climatic baseline
54 DIVA, a fully dynamic and interactive tool (product of the DINAS-COAST consortium), consists of a global coastal database, a model, a set of scenarios and a GUI that enables its users to simulate the effects of climate and socioeconomic change and of adaptation on natural and human coastal systems at national, regional and global scales.
55 Source: Albania's Second National Communication to UNFCCC

than temperature, so using precipitation is a stringent test of model skill. For this model validation the statistics used are: pattern correlation (r), root-mean-square error (RMSE), bias (B), and a bias-corrected RMSE (RMSE-corr).
After a detailed statistical analysis of these parameters five top models that that better simulate the present precipitation pattern are selected: BCCR-BCM2 (Norway); CNRM-CM3 (France); GFDLCM21 (USA); UKHADCM3 (UK); INCM-30 (Russia).

- **Climate change scenarios**

The seasonal and annual expected changes in temperature and precipitation patterns for Albania developed above used by GCM that have a low resolution (50*50 km), which is not appropriate for adaptation. A statistical downscaling process up to 1*1 km, which took into account the country's topography was carried out for the Albanian coastal territory.

- **Climate indices**

There were evaluated the changes in following climate indices to be used during the impact analysis.

- Maximum temperatures ≥ 35°C.
- Minimum temperatures < -5°C.
- Hazardous precipitation.
- Number of days with hazardous precipitation and SPI3 values.
- Expected changes in growing season.
- Degree days for heating and cooling.
- Tourism climate index (TCI).

A.4.1.2 Impacts analysis

The impact analysis is primarily based on three approaches

- Modelling.
- Analogue studies.
- Expert judgement.

For impact analysis of climate change in different sectors/systems the following are used:

- Water resources: WATBAL, WEAP, empirical statistical models.
- Agriculture: CROPWAT 8, statistical models, analogue studies, expert judgment.
- Forestry: statistical models to evaluate the shift in bioclimatic floors, DIVA (expected changes in coastal forestry areas), analogue studies, expert judgment.
- Biodiversity: habitat mapping to evaluate the loss of biodiversity from sea level rise using existing GIS metadata sources or Corine Land Cover in coastal area; DIVA (total wetland area, net loss of wetland area, low un-vegetated wetlands area), empirical model analogue studies, expert judgment.
- Tourism: Statistical models , Tourism Comfort Index[56], expert judgement, GIS.
- Population & settlements: GIS maps and DIVA to evaluate the population and the loss of settlements threatened by sea level rise in coastal areas.
- Coastal risk map (designed at scale1:50 '000): taking in consideration assessment of the climate change impacts in all targeted sectors within the coastal area.
- Adaptation maps (schematic, designed at scale 1:50 '000): the spatial mapping of adaptation measures proposed and prioritized in the frame of V&A activity.

56 After Mieczkowski Z (1985) the tourism climatic index: a method of evaluating world climates for tourism. Can Geogr 29: 220–233

4.1.3 Adaptation Analysis

Adaptation responses and decisions proposed by each and every sector/system are classified as:

- *Green*, measures aiming at raising the resilience of ecosystems and their services.
- *Gray*, invasive and/or energy intensive technical and construction measures aiming mainly at the protection of infrastructures or people.
- *Soft*, non-invasive spatial planning measures and measures to enhance knowledge transfer/raising adaptive capacity.
- *Fiscal*, aiming at saving critical resources/protect values by adaptation (e.g. water or public/private infrastructures) by introducing measures like payment for ecosystem services (PES) or risk transfer mechanisms (e.g. insurances).

There are many different criteria that might in principle be used. The criteria already used by the adaptation team for prioritization have been grouped under five separate ***Heading Criteria***, which may themselves help to prompt the inclusion of other criteria that may be important in specific circumstances. The Heading Criteria have been developed within a ***Score Rating***.

The Heading Criteria are:

- *Financial Indicative Cost* - covering the secured and estimated cost and expenditure associated with the project and the sources of finance.
- *Time Frame Criteria* - measure or action in question to the time implementation planning, that may impact on the timing or success of a proposed project.
- Potential *Partnership* - particularly in relation to support for, or opposition to, a proposed project and mobilization of additional funds.
- Principle of *Additionality* Criteria - that assesses existing institutions or related activities/ measures that could provide additional values.
- Win-Win Criteria - covering the wider economic framework (costs, benefits and affordability), relating directly to the nature of the project and how it can be implemented successfully to increase the resiliency of ecosystems and protection of the community.

ANNEX 4.2

Biodiversity: Impact of Climate Change on different Habitats

To determine the impacts on habitats, a five scale impact assessment was used to assess the severity of climate impacts on habitats (using GIS).

The main habitats (according to Natura 2000 Biogeographical Regions that are expected to be highly impacted by the climate change in time horizon 2050, are:

1130[57] - Estuaries – those of Ishmi and Erzeni rivers, likewise Buna, Drini (Lezha) and Mati rivers are also under degradation due to negative sediment balance resulting from gravel extraction and dams constructed upstream of their watershed. Vjosa, Semani and Shkumbini rivers are progressively increasing their estuaries, and natural successions are taking place along the newly created estuarine habitats (although this will be reversed by planned hydropower installations). Industrial and urban pollution is becoming another threat to estuarine habitats all along the coast.

1150 - Coastal lagoons – most are of brackish water regime during rainy season, while during dry summers their salinity increases. Climate change will exacerbate coast line dynamics and erosion as well as dry summer season anoxic conditions and algae blooms. Reclamation and drainage work from the agriculture sector, salt production for Industry, and management interventions for fishery have modified and altered their natural status. These changes will impact on breeding bird colonies.

1210 - Annual vegetation of drift lines – threatened by erosion that is removing this habitat.

1410 - Mediterranean salt meadows (*Juncetalia maritimi*) - characteristic of lowland coastal marshland influenced by the intrusion of the sea waters, and is found all along the Albania's coast where it is threatened by reclamation. This type of habitat will increase in the future due to sea level rise and intrusion of salt waters along the coast, and is expected to gradually replace most of the arable land that is placed along the coast.

1420 - Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*) - typical salt marsh vegetation, a good part of this habitat has been lost in the past due to reclamation work, but areas are being restored as a result of collapse of irrigation and drainage schemes along the lowland coastal zone. It is partly used for grazing and currently this habitat is threatened by tourism and industrial activity. In the future, this type of habitat will likely increase along the coast due to sea level rise and increased salinity of arable land.

1510 - Mediterranean salt steppes (*Limonietalia*) - this habitat type is of limited distribution and highly fragmented, but will benefit from climate changes and sea level rise as it is very highly adapted to high salinity.

2110 - Embryonic shifting dunes – are threatened by sea level rise, tourism and recreation and urbanization of the coastal zone. In the future, sea level rise scenarios are expected to heavily impact this type of habitat.

2120 - Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes') – threatened by tourism, recreation, coastal erosion, sea level rise and urbanization.

57 the numbers indicate the habitat code according to NATURA 2000 habitat classification

2190 - Humid dune slacks (dominated by *Erianthus ravennae* and *Schoenus nigricans*) - threatened by coastal erosion, tourism and recreation, including urbanization, together with degradation of sand dunes and increased salinity this habitat type will be heavily impacted and almost disappear from the Albania's coast.

2250 - Coastal dunes with *Juniperus spp* - threatened by tourism development, illegal log cutting and coastal erosion in some sections. Urbanization in some sections of the coast is another recent threat. Future climate change scenarios will all have adverse impacts that will drastically reduce coverage and distribution, and may almost disappear by the 2010 time horizon.

2270 - Wooded dunes with *Pinus pinea* and/or *Pinus pinaster* – although artificially created, many are in excess of 100 years old. There has been considerable loss through coastal erosion, as well as illegal and uncontrolled urbanization, tourism, and industrial developments along the coast. Climate change scenarios and sea level rise will adversely impact this type of habitat, by intensifying coastal erosion, inundation and increased salinity that will all affect both its distribution range and quality.

91F0 - Riparian mixed forests of *Quercus robur, Ulmus laevis* and *Ulmus minor, Fraxinus excelsior* or *Fraxinus angustifolia* along the great rivers (*Ulmenion minoris*) – some losses during the last 60 years due to intensive coastal erosion that will increase due to sea level rise, increased salinity and urbanization and illegal cutting.

92A0 - *Salix alba* and *Populus alba* galleries - the habitat is threatened by coastal erosion, increased salinity and tourism, industrial activities and illegal cuttings.

NATURA 2000's Coastal Habitats and their projected impacts from Climate Change.

Natura 2000 code	Habitat type	Distribution in Albania	Climate Impacts in 2050 (Very low; Low; Moderate; High; Severe)[3]
1.	COASTAL AND HALOPHYTIC HABITATS		
11.	Open sea and tidal areas		
1110	Sandbanks which are slightly covered by sea water all the time	Widespread	Severe (-)[4]
1120 *	Posidonia beds (Posidonion oceanicae)	Scattered	High (-)
1130	Estuaries	Widespread	Severe (-)
1140	Mudflats and sand flats not covered by seawater at low tide	Scattered	Severe (-)
1150 *	Coastal lagoons	Widespread	Severe (-)
1160	Large shallow inlets and bays	Scattered	Severe (-)
1170	Reefs	Rare	High (-)
12.	Sea cliffs and shingle or stony beaches		
1210	Annual vegetation of drift lines	Scattered	High (-)
1220	Perennial vegetation of stony banks	Rare	High (-)
1240	Vegetated sea cliffs of the Mediterranean coasts with endemic Limonium spp.	Rare	Moderate (-)
13.	Atlantic and continental salt marshes and salt meadows		
1310	Salicornia and other annuals colonizing mud and sand	Widespread	High (+)[5]
14.	Mediterranean and thermo-Atlantic salt marshes and salt meadows		
1410	Mediterranean salt meadows (Juncetalia maritimi)	Widespread	Severe (-/+)[6]
1420	Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)	Widespread	Severe (-/+)
1430	Halo-nitrophilous scrubs (Pegano-Salsoletea)	Scattered	Severe (-)

3 A five scale impact assessment is used to assess the severity of climate impacts on habitats: Very low- less than 5% of the habitat will be lost or affected due to sea level rise; Low-between 5- 24% of the habitat will be lost or affected; Moderate- between 25-49% of the habitat will be lost or affected; High-between 50-74% of the habitat will be lost or affected, and Severe (Very High)-more than 75% of the habitat will be lost or affected.
4 (-)-means that the climate impact is expected to be negative or adverse
5 (+)----means that the climate impact is expected to be positive or beneficial
6 (+/-)------means that the climate impact is uncertain

Natura 2000 code	Habitat type	Distribution in Albania	Climate Impacts in 2050 (Very low; Low; Moderate; High; Severe)[3]
15.	Salt and gypsum inland steppes		
1510 *	Mediterranean salt steppes (Limonietalia)	Very Rare	Low (+/-)
2.	COASTAL SAND DUNES AND INLAND DUNES		
21.	Sea dunes of the Atlantic, North Sea and Baltic coasts		
2110	Embryonic shifting dunes	Scattered	High(-)
2120	Shifting dunes along the shoreline with Ammophila arenaria ('white dunes')	Scattered	High (-)
2190	Humid dune slacks	Scattered	High (-)
22.	Sea dunes of the Mediterranean coast		
2220	Dunes with Euphorbia terracina	Very rare	Severe (-)
2250 *	Coastal dunes with Juniperus spp.	Scattered	Severe (-)
2270 *	Wooded dunes with Pinus pinea and/or Pinus pinaster	Widespread	High (-)
3.	FRESHWATER HABITATS		
31.	Standing water		
3130	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea	Scattered	Severe (-)
3140	Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.	Scattered	Severe (-)
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition — type vegetation	Scattered	Severe (-)
3160	Natural dystrophic lakes and ponds	Scattered	Severe (-)
3170 *	Mediterranean temporary ponds	Rare	Severe (-)
32.	Running water — sections of water courses with natural or seminatural dynamics (minor, average and major beds) where the water quality shows no significant deterioration		
3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	Scattered	Moderate (-)
3270	Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation	Scattered	Moderate (-)
3280	Constantly flowing Mediterranean rivers with Paspalo-Agrostidion species and hanging curtains of Salix and Populus alba	Scattered	Moderate (-)
3290	Intermittently flowing Mediterranean rivers of the Paspalo-Agrostidion	Scattered	Moderate (-)
5.	SCLEROPHYLLOUS SCRUB (MATORRAL)		
51.	Sub-Mediterranean and temperate scrub		
5110	Stable xerothermophilous formations with Buxus sempervirens on rock slopes (Berberidion p.p.)	Widespread	Low (-/+)
5130	Juniperus communis formations on heaths or calcareous grasslands	Widespread	Very low (+)
52.	Mediterranean arborescent matorral		
5210	Arborescent matorral with Juniperus spp.	Widespread	Very low (-)
5230 *	Arborescent matorral with Laurus nobilis	Rare	Very low (-)
53.	Thermo-Mediterranean and pre-steppe brush		
5310	Laurus nobilis thickets	Rare	Very low (-)
5320	Low formations of Euphorbia close to cliffs	Rare	Very low (+)
5330	Thermo-Mediterranean and pre-desert scrub	Widespread	Very low (+)
54.	Phrygana		
5420	Sarcopoterium spinosum phryganas	Rare	Very low (+)
6.	NATURAL AND SEMI-NATURAL GRASSLAND FORMATIONS		
62.	Semi-natural dry grasslands and scrubland facies		
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	Scattered	Very low (+)
6220 *	Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea	Scattered	Very low (+)
62A0	Eastern sub-Mediterranean dry grasslands (Scorzoneratalia villosae)	Scattered	Low (+)
62D0	Oro-Moesian acidophilous grasslands	Scattered	Low (+)
63.	Sclerophillous grazed forests (dehesas)		
6310	Dehesas with evergreen Quercus spp.	Rare	Very low (+)
64.	Semi-natural tall-herb humid meadows		
6420	Mediterranean tall humid grasslands of the Molinio-Holoschoenion	Rare	Low (-)
65.	Mesophile grasslands		
6510	Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)	Scattered	Moderate (-)

Natura 2000 code	Habitat type	Distribution in Albania	Climate Impacts in 2050 (Very low; Low; Moderate; High; Severe)[3]
8.	ROCKY HABITATS AND CAVES		
81.	Scree		
8130	Western Mediterranean and thermophilous scree	Scattered	Low (+)
8140	Eastern Mediterranean screes	Rare	Low (+)
82.	Rocky slopes with chasmophytic vegetation		
8210	Calcareous rocky slopes with chasmophytic vegetation	Scattered	Low (-/+)
8220	Siliceous rocky slopes with chasmophytic vegetation	Scattered	Low (-/+)
83.	Other rocky habitats		
8310	Caves not open to the public	Rare	Very low (-)
8330	Submerged or partially submerged sea caves	Rare	Moderate/High (-)
9.	FORESTS (Sub)natural woodland vegetation comprising native species forming forests of tall trees, with typical undergrowth, and meeting the following criteria: Rare or residual, and/or hosting species of Community interest		
91.	Forests of Temperate Europe		
9170	Galio-Carpinetum oak-hornbeam forests	Widespread	Very low (-)
91E0 *	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno- Padion, Alnion incanae, Salicion albae)	Scattered	High (-)
91F0	Riparian mixed forests of Quercus robur, Ulmus laevis and Ulmus minor, Fraxinus excelsior or Fraxinus angustifolia, along the great rivers (Ulmenion minoris)	Scattered	Severe (-)
91L0	Illyrian oak-hornbeam forests (Erythronio-Carpinion)	Scattered	Very low (+)
91M0	Pannonian-Balkanic turkey oak –sessile oak forests	Scattered	Very low (+)
92.	Mediterranean deciduous forests		
9250	Quercus trojana woods	Scattered	Very low (+)
9290	Cupressus forests (Acero-Cupression)	Rare/ Scatered	Very low (+)
92A0	Salix alba and Populus alba galleries	Widespread	High (-)
92C0	Platanus orientalis and Liquidambar orientalis woods (Platanion orientalis)	Widespread	Low (-)
92D0	Southern riparian galleries and thickets (Nerio-Tamaricetea and Securinegion tinctoriae)	Rare	High (-)
93.	Mediterranean sclerophyllous forests		
9320	Olea and Ceratonia forests	Scattered	Very low (+)
9340	Quercus ilex and Quercus rotundifolia forests	Rare	Very low (+/-[6])
9350	Quercus macrolepis forests	Scattered	Very low (+/-)
95.	Mediterranean and Macaronesian mountainous coniferous forests		
9540	Mediterranean pine forests with endemic Mesogean pines	Widespread (mostly cultivated)	Moderate/High (-)
95A0	High oro-Mediterranean pine forests	Scattered	Very low (+)

IMPACTS

Very low- less than 5% of the habitat will be lost or affected due to sea level rise;
Low-between 5- 24% of the habitat will be lost or affected;
Moderate- between 25-49% of the habitat will be lost or affected;
High-between 50-74% of the habitat will be lost or affected, and Severe (Very High)-more than 75% of the habitat will be lost or affected

As well as impacting vegetation, a decline in precipitation and resulting water shortages will further deteriorate fresh and brackish water wetlands along the coast consequently effecting ecology and aquatic life, especially breeding water birds. A reduced temperature range, resulting from a higher rate of increase in minimum versus maximum temperatures, is likely to occur over nearly all coastal areas. Frost days and cold waves are very likely to become fewer. Under this scenario, the number of species and effectives[58] of wintering water birds and waterfowls along visiting wetlands along the Albania's coast will markedly reduce. The increased temperature and the increased number of intensive rain events will likely lead to further invasion of alien plant and animal species along the coast and increase their impacts on native plant and animal species and communities.

58 Number of Individuals for every specie

ANNEX 4.3

Climate Change Scenarios for Albania- Upgrade

Introduction

The climate change scenarios for the Albanian coast, and the related impact analysis, are based on IPCC AR4 recommendations. IPCC recently moved away from SRES (TAR, ar4) and switched to using a new set of scenarios – called 'Representative Concentration Pathways' (RCPs) for the climate science assessment ('Working Group I') of the Fifth Assessment Report (IPCC AR5, 2014). However, the current assessment was made prior to the introduction of the new scenarios, and it has been deemed appropriate to provide the current V&A under the TNC without first making a reassessment of the individual sectorial climate impact.

General overview on methodology applied to develop climate change scenarios

The IPCC AR5 report RCPs has moved away from explicitly describing various specific social factors, such as economic or population growth. Instead, for the first time the RCPs include scenarios that explore approaches to climate change mitigation in addition to traditional 'no climate policy' scenarios. Each RCP represents a different emission pathway:

- RCP8.5 (4 degrees world) leads to a greater than 1370 PPM (parts per million) CO2 equivalent by 2100 with a continued rise post-2100 (equivalent of SRES A1FI);
- RCP6.0 stabilises by 2100 at 850 PPM CO2 equivalent to 2100 without overshoot (equivalent of SRES B2);
- RCP4.5 stabilises by 2100, but at 650 PPM CO2 equivalent without overshoot (equivalent of SRES B1)
- RCP2.6 (2 degrees world) peaks at 490 PPM CO2 equivalent before 2100 and then declines (none SRES equivalent)

The new CCS for the Albanian coast are developed by using SimClim 2013.[59]

Unlike the SRES scenarios in IPCC AR4 that consider the years 1961-90 as a reference period, the RCPs in IPCC AR5 consider a new climate normal, the period 1985-2005.

An ensemble of 40 GCMs are used to generate the temperature and precipitation changes for each RCP in order to manage the uncertainty in GCM impacts on climate change risk analysis, i.e., the range of possible outcomes based on the choice of GCM pattern in the analysis. An ensemble of 22 GCMs are used to generate the changes in extreme temperature and precipitation.

Temperature regime

The new scenarios do reconfirm that the Albanian Costal Area is likely to become warmer. Similarly, increasing trends in annual and seasonal temperatures, both minimum and maximum values, are expected.

Maximum temperature

The expected changes in annual maximum temperature for all RCPs, compared to the period 1995-2005, are presented in Table 1. Given the mitigation approach, RCP2.6 projects the lowest increase. The projections reach up to 1.2°C by 2050 and remain unchanged thereafter. The RCP

59 SimCLIM 2013 is a computer-based modelling system for examining the effects of climate variability and change over time and space. It is a customised GIS which includes tools for the spatial analysis of climate variability and change and associated impacts on various social-economic sectors. Available at http://www.climsystems.com/simclim.

8.5 (4°C world) reveals the worst projections: increases in maximum temperatures up to 2.0°C, 3.6°C and 4.9°C by 2050, 2080 and 2100 respectively. The distribution of expected annual and seasonal changes in maximum temperatures is shown in Figures, A4.1 - A4.3.

Figure A4.1: Summer maximum temperature, baseline and expected by 2050

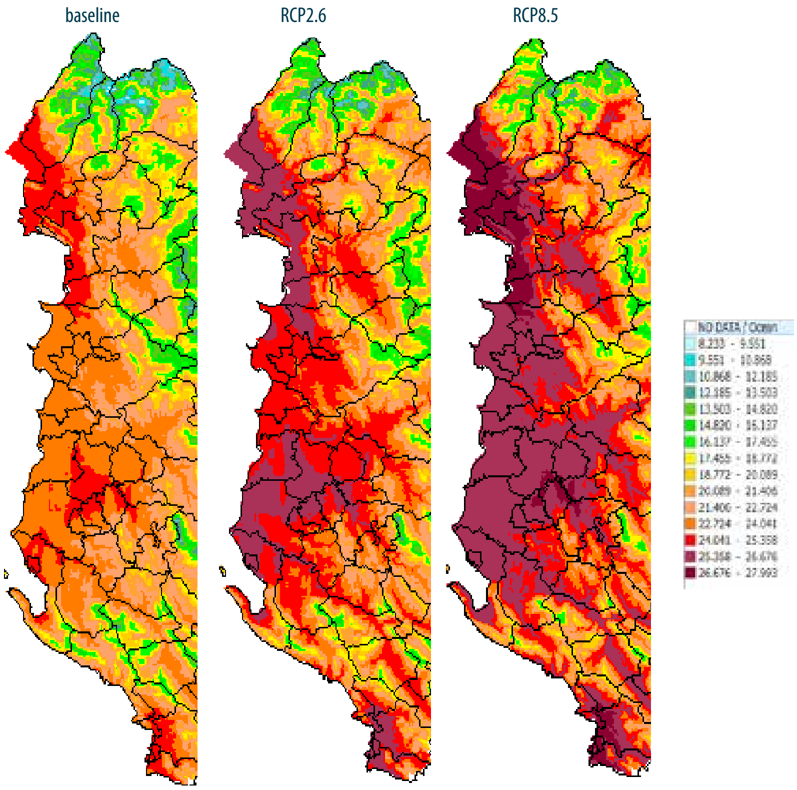


Table A4.1. Expected changes in mean maximum temperature (°C), annual and seasonal

	Scenarios	2050	2100
Year	RCP2.6	1.2 (0.7-1.8)	1.2 (0.7-1.8)
	RCP4.5	1.5 (0.9-2.2)	2.1 (1.2-3.1)
	RCP8.5	2.0 (1.2-3.0)	4.9 (2.9-7.3)
Winter	RCP2.6	0.9 (0.5 -1.5)	0.9 (0.5 -1.5)
	RCP4.5	1.2 (0.7-1.9)	1.6 (1.0-2.7)
	RCP8.5	1.6 (1.0-2.6)	3.8 (2.3-6.3)
Spring	RCP2.6	1.0 (0.5-1.5)	1.0 (0.5-1.5)
	RCP4.5	1.3 (0.7-1.9)	1.8 (0.9-2.7)
	RCP8.5	1.7 (0.9-2.6)	4.2 (2.2-6.3)
Summer	RCP2.6	1.5 (1.0-2.1)	1.5 (1.0-2.1)
	RCP4.5	1.9 (1.3-2.8)	2.5 (1.6-3.9)
	RCP8.5	2.8 (1.7-3.8)	6.4 (4.1-9.2)
Autumn	RCP2.6	1.2 (0.7-1.7)	1.2 (0.7-1.7)
	RCP4.5	1.5 (0.9-2.2)	2.1 (1.3-3.2)
	RCP8.5	2.1 (1.2-3.1)	5.1 (3.0-7.4)

Figure A4.2 Baseline and projections of average annual maximum temperatures. Median estimates are given as full thick lines and the lower and upper bound given as dotted line.

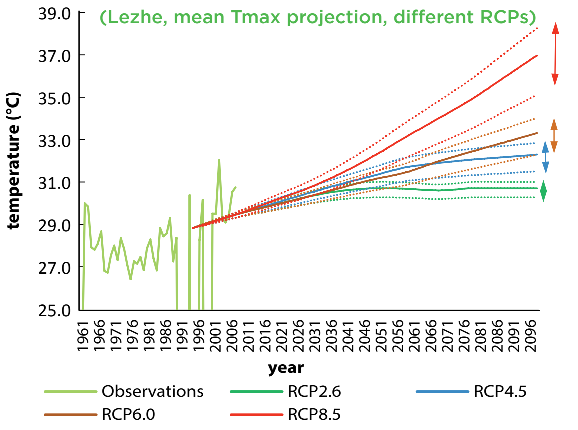
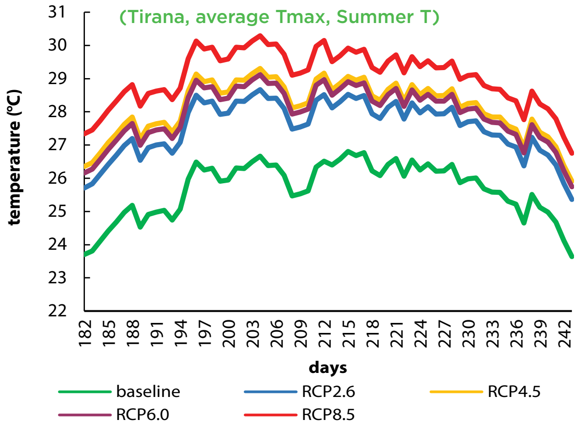


Figure A4.3 Daily course of observations and projected changes in average maximum temperatures in Summer for different RCPs by 2050



As in the case of SRES scenarios, related to 1995 the new scenarios do project the lowest increase for temperature in winter and spring compared to other seasons (Table A4.1). For summer projections the mean temperature changes are likely to reach up to 1.5°C (1.0-2.1°C) after 2050 for RCP2.6, and from 2.8 (1.7-3.8) to 6.4 (4.1-9.2) for RCP8.5, by 2050 and 2100 respectively. The coastal zone is likely to experience average maximum temperatures higher than 25°C by the summer of 2050, and average maximum temperatures up to 30°C will dominate in all parts of this zone by 2100 (Figures A4.1). The projections show that high-percentile temperatures (95%) increase faster than mean temperatures, especially in summer (Table A4.1, Figure A4.2). Taking also into account the simultaneous increase in minimum temperatures (see 'Minimum temperatures' below) an increase in intensity of heat waves is expected. The elevation of temperature extremes are likely to be amplified by changes in soil moisture.

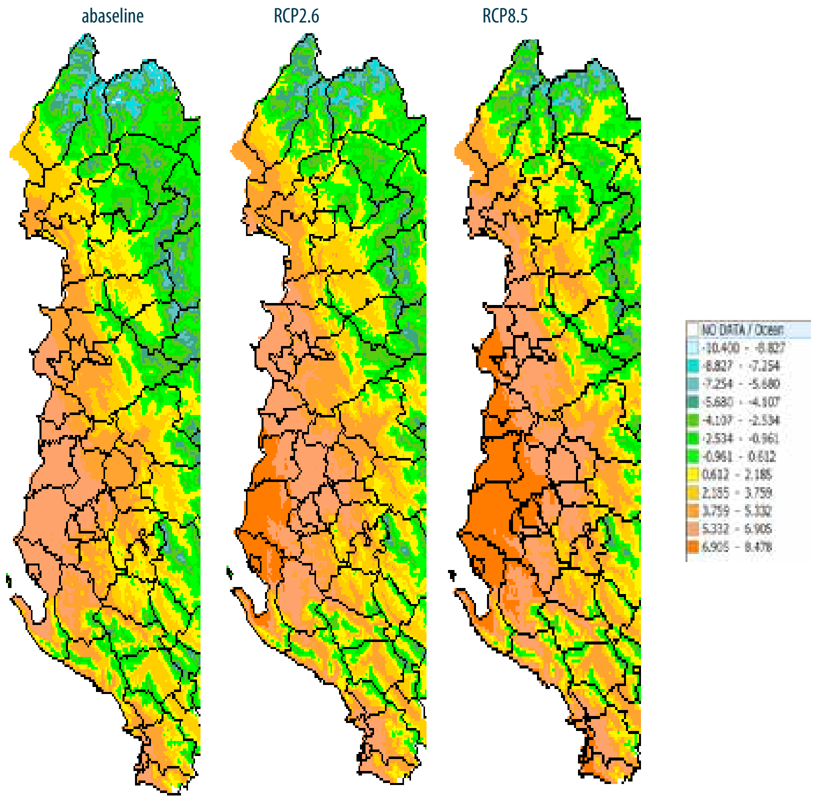
Minimum temperatures

The analysis reveals that the coastal zone is likely to experience higher average minimum temperatures (Figure A4.4-A4.6 and Table A4.2). The expected changes in winter are of 0.9°C for RCP2.6, and from 1.6°C and 3.8°C by 2050 and 2100 respectively. The fact that the expected changes for different RCPs have positive values (Table A4.2) indicate that frost days are likely to be a very rare phenomenon and less cold waves are very likely over the whole coastal area.

Table A4.2. Expected changes in mean minimum temperature (°C), annual and seasonal

	Scenarios	2050	2100
Year	RCP2.6	1.2 (0.7-1.8)	1.2 (0.7-1.8)
	RCP4.5	1.5 (0.9-2.2)	2.1 (1.2-3.1)
	RCP8.5	2.0 (1.2-3.0)	4.9 (2.9-7.3)
Winter	RCP2.6	0.9 (0.5 -1.5)	0.9 (0.5 -1.5)
	RCP4.5	1.2 (0.7-1.9)	1.6 (1.0-2.7)
	RCP8.5	1.6 (1.0-2.6)	3.8 (2.3-6.3)
Spring	RCP2.6	1.0 (0.5-1.5)	1.0 (0.5-1.5)
	RCP4.5	1.3 (0.7-1.9)	1.8 (0.9-2.7)
	RCP8.5	1.7 (0.9-2.6)	4.2 (2.2-6.3)
Summer	RCP2.6	1.5 (1.0-2.1)	1.5 (1.0-2.1)
	RCP4.5	1.9 (1.3-2.8)	2.5 (1.6-3.9)
	RCP8.5	2.8 (1.7-3.8)	6.4 (4.1-9.2)
Autumn	RCP2.6	1.2 (0.7-1.7)	1.2 (0.7-1.7)
	RCP4.5	1.5 (0.9-2.2)	2.1 (1.3-3.2)
	RCP8.5	2.1 (1.2-3.1)	5.1 (3.0-7.4)

Figure A4.4 Winter minimum temperature, baseline and expected by 2050



Extreme temperatures

The analysis reveals that temperature extremes are also expected to increase. On the other hand, the return periods of maximum absolute temperatures are expected to drastically decrease over the Albanian coastal area. Data for Tirana (Table A4.3) indicates that temperatures of 38°C that are currently reached once in 50 years, might occur more frequently, once in every 7 years (RCP2.6) or 3 years (RCP8.5). A similar decreasing trend is expected for the occurrence of 3 or more consecutive days with daily maximum temperatures higher than 36°C. Figures A4.7 and A4.8 illustrate the expected reduction in return periods for different RCP for the Shkoder and Fier areas.

Figure A4.5 Expected changes in winter minimum temperatures (°C), Lezha, different RCPs

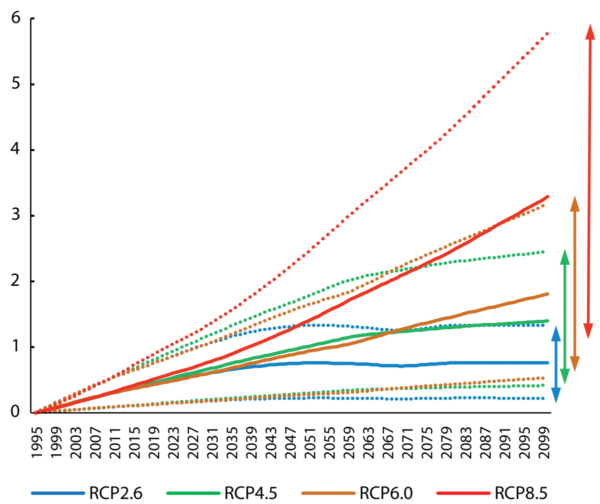


Figure A4.6 Daily course of observations and projected changes in average minimum temperatures in winter for different RCPs by 2050 (Tirane, average Tmin, winter)

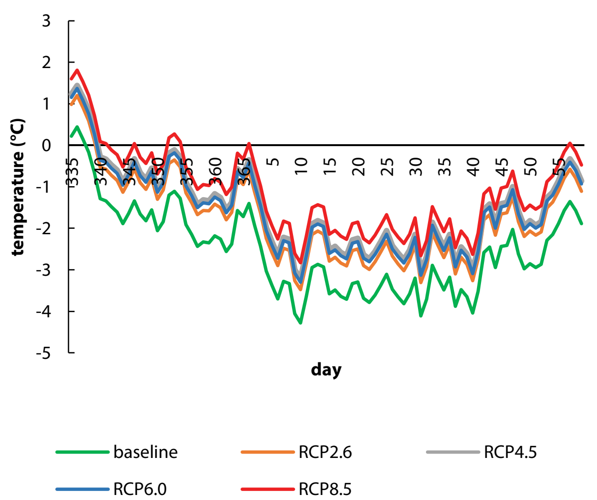


Table A4.3: Change of return periods of maximum temperatures for scenarios RCP2.6 and RCP8.5, different consecutive days, Tirana

	Return periods (year)								
	1 day			consecutive 3 days			consecutive 5 days		
Base RP	Value	RCP2.6	RCP8.5	Value	RCP2.6	RCP8.5	Value	RCP2.6	RCP8.5
10	36.9	3.3	1.9	35.6	3.6	2.1	34.5	3.5	2
20	37.5	4.6	2.4	36.4	5.5	2.8	35.3	5.3	2.6
50	38.1	7.0	3.1	37.1	9.3	4.0	36.0	9	3.8
100	38.4	9.2	3.6	37.5	13.5	5.1	36.4	13.2	4.8

Figure A4.7 Change in return periods, 1 day with absolute max temperature (years), Shkoder

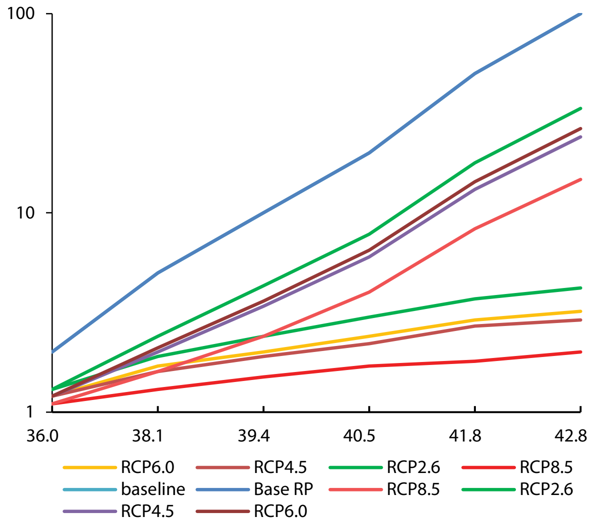
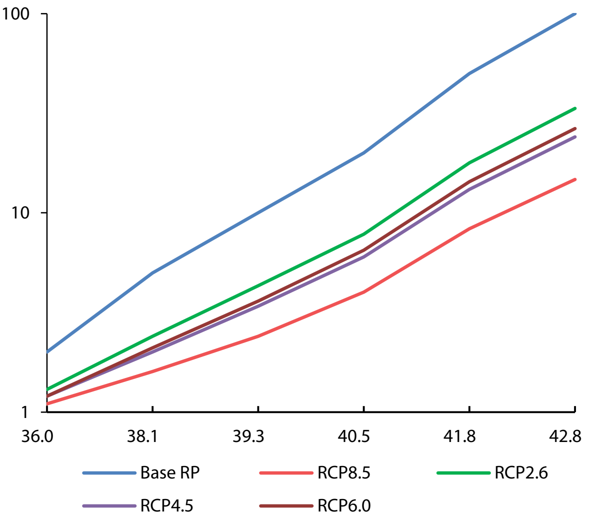


Figure A4.8 Change in return periods, 3 consecutive days with absolute max temperature (years), Fier



An opposite trend is expected with regard to occurrence of absolute minimum temperatures (Figures A4.9, A4.10). According to all RCPs the return periods are expected to increase. For example, the return period for absolute minimum temperatures of about -14°C are expected to increase from 1:50 years to 1:86, 1:100 and 1:145 years respectively for 1, 3 and 5 consecutive days according to RCP8.5 for the Shkodra area. A lower increase in return periods, from 1:50 years to respectively 68, 74 and 90 years is expected according to RCP2.6.

Figure A4.9 Change in return periods, 1 day with absolute min temperature (years), Shkoder

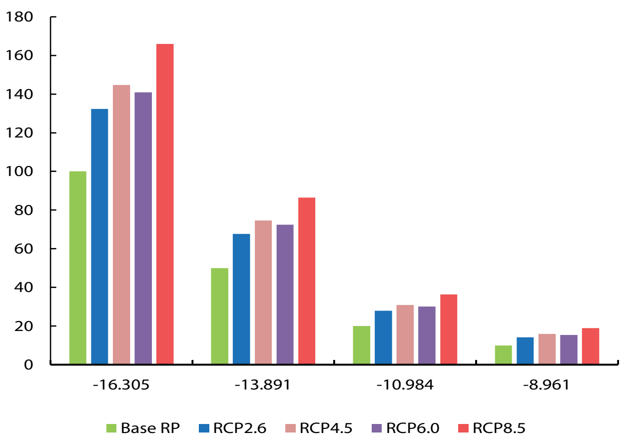
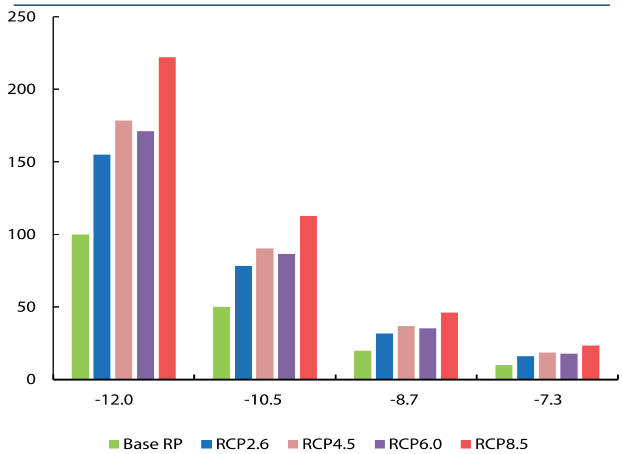


Figure A4.10 Change in return periods, 1 day with absolute min temperature (years), Fier



Precipitation

All the RCPs reveal a likely decrease in annual and seasonal precipitation relative to 1995 (1986-2005) for all time horizons (Table A4.4). Compared to SRES scenarios, the RCPs project lower decreasing trends. This might be related to the fact that RCPs and SRES scenarios use different approaches and, in particularly, consider a different climate normal as reference periods. It should be noted that the projection of variability around the average values (levels 5% and 95%) are high in both cases (Figure A4.11). The projections show that high-percentile precipitation (95%- Figure A4.11, Table A4.4) change/increase faster than average precipitation changes. This is an indicator of the intensification of heavy precipitation that causes flooding. On the other hand, the high reduction at the 5% level of changes is an indicator of a likely increase in drought frequency.

Figure A4.11 Precipitation distribution, baseline and expected changes by 2050 (average and 5% and 95% levels)

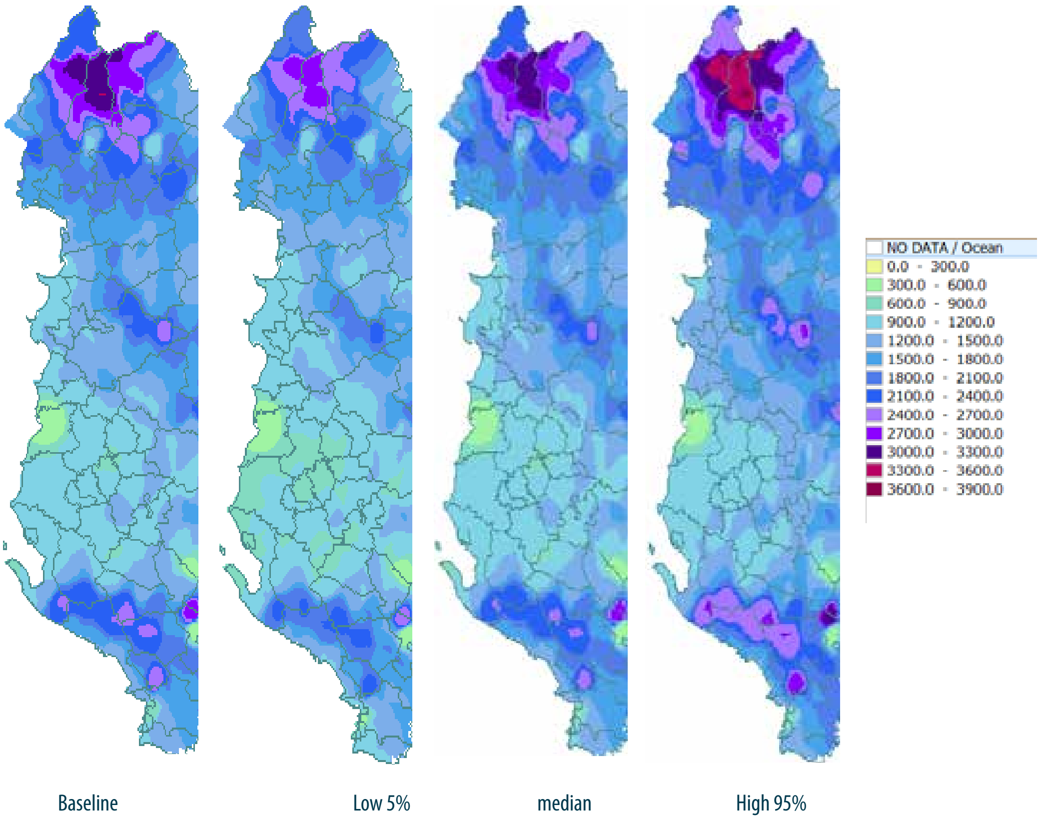


Table A4.4: expected changes in precipitation (%), annual and seasonal

		2050	2100
YEAR	RCP2.6	-1.6 (-17 to +14)	-1.6 (-17 to +14)
	RCP4.5	-2.2 (-21 to +19)	-3.0 (-30 to +26)
	RCP8.5	-2.9 (-28 to +25)	-7.1 (-65 to +60)
Winter	RCP2.6	1.8 (-12 to +16)	1.8 (-12 to +16)
	RCP4.5	2.4 (-17 to +21)	3.3 (-23 to +29)
	RCP8.5	3.2 (-22 to +29)	7.8 (-44 to +58)
Spring	RCP2.6	-3.1 (-18 to +15)	-3.1 (-18 to +15)
	RCP4.5	-4.1 (-24 to +20)	-5.7 (-33 to +27)
	RCP8.5	-5.6 (-33 to +25)	-13.5 (-80 to +68)
Summer	RCP2.6	-8.7 (-31 to +18)	-8.7 (-31 to +18)
	RCP4.5	-11.5 (-41 to +23)	-16.2 (-58 to +33)
	RCP8.5	-15.8 (-56 to +32)	-38.1 (-99 to +78)
Autumn	RCP2.6	-2.2 (-18 to +13)	-2.2 (-18 to +13)
	RCP4.5	-2.8 (-23 to +17)	-4.0 (-30 to +22)
	RCP8.5	-3.9 (-32 to +24)	-9.4 (-78 to +58)

The analysis shows that:

- The scenario RCP8.5 projects the highest decrease in precipitation. The annual and summer values likely to reach up to -7.1 %(-65 to +60%) and -38.1% (-99 to +78%) respectively by 2100 (Table A4.4, Figures A4.11-A4.12).
- The mitigation scenario, RCP2.6 projects the lowest decrease in precipitation, likely to reach a value of -3.1% (-18 to +15%) by 2100 in the summer season.
- All scenarios project a slight positive trend of winter precipitation for all time horizons (Figure A4.13), likely to reach a value of +3.2%(-22 to +29%). This can be explained by the fact that given higher winter temperatures, a reduction of snowfall is expected, which might lead to a reduction of river flows during spring.

Extreme precipitation

A further consequence of the predicted changes in precipitation is related to the levels of maximum precipitation levels and their duration. The return periods of maximum precipitation levels are expected to decrease over the Albanian coastal area.

Figure A4.12 Changes and variability of annual precipitation (%), different scenarios. Median estimates are given as full lines and the lower and upper bound given as dotted line. (Lezhe)

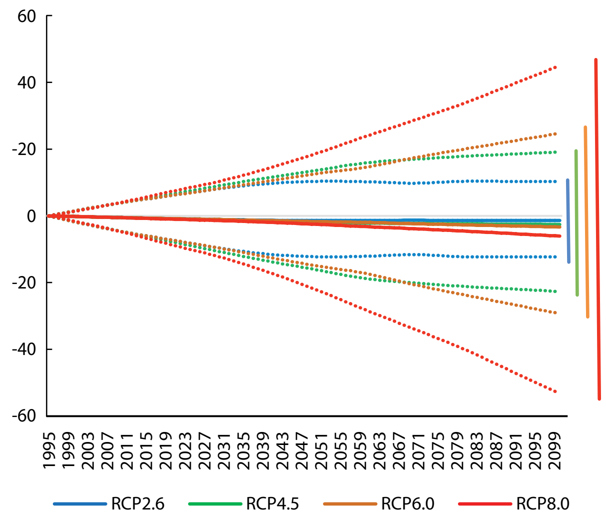
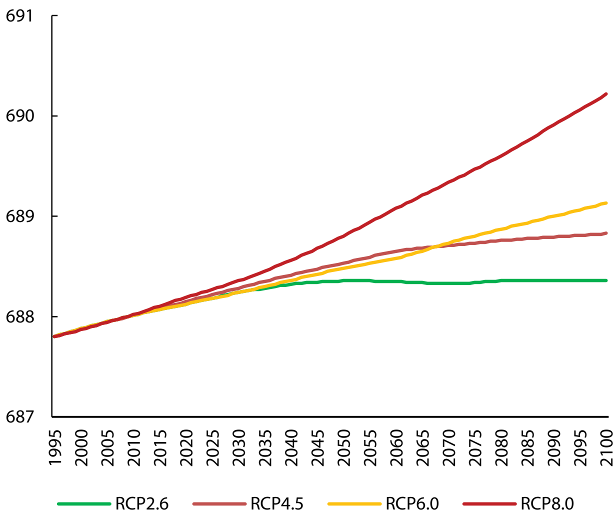


Figure A4.13 Likely precipitation changes (mm), winter averages (Shkoder)



As a consequence, more frequent heavy rains with longer duration, causing flooding and economic damages, are likely to happen.

Figure A4.14 illustrates the likely changes for Tirana area. It can be seen that a maximum precipitation of 144mm/d that were met once to 50 years may now be expected to occur more frequently, every 40 years (RCP2.6), 38 years (RCP4.5&6.0) or 35 years (RCP8.5). In parallel with a decrease of return periods, the amount of total precipitation falling during intense multi-day events is expected to increase from 144 mm (1 day) to 177 mm and 206 mm falling during 2 and 3 consecutive days respectively (Figure A4.15).

Figure A4.14 Change of return period (year), baseline and different RCPs (Tirana)

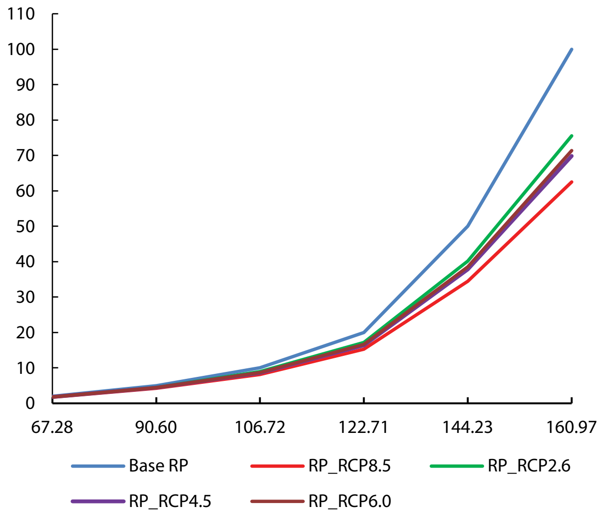
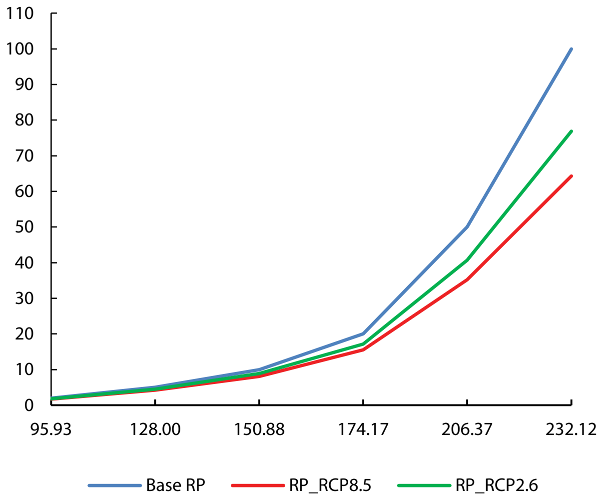


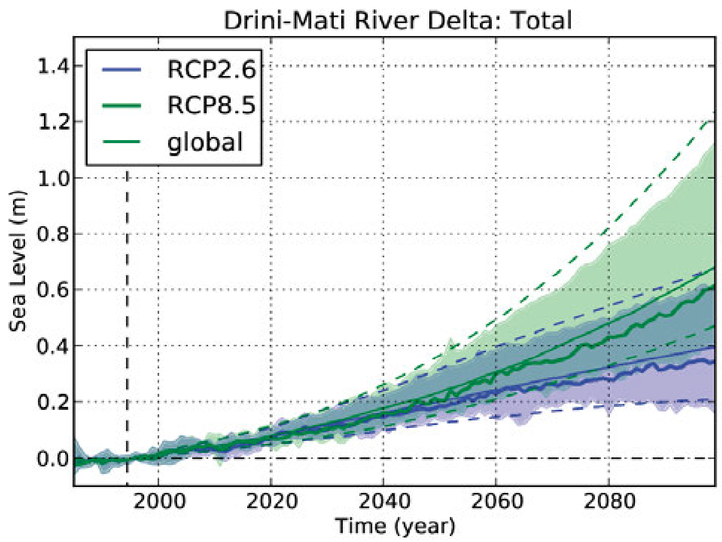
Figure A4.15 Return period (year) for 3 consecutive days with maximum precipitation. Median estimates are given as full lines and the lower and upper bound given as dotted line (Tirana)



Sea-level Rise Projection

Sea level as in the case of SRES scenarios is projected to rise. Figure A4.16 illustrates the time series for sea-level rise for the two scenarios RCP2.6 (blue, 2°C world) and RCP8.5 (green, 4°C world) for the northern Albanian coast.

Figure A4.16 Projection of sea level rise.Median estimates are given as full thick lines and the lower and upper bound given as shading. Full thin lines are global median sea-level rise, with dashed lines as lower and upper bound. Vertical and horizontal black lines indicate the reference period and reference (zero) level.



Source: World Bank. 2014. Turn Down the Heat: Confronting the New Climate Normal. Washington, DC: World Bank.

ANNEX 4.4

List of PIF proposals from DMRD project

This catalogue is based on proposals for implementation of the priority adaptation measures to climate change, proposed in the frame of the MSP Project "Identification and implementation of adaptation response measures in Drini-Mati River Deltas" (DMRD). This project, financed by GEF/Government of Albania/ UNDP is focused at increasing ecosystem and livelihood resilience to climate change threats.

These project proposals (set out below) are drafted by specialists from the Lezha Regional Council and Communes Shëngjin, Shënkoll and Fushe Kuqe, during a capacity building/training process in the frame of the DRDM project. They consist in a combination of:

- Ecosystem-based adaptation (EbA), which uses biodiversity and ecosystem services as part of an overall adaptation strategy;
- 'hard' engineering/restoration activities to address coastal erosion, water exchange between the lagoons and the sea and sea level rise issues; and
- community-based adaptation (CbA).

A cost and benefit analysis showed that costs of measures designed to conserve the wetland and coastal biodiversity, and safeguarding community assets, is less than the benefits that these systems and assets currently provide, i.e. the cost of measures to adapt to climate change are less than the cost of 'doing nothing' and allowing them to degrade.

List of project proposals

No	Project proposal	Measure	Location
1	Management of the fresh water in the Kune-Vain area (EbA)	New wells over the PA Kune-Vain and Patok	Kune island, littoral at Zaje lagoon, Patoku lagoon
2	Maintenance of the embankment in Kune-Vain and Shëngjini island (CbA)	Raise level/maintenance of the embankment (continuous)	Shëngjin Island embankment
		Raise road level up to 100 cm - embankment.	Shëngjin Island road
		Raise level/maintenance of the embankment	Kune/ Merxhani Lagoon embankment
3	Maintenance of the embankment in Tale area (CbA)	Raise road level up to 30 cm and maintenance of the embankment	Tale - the protected area border
4	Management of coastal area (EbA)	Reforestation of PA (pilot sites)	Parcels 1 and 2 and in north of tale hidrovor (Vain), in west of Alku (Fushë Kuqe).
5	Management of the connection channels in Kune area (engineering)	Rehabilitation of channels connecting the water bodies within the Kune lagoon.	Kune Island
		Construction of terminal groynes	Merxhani communication channel (Kune spit),

No	Project proposal	Measure	Location
6	Treatment of waste water in the DMRD area (CbA)	Waste water treatment. Decentralized waste water treatment plants in Commune level.	Whole area of DRDM including three Communes Shëngjin, Shënkoll and Fushë Kuqe.
7	Maintenance of the irrigation channels in the DMRD area (CbA)	Cleaning and deepening irrigation channels	Shëngjini Island
		Cleaning and deepening irrigation channels	Shënkoll (after the embankment of Tale)
8	Management of the coastal erosion (EbA +engineering)	Beach nourishment	1. Kune shoreline; 2. Merxhani shoreline; 3. Zaje shoreline
		Restore the dune (planting)	A. Kune B. Vain (coastal area)
		Construction of groyne field - Merxhani lagoon	Shëngjini beach/Kune spit
9	Management of the Ceka Lagoon tidal channel (engineering)	Construction of terminal groynes -	Ceka lagoon
		Ceka lagoon tidal inlet cut and fill	Ceka lagoon
		Maintenance dredging of Ceka lagoon inlet	Ceka lagoon
10	Maintenance of the communication between Ceka and Zaje lagoons and Ceka and Drini river (engineering)	Moving gate at Drini River – Zaje lagoon inlet	Communication channel of Drini - Zaje
		Breaching Zaje – Ceka lagoon embankment	Zaje-Ceka Lagoon
		Bridge over Zaje – Ceka lagoon breach	Communication channel, Vain Zone
11	Feasibility study of hole DMRD area	Feasibility study of hole DMRD area	all protected areas (Kune-Vain-Patok)

Source: Project proposals are based on priority measures to adapt to climate change from the Project 'Identification and implementation of the adaptation response measures to Drini-Mati River Deltas'. UNDP Climate Change Programme.

ANNEX 5.1: SUMMARY OF DEVELOPED NAMAs

Background to NAMAs

The concept of Low-Emission Development under the United Nations Conference on Climate Change (UNFCCC) provides a framework for countries to formulate their approaches to sustaining long-term national growth in the context of mitigation of greenhouse gas emissions. NAMAs are mitigation actions, programmes or policies voluntarily undertaken by developing countries in the context of sustainable development, supported and enabled wholly or in part by technology, financing and capacity building from developed countries. An initial inventory of potential NAMAs in Albania has been established with UNDP support (2013-2014). On the basis of a multi-criteria analysis, considering the benefits for a range of sustainable development areas, priorities have been established, resulting with the full development of two NAMAs summarized in this Annex.

1. NAMA: FINANCING MECHANISM FOR ENERGY EFFICIENCY IN BUILDINGS (ENERGY EFFICIENCY FUND)

In 2009, the National Energy Efficiency Action Plan 2010 – 2018 (NEEAP) was adopted with a target for energy savings of 9% of the average energy consumption between 2004 and 2008 to be achieved by 2018. The Ministry of Energy and Industry is now at the final stages of adopting the Second and the Third National Energy Efficiency Action Plan (NEEAP) and the challenge now is to implement this action plan.

A key element in the implementation of the NEEAP is to set up a financial mechanism that will provide incentives to invest in energy efficient technologies in residential, commercial and public buildings. It is proposed that this is realized in the form of a (revolving) energy efficiency fund that could blend grant and loan funding from domestic and international sources.

1.1 NAMA Energy Efficiency Fund - Results and Objectives

The NAMA will establish and operate an efficient and effective financial support mechanism for energy efficiency investments in buildings, resulting in improved energy performance of those buildings. Additionally, it will support the policy, regulatory, institutional, and market transformations that could increase the levels of energy efficiency and decrease GHG emissions from the building sector. The NAMA will also:

1. Improve energy performance of buildings.
2. Improving living comfort levels and the overall quality of public services.
3. Reduce energy costs for private residential and businesses.
4. Increase value public and private real estate.

At national level it will:

1. Support implementation of the Second and Third NEEAP.
2. Improve energy security of the country.
3. Increase competitiveness of national economy.
4. Cut public budget allocations for energy bills for public buildings.
5. Contribute to a low carbon development.
6. Contribute to development objectives of Albania (environment, economic, and social), including poverty alleviation and social inclusion.

1.2 NAMA Energy Efficiency Fund - Sector Scope

The NAMA will target the following sectors in the country: public sector buildings (central government and local authorities), commercial / private services, and residential sector single family and multi apartment buildings. Eligible energy efficiency measures and technologies could include:

1. Energy efficient (capital) renovation of buildings, including;
   b. Space heating, hot water, cooling and ventilation,
   c. Measures for building envelope and heating installation,
   d. Integration of renewable energy, including solar.

2. Energy efficient lighting and appliances.

3. Energy efficient building maintenance and management.

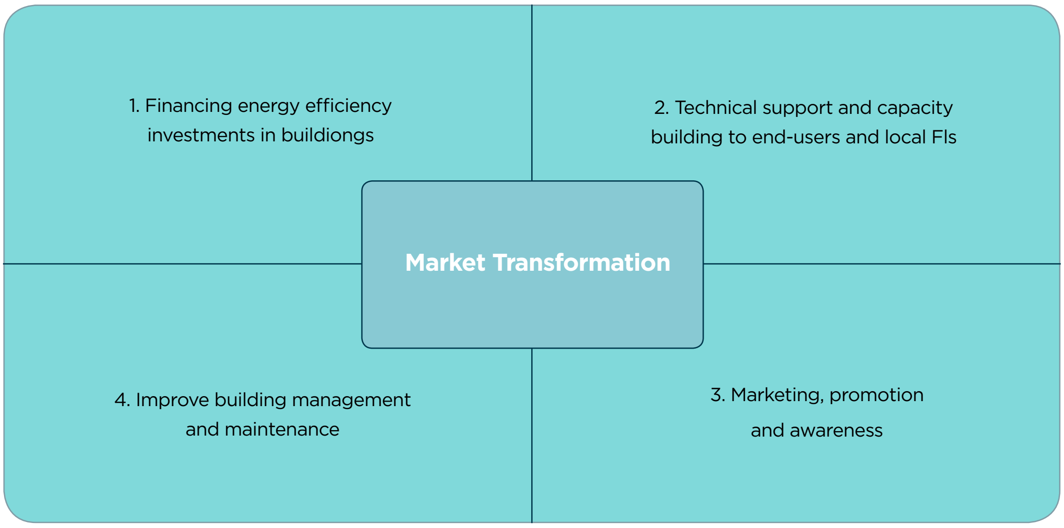
1.3 NAMA Components, Activities and Implementation

Component 1: Financing mechanism for energy efficiency (Energy Efficiency Fund), disbursing preferential loans and grants for investments into energy efficiency, in close cooperation with donors and IFIs.

Component 2: Technical support and capacity building linked to the Fund, supporting the projects and actors involved in project development, project implementation, evaluation, and management/operation of buildings. This includes the MRV system.

Component 3: Outreach and awareness raising. Public awareness campaigns will be conducted to inform the public about the opportunities and benefits of energy efficiency in buildings as well as renewable energy. This will be done together with the promotion of the financing instruments of the Fund.

Component 4: Improved building management. It is not enough to ensure energy efficiency in rehabilitation of public buildings. Proper management is needed to secure the sustainable impact of energy efficiency investments (e.g. in operation of heating systems), and to explore the large potential for energy efficiency improvements in management of the existing building stock.



1.4 NAMA Energy Efficiency Fund - Stakeholders and Organization

The NAMA is proposed by the Ministry of Energy and Industry (MEI), in corporation with Ministry of Environment (MoE). The NAMA needs both a governing/supervisory and an operation/executive body. The core component of the NAMA is the energy efficiency fund. The institutional set-up of the Fund, therefore, determines the organization of the NAMA (including Board and Fund Manager). An energy efficiency fund is best established as an independent organization governed by a government-appointed board of governors or board of trustees comprising both public sector and private sector members.

The NAMA will cooperate with Project Management Units (PMUs), developers, architects, designers, contractors, suppliers/ manufacturers, inspectors, auditors, building maintenance/ operators, and the managers/users of buildings.

1.5 NAMA Preparation Energy Efficiency Fund - Time Frame

The following main steps need to be taken while preparing a NAMA:

1. Presentation and discussion NAMA concept to national stakeholders.
2. Registration at UNFCCC.
3. Active dissemination of this proposal, and discussion with potential financiers by government, supported by UNDP.
4. Secure local commitment and ownership. This NAMA is a proposal of the Albanian government to the international community. Local commitment needs to be clearly proven and convincing.
5. Establishing the legal framework (including adoption of the Energy Efficiency Law as well any necessary regulation on the Fund).
6. Establish capacities for energy efficiency policies (proposed Energy Agency).
7. Establish the governance and operational structure of the Fund.
8. Attract financing and other international support.

Conditional to the above, the NAMA could start in 2016 and run until 2020 in a 1st phase.

1.6 NAMA Energy Efficiency Fund Scenarios

The baseline scenario were based on the new GHG inventory for the year 2005. The GHG mitigation analysis is made for 25 years, i.e. by the year 2030 that is 5 years beyond the analysis carried out under the TNC. Macro-economic indicators show that after 2005 the Albanian economy has strengthened, a large increase of activity is especially notable in construction, services, agriculture, and also in the industrial sector. Inflow of capital from emigrants is an important economic factor. Over the past decade, the Albanian economy has experienced changing patterns of development. Albanian GDP is highly dependent on the service sector (including transportation) and agriculture. Meanwhile, the industry sector, including energy production, is emerging. After 2002, the Albanian economy experienced a period of growth, peaking in 2008 (7.5%). Since 2008, the economy has undergone a decline in growth, registering its lowest level in 2013 (0.4%). The causes have been linked not only to the global economic crises, but also to internal policies and development strategies. However, this pattern is predicted to not continue: The IMF World Economic Outlook has forecast a rate growth of 2.7%, 2.9% and 3.4% for 2014, 2015 and 2019 respectively[1].

1 IMF, 2014

In 2006 the general situation of the economy was reflected both in the growth and inflation rate. The expansion of the credit sector has sustained the level of economic development. Fiscal policy and budged deficit control have further contributed to the levels of growth[2]. 2008 is considered the last year of prosperous economic growth, reflected both in the level of value added in the economy, and in the level of production of different economic activities. However, the effects of the economic crises were reflected in slower growth in the last trimester of the year[3]. The low rates of economic growth continued in subsequent years, respectively 2.8% in 2011, 1.3% in 2012 and 0.4% in 2013. Sluggishness of economic activity was mainly caused by poor performance of investment and private consumption, which continued to suffer from low confidence by economic agents and tight financial conditions. Consumption and private investment were not favored by conservative lending policies. These policies resulted from difficulties that characterized financial markets in the Euro area and the perception of high risk of credit default. On the other hand, fiscal stimulus and foreign demand had a positive contribution to economic growth[4].

1.7 Costs and financing for implementation

The volume of the Fund strongly depends on the available local and international funding and expected demand. An initial indicative budget is (period 2016-2020):

Financial component: Total concessional loans, commercial loans and partial credit guarantees	€ 40 million
Incremental costs: Investment grants, TA, outreach, pre-feasibility, administration and MRV	€ 6 million
Total NAMA budget	€ 46 million

The main share of NAMA finance will be needed to run the Fund (as concessional finance, capital (in case of revolving fund), and grants).

NAMA could be financed through (a combination of) different sources: state and local public budget, private sector contribution, and international support (grants, concessional finance).

1.8 Measuring, reporting and verification (MRV)

The direct impact of the NAMA is achieved through energy efficiency investment directly supported by the NAMA (decreasing energy use in relation to a baseline reference). In addition, market transformations induced by the NAMA could lead to indirect impacts. The NAMA will establish a methodology and institutional framework for measuring, reporting, and verification (MRV) the NAMA impact on energy efficiency and GHG emissions.

1.9 Impact of the NAMA Energy Efficiency Fund

The impact of the NAMA was estimated on the basis of an assumed funding volume of € 46 million, implementation of 5 years (2016-2020), breakdown to sectors proportional to current share of building stock, and application of a set of energy efficiency measures as identified under the NEEAP. For all these measures the marginal costs are lower than the current electricity prices. The total cumulative GHG emission reduction could amount to 300 kt CO_2 eq. p.a. in 2020.

2 BoA, 2006
3 BoA, 2008
4 BoA, 2013

2. NAMA: REPLACING FOSSIL FUELS WITH NON-HAZARDOUS WASTE IN THE ALBANIAN CEMENT INDUSTRY

2.1 Starting points for the NAMA cement industry scope and design

The underlying idea of the NAMA cement industry is to solve issues in two separate sectors by connecting them to each other. In the waste management sector, large volumes of waste are currently either collected in a single-bin system and then deposited on landfill sites or directly deposited on illegal dumpsites. Apart from minor recycling activities, there is hardly any separation of waste streams. As a result, waste streams with high energy content are being landfilled.

In contrast, the cement industry is either using imported or local fossil fuels for their clinker production process. The kilns installed in the cement industry are designed to use waste material/alternative fuels in the process, but the quantities and qualities of waste streams required to be used by the cement companies as alternative fuels are not available currently.

The NAMA aims at closing this gap and supporting the development of an interface between these two sectors. This will help to reduce waste volumes to be deposited on landfill sites and give the cement sector the opportunity to use alternative fuels in their plants.

2.2 NAMA cement industry targets

The NAMA aims at achieving the following targets:

- Considerably reducing greenhouse gas emissions from waste and cement sector. This will be achieved by replacing fossil fuels in the cement sector and thereby reducing CO_2 emissions as well as avoiding methane emissions from landfills.

- Albania is facing challenges in meeting the requirements of EU legislation, which became recently transposed into national law. The NAMA for cement industry will support the installation of a waste management system in line with EU and national regulations.

- A large number of European cement companies already use alternative fuels, which helps them to reduce fuel costs. In some cases, cement companies even have negative fuel costs, as waste companies pay for being able to burn waste in cement companies. The NAMA for cement industry will support the competitiveness of the cement industry by providing access to alternative fuels.

Additionally, the NAMA aims at contributing to a number of sustainable development factors:

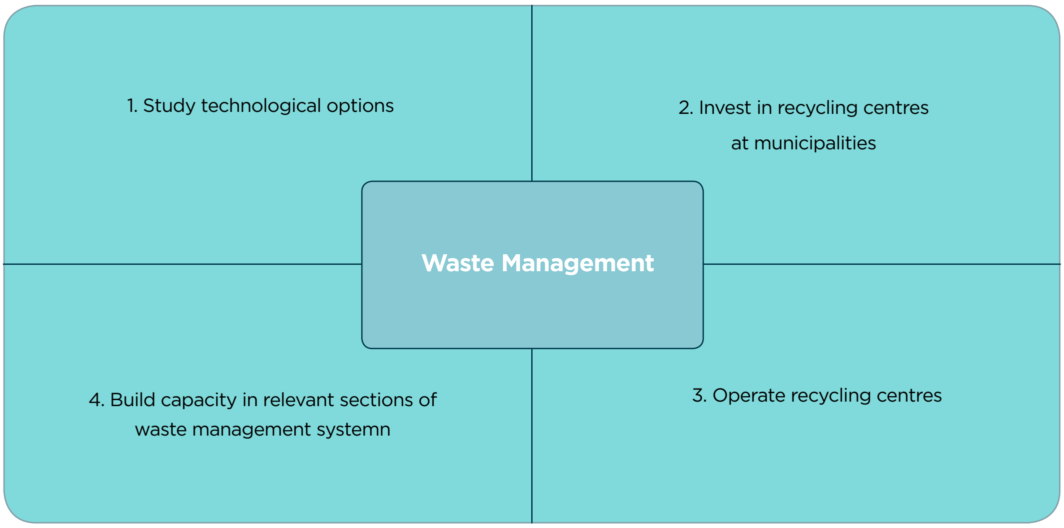
- Through a separate collection system, more waste will be collected and less waste will be dumped on illegal dumpsites. This will improve the living situation of people residing next to these dumpsites.

- The NAMA will create additional jobs. Additional personnel will be needed to collect and separate the waste. In the cement plants, additional jobs will be created for managing the waste streams in the plant (transport, storage, preparation, etc.)

- The cement sector is mainly using imported fossil fuels. Replacing part of these fuels with alternative fuels will decrease its dependency on fuel imports and reduce Albania's trade deficit (importing fossil fuels accounts for 50% of Albania's trade deficit according to INSTAT for 2014).

2.3 NAMA cement industry components, activities and implementation

The NAMA for cement industry will be implemented in four different components. These components are closely linked to secure the successful implementation of the NAMA. The four components are:



Component 1: Study technological options and feasibility of using municipal solid waste as alternative fuel in the cement industry.
Component 2: Invest in recycling centers at municipalities.
Component 3: Operate recycling centers.
Component 4: Build capacity in relevant sections of waste management system.

2.4 Stakeholders and organization of the NAMA cement industry

The institutional structure of the NAMA for cement industry will include the following institutional bodies:

NAMA Coordinating Authority (NCA): As there are a number of stakeholders, mainly ministries, involved in the NAMA, it is proposed that the role of the NCA is taken by a NAMA Supervisory Committee. The NAMA Supervisory should consist at least of the Ministry of Environment, Ministry of Energy and Industry and Ministry of Urban Development. As the waste sector plays the major role in the NAMA, the Committee should be headed by the Ministry of Environment.

NAMA Implementing Entity (NIE): The NAMA Implementing Entity (NIE) is the main operative body and will take responsibility for the implementation of the NAMA. The NIE reports to the NAMA Supervisory Committee. It is suggested that the Ministry of Environment takes the role of the NAMA Implementing Entity.

2.5 Time frame for NAMA cement industry preparation in implementation

Before commencing the implementation of the NAMA, a number of preparatory steps are first necessary, such as; endorsement of the NAMA by key stakeholders, securing financing, taking preparatory steps for implementation and preparing governance and operational structures. The NAMA itself should be implemented in 2 steps: 1) Implementation of Component 1 and Implementation of Components 2, 3 and 4. The feasibility study (Component 1) can be carried out over a period of 9 months, followed by a 3-months period for decision making. If the feasibility study is started mid-2016, construction of the centres (Component 2) can start mid-2017. Construction of the first recycling centres will take 12 months, so they can become operational by mid-2018.

2.6 Costs and financing for implementation

The overall level of financing of NAMA cement industry implementation will mainly depend on the results of the feasibility study and the number of recycling centres to be implemented. An indicative budget is estimated at:

Activity	Amount (indicative) million €
Component 1: Feasibility study	0.20
Component 2: Investment in recycling centres (indicative figures based on 5 centres)	9.40
Component 3: Operate recycling centers (indicative figures based on 5 centers)	0.55
Component 4: Capacity building	1.50
Total	11.65

The NAMA for cement industry can be financed through a combination of different sources: State and local public budget as well as international support (grants, concessional finance).

2.7 Measuring, reporting and verification (MRV)

The methodology for monitoring the effects of the NAMA will follow general principles of transparency, reliability and conservativeness. The MRV will monitor the quantities and qualities of alternative fuels generated in recycling centers and fossil fuels replaced in the cement plants. The main responsibility for the MRV system lies with the NAMA Implementing Entity, which can delegate some of the tasks to other stakeholders involved in NAMA implementation (for example, municipalities, MSW Contractors, Recycling Center operators, cement companies, etc.).

2.8 Impact of the NAMA cement industry

It is intended that the recycling centers will have a capacity of 100,000 tons of MSW treated per year. From this 100,000 tons of MSW, around 35% can be used as alternative fuel for the cement industry. This gives an annual volume of alternative fuel of 35,000 tons. The alternative fuel used in the cement industry contributes to emission reductions by replacing fossil fuels (in the case of Albania, coal) and reduces methane emissions, which would otherwise be emitted in landfills. Each ton of alternative fuel leads to a reduction of 2.778 tons of CO_2[5]. Therefore, the GHG emission reductions generated will be around 100,000 tons. In addition to GHG emission reductions achieved by implementing the NAMA, Sustainable Development (SD) indicators are gaining an increasingly important role for NAMA donors. The selection of the Sustainable Development (SD) indicators used the Sustainable Development Evaluation Tool (SD Tool) developed by UNDP[6]. The SD Tool defines 4 different SD domains: i) Environment, ii) Social; iii) Growth and Development and iv) Economic development. The tool requires for each of the activities to decide whether an indicator (such as air pollution, biodiversity, health, etc.) is selected, identify the impact, add an explanation on the chosen indicator, define the effect (positive, negative, both) and indicate whether monitoring is done.

5 http://www.wbcsdcement.org/pdf/tf2/CEMBUREAU.pdf
6 UNDP: Sustainable Development Evaluation Tool, 2014

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