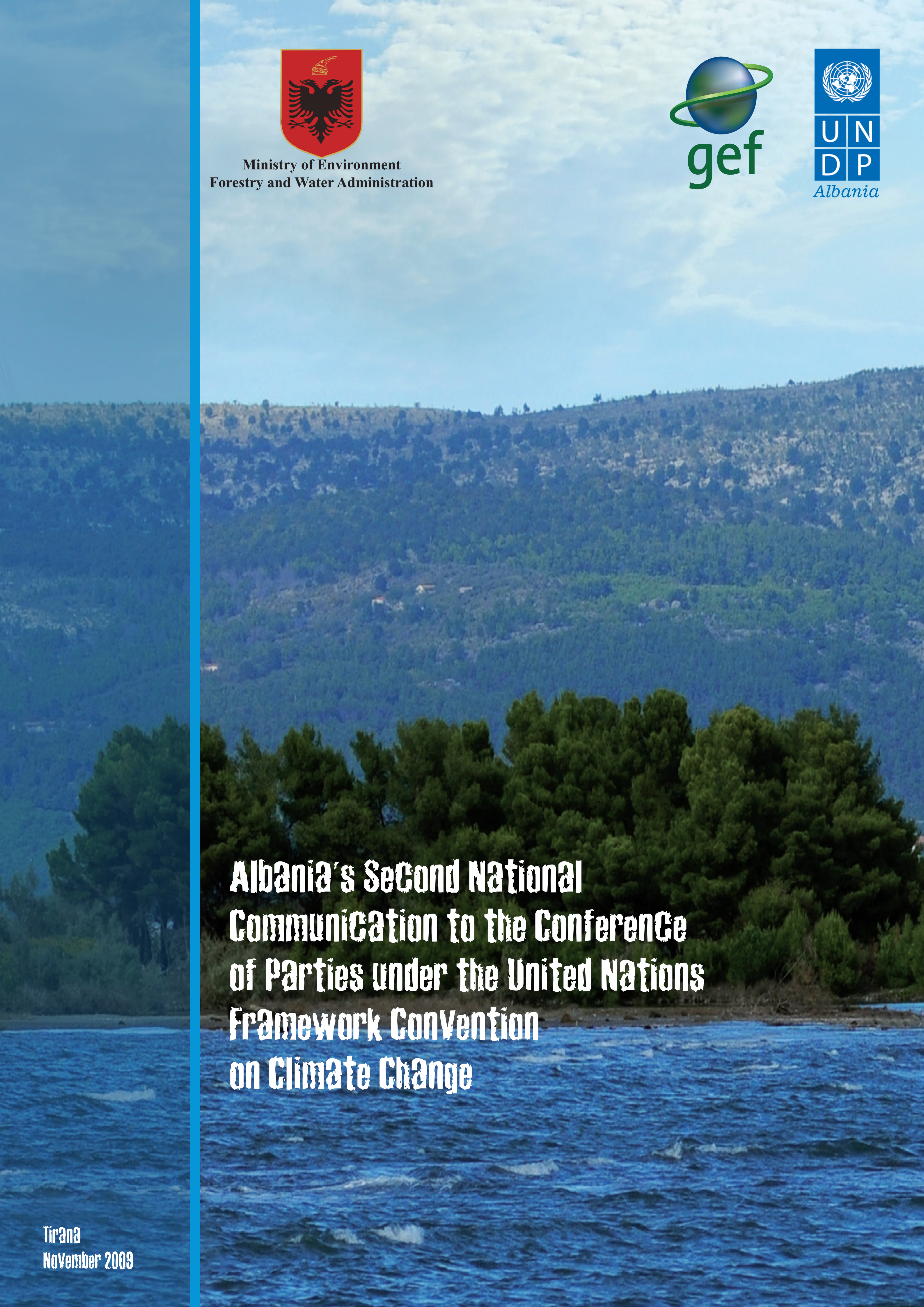

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UNDP
Albania

Albania's Second National Communication to the Conference of Parties under the United Nations Framework Convention on Climate Change

Tirana
November 2009

Republic of Albania
Ministry of Environment, Forestry
and Water Administration

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CONTENTS

FOREWORD

Acknowledging the significance of the climate change problem and the necessity to take effective steps for its mitigation, the Government of Albania joined the UNFCCC on January 1995 and ratified Kyoto Protocol on 16th of December 2004.

Ever since 2008, Albania has in place the DNA, as well as rules and procedures to review and approve CDM projects, thus benefiting from the flexible mechanisms of Kyoto Protocol.
Seven years after the First National Communication, GEF-UNDP kindly offered us financial assistance to prepare the Second National Communication, which we are pleased to present to you in response to the commitments of Albania to the UNFCCC.

The Second National Communication is the second assessment of Albania's present situation with regard to climate change. At the same time, it serves as the basis for future action, research, improvement, offering opportunities for policy refinement and development.

This document goes beyond the reporting commitment of a non-Annex I Party, under the existing guidelines for the preparation of the National Communications to the UNFCCC. Albania, has developed the time series for GHG inventories for the period 1990 – 2000, has updated the mitigation analysis and has developed the Action Plan for Adaptation to facilitate the process of mainstreaming the climate vulnerability and adaptation response to the national planning and policy.
A set of prioritized measures/technologies are recommended to bring GHG emissions reduction, cut energy demand and increase energy supply, contribute to sustainable development and enable Albania to mobilize resources from Kyoto or market based mechanisms.

New resources have been mobilized on priority areas/technologies, like enabling activities to access carbon financing, Albanian program under Global Solar Water Heating Initiative, identification and implementation of adaptation measures in Drini – Mati River Deltas, low carbon and climate change resilient local development in the regions of Kukës and Lezhë, development of a set of project ideas for CDM projects, public awareness through the implementation of the climate change Communication Strategy, etc.

Despite development problems and constraints, which have affected this exercise, a considerable experience has been gained, a national capacity has been further developed and many lessons have been learnt. It has become a useful tool and the basics for sustainability of the preparation process of future National Communications and mainstreaming of climate change related issues into other sectorial policies.

Finally, on behalf of the Government of Albania, I avail myself of this opportunity to express my highest appreciation to the Global Environmental Facility, to UNDP as its implementing agency and UNFCCC Secretariat for their support throughout the preparation process of Albania's Second National Communication.

Fatmir MEDIU

Albanian Minister of Environment, Forestry and Water Administration

Acknowledgements

The development of the Second National Communication of Albania to UNFCCC has been a joint undertaking of the Ministry of Environment, Forestry and Water Administration (MoEFWA) and the UNDP Albania in the frame of the support to capacity building in the field of climate change given by Global Environment Facility (GEF) funded project "Enabling Albania to prepare its Second National Communication to the UNFCCC".

The report was prepared under the direction of Prof. Dr. Pellumb Abeshi, General Secretary of the MoEFWA and the Project Director. UNDP Climate Change Programme (UNDP CCP) appreciate 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.

UNDP CCP recognize in particular the contribution of Ermira Fida, MBA, the Project Coordinator of the Second National Communication up to February 2009, who developed the structure of the document, assembled the teams of contributors and provided direction and untiring support as the project came to fruition.

Three people had primarily responsibility for developing the content of the report: Eglantina Demiraj Bruci, Prof. Dr. –Team Leader of the Vulnerability and Adaptation, Dr. Besim Islami, Dr. –Team Leader of the GHG Inventories, and Mirela Kamberi, M.Sc., Team Leader of the GHG Abatement Analysis. Besides their very professional inputs, UNDP CCP recognize the very important contribution of the following blend of experts, mainly coming from the research institutions and academia, who worked under the guide of the Team Leaders to feed in the sectorial analysis as per their area of expertise:

o Vulnerability and assessment

Liri Mucaj, Prof.Assoc. Dr. - climatologist, Vangjel Mustaqi, Prof.Assoc. Dr. - climatologist, Miriam Bogdani, Dr. - hydrologist, Thimaq Lako, Prof. Dr. -agriculture expert, Spiro Karadumi Prof. Dr. -forestry expert, Besim Islami, Dr.-energy expert, Sabri Laci, Prof.Dr. -tourism and population expert.

o Green house inventories and GHG abatement analysis

Spiro Karadumi Prof. Dr. – land use change & forestry expert, Abdulla Diku – agriculture expert, Pranvera Bekteshi, PhD – industrial processes expert, Agron Jana – waste expert, Tatjana Mulaj, Prof. Dr. - uncertainty assessment expert of greenhouse gas inventory.

Robert Spendl of Chronos, served as the principal writer. He brought to the task both considerable writing skills and the understanding of how chapters should be linked together to provide an entire report.

UNDP CCP gratefully acknowledge the important contribution of Yamil Bonduki of

UNDP National Communications Support Unit for both coordinating the peer review of the technical chapters of the Report and reviewing himself the GHG Abatement Analysis and the Vulnerability and Adaptation ones. Many thanks to Dr. Carlos Lopez of Institute of Meteorology in Cuba for providing valuable inputs on the GHG Inventories during the peer review process. Their comments and suggestions have been largely considered and reflected in the SNC.

Special thanks goes for David G. Smith, who provided the proof reading of the English version of the Report.

Furthermore, many thanks go to the Steering Committee members which represent line ministries and other governmental organizations, research institutions and related NGOs.

Special appreciation must be given to the support provided by the Ministry of Environment, Forestry and Water Administration of Albania especially to Ministers namely, Prof.Dr. Lufter Xhuveli, and Mr. Fatmir Mediu and to their heads of cabinets, respectively to Auron Meneri and to Enkelejda Malaj.

Many credits to the contribution of the UNDP country office especially to H.E. Gülden Türközz Cosslett, the UNDP Resident Representative and UN Resident Coordinator, Norimasa Shimomura, UNDP Country Director, Vibeke Risa, Deputy Country Director, and in particular to Environmental cluster heads, respectively, Batkuyang Baldangombo for the period 2005 - 2007 and Adriana Micu for 2007 - 2009. An important technical contribution was given as well by Keti Chachibaya, Regional Technical Advisor of UND Bratislava Regional Centre.

The final thanks belong to the support staff of the project namely: Odeta Zheku, MSc -communication officer and Melita Leka - administrative and finance officer.

Despite the wide range of inputs into the process, the responsibility for this final output rests with the Project Manager and any errors and omissions thereof is not to be attributed to the other participants in the process.

Mirela Kamberi, M.Sc.
Team Leader/Project Coordinator

CHAPTER 1

1. EXECUTIVE SUMMARY

1.1 NATIONAL CIRCUMSTANCES

Table 1-1: Basic country data	
Location	42°39'N, 19°16'E / 21°40'N, 39°38'E
Area	28,745 km^2
Population	3.2 million in country, significant number of emigrants
Terrain	77% hilly and mountainous average elevation 708 m (double European average)
Borders	Montenegro, Kosovo, Macedonia, Greece 657 land borders, 48 km river border, 72 km lake border 316 km sea border (Adriatic and Ionian Sea)
Regional division	12 prefectures, 36 districts, 315 communes, 2900 villages
Climate	Mediterranean, average 12–14 °C (lowland), 7 °C (mountains)
Precipitation	1485 mm/year (average), 600–3000 mm/year
River runoff	39,220 x 10^6 m^3 total, over 50 % by the river Drini
Land use	36 % forests, 24 % arable land
Economy	free market economy in transition
Main sectors	services incl. transport (35 %), agriculture (20 %), construction (15 %), industry (10 %), remittances from emigrants (10–15 %)
GDP per capita PPP	$6,000 (2008 est.)
GDP growth	5.5–6 % annually
Agriculture	mostly subsistence farming on small farms (1,3 ha), employs over half of population
Energy consumption	2000 Mtoe, over 50 % by households, 25 % services
Energy supply	90 % of generated electricity from hydro power (5500 GWh) net imports of electricity and petroleum products

Table 1-1: Basic country data

Transport	less than 100 cars/1000 inhabitants, but the number is growing rapidly (doubles in 5 years) high investments in road infrastructure 447 km of railway, poor quality public transport organized in cities, poor quality 1 international airport ("Mother Teresa", Tirana)
Industry	electrical energy, oil, minerals (chromium), cement, lime, steel
Tourism	1 million overnight stays, 15 % of GDP and increasing
Education	770,000 people attend education, 57 % enrollment in secondary school

1.2 NATIONAL GREENHOUSE GAS INVENTORY

Total GHG emission in Albania in 2000 were 7619.90 Gg. Main contributing sector is Energy (44.00 %), followed by Agriculture (27.12 %) and Land Use Change and Forestry (21.60 %) (Figure 1-1). The share of LUCF is significantly reducing, while the shares of energy and waste are rising. Among energy sub-sectors, transport is the fastest growing sector (Figure 1-2).

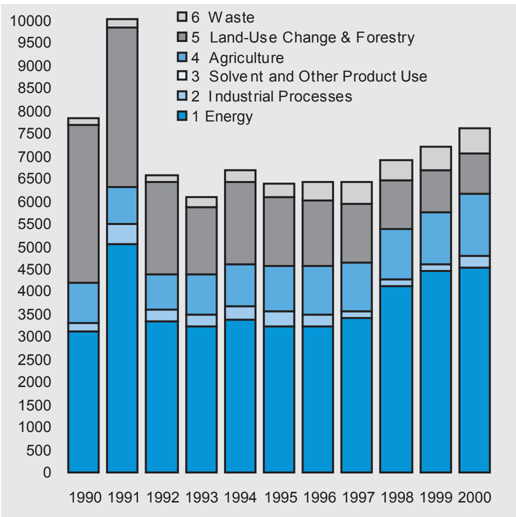


Figure 1-1: GHG emissions from all economic sectors (Gg CO_2 eq)

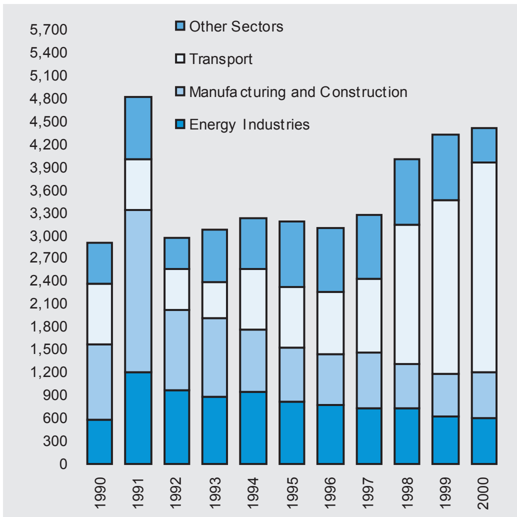


Figure 1-2: GHG emissions from energy sub-sectors (Gg CO_2 eq)

GHG emissions per capita in Albania were 2.47 tones CO_2 eq per capita, what is 4–5 times lower than the average of industrialized countries. This is due to generally low energy consumption, more than 90 % of electricity is produced by hydro power plants and most energy is consumed as electricity.

1.3 VULNERABILITY ASSESSMENT AND ADAPTATION OPTIONS

The assessment of vulnerability and adaptation options is focused on the Drini River Cascade (area from Kukës to Lezha Plain). The area is very important for electricity generation since more than 95 % of electrical energy in Albania is produced from hydro sources, primarily in the hydropower cascade of the Drini River with total exploitable capacity of 1.7 GW and a generation potential of 6.8 TWh.

1.3.1 Current Climate

Considerable variability of climate exists in the study area, mainly due to varied altitude and distance from the sea. The annual mean air temperature of the whole area is 11.7 °C and it varies from 8.9 °C in the inner part to 15.4 °C at the mouth of Drini River in Lezhe (Figure 1-3).

Analysis of anomalies in 1961–2000 shows that in general annual mean temperature has risen by approx. 1.0 °C for the entire zone. In Figure 1-4 the yearly anomaly of mean temperature is given for the station Shkodra.

The amount of precipitation also varies widely, from 910 mm in the eastern part (Kukës) to 2260 mm in Iballe, average precipitation for the whole area is 1634 mm per year (Figure 1-5). Analysis of the period 1961-2000 shows that annual precipitation total is slightly decreasing, but is statistically non significant. Figure 1-6 illustrates the results for Kukes station.

The highest amount of precipitation is recorded during the cold months (October-March), about 66 % of total. The wettest months are November–December, while the driest are July–August. The number of rainy days with precipitation higher than 1.0 mm varies from 94 in the eastern part up to 120 days in Iballe, while in the whole study zone the average is 103 days.

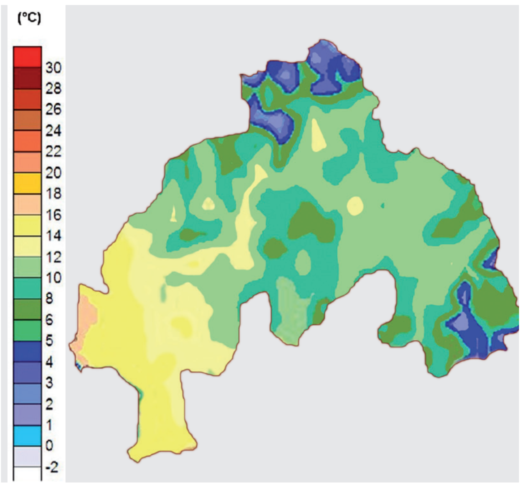


Figure 1-3: Yearly mean air temperature.

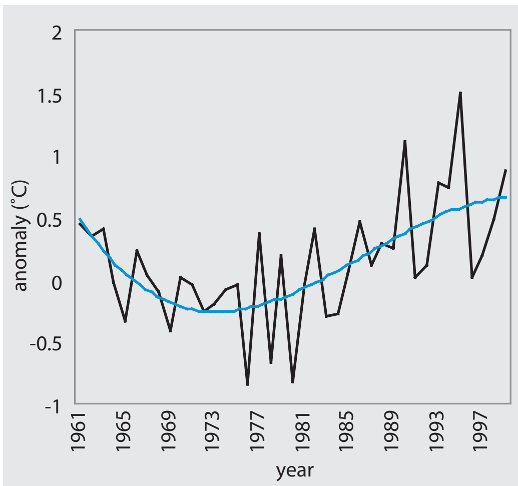


Figure 1-4: Yearly anomaly and the trend of air temperature (Shkoder)

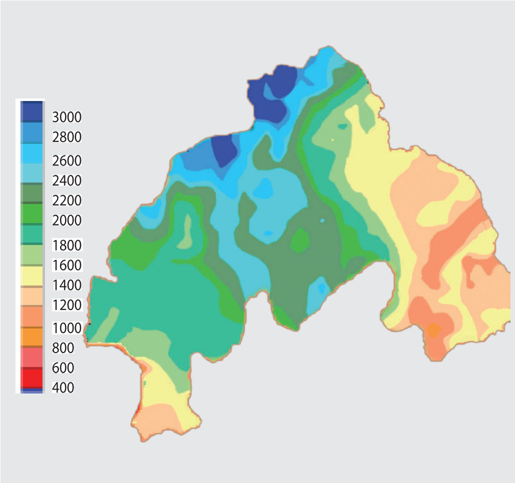


Figure 1-5: Distribution of annual precipitation total (1961–90)

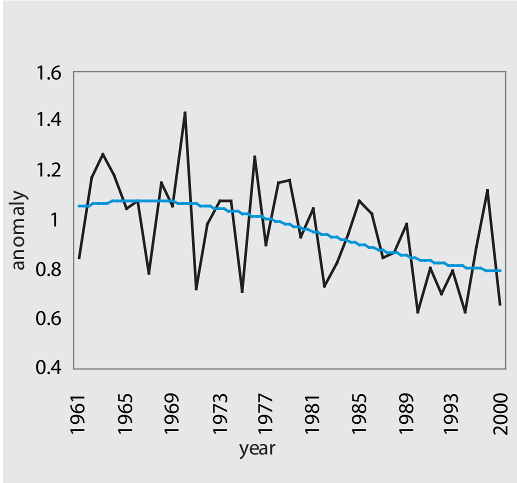


Figure 1-6: The annual precipitation anomaly and trend (Kukës)

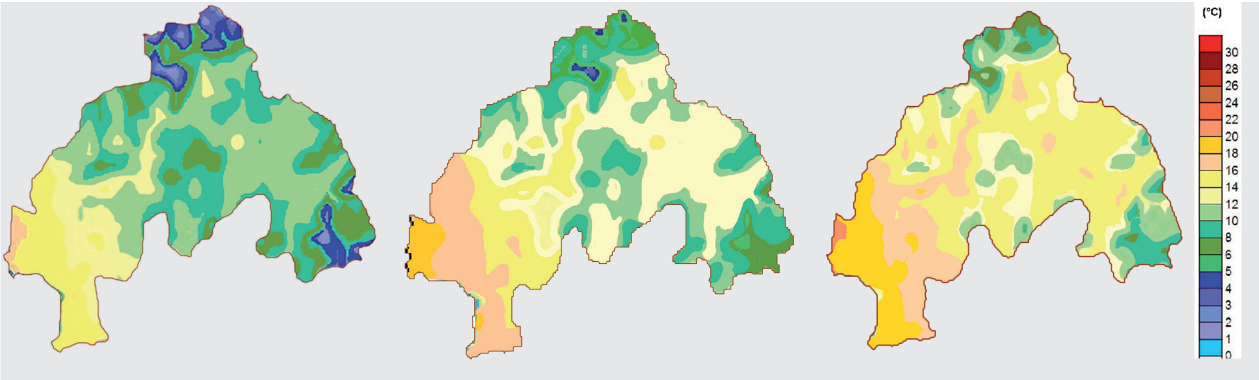
1.3.2 Expected Climate Change

1.3.2.1 Temperature and Precipitation

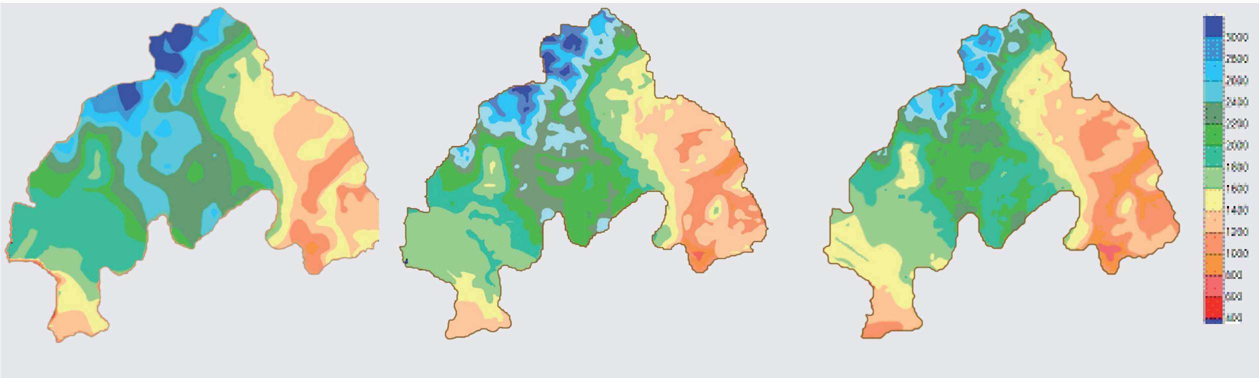
Likely changes in temperature and precipitation in Albania (including the study area) are presented in Table 1-2. Temperature is expected to increase and precipitation to decrease, giving milder winters, warmer springs, hotter and drier summer and drier autumn. Figure 1-7 illustrates likely annual changes for the study area.

Table 1–2: Climate change scenarios for Albania

Scenarios for Albania		Time horizon		
		2025	2050	2100
Annual	temperature (°C)	0.8 to 1.1	1.7 to 2.3	2.9 to 5.3
	precipitation (%)	–3.4 to –2.6	–6.9 to –5.3	–16.2 to –8.8
Winter	temperature (°C)	0.7 to 0.9	1.5 to 1.9	2.4 to 4.5
	precipitation (%)	–1.8 to –1.3	–3.6 to –2.8	–8.4 to –4.6
Spring	temperature (°C)	0.7 to 0.9	1.4 to 1.8	2.3 to 4.2
	precipitation (%)	–1.2 to –0.9	–2.5 to –1.9	–5.8 to –3.2
Summer	temperature (°C)	1.2 to 1.5	2.4 to 3.1	4.0 to 7.3
	precipitation (%)	–11.5 to –8.7	–23.2 to –17.8	–54.1 to –29.5
Autumn	temperature (°C)	0.8 to 1.1	1.7 to 2.2	2.9 to 5.2
	precipitation (%)	–3.0 to –2.3	–6.1 to –4.7	–14.2 to –7.7



a. Expected changes in average temperatures (annual)



b. Expected changes in precipitation total (annual)
Figure 1-7 Expected changes in the Drini river cascade

Likely changes in other climatic parameters are:

- Drought is expected during summer due to increased temperature (likely increase up to 5.6 °C) and potential evaporation, not balanced by precipitation (reduction by 41%).
- Increasing temperatures will raise the probability of extreme events and higher intra-annual variability of minimum temperatures. Higher increase of daily minimum than maximum temperatures is likely to occur. More frequent and severe droughts with greater fire risk are likely.
- Decreased number of frost days (temperatures ≤–5°C) in high altitudes is likely to occur. Expected decrease is 4–5 days, 9 days and 15 days by 2025, 2050 and 2100 respectively.
- Owing to higher average temperatures in winter more precipitation is likely to fall in the form of rain rather than snow, that will increase both soil moisture and run-off. Increase in total precipitation rate may induce greater risks of soil erosion, depending on the intensity of rain episodes.
- Increase in summer temperature is likely to result in increase in frequency and intensity of extreme weather events (heat waves). The number of days with the temperature ≥35 °C is likely to increase by 1–2 days by 2025 and by 3–4 days by 2050 compared to 1951–2000 average. By 2100 the expected increase is 5–6 days over the mountainous part, and up

to 8 days in the low land.

- The expected changes in surface air temperature and humidity will increase the heat index (combined effect of temperature and moisture). More hot days and heat waves are very likely over nearly all of the study area. The increase will be the largest in the lower part of the study area where soil moisture decrease is likely.
- Although total precipitation is expected to decrease, an increase of intensive rain episodes is likely. The number of days with heavy precipitation (24 hours maximum) compared to 1951–2000 average is likely to increase by 1–2 days by 2025, 2–3 days by 2050, and 3–5 days by 2100.

1.3.2.2 Water Resources

The patterns of change are broadly similar to the change in annual precipitation: increases in high altitudes but decreases in mid-altitudes. But the general increase in evaporation means that a reduction in runoff is probable (Figure 1-8).

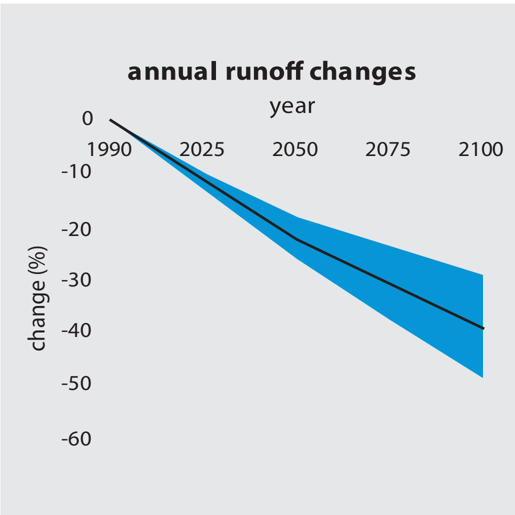


Figure 1-8 Expected runoff changes in DRA

1.3.2.3 Agriculture

- The total growing season may be reduced for some crops due to temperature increase. Cereal harvest dates would occur sooner.
- Lack of cold days during December–January could reduce vernalization effects and consequently lengthen the first part of the growing season for winter wheat. Air temperature in April could slow down biomass growth and reduce wheat yield.
- The expected increase of temperature will cause faster rates of development and shorten the length of growing periods for some crops, consequently shortening the length of the grain-filling period.
- Increased temperatures during growth season will promote the development rate of all winter crops, which will therefore face extreme events (cold spells) at a later stage when they are more sensitive.
- Higher summer temperatures (up to 5.5 °C higher by the year 2100) should not be very detrimetal to summer crops (except spring cereals, if subjected to elevated temperatures during the grain-filling period) because they are more resilient than winter crops. Drought could be a major concern in the future.
- Higher temperatures will be probably beneficial to grasslands, at least early in the season through increased early biomass production. Higher temperatures during the summer may decrease the growth capabilities of grass.
- Weeds are expected to benefit from higher CO_2 concentrations. The expected result of the crop-weed competition will depend on their respective reactions to climate and atmospheric fertilization.
- In general, increase of the temperature may shorten the reproductive cycle of many pests, so the risk of crop damage

from pests and diseases increases under a warming of climate.

1.3.2.4 Forestry

In general, evergreen species and oak forests are expected to expand, while the area of beech forests that are more important to produce wood would reduce. Common spruce forest (*Picetum*) is expected to disappear by 2025 while the alpine pasture on the top of high mountains would be reduced tenfold in size (from over 20 % of forest area to 2 %).

1.3.2.5 Sea Level Rise

National parks of Kune-Vain (Lezha District) and Velipoja (Shkodra District) are located along the Drin and Buna river deltas, between 0.8 to 2 m and 0–1.2 m above sea level, respectively. According to sea level rise scenarios, the coastal forest area (Lezha coast) is likely to decrease from 1.14 to around 1 km^2 by 2100.

Likely enlargement of lagoons is expected to increase their holding capacity for migratory birds and change the species present. Change in water fauna and flora in favor of species that like more warmth and salinity, is likely as well.

1.3.2.6 Energy

Climate change could have significant effects on the energy sector. Rising temperatures, changes of the amount of precipitation, and variation in humidity, wind patterns, and the number of sunny days per year could affect both consumption and production of energy in the whole Drini River Area (DRA). To evaluate the likely effects of climate change are established two scenarios: (i) without and (ii) with considering climate change effects up to the year 2025.

<u>Effects on energy consumption</u>

Climate change is likely to affect the following major electric end uses: space heating, air conditioning, water heating and refrigeration. Of these end uses, air conditioning and space heating are those most likely to be significantly affected, since both are functions of the indoor-outdoor temperature difference. The assessment of expected climate impact for this sector expands up to the year 2025.

Space heating energy demand for households is likely to reduce by 10.6 %, while cooling energy demand is likely to increase by 11.7 %.

<u>Effects on energy production</u>

- Electricity generation is likely to increase from 5,850 GWh in 2000 to 13,620 GWh by 2025 (mostly due to new thermal power plants);
- Owing to projected climate change a likely reduction of 700 GWh (year 2025) or 10–12 % of total hydro generation in 2025 is expected. In order to meet that demand, the capacity of thermal power plant needs to be increased to 700 GWh, equivalent of 120 MW;
- The share of electricity generated in Thermal Power Plants will increase from 6 % in 2000 to 59.90 % in 2025.

<u>Solar and Wind Power</u>

Climate change may also affect the supply of energy from solar and wind power. An increase in the hours of sunshine will lead to increase of solar energy use for different energy services. As an increase of wind speed is likely as well, this might encourage use of wind energy.

1.3.2.7 Population and Tourism

The expected climate change and sea level rise will largely influence the geographical distribution of the residence areas, population, their economic activity in general and tourism in particular.

Along the valley of "Drini i Bashkuar" river (from Kukesi to "Vau i Dejes") settlements are rare and in the process of being abandoned owing to the harsh natural conditions and limited possibilities for living and working. Tourism activity has not developed in this valley so far and it is not expected to be influenced by future climate change.

In the coastal part of the area the likely changes are:

- Considering an increase in temperature from 2.8 to 5.6 °C during summertime, it might be expected a general inclination of tourism towards the mountains or the lakes, instead of the beaches. Coastal tourism would be preferable by the end of spring and beginning of fall.
- The expected changes in surface air temperature and humidity are projected to result in increase of the heat index (which is a measure of the combined effects of temperature and moisture). These increases are projected to be largest mainly in the low part of study area and are likely to influence especially the health conditions of population.
- Increased frequency of extraordinary events (heavy rains, strong winds, droughts, flooding) might have a great influence in the settlement and tourists infrastructures.
- Coastal tourism is expected to suffer consequences of sea level rise. The possibility for new beaches to be created (in a natural way) does exist, but building a new tourism infrastructure would require huge investments. After 1990, a considerable number of population moved from the high mountainous areas of Albania towards the coastal area. They are settled in existing coastal cities and in areas where there were no dwellings before (mainly in the state properties of the ex swamps which were drained in the period 1950–1960). These areas are situated close to sea level or sometimes below sea level, so they are continuously threatened by flooding due to sea level increase or rivers. overflowing
- At the beach of Shengjin the tourism constructions are all threatened by sea level rise in the coming 50–100 years.

1.3.2.8 Health

An increase of frequency and intensity of heat-waves could be leading to additional summer heat related cardiovascular and respiratory deaths. Also, an increase of extreme precipitation events could aggravate current problems already existing in the area of water related diseases, accidents and injuries. Albania being in the Mediterranean area is subject to potential disease outbreaks of tropical origin such as Chikungunya, dengue and other diseases. Climate change will further aggravate air quality related health problems in the major cities of Albania, but in particular in Tirana.

1.3.2.9 Adaptation Action Plan

In the report the following types of adaptation policies for coping with negative effects of climate change were identified:

- Prevent the negative effects:
  - legislative, regulatory, and institutional,
  - structural & technological (technological/engineering solutions);

- Avoid or exploit changes in risk;
- Research into new methods/ technologies of adaptation;
- Educate, inform, and encourage behavioural change- dissemination of knowledge through education and public information.

Projects, identified for adapting to climate change are listed in Table 1-3.

Table 1-3: Climate change adaptation projects	
Data gathering	• Network of automatic meteorological stations • Network of automatic hydrological stations • Monitoring of sea and shoreline • Modernization of hydraulic laboratories • Satellite remote sensing • Geographical Information System (GIS)
Coastal protection technologies	Coastal defense structures • Construction of a series of dams parallel and perpendicular to the coastal line and refilling • Supplying the sea with the sediments to restore beaches (example Sochi/Batumi, Black Sea) • Building with "nature" techniques
Agriculture	• Land operations (leveling, terracing) • Conserving moisture (irrigation, adjustment of sowing dates etc.)
Livestock	• Microclimate in farmhouses • Disease control.
Fishery	• Warning system for abnormal phytoplankton blooms • Tests for toxins in shell species
Forestry	• Increasing the area of the protected forest zones to protect biodiversity. • Preparation of management plans to conserve biodiversity, taking into account the likely impacts of climate change. • Optimum Land Use Planning considering the impacts of climate change. • Likely erosion extension and ways to combat it.
Health	• Health information system (alert information system). • Civil emergency preparedness at all levels of health care system • Improvement of the potable water and urban waste water infrastructure coupled with the strengthening of the monitoring capacities.

1.4 MEASURES TO MITIGATE CLIMATE CHANGE

1.4.1 Energy

Abatement measures to reduce GHG emissions from the Energy sector are listed in Table 1-4, including their estimated emission reduction potential. The first 17 measures have a combined effect of 95 % of total reduction of GHG emissions.

Table 1–4: Cumulative effect of key abatement measures that represent 95 % of total reduction for the year 2025				
Selected Abatement Measures		Reduction in 2025	Key abatement measures (which compose 95 % of total reductions)	Cumulative sum %
1	Gas power plant	1448.975	18.329 %	18.329 %
2	Gas power plant	1448.975	18.329 %	36.657 %
3	Efficient boilers fuel oil-diesel	1087.567	13.757 %	50.414 %
4	Minihydro power	505.024	6.388 %	56.802 %
5	Hydro power	382.368	4.837 %	61.639 %
6	Thermal Solar	344.667	4.360 %	65.999 %
7	Prepayment meters	316.977	4.010 %	70.008 %
8	Landfill gas plant with 70% recovery	288.230	3.646 %	73.654 %
9	Eff. refridgerators	236.102	2.987 %	76.641 %
10	Efficient boilers coal	233.564	2.954 %	79.595 %
11	Coogeneration-CHP	216.911	2.744 %	82.339 %
12	District Heating-DH	208.903	2.642 %	84.981 %
13	Central Heating- CH	203.918	2.579 %	87.561 %
14	Efficient motors	187.029	2.366 %	89.927 %
15	Thermal timeswitches	177.016	2.239 %	92.166 %
16	Wind turbines	174.544	2.208 %	94.374 %
17	Gastaxies	167.090	2.114 %	96.487 %
18	Power factor correction	109.914	1.390 %	
19	thermal insulation of households-elec	76.356	0.966 %	
20	thermal insulation of households-LPG	45.595	0.577 %	
21	thermal insulation of households-wood	41.500	0.525 %	
22	Methane from sewage	2.462	0.031 %	
23	thermal insulation of households-DH	1.085	0.014 %	
24	thermal insulation of households-ker	0.650	0.008 %	
25	Efficient lighting	0.156	0.002 %	
	TOTAL	**7.209**	**100.000 %**	

Implementation of these measures is expected to reduce GHG emissions, shown as a Baseline and Abatement scenario in Figure 1-9.

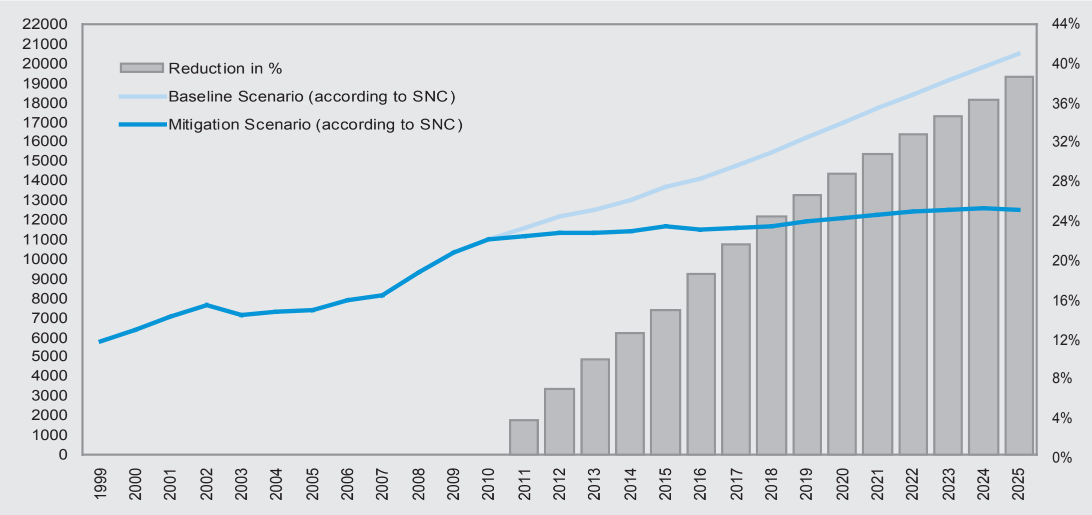


Figure 1-9: Baseline Scenario, Abatement Scenario and the evaluated reduction of GHG emissions (kton CO_2 eq) from Energy & Transport Sector

1.4.2 Agriculture

The following abatement measures were identified for the Agriculture sector:

1. Crop rotation
2. Perennial crops (including agro-forestry practices), and reduced bare fallow frequency
3. Use of improved grazing systems with higher quality forage
4. Reversion and afforestation of abandoned areas
5. Understanding of crop fertilizer needs
6. Adopting a good manure nutrient management plan
7. Voluntary agreements (e.g., soil management practices that enhance carbon sequestration in agricultural soils)
8. Determine amount of manure produced
9. Liquid manure systems
10. Supporting programs of technology transfer in agriculture
11. Improved animal genetics and reproduction
12. Timing of manure application
13. Using manure as a nutrient source
14. Application of compost
15. Separation, aeration, or shift to solid handling or storage management systems
16. Installation and usage of anaerobic digesters for reduced CH4 emission from livestock waste
17. Management practices to increase soil carbon stocks include reduced tillage, crop residue return
18. Increasing the digestibility of forages and feeds
19. Soil testing

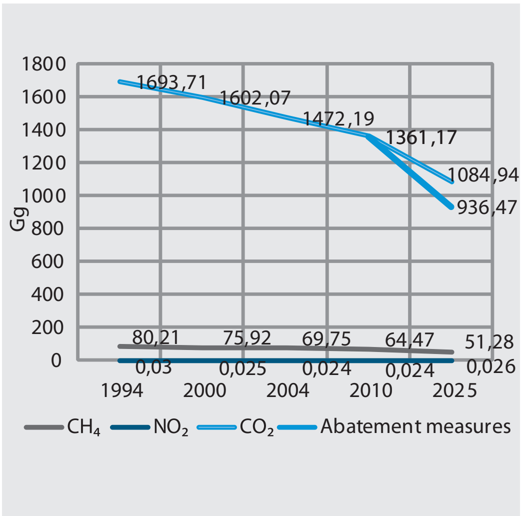


Figure 1-10: Total emissions (Gg) from Agriculture Sector as per the Baseline and Abatement Scenarios

1.4.3 Waste

Reduction of emissions from waste landfills is proposed by two measures:

- construction of environmentally sound landfills with methane recovery (first scenario) and
- construction of municipal solid waste incinerator (second scenario).

Figure 1-11 shows all emission scenarios, since the measures do not exclude each other, a scenario of applying both measures is also shown.

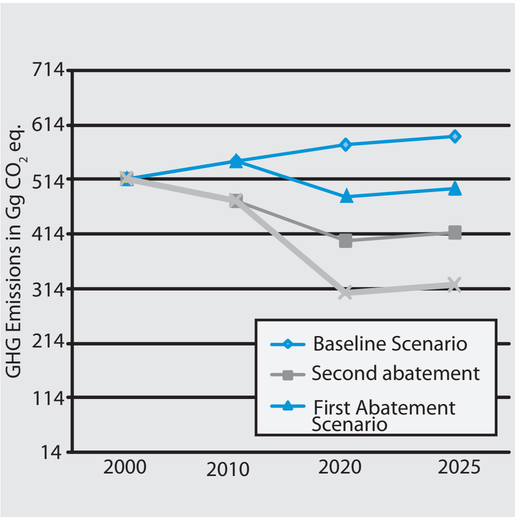


Figure 1-11: GHG emissions Baseline and Abatement Scenarios for the Waste Sector

1.4.4 Land Use Change and Forestry

The following general measures were identified to mitigate climate change:

- Preparation of a sustainable forestry development strategy and action plan, taking climate change into account;
- Integration of climate change into other development policies and action plans related to land use, forest management, aforestation/reforestation, forest protection against fires, etc.;
- New legislation and enforcement of existing legislation that prohibits illegal cuttings, regulates annual harvesting of forests, defines emergency response measures against forest fires, etc.;
- Identification and monitoring of vulnerable forest areas (fires, diseases);
- Research on adaptation of forest species to climate change and sea level rise.

The following directly applicable measures were identified to mitigate climate change:

- Better management of pollarded forest areas for fodder (mainly for goats);
- Rehabilitation of degraded forests (10,000 ha/year for a period of 20 years);
- Increase of forest area by planting trees on abandoned agricultural land (90,000 ha in 20 years).

Total GHG emissions/removals from LUCF sector, are expected to change from – 2,082.66 Gg (emissions) in the year 2000 to + 3,426.76 Gg in the year 2025 (removals) as shown in Figure 1-12.

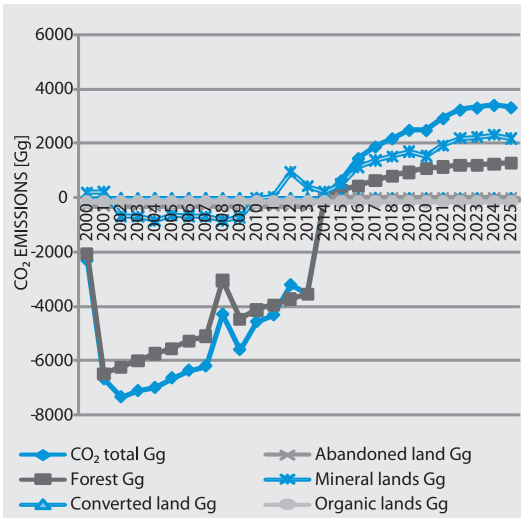


Figure 1-12: Balance of CO_2 emissions after the GHG emissions Abatement Scenario

1.4.5 Industry

GHG Emissions from industry in Albania are small compared to other sectors, therefore no explicit measures are anticipated for their reduction. The GHG emissions baseline scenario without mitigation measures anticipates growth of the industrial sector; emissions of CO_2 are expected to grow as shown in Figure 1-13.

1.4.6 Total GHG Emissions by All Sectors

Combined GHG emissions by baseline and abatement scenarios are shown in Figure 1-14. The measures are not excluding each other therefore the combined scenario is achievable. By the year 2025, the emission reduction by abatement scenario shall reach 48 %.

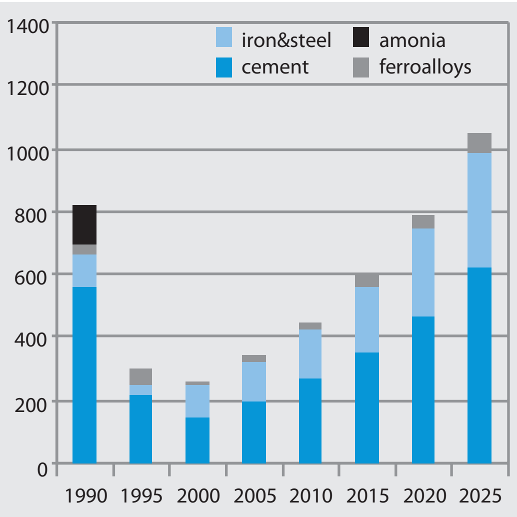


Figure 1-13: CO_2 emissions from industry sector [Gg]

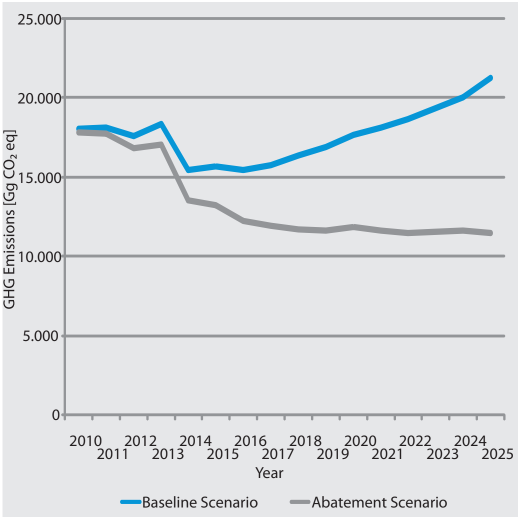


Figure 1-14: GHG Emissions by Baseline and Abatement Scenarios [Gg CO_2 eq]

1.5 OTHER INFORMATION

1.5.1 Integration of Climate Change in Social, Economic and Environmental Policies

The National Strategy for Development and Integration 2007–2013 (adopted in 2008) is a key national strategic document that also includes climate change related isses and measures. It recognizes that Albania has a relatively low impact on global environment through low per capita GHG emissions, but there are several measures for climate change mitigation or adaptation already included in the strategy although their primary aim is not explicitly climate change related.

1.5.2 Technology Transfer Needs

A Technology Needs Assessment was prepared for Albania (UNDP, 2005), identifying technology transfer needs for climate change mitigation and adaptation. The identified technologies are categorized by sectors and described in significant detail.

1.5.3 Climate Change Research and Systematic Observation

The key institution that conducts systemic observation of weather and climate is the Institute of Hydrometeorology Albania (today merged into the Institute of Water, Energy and Environment of the Polytechnic University of Tirana), that maintains a national monitoring network, consisting of a meteorological network (165 stations) and a hydrological network (107 stations).

The Institute of Water, Energy and Environment of the Polytechnic University of Tirana is the main research institution that is regularly conducting basic and applied scientific studies related to climate change. Currently their main activities are vulnerability and adaptation to climate change.

Climate change related research is also conducted at the Faculty of Natural Sciences of the University in Tirana and at some other Academia related centers.

1.5.4 Education, training, public awareness

Despite the increasing public awareness activity regarding environmental issues in general, the issue of climate change is still relatively dormant in Albania, and even at the level of policy makers one does not find very good understanding of climate change and related issues.

To assess the level of public awareness and other relevant components addressed under Article 6 of the UNFCCC, a survey has been carried out under the Article 6 Project funded by the United Nations Environment Program. The main finding of the survey is, that more than half of the public is not aware of climate change and its threats. Even more people do not know about Albania's position, institutions and accomplishments under the UNFCCC and the Kyoto Protocol. To overcome this issue a communication strategy on climate change has been developed.

1.5.5 Capacity-building

Important support to capacity building in the field of climate change were UNDP-GEF funded projects "Enabling Albania to Prepare its First National Communication in Response to its Commitments under the UNFCCC" with a follow-up Phase II of Climate Change Enabling Activities and "Enabling Albania to prepare its Second National Communication in Response to its Commitments to the UNFCCC". Within this framework projects several specific studies were prepared.

UNDP has recently or is currently supporting the following climate related projects in Albania, that are all directly or indirectly building capacity:

- Market Transformation on Solar Thermal Water Heating
- Building Capacity to Access Carbon Finance in Albania
- Identification of adaptation response measures in the Drini - Mati River Deltas

A core team of national experts has developed through the work on national communications and other projects, representing a blend of experts from private companies, research instutions and independent experts working on project basis.

The Climate Change Unit of the UNDP office in Albania used to be the focal point of climate change related activities in the country. The unit is managing all UNDP executed projects and disseminating data and results in the field of climate change . It co-operates closely with the Ministry of Environment, Forests and Water Administration as a de-facto national task force on climate change.

The main needs for capacity building in Albania are:

- Improvement of data collection and reporting on activity in the key sectors,
- Implementation of QA/QC procedures for GHG inventory,
- Capacity of research institutions for key climate change issues (energy efficiency, reforestation in changed climate, agricultural practice that minimizes GHG emissions etc.).

1.5.6 Co-operation with Annex II Parties and International Institutions

Albania is regularly receiving support from developed countries through various programmes from UNDP, European Commision and Annex II countries directly.

1.5.7 Proposed Projects for Financing

Table 1–5: Proposed projects for financing

Project	Time line	Estimated cost
Adaptation		
Plan and equipment for monitoring and response to anticipated climate change impacts in the Drin River Cascade at the institutional and community levels	2010-2013	$150,000
Integrated irrigation plan for agriculture in Drini and Mati delta	2012-2015	$350,000
Monitoring of coastal area	2011-2015	$150,000
Construction of Coastal Infrastructure: Feasibility study and design of of coastal infrastructure objects	2013-2014	$450,000
Public awareness of the need to take individual actions to deal with climate change	2011-2012	$100,00
Guidelines for agricultural practices in changed climate (crop selection/substitution, conservation tillage, etc.)	2012-2013	$70,000
Guidelines for reforestation in changed climate	2015-2016	$90,000
Tests for toxins in shellfish species	2012	$120,000
Water quality monitoring system (pilot project)	2015-2018	$550,000
Emission Abatement		
Small hydo power plants	2012-2020	(CDM project)
Energy efficiency in electrical distribution	2011	(CDM project)
Wind Farm	2012-2015	(CDM project)
Efficient Lighting	2011-2013	(CDM project)
Thermal Solar for Coastal Hotels	2011-2015	(CDM project)
National sustainable transport plan	2011	$450,000
Feasibility Study of Municipal Solid Waste Incinerator	2012	$350,000

2. NATIONAL CIRCUMSTANCES

2.1 Geographic Profile

The Republic of Albania is situated in southeastern Europe, in the western part of Balkan Peninsula facing the Adriatic Sea (sandy shore) and the Ionian Sea (rocky shore). Its coordinates are 39º 38' E (Konispol) and 42º 39' N (Vermosh) and 19º 16' E (Sazan Island) and 21º 40' N (Vermik village, Korça). Albania has a surface area of 28,745 km2. Its terrain is mountainous, where hilly and mountainous areas represent 77% of the country's territory and the average altitude of 708 meters is double the European average. It is administratively divided into 12 prefectures, 36 districts, 315 communes and 2,900 villages. The total length of the state border is 1,093 km, out of which 657 km is land border, 316 km sea border, 48 km river border and 72 km lake border. To the northwest Albania borders with Montenegro, northeast with Kosovo, east with Macedonia, while south and southeast with Greece. Owing to the rugged relief of the land, rivers are torrential with high erosive power. Rivers Buna, Drini, Mati, Ishmi, Erzen, Shkumbin, Seman and Vjosa flow into the Adriatic Sea, Bistrica flows into the Ionian Sea. The rivers that flow into the Adriatic Sea form a number of coastal lagoons and swamps. The rivers of Albania are an important source of hydro power.

The lakes are of varying origin: glacial lakes in the highlands, carstic lakes in the hills, and tectonic lakes (Shkodra, Ohri and Prespa). The lakes in hills and highlands are important, in terms of tourist ecosystems. They are used for irrigation purposes. Moreover, they are very important regarding fisheries, especially those of the wetland type, which are large fishing reserves.

2.2 CLIMATE PROFILE

2.2.1 Temperature

Climate of Albania is typically Mediterranean. It is characterized by mild winters with abundant precipitation and hot, dry summers. Temperature values vary from 7° C over the highest zones up to 15° C on the coastal zone; in the south- west the temperatures even reach up to 16° C. Along the lowland, an almost stable distribution of annual mean temperature (12–14°C) is observed. Annual mean maximum air temperature varies from 11.3 °C in the mountainous zones up to 21.8 °C in the low and coastal zones while annual mean minimum varies from – 0.1°C up to 14.6 °C respectively.

2.2.2 Precipitation

The mean annual precipitation total over Albania is about 1485 mm/year. Nevertheless, the spatial distribution varies within quite wide limits. The southeast part of the country receives the smaller amount of precipitation (annual value reaches up to 600 mm), followed by the Myzeqeja field, that receives about 1000 mm/year. The highest precipitation total is recorded in the Albanian Alps, where the values reach up to 2800-3000 mm/year. Another center with abundant rainfall is also the mountainous southwest zone, with a precipitation total up to 2200 mm. Precipitation displays a clear annual course with the maximum in winter and the minimum in summer. The highest total precipitation (about 70 %) is recorded during the cold months (October-March). The richest month in precipitation over the whole territory is November, while the poorest are July-August. Snow is characteristic for inland mountainous regions, i.e. the Albanian Alps, and the central and southern mountainous regions. It is a rare phenomenon in the West Plain lowlands, in particular in the southwestern part of the Albanian coast.

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

2.3 NATURAL RESOURCES

2.3.1 Water Resources

2.3.1.1 Surface Water

The area surrounding Albania has relatively abundant fresh water resources. Seven main rivers run from east to west in Albania. The contribution of rivers discharging into the Adriatic sea is very large (95 %), compared to the discharge into Ionian sea (5 %). The total volume of water flow is 39,220 x 10^6 m^3/year. There are two characteristic periods in the year, in terms of the water flow: the wet period, (October – May) and the dry one (June – September). 86 % of the annual water flow is discharged during the wet period and 8 % during the dry one. June is the transition period, accounting for 6 % of the annual water flow. Long term runoff values for all the rivers discharging into the seas are shown in Table 2-1.

Table 2-1: Long term runoff for all rivers discharged into seas

River basin	Q [m^3/s] average flow	V [10^6 m^3/year] annual discharge
Drini	675.0	21,287
Mati	87.4	2,756
Ishmi	19.8	624
Erzeni	16.9	533
Shkumbini	58.7	1,851
Semani	86.0	2,712
Vjosa	189.0	5,96
Bistrica	32.1	1,012
Pavia	6.7	211
Others	72.1	2,274
Total	**1,243.7**	**39,220**

Source: Albania's First National Communication

2.3.1.2 Ground Water

Ground water in Albania is present in different sorts of rocks of different ages, from Paleozoic to Quaternary age. It is a very important resource because it is the main source for drinking water. Ground water is subject to climatic, morphological, hydrological, geographical factors and the influence of human activity. The most important factor, on which groundwater levels depend, is precipitation.

The drinking water supply is provided by using underground resources extracted by forced flow. The networks of drinking water provide water not only for domestic use but also for industrial activities.

2.3.1.3 Marine Water

The Albanian coast consists of the Adriatic and Ionain sea coasts. Monthly variation in sea level is caused by non uniform influences on the hydro-meteorological factors. The highest levels are observed during November – December because strong southern winds at this time push the water mass to the north and increase the sea level. The lowest levels are observed during July – August which is the quietest period of the year. Of great impact to sea level, are the extremes caused by strong winds blowing from sea to land and vice versa, especially when the strong southern winds are active. They have high speed and long duration. The wave altitude varies from the minimum value of – 60 cm to the maximum one of + 175 cm. The temperatures of the seawater are mainly determined by solar radiation, but it is also subject to the influence of fresh water, winds, marine currents, waves etc. The highest temperatures are observed during July – August, when the solar radiation is at its maximum, while minimum temperatures are observed in February.

2.3.2 Land Use, Land Use Change and Forestry

Albanian forests cover 36 % of the territory. They consist of the high stem forests (45.7 %) and coppice (54.3 %).The single species forests occupy 72.3 % and the mixed species forests 27.7 %. According to their functions forests may be classified as production forests (86.0 %) and protection forests (14.0 %). Also, one may distinguish 91.2% natural forests and 8.8% man made forests or plantations. About 83% of forest area is covered by semi natural forests originating from natural regeneration, conserving the main species composition. Then there are around 8.2% or 84,841 ha of virgin /primeval forests, mainly located in the northern part of Albania. The rest (8.8 %) is covered by man made forests, an area that has been increasing up to 1990 and after that it was suspended due to lack of investments.

The forests in Albania play both production and protection roles, to meet the needs of consumers for logs (wood industry, construction, etc.), and firewood, and to perform other functions (erosion control, biodiversity conservation, relaxation, tourism, hunting, sports, etc.). The broadleaf species compose 83.3 % of forest area; the most important are oak species 32.2 % followed by beech 19.2 %, eastern hornbeam 8,8 % and so on; the conifers (16,7 %), are represented, mainly by black pine 10.4 %, Mediterranean pines (Aleppo pine, Stone pine, Seaside pine) 3.3 %, silver fir 1.6 %, etc. Albania has a hill mountainous relief, where three-quarters of which are hills and mountains and only one quarter is flat.

During the last 50 years the following phenomena have been noticed:

- The arable land up to 1990, has increased and after that decreased, resulting in an area of approximately 120,000 ha abandoned arable land. Farmers have refused the abandoned arable land as inappropriate land to be cultivated with crops;
- The share of forests has decreased in the past 50 years owing to the deforestation process aiming at having more arable land, much less reforestation and due to changes on forest definition (much more forest area is included in pastures);
- The pasture area has decreased up to 1990 and after this year it has increased;
- The other area (water, stone, etc.) has decreased until 1990 by drainage of the inland water area and on the other hand it has increased by construction of artificial lakes used for irrigation or for energy generation purposes. The drying of a considerable inland water area has increased organic soils with considerable CO_2 reserves.
- The present situation of the forests in Albania is a consequence of the continuous over- exploitation during 60 years, and especially during the last 17 years. It reached a peak in 1997, when more than 550,000 m^3 timber was cut.

Fires that in the majority of cases were intentional have caused considerable damage to forests and grasslands in recent years. The lack of investments and organizational measures for silvicultural work, for new forestations or reforestation, for combating pests, maintaining forest roads, for fire protection, etc., has caused the loss and degradation of the habitats of many plant and animal forest species. Recently forest protection is better organized through the creation of communal forests around the rural areas, which are managed by the communities. The pace of the creation of private forests should be accelerated.

2.4 ECONOMIC PROFILE

During the years of democracy, Albania has experienced large political, institutional and socio-economic changes. From a deeply isolated country of constitutionally denied freedoms and rights and imposed atheism, it transformed into a country of political pluralism that has been already consolidated. Albania is today a country where the freedoms and rights of individuals and minorities are respected and guaranteed, a country of free media and full religious freedom. The Albanian economy is already based on free initiative, as more than 80 % of the domestic product comes from the private sector, and per capita incomes today are twenty times higher than they were in 1992.

The year 1992 for Albania was considered the start of transition from a centralized economy to a market one. The economic development programs had a very clear stabilizing nature and were imposed owing to the deep crisis that was inherited by the previous system. Until 1996, the achievements were positive and this experience was considered as positive even by the international financial institutions. Guided by the International Monetary Fund and the World Bank, Albania became a model in the Balkan for progress in economic reform.

Albania has become an important factor of security, peace and stability in the region. Its foreign policy has so far been realized through active participation in and support to regional and international organizations; trust building through dialogue and good neighborly relations; support and active participation in regional and international programs aimed to build trust; honesty and sincerity in regional and international transactions. In 2009 Albania became a member of North Atlantic Treaty Organization (NATO) and formally applied for European Union (EU) membership, after entry into force of a Stabilization and Association Agreement.

The association with the Euro–Atlantic countries and institutions has helped Albania to strengthen its democratic processes and structures and implement its domestic reforms, which are necessary for a strong and functioning democracy.

Economic growth is supported by stabilizing macroeconomic policies, which are oriented toward maintenance of stable inflation and reduction in total deficit and public debt. This has been ensured through improved fiscal discipline, resource administration, effectiveness of public expenditure, and provision of incentives for development of the private business sector. Additionally, it is noteworthy that public investments in relation to the GDP have increased in recent years and have been significantly higher than the total deficit. The bulk of them are financed from state revenues.

During institutional and legal improvements in the period 2006-2007, Albania maintained a steady real economic growth rate at the level of 5.5-6%. Growing GDP per capita had a positive impact on rising standard of living. Notably, there has been an increase in exports, particularly of the goods of "pure origin of Albanian economy," where the groups of "minerals, combustion substances" are included. Foreign direct investments have increased, although investments per capita are still lower compared to the countries of the region.

There has been a significant improvement of the business climate owing to regulatory reform launched by the Government of Albania. However, further progress should be made toward the creation of fiscal incentives in order to attract more foreign investments, compared to the SEE countries. The level of the electronic governance indicator has improved as result of a series of policies undertaken to facilitate business registration, electronic procurement, provision of electronic tax services, and broad use of information technology in education. The contributions of each economic sector in the GDP and the growth rates of GDP during 2002 – 2006 are shown in Table 2-2.

Table 2-2: Share of value added to GDP

Sector Year	Industry	Agriculture	Construction	Transport	Other
1996	9.7	36.1	5		49.2[1]
2000	7.6	25.5	8.1		58.8
2002	10.8	26.3	7.9	11.2	25.6
2003	8.7	23.5	13.7	10.7	23.3
2004	10.0	22.3	13.9	9.0	23.2
2005	10.6	20.6	13.8	9.4	24.1
2006	11.0	19.5	14.2	9.2	25.4

Source: INSTAT, Ministry of Agriculture, Food & Consumer Protection

2.4.1 Agriculture

Agriculture continues to be one of the most important sectors of the national economy. Its contribution has been decreasing over years (Table 2-2). Rural families continue to dominate the national economy, more than 50 percent of the population lives in the rural areas, and agriculture is the main working alternative for people living in these areas. The real mean increasing rate of agriculture production during the last five years is estimated to about 3 percent per year.

Since the privatization of land started, agricultural production has risen every year. A rapid growth and recovery during the early stages of the transition resulted mostly from the ability of farmers to quickly adapt to the changes brought about through the privatization by modifying their production structures. During the period 1990–2004, 564,000 ha of agricultural land or 98.9 % of planned land for distribution was privatized, resulting in creation of about 450,000 private farms of

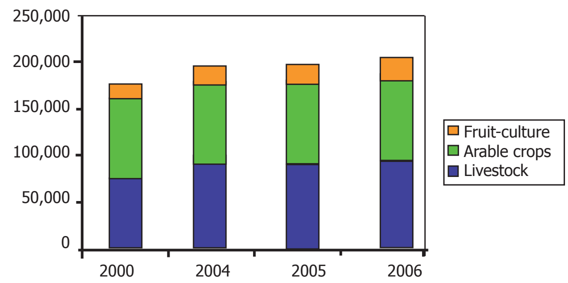
[1] The data on Transport for the years 1996 and 2000 are not presented separately, they are included in »Other Services«.

an average size of about 1,3 ha. There are no longer any state agriculture enterprises and no large private agriculture enterprises. Production is predominantly subsistence farming, generally involving a mixture of annual crops (e.g. wheat, alfalfa, and vegetables), some cattle and poultry and perhaps a few fruit trees. Most farmers operate as individuals, and progress towards farm amalgamation or even inter-farm cooperation with joint buying and marketing seems very slow.

Agriculture is still the backbone of Albania's economy; nearly half of the working force is employed in agriculture and a considerable part of the GDP is generated in this sector. Although the overall contribution to the country economy is decreasing due to rapid development of new emerging sectors of economy (commerce and services), the national economy will continue to be dominated by agricultural activity. Income increase from crop production, livestock, agro-industries, and fishery and forestry sectors remains crucial for the economic and social development of the country.

The size of an average agricultural household is 4.8 persons. The rural population is dominated by young people. About 26 % are less than 15 years old, 67 % are between 15 and 65 years old and only 8.6 % are older than 65 years. About 52 % of farm operators are 25-54 years old. About one third of the population lives in the mountainous areas. The agricultural farm is a main source of employment. 73 % of the working force is employed in agriculture, 6 % in non-agricultural businesses, 6 % in agro-industrial activities and 3 % in other jobs. Only 50 % of young people work on the farm, mainly because of the low-income level offered.

The growth rate of the agriculture sector is below the mean national rate due to migration from rural areas, land ownership issues and the very limited size of agriculture farms, poorly organized marketing of products, lack of irrigation and drainage systems, low level of technologies in use, weak organization of farmers, low level of development of agro – processing, etc. The consequence is lack of motivation and low interest of larger investors for agriculture oriented activities.



Source: Ministry of Agriculture, Food & Consumer Protection

Figure 2-1: Agriculture Production

Table 2-4: Fruit tree stock and production								
	2000	2001	2002	2003	2004	2005	2006	2007
Fruit Trees	5,573 (64.9)	5,573 (64.9)	5,573 (64.9)	6,530 (77.4)	6,785 (85.3)	7,120 (90.0)	7,699 (110.3)	9,310 (120.0)
Citrus	391 (2.6)	422 (2.8)	453 (3.4)	489 (4.4)	521 (4.9)	550 (5.2)	528 (5.6)	577 (6.7)
Grapes (pergola)	4,638	4,793	4,806	4,259	4,404	4,536	4,708	4,957
Grapes (ha of vineyard)	5,824	6,275	6,800	7,180	7,605	7,994	8,357	9,103
Olive Trees	3,611 (36.2)	3,667 (39.6)	3,809 (27.3)	3,,940 (27.9)	4,092 (58.7)	4,264 (30.2)	4,497 (40.2)	4,715 (27.6)

('000 trees unless otherwise indicated; '000 ton of production in brackets)
Source: INSTAT

2.4.2 Livestock

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 has increased rapidly in the past but it is decreasing in recent years. The number of pigs and poultry is increasing, though the total quantity of animals expressed as animal unit equivalents is decreasing. The density of livestock per hectare of land is still very high. An overview of the state of the livestock, their number and production are given in Table 2-5:

Table 2-5: Number of livestock								
	2000	2001	2002	2003	2004	2005	2006	2007
Cattle	728	708	690	684	654	655	634	577
Pigs	103	106	114	132	143	147	152	147
Sheep	1,939	1,906	1,844	1,903	1,794	1,760	1,830	1,853
Goats	1,104	1,027	929	1,015	944	941	940	876
Poultry	5,291	5,422	5,826	6,104	6,275	6,432	6,200	7,135

('000 heads)
Source: INSTAT

2.4.3 Fishery

The fishery sector is a poorly developed sector of the Albanian economy. Consumption of fish products is relatively low, about 3.3 kg per capita annually, compared to the average of Mediterranean countries at 15.1 kg per capita. The maritime fleet is dominated by submerging ships (68 %), pelagic fishing boats are 6% of the fleet, the rest engage in selective fishing with hooks. Fishing in sea lagoons (of surface area of 10,000 ha) is frequent, yields are varying from 42 to 97 kg per hectare. 750 fishermen currently work in three main lakes of Albania (Shkodra Lake, Pogradec Lake & Prespa Lake).

Table 2-6 Fish catches						
Type of fishing	2002	2003	2004	2005	2006	2007
Marine	1,956	1,921	1,722	1,752	1,932	1,974
Coastal Line	90	95	67	240	254	473
Coastal lagoon	235	175	428	270	282	295
Inland waters	1,373	1,512	1,881	2,180	2,078	2,145
Aquaculture	108	167	684	725	1,470	1,430
Mussel	350	860	720	1,250	1,360	1,042

(ton)
Source: INSTAT

The fish processing industry is expanding. The fishery sector is negatively affected by illegal and non-reported fishing activity. The total catch is very low compared to the activities of the other countries of the Adriatic and Ionian Sea, and thus not a significant environmental issue.

2.4.4 Energy

The energy sector is a priority sector of government policies bearing in mind that its development is not at a sustainable level as evidenced by the electricity crises of 2002 and 2007. Albania is endowed with a wide variety of energy resources ranging from oil and gas, coal and other fossil fuels, to hydropower, natural forest biomass and other renewable energy. The role of coal and natural gas has gradually decreased since the beginning of the 90's while the oil sector remains stable thanks to imported petroleum products. The electricity sector is the most important energy sub-sector. Hydro-energy accounts for 90 % of generated electricity. Only 30% of hydro resources are exploited. The energy sector contributes to approx. 10 % of the GDP and employs approx. 17,000 employees, the majority of which work in the two biggest energy companies, KESH and the Albanian Petroleum Corporation (APC).

2.4.4.1 Energy Consumption

The consumption of energy resources for all the economy sectors in our country has increased from year to year and an exception in this context is the period 1990-1992, in which there was a fall in consumption from 2.26 MTOE in 1990 to 1.22 MTOE in 1992, as a consequence of closing down many industrial consumers. Subsequently, the situation in Albania changed deeply, intensity of energy was reduced by approximately 50 %, although the consumption per capita of the energy is still at low levels. In 2005, with regard to these two indicators, there is an increase of the energy consumption per capita by 11.7 % and with a small increase of the energy intensity by 2.3 %. The consumption of energy resources at this year is at the value of 1.996 MTOE. For 2005, we highlight that the household sector had the biggest share in the consumption of electrical power by 54 %, second comes the services sector by 23 %, third is the industry sector by 18.8 % and followed by agriculture 6 %.

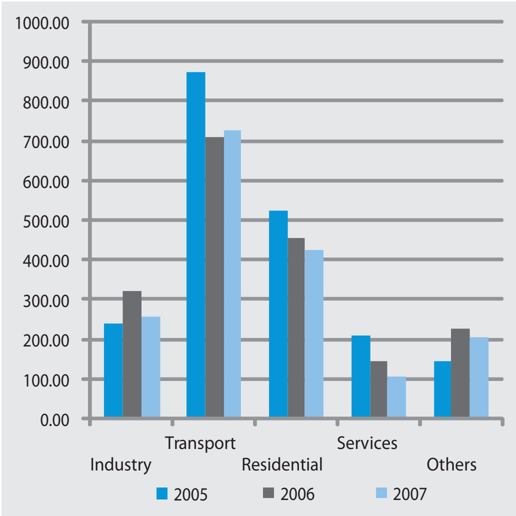


Figure 2-2 Energy consumption by sources [ktoe]

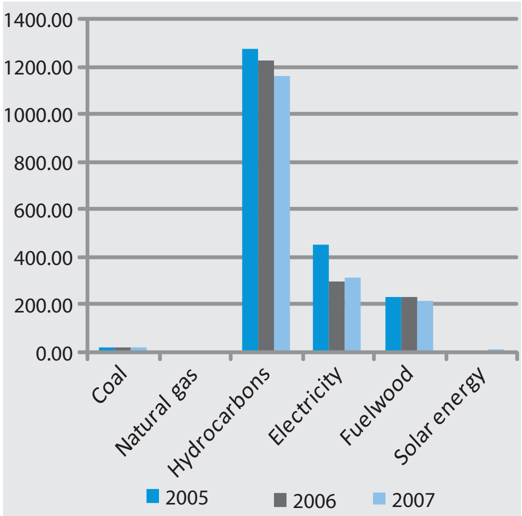


Figure2-3 Total final consumption of energy[ktoe]

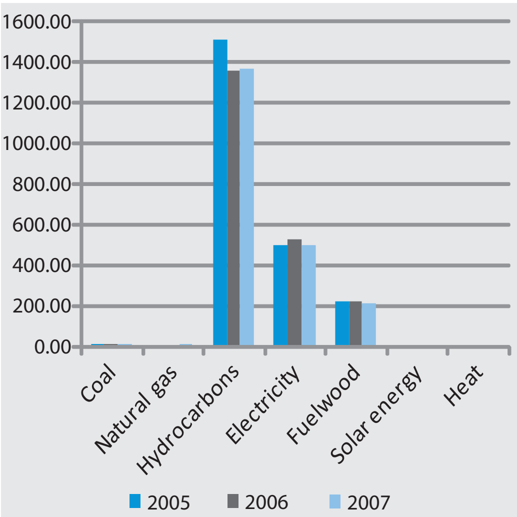
After 2000, there was a decrease of electrical power consumption, not because the economy would consume less, but because the electrical power system was not able to supply electricity to many consumers. This has urged several enterprises and services to install reserve generators of electrical power. The sector that has been constantly growing was transport. In 1990, it consumed 6 % of total energy, while in 2005 this sector consumed 44.3 %, households sector 26.5 %, industrial sector 12.4 %, services sector 10.4 % and agriculture 4.5 %.

Petroleum products have increased their share in the final consumption of energy from 48 % in 1995 to 63.1 % in 2005. This has happened owing to decreased consumption of firewood, coal and natural gas on one hand, and a large increase of transport on the other. The average annual rates of petroleum product consumption growth during this period is 6.2 %, while the sector of transport registered an increase of 8.8 % and services 9.1 %.

2.4.4.2 Energy Supply

The energy sector has historically played an important role in the Albanian economy. Albania was largely self - sufficient in energy resources and generally until 1989 has been a net exporter of electricity and refinery oil by products. Albania was rich in energy resources such as oil, gas, coal, fuel wood, peat, and hydro, which contribute in different ways to meet energy demands in the country. Inadequate technology, over-used equipment and poor operating performance have resulted in increasing costs and declining yields in coal, oil and gas production and led to frequent disruptions of electricity supply.

Since 1990 there have been major structural changes as regards the shares of energy sources on the supply side. Domestically produced coal and gas have been the "big losers" since the economic turmoil caused many industrial consumers to shut down. In the figure 2-4 has been laid out the supply with primary energy resources during the period 1990-2005, where it shown that supply has fallen after the year 1990 to 2.75 Mtoe to reach a minimum of 1.49 Mtoe in 1992. Subsequently, the supply with primary resources has recognised a normal increase reaching the value of 2.3 Mtoe until 2005. Although the situation of supply with primary products is constantly increasing, the market of our country has been under-performing in supplying electrical power, hydrocarbons and not connected to the international network of natural gas.



Source: INSTAT

Figure 2-4: Primary energy supply by sources [ktoe]

Owing to the lack of domestic generating capacity, Albania has become a net importer of electricity and this will continue during a number of years until the domestic generating capacity has been expanded (more in detail will be discuss in the following sections). The generation of electricity is dominated by hydropower output, which has increased from 2,800 GWh in 1990 to 5,459 GWh in 2006 whereas the thermal based generation has remained stable around 200 GWh per year. Owing to the high growth in the transport sector's demand for diesel and gasoline, the import of liquid fuel has increased in recent years.

Production of electrical power from the hydro resources has increased in the recent years mostly due to higher precipitation. Owing to the increase in demand import of electrical energy has increased considerably and this is going to continue until new power stations are constructed in Albania. Data on the electricity supply and consumption in Albania are given in Table 2-7.

Table 2-7: Data on the electricity supply and consumption (GWh)

	2000	2001	2002	2003	2004	2005	2006	2007
Total supply	5,962.1	5,511.4	5,458.6	6,145.6	6,361.4	6,707.4	6,793.5	5,881.3
Domestic Production	4,738.2	3,692.1	3,179.5	4,903.7	5,492.6	5,453.9	5,551.2	2,946.7
Thermopower plants	143.6	136.9	106.7	81.3	76.0	76.9	92.6	72.4
Hydropower plants	4,594.6	3,555.2	3,072.8	4,822.4	5,416.6	5,376.9	5,458.6	2,874.4
Import*	1,223.9	1,819.3	2,279.1	1,241.9	868.8	1,253.5	1,242.3	2,934.5
Total consumption	5,962.1	5,511.4	5,458.6	6,145.6	6,361.4	6,707.4	6,793.5	5,881.3
Export	221.8	69.3	52.6	326.2	390.3	729.5	637.2	106.6
Network losses	2,479.4	2,058.4	1,886.0	2,254.5	2,193.9	2,404.6	2,481.2	2,085.2
Consumption by users, of which	3,192.8	3,350.6	3,462.9	3,490.9	3,677.1	3,473.6	3,572.7	3,590.1
• Industry	546	581	582.2	649.2	743	687.5	626.9	584
• Agriculture	40.7	50.6	29.2	28.2	43.1	189.7	35.6	46.5
• Household	1,663.9	1,997.6	2,041.2	2,219.8	2,234.2	2,007.5	2,124.6	2,079
• Other non specified	942.3	721.7	810.3	593.7	656.7	589	785.7	880.6

Source: INSTAT

2.4.5 Transport

2.4.5.1 Road Transport

Road transport is the main mode for transporting goods and passengers. Growing investments (level of budgetory investments for new roads has increased from 5,545 million ALL in 2002 to around 32,445 million ALL in 2008 and even more are planned for 2009) in road building and rehabilitation as part of the road network, alongside the major priority project of the construction of Corridor Durrës-Morinë (170 km with 5.6 km of tunnel) are the main characteristic of road infrastructure sector in recent years. Beside development of the national road network, investments are focused on road building in tourist areas and in sections interconnecting border crossings. Construction of high-standard roads with 4-lane carriageways, tunnels, and massive civil works is a main feature of this period. Concurrently, during last years, a total of 89.4 km road with 2-lane carriageways were built and 169 km of road were improved and asphalted.

Rapid development of the road network in recent years has contributed to an increase in the number of motor vehicles (Figure 2-5) and consequently increased traffic and congestion throughout the road network. Traffic signaling is still inadequate and not respected.

2.4.5.2 Railway Transport

There are 447 km of mainline railway, of which 424 km is currently operated. The system was built primarily for freight traffic and, apart from the Tirana – Durres line, has only ever carried a very basic passenger service. The physical infrastructure of the railways is in very poor condition aggravated mostly in the mountainous areas by soil instability: train crossing points out of use, major crossings without communication links, derelict condition of the permanent way across the whole system, continuous safety hazard, severe lack of maintenance and bad drainage of bridges or viaducts, ineffectual track drainage systems, etc. This has lead to the imposition of system - wide speed restrictions, causing extended

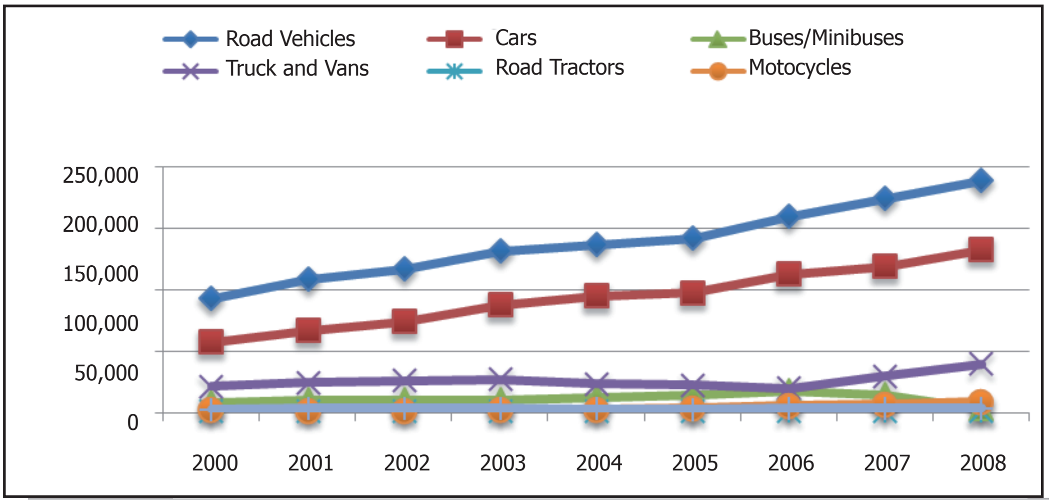


Figure 2-5 Road transport stock development

journey times and reducing the attraction of rail travel. Plans, currently awaiting for finance, exist for track rehabilitation on the Pogradec and Shkoder routes. The sections most requiring early attention are between Plaza and Rrogozhine, and between Elbasan and Pogradec.

2.4.5.3 Urban Public Transport

Urban public transport is organized in larger cities and as a regional service. The quality of service is low with outdated vehicles, though it is still used by many passengers who do not use private vehicles.

2.4.5.4 Marine Transport

There are two major sea ports, both being refurbished. The larger of these ports is at Durres, which has roll-on / roll-off ferry facilities. The smaller one, in Vlore, is a ferry and naval port. The port of Saranda in the far south (passenger and light-freight services to Greece and Italy) is being constructed with UN and Italian funds. The port of Shengjin in the north has not yet been improved.

2.4.5.5 Air Transport

The only civil airport currently operating in Albania is "Mother Teresa" International Airport, located about 25 km by road (16 km by air) North-west of the city of Tirana. By the end of 2007, when the construction of new terminal of passengers of this airport was completed (March 2007), the investments made by TIA (Tirana International Airport) amounted to €50 million. As a result, the airport processed a throughput of 1,107,323 passengers by the end of 2007. Additionally, the enhancement of safety standards and high level of airport services has led to an increase in the throughput of passengers and a significant increase in number of airline companies operating in the airport.

During the period 2006–2007, prestigious companies started their operations and currently 13 airline companies offer flights connecting Tirana with 33 destinations in other countries. Development of the Management System of Air Surveillance has guaranteed safe, rapid, and effective movement through the services carried out by the National Agency of Air Traffic (ANTA). As a result, there is a significant increase in revenues for operating companies and further development of standards in the air transport.

There are no regular air services within the country at the moment. This is partly due to limited market with relatively short distances, but also due to the condition of airfields. There is some potential for domestic services mostly in Saranda – Delvina, Korça, Vlora – Fier and Kukes. This would most likely be a long-term development since purchasing power of most Albanians is still far from a level that would sustain this expensive mode of travel. Another limiting factor is also travelling distance from Tirana downtown to "Mother Teresa" airport for these short flights.

2.4.6 Industry

The level of industrial activity is considerably lower than in the previous decades. Industry has accounted for a steady 11% of GDP. Albanian's historical dependence on mineral extraction is owed to substantial commercially exploitable reserves. Chrome, copper, and nickel deposits have long been opened up, but equipment and mining methods are now antiquated and many workings have fallen into desuetude.

During the communist era, the state policy assured each of the 26 administrative districts some development. All of them had food processing industries and most of them produced building materials. Districts with forests also developed timber and wood products industries. However, the bulk of industrial output came from six main districts that contained large plants, some of them capable of exporting.

In Albania two main companies, ALPETROL sha and Albanian Power Cooperation (KESH sha), represent the majority of industrial production.. Since 2001 the production of crude oil has increased 17 percent; production of electricity has increased 17 percent and production of electricity has increased 34 percent. Pproduction of cement and rolled steel, which are privately owned, have increased by respectively 1.6 percent and 21 percent compare with 2002.
The most important industries contributing to climate change are cement production, chromium production and iron and steel production.

2.4.6.1 Cement Production

Cement production facilities are installed in Tirana, Shkodra, Fushe- Kruje, Elbasan and Vlora, all of them were working with their full capacity until 1990. Today only cement factories of Fushe Kruja and Vlora are working, only Vlora has a cement kiln running for production of clinker. Fushe Kruja imports clinker that is only ground and packed. Annually the factories produce approx. 900,000 tons of Portland cement, approx. 200,000 tons are exported. Large quantities of white cement, hydraulic cement, etc. are imported for special purposes.

2.4.6.2 Lime Production

Lime production has been growing annually since 1994, reaching the production of 120,000 tons of lime per year. The kilns are small and scattered, using outdated technology and low quality fuel: the only exception being the Metallurgical Complex of Elbasan and Soda-PVC plant in Vlora.

2.4.6.3 Chromium Production

Albania is among the top world producers and exporters of chromium. Approx. 1 million tons of cromite ore is exported annually. The mines and processing plants, constructed in 1970s were privatized, currently the operator is Albanian Chrome ACR (former DARFO).

2.4.6.4 Iron and Steel

Steel has been produced in the Metallurgy Plant of Elbasan from 1976. Since 1994 the primary raw material has been scrap iron. Since 2000 the plant has been operated by a Turkish company KURUM, that is expanding production.

2.4.7 Tourism

In many countries in the world, tourist activity is considered even more important than productive activity in economic and social activity. Tourism develops in the areas where there is strong demand for natural benefits like climate, natural beauties, environment and where the tourism sector is supported by transport and communications.

During the two last years, tourism has experienced significant growth and the tourist infrastructure has been remarkably improved. Both the number of accommodation units and services standard has been increased. Due attention was paid to investments in road infrastructure, particularly in tourist areas. In 2007, the number of foreign night-stay visitors was 966,900 persons and the number of daily visitors was 131,800 persons (without including Albanian immigrants, who are also considered "tourists" according to the World Organization of Tourism definition). The Tourism Strategy has set as objective to attract 1.25 million visitors by 2012 and raise the contribution of tourism to the GDP by 15% of the GDP. The Government of Albania's objective is to develop special interest tourism, e.g. cultural and environmental tourism, as well as beach and business tourism. To ensure long–term, sustainable tourism development, tourism sector policies are oriented toward the integrated management of cultural and natural heritage.

2.5 RESOURCES AND INFRASTRUCTURE

2.5.1 Population Profile

Actually the Albanian population comprises 3,2 million inhabitants (without those who live or are seeking job abroad). The Albanian population is largely ethnically homogenous. The largest minority are Greeks with around 40,000. There are also populations of Vlachs, as well as significant numbers of Roma (gypsies) and Slav Macedonians. Although Albania remains a largely agrarian economy (over 55% of the population still live in rural areas and more than half of GDP is generated by agriculture), in the last half century its demography has been transformed.

During 1991–1998, Albania experienced demographic changes dominated by the negative rate of population increase, migration from the villages towards the towns and from the remote areas towards the capital, the massive emigration and the decrease of births. The re-urbanization and the overpopulation are the main existing problems at local level in Albania. Emigration of Albanians abroad is higher than from the other countries of Central and Eastern Europe. A clear vision of the share of population is given in Table 2-8.

Table 2-8 Annual average population ('000)

Year	Total	Urban	%	Rural	%	Density[capita/km^2]
1990	3196.8	1154.0	36.1	2042.7	63.0	111.2
1991	3140.7	1149.8	36.6	1991.0	63.4	109.2
1992	3110.3	1154.5	37.1	1955.9	62.9	108.2
1993	3095.1	1164.5	37.6	1930.6	62.4	107.7
1994	3033.3	1156.7	38.1	1876.6	61.7	105.5
1995	3037.1	1173.6	38.6	1863.5	61.4	105.6
1996	3062.9	1199.1	39.1	1863.8	60.9	106.5
1997	3088.2	1224.7	39.7	1863.5	60.3	107.4
1998	3061.5	1229.7	40.2	1831.8	59.8	106.5
1999	3049.2	1240.2	40.7	1808.9	59.3	106.1
2000	3058.5	1259.6	41.2	1798.9	58.8	106.4
2001	3063.3	1277.1	41.7	1786.2	58.2	106.6
2002	3084.1	1300.6	42.2	1783.6	57.8	107.3
2003	3102.8	1342.2	43.3	1760.6	56.7	107.9
2004	3119.5	1369.0	43.9	1750.6	56.1	108.5
2005	3135.0	1396.0	44.5	1739.0	55.5	109.1
2006	3149.1	1513.3	48.1	1635.8	52.0	109.5
2007	3152.6	1544.5	49.0	1608.1	51.0	109.7

Source: INSTAT

The immediate change of the political structure in Albania in the beginning of the 90's, brought about a great change of the social-economic structure of the country. Many people started leaving the village, aiming at finding work in the city. The free and uncontrolled movement of the population has had an impact on the change of the proportion between the urban and rural population. The phenomenon of urbanization growth, though it is a natural tendency, creates a dilemma for Albania. Under the conditions of a democratic society, people have the right and freedom of movement, but on the other hand, there is also impossibility for accommodating these movements economically and socially. Thus, the phenomenon of re-urbanization or overpopulation is the main problem faced by the local authorities today in Albania. The massive migration and the redistribution of the population changed the structure of the population of working age, changing the balance in the job market, often by increasing unemployment. But at the same time, the internal migration brought an urbanization or overpopulation of several regions of the country, which caused big social, economic and environmental changes of these areas. Population migration has proved to be very disorganized and uncontrolled, concerning not only the real movement level but also the calculation of the new living areas. An outcome of the lack of control has been the widespread of abusive construction of new buildings, in most of the cases within the towns or in the suburbs, increasing their surface, which of course is not supported by respective infrastructure.

2.5.2 Health

Albania has a predominately public health system, where the state provides the majority of services. The diagnostic and curative health care service is organized into primary, secondary, and tertiary hospital services, which are provided by public and private institutions. The public health care and counselling services are provided in the framework of primary health and are supported and monitored by the Institute of Public Health. The level indicators of life expectancy, mortality, and chronic diseases in Albania are comparable with those of the developed countries, whereas others such as infant mortality and maternal mortality are comparable with developing countries. However, the situation of public health remains a concern and most indicators concerning health care results fall short of the levels reported in other SEE countries and are under the EU average. The magnitude of changes that has occurred in Albania over the last fifteen years has contributed to the rapid demographic and epidemiological transition.

The public primary health care institutions aim at providing very good living conditions in compliance with the objectives of the World Health Organization (WHO) "health for everyone". Owing to the restructuring process, Health Care centers at Primary Health Care Level are given a substantial managerial and finacial autonomy. As a result, the performance is better and measured more adequately. The number and the distribution of Health Centers in the country is conditioned by demographic and epidemiologic changes.

The private sector in encouraged, thus being complimentary to the public sector (Table 2-9). In hospitals, the indicators of hospital service related to disease, epidemic, death, and human resources are analyzed. The hospital reform started in 2009, by financing hospital services through the Health Insurance Institute. It is considered essential the reconfiguration of the hospitals (number, distribution, package of services) concentrating them at regional level. Statistics show that a relatively high number of deaths and diseases in Albania are result of smoking, alcohol, imprudence in the streets, use of illegal drugs, food and stress as the new modern phenomenon of the society. Sedentary lifestyle is a risk factor as it presents a potential problem for hypertension, heart diseases, strokes etc.

Table 2-9 Patient health care indicators

Year	Hospitals	Medical centers without beds		
		Health Centres	Ambulances	Policlinics
1999	51	567	1,624	51
2000	50	580	1,505	50
2001	50	577	1,421	50
2002	50	571	1,375	50
2003	50	582	1,501	50
2004	50	688	1,779	50
2005	50	671	1,675	50
2006	49	682	1,690	50
2007	48	605	1,673	50

Source: INSTAT

2.5.3 Education

Education is central to the government's priority policies and was marked by significant achievements during recent years. Education indicators were improved as a result of several implemented reforms concerning strengthening of policy-making, managing and decision-making capacities, qualitative improvement of the teaching process, capacity building and development of human resources, and strengthening and expanding of vocational education. During recent years, the work has been focused on adapting the new secondary education structure reform after the compulsory 9-year education structure. In 2006, projects for equipment of all schools in the pre-university system with computer laboratories, capacity building, and training for teaching and maintenance personnel started the implementation at a large scale. Furthermore, 2006 saw the application for the first time of the "State Matura"[2] , which ensures results of high school students are externally evaluated countrywide, a new process for acceptance to higher public education institutions. For the academic year 2007-2008, the secondary net enrolment rate for both full-time and part-time system was at the level of 57.6%. Thus, this indicator has increased by 2.5% compared to the level of 55% of the prior academic year 2006-2007. This also follows a higher than 2% growth rate from the academic year 2005-2006 (53%) to the academic year 2006-2007 (55%).

In recent years 31 % of students have studied in social, economics and law sciences. Another positive trend in tertiary education in Albania is that a number of private institutions has quickly increased. More than ten of private institutions have opened so far. Tertiary education still suffers problems of modernization and liberalization in its efforts to achieve acceptance and evaluation of Albanian University Diplomas as well as implementation of Bologna Process. In 2005–06, 769.6 thousand children pupils and students were enrolled and attended in all levels of education. The gross enrolment rate for all levels of education age group of people (3–22 years old) who should go to schools is 67 percent. A large number of students is studying successfully at schools and universities abroad and many of them want to return to Albania after finishing their education.

2.6 ENVIRONMENT

2.6.1 Legislation

In the face of the formidable social and economic challenges, Albania has begun to develop a framework for addressing the environmental problems that have arisen during last decade. One of the priorities of the Environmental Strategy and National Environmental Action Plan has been establishment of the respective legal framework, as an important instrument for the application of the environmental policies in the country. From this viewpoint, this issue has had the serious commitment of the Government and the Assembly of the Republic of Albania. In the period 1998 - 2008, major legal documents such as the Constitution and the amendments of the law on "Environmental Protection" (No. 8934, date 05.09.2002) were developed.

The adoption of the Constitution of the Republic of Albania in September 1998 represents the most important legislative step in the realization of an environmental legal framework. Specific articles of the Constitution, sanction the aims of the state for a "...healthy and ecologically

[2] The final exams young adults (aged 18 or 19) take at the end of their secondary education.

suitable environment for the present and future generations...", for the "...rational exploitation of forests, waters, pastures as well as other natural resources, based on the sustainable development principle...", as well as the right of everyone "...to be informed on the environmental situation and its protection...".

The Law on Environmental Protection addresses the full spectrum of environmental policy issues. It also requires the publication of the State of the Environment Report (SoE). The first official SoE report was published in 1992. Up to 2008, eight SoE reports have been published. During 2000 – 2008, other laws and by-laws were adopted to assist in a more effective work for environmental protection and administration.

2.6.1.1 Key Environmental Laws

- Law on environmental protection (No. 8934, date 05.09.2002, amended in 2008)
- Law on forests and the forest service (No. 9385, date 04.05.2005, amended in 2006, 2007, 2008);
- Law on city planning (1993, amended in 1998, 2008);
- Law on hunting and wildlife protection (1994, amended in 2004 & 2008);
- Law on fishing and aquaculture (No. 7908, date 05.04.1995 , amended in 2002, 2008);
- Law on pastures fund (1997, amended in 2007, 2008);
- Law on water resources (1996, amended in 1998, 2000, 2001);
- Law on water supply and sanitation regulation (1996);
- Law on urban planning (1998, amended in 1999 & 2003);
- Law on civil emergencies (2001);
- Law on protected areas (No. 8897, date 16.05.2002, amended in 2008);
- Law on air protection from pollution (No. 8897, date 16.05.2002);
- Law on protection of marine environment from pollution and damage (No. 8905, date 06.06.2002);
- Law on the protection of Tranboundary Lakes (No. 9103, date 10.07.2003);
- Law on Environmental Impact Assessment (No. 9010, date 13.02.2003, amended in 2008);
- Law on chemical substances and preparations (No. 9108, date 17.07.2003);
- Law on environmental treatment of solid waste (No. 9010, date 13.02.2003);
- Law on environmental treatment of polluted waters (No. 9115, date 24.07.2003);
- Law on protection of biodiversity (No. 9587, date 20.07.2006)
- Law on administration of hazards waste (No. 9537, date 18.05.2006);
- Law on environmental noise assessment and administration (No. 9774, date 12.07.2007);
- Law on environmental protection from transboundary impacts (No. 9700, date 26.03.2007).

2.6.2 Institutional Framework

The main responsible institution for climate change issues is the Ministry of Environment, Forests and Water Administration (MoEFWA) established in 2005, a successor of Ministry of Environment which was established for the first time in 2001. The Mission of the MoEFWA is to draft and propose policies, strategies and action plans for the protection and administration of the environment, forests, waters and fisheries in order to achieve sustainable development, and to improve the quality of life and enable the country to join the European Union. The accomplishment of this mission is carried out through participation, initiation and coordination of the activities that lead to long term developments and wellbeing, by protecting nature and raising the awareness of the public opinion.

The MoEFWA's main tasks include:

- Implementing relevant national policies;
- Defining priority environmental and forestry investments;
- Development of national research programs in the environmental field; and
- Coordinating environmental protection-related activities of the other ministries and local authorities.

The MoEFWA may propose measures for the protection and preservation of the environment, forestry and water resources and is responsible for the implementation of water policy and forestry policy.

Several other governmental entities have significant environmental policy roles: Ministry of Agriculture, Food and Consumer Protection; Ministry of Public Work, Transport and Telecommunications, Ministry of Economy, Trade and Energy, Ministry of Health, National Environmental Agency; National Water Council, Public Health Institute, Institute of Water, Energy and Environment; Council on Territorial Adjustment, etc..

2.6.3 State of Environment

2.6.3.1 Waste

The Albanian economy is going through rapid transition and society is experiencing population growth. Both factors encourage the generation of higher quantities of waste. Combined with population migration from rural to urban area, waste management has become one of the major challenges for cities. Solid waste from households, public administration, the construction sector and other production and services is collected without separation. Household hazardous waste is also part of a common waste stream. Waste collection is done in the municipal collection centers through direct discharge or through special bags.

Waste collection is a responsibility of local governments. It is performed only in urban areas, the rural area population resorting to dumping waste by the roads and open-air burning.

The actual level of waste generation per capita is not known since most collection and disposal services are not equipped with weighing equipment. However, the production of inert and solid urban waste are estimated on average 550 kg per capita per annum for urban areas and 170 kg per capita per annum for rural areas. The total production of urban waste for 2007 reached an approximate amount of 722,731 tons, with Tirana ranking ahead of the other regions (228,190 tons). Biodegradable materials compose 40-60% of waste, depending on the region. Waste management in Albania is at a low level. Systems for the collection of urban solid waste are provided in most cities and towns. Very little recycling of waste is undertaken. The main method of disposal is landfill. There are no properly engineered landfill sites in the country. There are no collection systems in rural areas and smalls towns. Most waste from these areas is disposed of by dumping in ditches, ravines or at the side of roads where it is washed and blown onto other land and ultimately into water courses. The transportation of the wastes to dump sites does not have the right frequency and quality, so it happens that, owing to the long disposal time of the waste in these places, they become fermented; therefore the problem gets worse and increases the risk of diseases in the city. The problem gets even worse during summer time. As far as the dumpsites are concerned, the main environmental problems are related to the burning of the waste, creating a very important source of air pollution and the possible penetration of the leakage into the underground waters.

2.6.3.2 Water

Albania's urban water supply system is plagued by problems. In addition, infiltration from parallel sewer lines causes periodic cross contaminations of the water supply. Monitoring is conducted for some fifteen physical and chemical parameters. the first National Water Strategy was formulated in 1996, a law for water resources was adopted in the same year, establishing a number of regulatory instruments, including effluent charges, drinking water fees and non-compliance fees. Despite this law, only drinking-water fees are in place today, and at very low levels.

2.6.3.3 Air

Historically, the major sources of air pollution have been industries involved with chromium smelting, copper, cast-iron, cement and steel metallurgy and thermo power plants. Since 1992, many of these industries have been closed. The results of air quality monitoring for 2006 show that the air quality norms for two parameters (LNP & PM_{10}) are not met in most of the urban areas, but the situation remains tolerable in terms of other monitored parameters (SO_2, NO_2, Ozone & Pb), which remain within the allowed norms. Today the major sources of air pollution are oil extraction and refining, mobile sources, domestic heating, cement production and unregulated garbage burning.

One of the main sources of air pollution in urban areas is transport. Poor urban planning so far has increased the traffic problems while reduction of green areas in the cities has reduced inhalation of CO_2. Existing vehicles in Albania are relatively old, and their number is increasing. Emissions from vehicles (PM_{10}) and road dust (LNP) caused by non asphalted roads and on-going construction highly contribute to air pollution causing breathing problems, particularly among very young and old people. Industry also contributes to local pollution to a large extend. Concentration of pollutants is more problematic in Tirana and Elbasan, where the main pollutants are two to five times higher than the allowed level.

2.6.3.4 Soil

Land erosion is widely known as a major problem caused by unsustainable agriculture, pastoral practices, or even by the uncontrolled exploitation of forests. Albania is one of the Mediterranean countries with highest level of erosion, which varies from 21.4 ton-hectares to 34.7 ton-hectares per year. Loss of land along river banks as a result of destruction of protective banks is a big concern for the communities, local and central government. About 140 thousand hectares of land face a risk of landslides, with Korca (10,000 ha), Elbasan (8,400 ha), Dibra (5,300 ha), and Tirana (5,100 ha) being at the highest risk. Level of chemical contamination is low in most agriculture soils; however large areas of industrially contaminated land remain unrestored. Some of these areas are occupied by migrants who have constructed dwelling on this land and are therefore exposed to serious risks arising from the contaminants on the sites.

2.6.3.5 Biodiversity

The mountainous relief, the different geological strata and types of soil, and overlapping of Central Europe with Mediterranean climate are the main factors in defining Albania's ecosystem diversity and biodiversity. Today 10.4 % of the country's territory or 303 thousand of hectares has protected status. However, this national network, which comprises 802 zones of which 750 are Natural Monuments, is too small to have an effective long – term impact on biodiversity protection. For comparison it is of note that 18 % of the territory of E.U Member states is designated under the Natura 2000 network. Many consider even this to be insufficient. Moreover, the current coverage of protected areas is uneven and is not representative of the different habitats which exist in the country.

The level of protection achieved in many protected areas is neither adequate, nor appropriate with informal forms of exploitation like wood cutting, construction and illegal hunting still being widespread.

An analysis of the status of protection of fauna and flora species shows that there are today 936 endangered species (575 fauna & 361 flora species) altogether in Albania, or 18.7 % of all fauna and flora species found in the country territory. Among the fauna species those standing on the top of the food chain, particularly the mammals and birds, are the most endangered. Vascular plants on other hand with 329 endangered species remain the group with the most disfavored protection status. 338 species of animals and 308 species of plants are currently protected by domestic legislation. The majority of them are endangered at both the global and local level.

3. NATIONAL GREENHOUSE GAS INVENTORY

3.1 INTRODUCTION

The following chapter provides an inventory of greenhouse gas emissions & removals by sinks for Albania, calculated for the whole period 1990–2000. The following Greenhouse Gas Inventory is the second inventory for Albania, which is developed in the framework of the GEF funded project "Enabling Albania to prepare its Second National Communication in Response to its Commitments to UNFCCC".

3.2 SUMMARY OF GHG INVENTORY METHODOLOGY USED UNDER SNC

The first GHG emission inventory for the year 1994 by sources and sinks for Albania was performed under Albania's FNC project during the period 1998-2002. Attempts to improve the quality of GHG inventory have been made under the GEF regional project named "Building capacity to improve the quality of the GHG inventories in East Europe and CIS" which has used key-sources and the IPCC Good Practice Guidance as cost –effective approaches for improving the quality of data inputs.

Albania's second national GHG inventory considers three direct GHGs (CO_2, CH_4 and N_2O) and indirect GHGs (CO, NO_x, SO_x and NMVOC). In addition, estimates of HFCs, PFCs and SF_6 have been included (they were not reported under the Albania's FNC). Estimates for SNC regarding the GHG inventory include the year 2000 and the whole time period 1990–2000. Re-estimates for the year 1994 are made as well.

All activity data concerning each sector are national. The main activity data source/ provider has been the INSTAT although it did not provide activity data for GHG inventory purposes according to the IPCC guidelines. Other data providers/sources have been the ex-National Agency of Energy, Ministry of Environment, Forestry and Water Administration, Ministry of Economy, Trade and Energy, Ministry of Public Works, Transport and Telecommunications, the General Directorate of Forestry, Taxation Department, Costumer Offices and different data bases, surveys and studies prepared by International organizations (including the World Bank, UNDP, EBRD, EIB etc), Universities and different NGOs. Default emission factors from IPCC 1996 Revised Guidelines are used. Most of activity data are characterized for their variability after the 90's – the time when the country started to develop rapidly.

The problem of data gaps is most important for key sources: mobile combustion, enteric fermentation, fuel combustion in industry, fuel wood burned for energy purposes and solid waste treatment. Various methodologies have been used to fill the gaps under the Second National Communication; the most important are:

1. Correlation;
2. Interpolation;
3. Extrapolation; and
4. Surveys

High uncertainty was identified for the data on traditional biomass burned for energy purposes, where a large share represents illegal cutting by farmers to fulfill their energy needs. The overall uncertainty estimated for the GHG Inventory of 1994 (performed under the FNC) was 17.03% out of which the CO_2 eq emissions from fuel wood category contributed 79.23 %. In 2008, an energy survey was carried out regarding fuel wood consumption in households, service and small industries. The purpose was mainly to reduce the uncertainty of activity data for this subcategory (especially from fuel wood self-collected from rural areas). The result of the survey is shown in Table 3-1:

Table 3-1: Fuel wood consumption according to the Energy Survey performed in 2008 (in kTOE)

Sector / Year	RESIDENTIAL	SERVICE AND COMMERCIAL	INDUSTRY	AGRICULTURE	TOTAL
1990	284.00	238.00	178.00	89.00	789.00
1991	243.67	330.00	160.00	64.33	798.00
1992	203.33	82.00	142.00	39.67	467.00
1993	163.00	56.00	124.00	15.00	358.00
1994	151.17	136.83	114.82	16.88	419.70
1995	139.35	96.26	105.64	18.76	360.00
1996	127.52	99.39	96.45	20.64	344.00
1997	115.70	86.51	87.27	22.52	312.00
1998	103.87	60.64	78.09	24.40	267.00
1999	92.04	39.38	68.91	26.28	226.61
2000	94.03	37.65	59.06	27.46	218.21

The data provided by the survey were used by both Energy and LUCF teams to estimate emissions from respective sectors under the Second National Communication for the year 2000 together with the time series 1990 – 2000. By using those data, the uncertainty of activity data regarding the fuel wood consumption in the year 2000 has been reduced from 79.23% to maximum 15.42%.

3.3 GREENHOUSE GAS EMISSIONS FOR THE YEAR 2000 AND THE PERIOD 1990–2000

3.3.1 Direct Greenhouse Gas Emissions

This section provides an overview of the greenhouse gases inventory for Albania for the period 1990-2000. Figures 3-1 to 3-6 show total emissions for the most important greenhouse gases (CO_2, CH_4, N_2O). Figures 3-7 and 3-8 show total emissions of CO_2, CH_4 and N_2O expressed as CO_2 eq by six main categories, recommended by the IPCC: Energy Activities (including all types of activity related to extraction, transportation, processing and combustion of fossil fuels), Industrial Processes, Solvent Use and Other Products, Agriculture, Land Use Change & Forestry and Waste.

As is shown in Figures 3-1 and 3-2, the main contributor of CO_2 is the energy sector (44–79 %) owing to fuel combustion activities. The second contributor is Land Use Change and Forestry, which was contributing 32.73 % in 1990 and has since reduced to 16 % in 2000. Industrial Processes are contributing (2.6–4.90), the other sectors (Waste, Solvents and Agriculture) do not contribute significant emissions of CO_2.

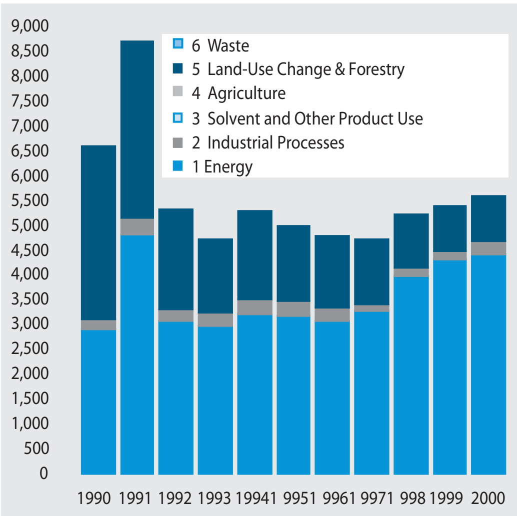


Figure 3-1: CO_2 emissions from all economic sectors (Gg)

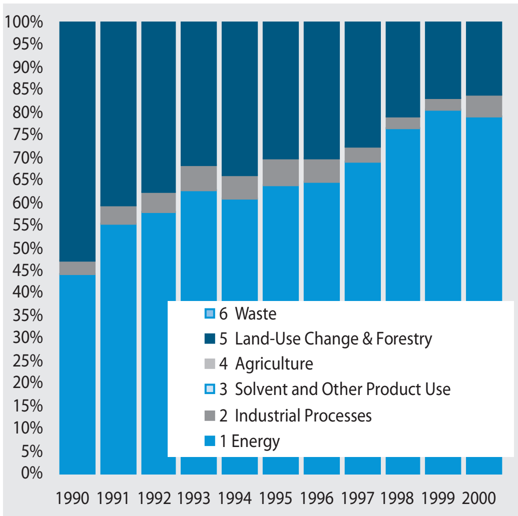


Figure 3-2: CO_2 emissions from all economic sectors (%)

As shown in Figures 3-3 and 3-4, the main contributor of CH_4 emissions is the Agriculture sector (74–77)%, followed by Waste (8–22%) and Energy (4.8–20.4)%.

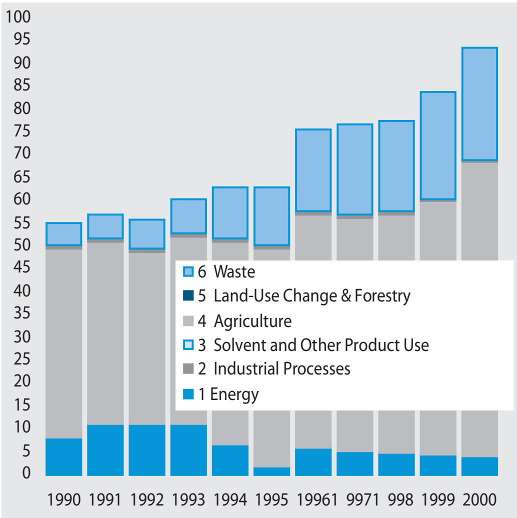


Figure 3-3: CH_4 emissions from all economic sectors (Gg)

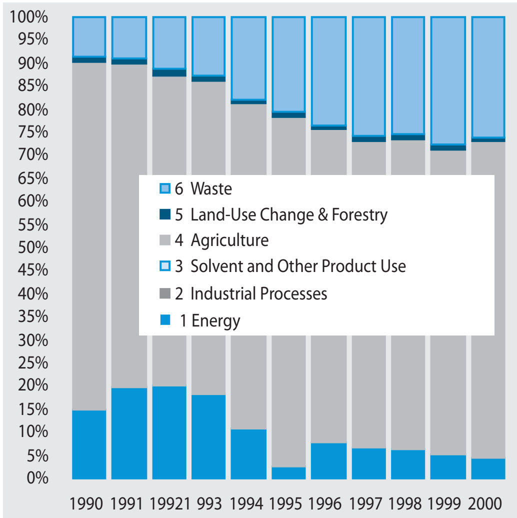


Figure 3-4: CH_4 emissions from all economic sectors (%)

As shown in Figures 3-5 and 3-6, the main contributor of N_2O emissions is the waste sector (45–57 %) , followed by the energy sector (33–35 %) and the agriculture sector (8–11.4 %).

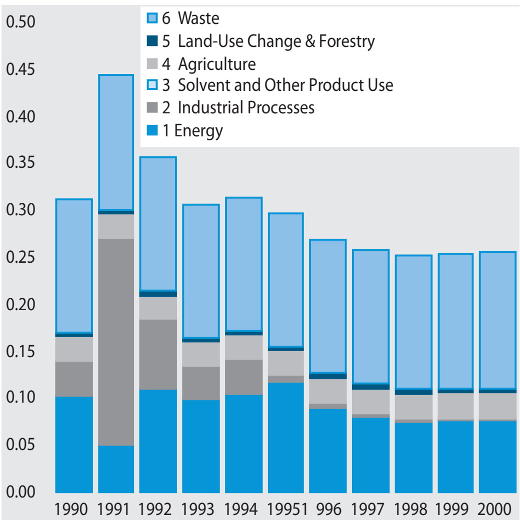


Figure 3-5: N_2O emissions from all economic sectors (Gg)

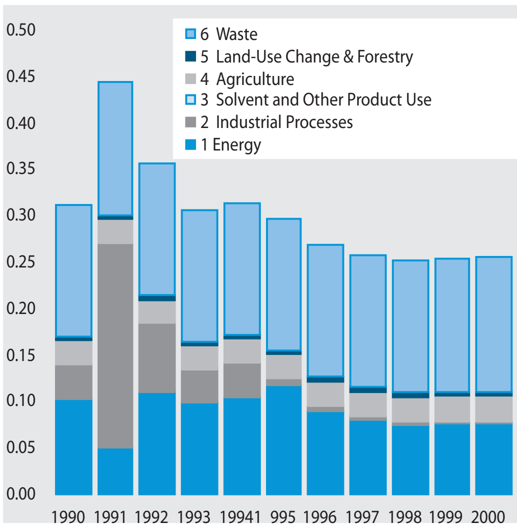


Figure 3-6: N_2O emissions from economic all sectors (%)

As shown in Figures 3-7 and 3-8, the total GHG emissions (expressed in CO_2 eq) arise mainly from Energy (44.00 %), followed by Agriculture (27.12 %) and Land Use Change and Forestry (21.60 %).

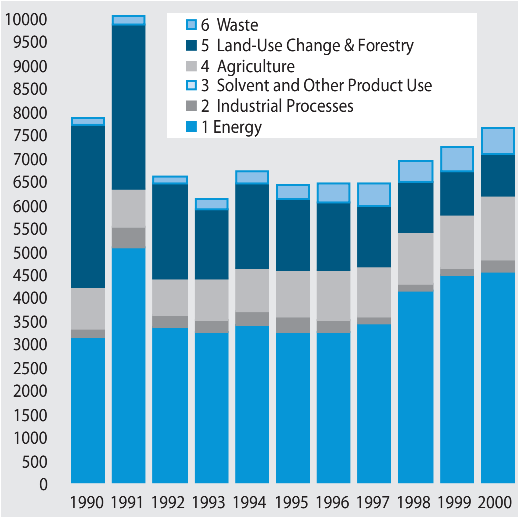


Figure 3-7: CO_2 eq emissions from all economic sectors (Gg)

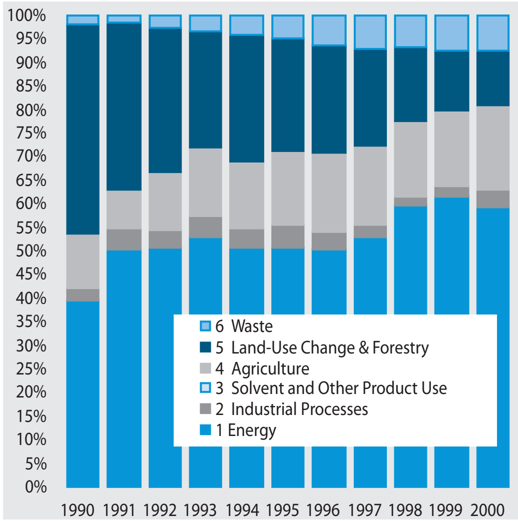


Figure 3-8: CO_2 eq emissions from all economic sectors (%)

CO_2 emissions from fuel wood are included in the Land Use Change and Forestry Sector according to the IPCC requirements. Still, if their emissions would have been reported under the Energy, the share of energy sector would be almost 82%.

CO_2 was the main greenhouse gas in Albania for the whole period 1990-2000 (83.98 % in 1990, 73.12 % in 2000). The share of CH4 has increased from 14.79 % in 1990 to 25.84 % in 2000, mainly due to increased emissions from agriculture and waste sector. The time-series of GHG emissions by gases and sectors is presented in Table 3-2.

Table 3-2: Anthropogenic greenhouse gas emissions in Albania (Gg)

Gas	Sectors	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
CO_2	1 Energy	2,902.95	4,812.04	3,080.59	2,977.74	3,216.03	3,175.62	3,093.14	3,269.54	3,997.01	4,327.98	4,419.78
	2 Industrial Processes	198.71	354.66	230.47	257.73	284.46	301.80	248.42	157.10	142.05	150.35	264.12
	3 Solvent and Other Product Use	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4 Agriculture	0.00	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	3,477.25	3,517.80	1,999.58	1,494.38	1,781.76	1,501.06	1,431.00	1,302.11	1,079.96	894.52	887.59
	6 Waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**6,578.92**	**8,684.50**	**5,310.63**	**4,729.85**	**5,282.24**	**4,978.48**	**4,772.56**	**4,728.75**	**5,219.03**	**5,372.85**	**5,571.50**
CH_4	1 Energy	8.19	11.25	11.21	11.04	6.74	1.71	6.03	5.31	5.02	4.39	4.03
	2 Industrial Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3 Solvent and Other Product Use	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4 Agriculture	41.54	40.03	37.77	41.12	44.45	47.79	51.12	51.12	52.21	55.54	64.49
	5 Land-Use Change & Forestry	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68
	6 Waste	4.74	5.08	6.34	7.67	11.18	13.04	17.77	19.90	19.78	23.29	24.56
	Total	**55.16**	**57.05**	**56.00**	**60.51**	**63.06**	**63.23**	**75.60**	**77.02**	**77.69**	**83.91**	**93.77**
N_2O	1 Energy	0.10	0.05	0.11	0.10	0.10	0.12	0.09	0.08	0.07	0.08	0.08
	2 Industrial Processes	0.04	0.22	0.07	0.04	0.04	0.01	0.01	0.00	0.00	0.00	0.00
	3 Solvent and Other Product Use	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4 Agriculture	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	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	0.00
	6 Waste	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
	Total	**0.31**	**0.44**	**0.36**	**0.31**	**0.31**	**0.30**	**0.27**	**0.26**	**0.25**	**0.25**	**0.26**
CO_2 eq	1 Energy	3107.08	5063.84	3350.18	3239.99	3390.14	3248.19	3247.27	3405.91	4125.61	4443.88	4528.29
	2 Industrial Processes	209.87	423.02	253.40	268.85	295.74	303.79	250.35	158.39	143.04	151.22	264.92
	3 Solvent and Other Product Use	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4 Agriculture	880.33	848.75	801.23	871.44	941.60	1011.80	1081.70	1081.71	1104.60	1174.57	1362.75
	5 Land-Use Change & Forestry	3493.05	3533.59	2015.37	1510.17	1797.55	1516.85	1446.79	1317.91	1095.76	910.31	903.39
	6 Waste	143.74	150.96	177.17	205.01	278.54	317.83	417.11	462.16	459.58	533.50	560.56
	Total	**7834.07**	**10020.17**	**6597.34**	**6095.46**	**6703.58**	**6398.46**	**6443.23**	**6426.07**	**6928.59**	**7213.48**	**7619.90**

3.3.2 Indirect Greenhouse Gas Emissions for the period 1990-2000

The total emissions of nitrogen oxides, carbon monoxide, sulfur oxides and NMVOC are shown in Figures 3-9 to 3-12 and Table 3-3.

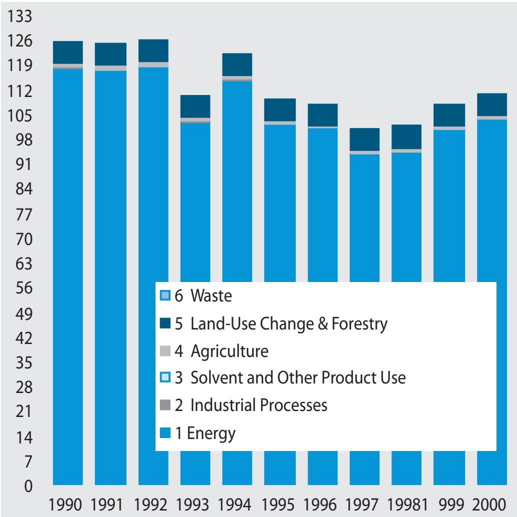


Figure 3-9: CO emissions from all economic sectors (Gg)

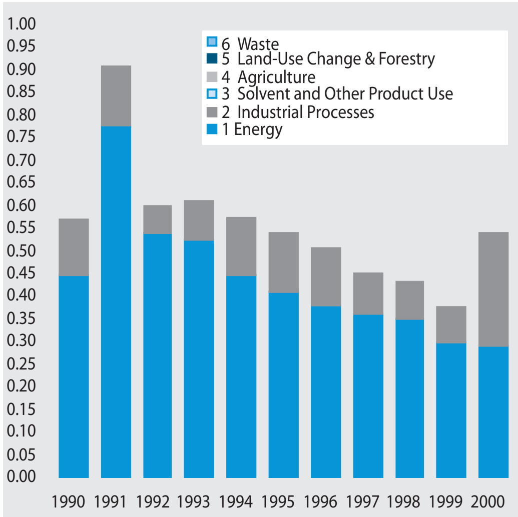


Figure 3-10: SO_2 emissions from all economic sectors (Gg)

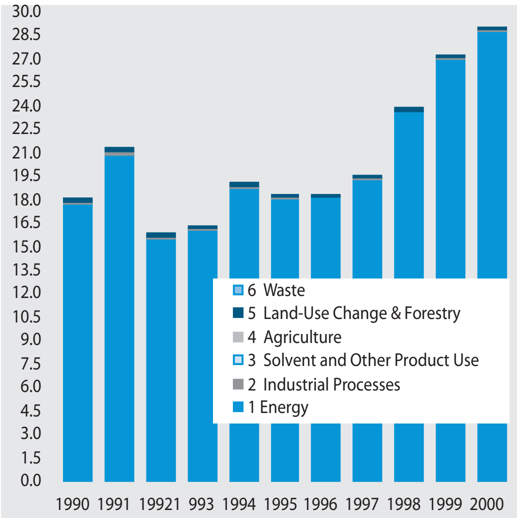


Figure 3-11: NO_x emissions from all economic sectors (Gg)

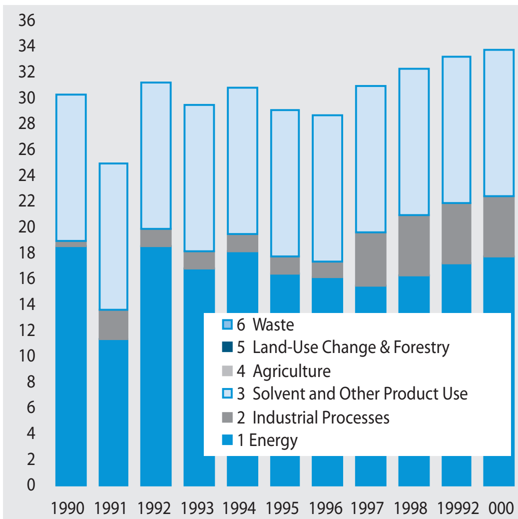


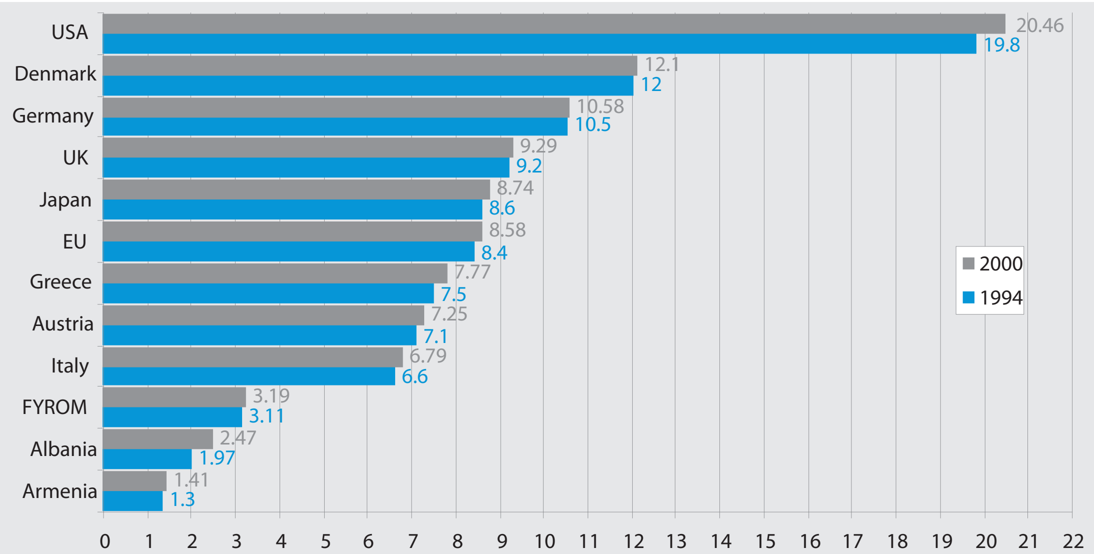
Figure 3-12: NMVOC emissions from all economic sectors (Gg)

Table 3-3: Anthropogenic indirect greenhouse gas emissions in Albania (Gg)

Gas	Sectors	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
CO	1 Energy	117.949	117.148	118.295	102.629	114.498	101.926	100.807	93.395	94.214	100.464	103.215
	2 Industrial Processes	0.050	0.251	0.139	0.127	0.064	0.031	0.033	0.031	0.029	0.024	0.097
	3 Solvent and Other Product Use	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	4 Agriculture	1.300	1.240	1.182	1.169	1.105	1.080	0.780	1.015	1.024	0.779	0.917
	5 Land-Use Change & Forestry	5.975	5.975	5.975	5.975	5.975	5.975	5.975	5.975	5.975	5.975	5.975
	6 Waste	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Total	**125.274**	**124.614**	**125.592**	**109.900**	**121.642**	**109.012**	**107.595**	**100.416**	**101.242**	**107.242**	**110.204**
SO_2	1 Energy	0.448	0.778	0.539	0.523	0.448	0.408	0.380	0.360	0.349	0.297	0.289
	2 Industrial Processes	0.122	0.130	0.060	0.088	0.123	0.129	0.125	0.091	0.084	0.079	0.248
	3 Solvent and Other Product Use	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	4 Agriculture	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	5 Land-Use Change & Forestry	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	6 Waste	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Total	**0.570**	**0.908**	**0.598**	**0.611**	**0.571**	**0.537**	**0.505**	**0.451**	**0.433**	**0.376**	**0.537**
NO_x	1 Energy	17.760	20.843	15.513	16.083	18.768	18.121	18.126	19.322	23.651	27.024	28.794
	2 Industrial Processes	0.038	0.222	0.074	0.037	0.038	0.009	0.009	0.007	0.006	0.005	0.010
	3 Solvent and Other Product Use	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	4 Agriculture	0.049	0.047	0.045	0.044	0.043	0.042	0.031	0.039	0.039	0.031	0.036
	5 Land-Use Change & Forestry	0.170	0.170	0.170	0.170	0.170	0.170	0.170	0.170	0.170	0.170	0.170
	6 Waste	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Total	**18.017**	**21.282**	**15.801**	**16.334**	**19.018**	**18.342**	**18.336**	**19.538**	**23.865**	**27.229**	**29.010**
NMVOC	1 Energy	18.570	11.372	18.559	16.745	18.100	16.444	16.133	15.409	16.213	17.198	17.752
	2 Industrial Processes	0.372	2.207	1.344	1.362	1.336	1.251	1.248	4.152	4.709	4.689	4.685
	3 Solvent and Other Product Use	11.323	11.323	11.323	11.323	11.323	11.323	11.323	11.323	11.323	11.323	11.323
	4 Agriculture	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	5 Land-Use Change & Forestry	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	6 Waste	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Total	**30.265**	**24.902**	**31.227**	**29.430**	**30.759**	**29.017**	**28.704**	**30.883**	**32.245**	**33.210**	**33.760**

3.3.3 Main CO_2 indicators

CO_2 emission indicators may signal a significant change in the level of efforts among developed countries and countries in transition (like Albania). Figure 3-13 shows the position of Albania among different countries in terms of CO_2 emissions per inhabitant from the energy sector for the years 1994 and 2000. Figure 3-14 shows the trend of resident population which has been reduced owing to the high rate of emigration. Figure 3-15 shows the trend of GDP (in million USD) which has increased almost 2.3 times owing to strong recovery of the economy and remittances coming from emigrants.



Source: Energy review in the world, IAE 1998, 2002

Figure 3-13: CO_2 Emissions (from energy sector) per capita for selected countries [ton CO_2/capita]

According to this chart, Albania follows Armenia with 1.97 and 2.47 tones CO_2 emission per capita respectively for 1994 and 2000. This is around 4-5 times lower than the average amount for industrialized countries and can be explained by the following reasons:

- Energy consumption per capita in Albania is still the lowest among the selected countries;
- Electricity production is based almost entirely on hydro energy (more than 98 %);
- Different energy services in residential sector like space heating, domestic hot water, and cooking are based mostly on electricity (residential sector consumes 67 % of total electricity),
- Industrial activities were severly reduced from 1990 to 1994; since then recovery has started.

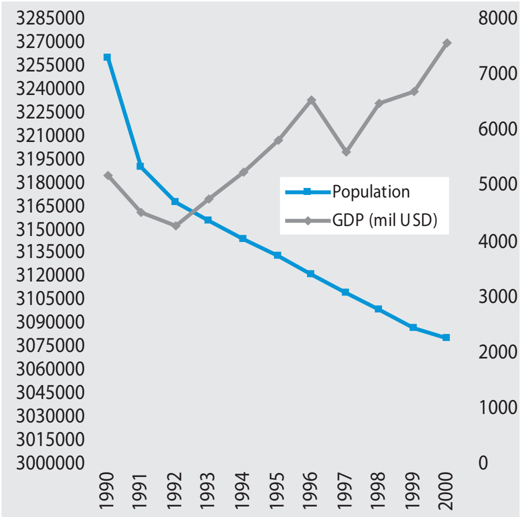


Figure 3-14: Population and GDP for Albania.

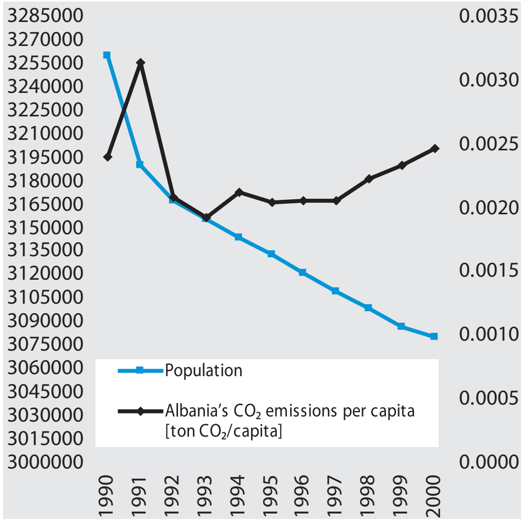
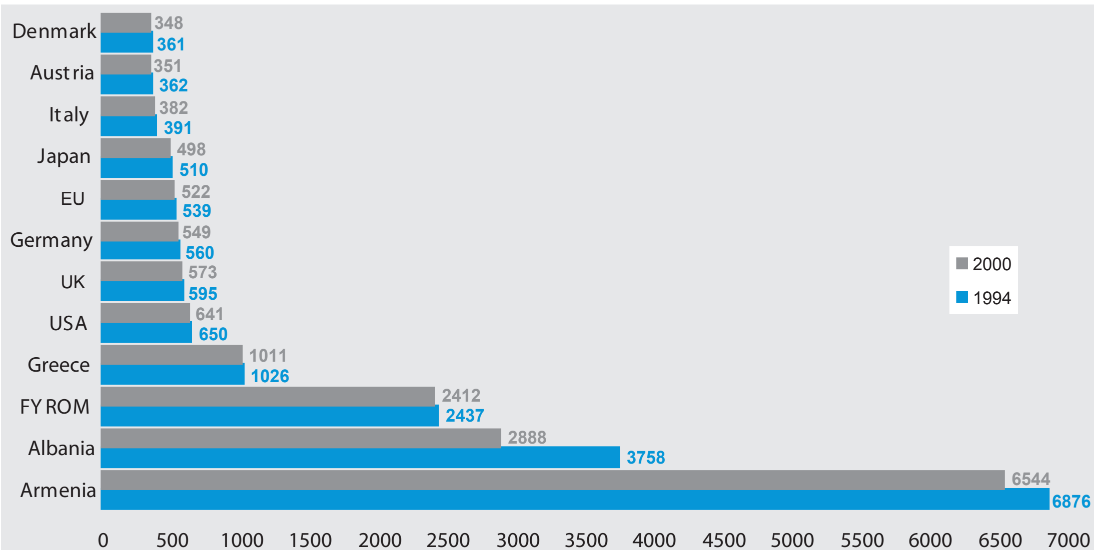


Figure 3-15: Population and CO_2 emissions per capita.

The second indicator is CO_2 emissions per GDP, present This indicator is very important as well. It is presented in Figure 3-16. According to this chart, Albania follows Armenia (the highest) with 3758 (1994) and 2888 (2000) tones CO_2 per Million USD of GDP. This is around 7-8 times higher than average value for industrialized countries due to the following reasons:

- Albanian technology is very old;
- Productivity of Albanian society is very low compared with industrialized countries;
- A large share of energy resources is consumed in residential and service sectors for people's comfort and not in industry sector that increases GDP.



Source: Energy Review in the World, IAE 1998, 2002

Figure 3-16: CO_2 Emissions per GDP for selected countries [ton CO_2/1000 USD]

Figure 3-17 shows the trend of GDP and CO_2 emissions, while Figure 3-18 shows both trends of CO_2 emissions per GDP and CO_2 emission for capita. CO_2 emissions per capita have been increased (what shows more energy consumption for Albania due to increased standard of life) , while CO_2 emissions per GDP have reduced.

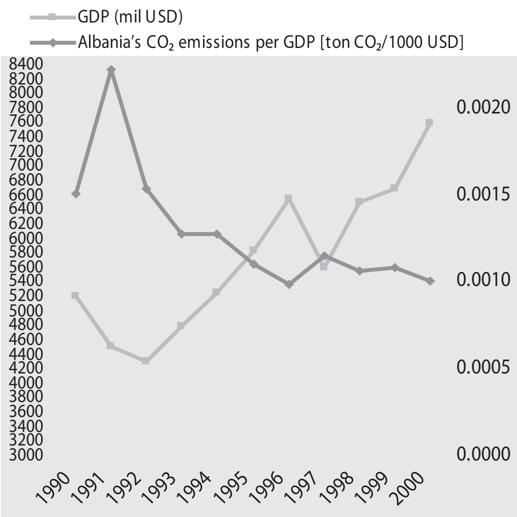


Figure 3-17: GDP and CO_2 emission per GDP.

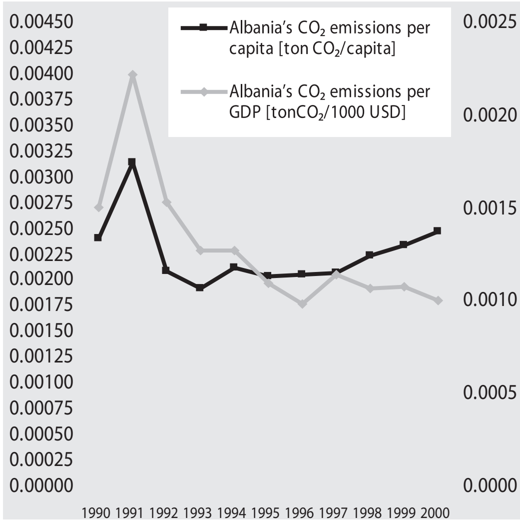


Figure 3-18: CO_2 emissions per capita and CO_2 emissions per GDP.

3.3.4 GHG Emissions from International Bunkers for the period 1990-2000

GHG Emission from the International Bunkers have been estimated under the Second National Communication and their trends for three direct greenhouse gasses (CO_2, CH_4, N_2O and CO_2 eq) are presented in Figures 3-19 to 3-22.

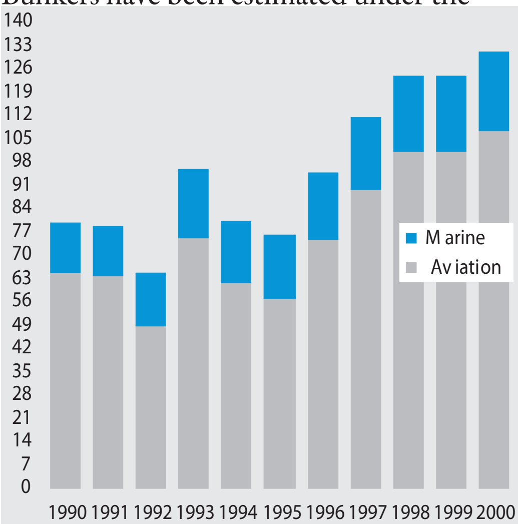


Figure 3-19: CO_2 from International Bunkers for the period 1990–2000.

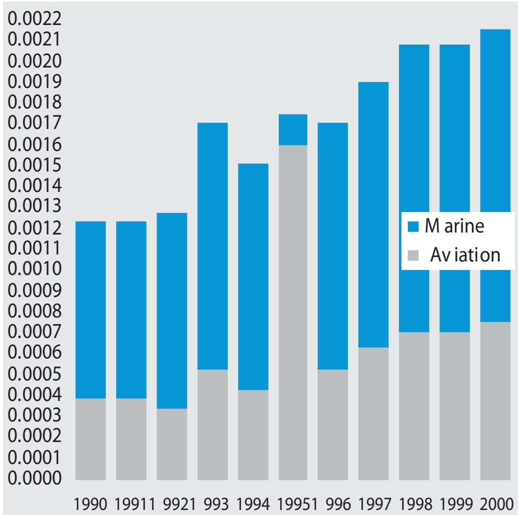


Figure 3-20: CH_4 from International Bunkers for the period 1990–2000.

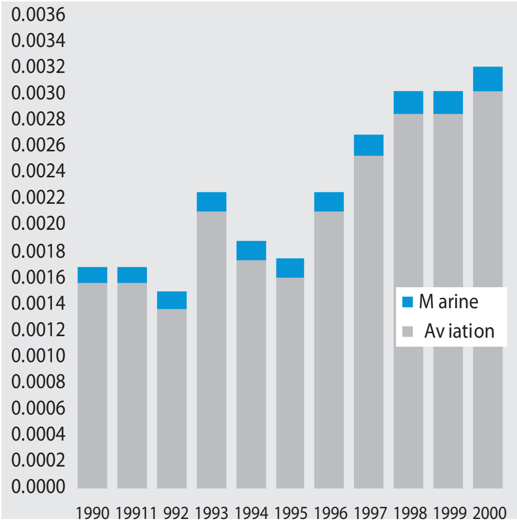


Figure 3-21: N_2O from International Bunkers for the period 1990–2000.

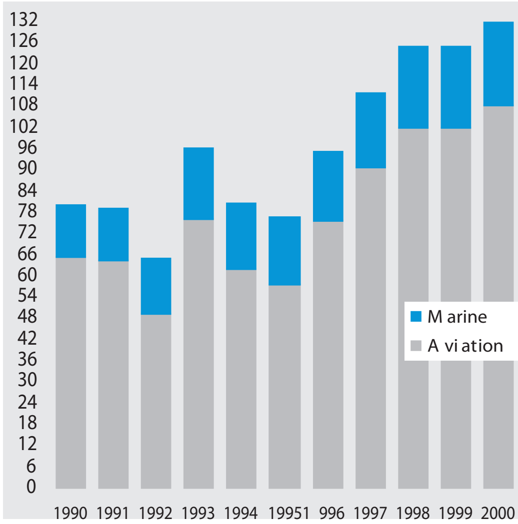


Figure 3-22: CO_2 eq from International Bunkers for the period 1990–2000.

Analyses show that the GHG emissions from international bunkers are increasing for the whole period and the main contribution comes from international aviation bunkers.

3.4 GHG INVENTORY FOR ENERGY AND TRANSPORT SECTOR IN 1990–2000

3.4.1 Activity Data from Energy Sector

The energy sector used to be one of the most important sectors for the Albanian economy. Albania is endowed with a wide variety of energy resources ranging from oil and gas, coal and other fossil fuels, to hydropower, natural forest biomass and other renewable energy. The role of coal and natural gas has gradually decreased since the beginning of the 90's while the oil sector remains stable thanks to imported petroleum products. The electricity sector is the most important energy sub-sector. Hydro-energy accounts for 90 % of generated electricity. The energy sector contributes approx. 10 % of the GDP and employs approx. 17,000 employees, the majority of which work in the two biggest energy companies, KESH and the Albanian Petroleum Corporation (APC).

Albania has identified oil and natural gas; historically approx. 56 million tons of oil and 6.2 billion cubic meters of gas was extracted. The reserves of coal are large, but its calorific value is low, ash content is very high, and its cost of production with existing technology is also very high. The total installed electricity generating capacity is 1,659 MW, comprising 1,446 MW hydro power and 213 MW thermal (almost all thermal power facilities are decommissioned). More than 98 % of annual supply comes from hydro power plants, where three plants in a cascade on the Drin River generate 85 % of the total output. Reserves of fuel wood in Albania are in forests that cover about 38.2 % of total area of Albania. Figures 3-23 and 3-24 show the time series for energy supply for Albania for the period 1990–2000 (numbers are in ktoe).

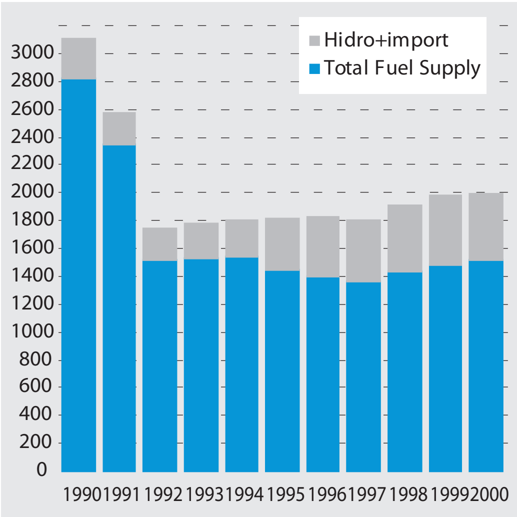


Figure 3-23: Total fuel supply and non-conventional energy sources (ktoe)

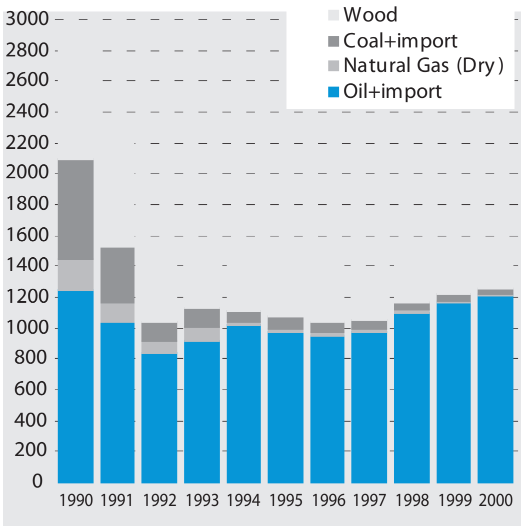


Figure 3-24: Total fuel supply for the period 1990–2000 (ktoe)

3.4.2 Energy consumption

From a historic peak of 2.76 million tons of oil equivalent (MTOE) in 1989 the primary energy supply dropped by more than 50 % to 1.482 MTOE in 1992. Since then, the primary energy supply has remained relatively constant around the level of 1.853 MTOE (in 2001). Though, there were major structural changes in the shares of energy sources on the supply side (Figure 3-24) and the final energy consumption by sectors and fuels (Figures 3-25 and 3-26).

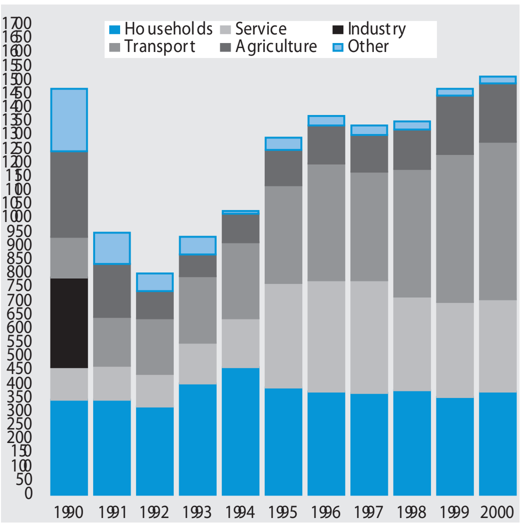


Figure 3-25: Final Energy Consumption by different sectors, 1990–2000 (ktoe)

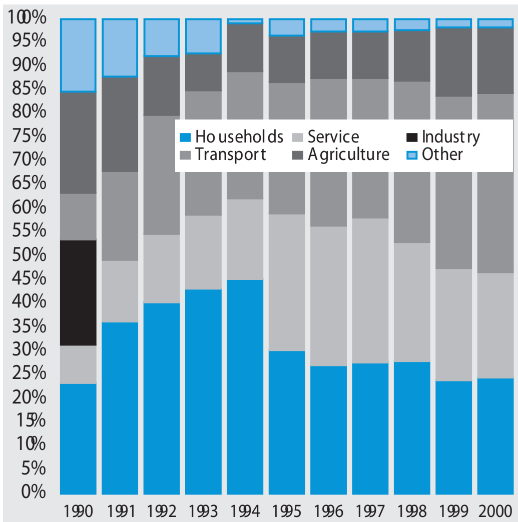


Figure 3-26: Final Energy Consumption by different sectors, 1990–2000 (%)

3.4.3 GHG Emissions

According to the IPCC Guidelines (1996), emissions coming from energy activities (fuel combustion), 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. Emissions of each direct greenhouse gas are shown in Figure 3-27, Figure 2-28 shows the CO_2 emissions by sectors, where transport is the major and fastest growing source.

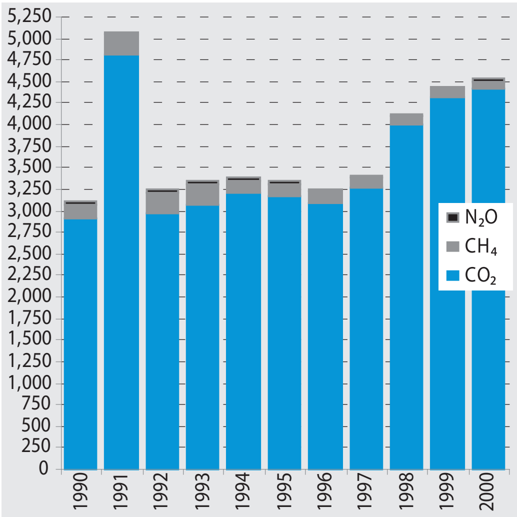


Figure 3-27: GHG from Energy Sector for three main gases, 1990–2000 (Gg)

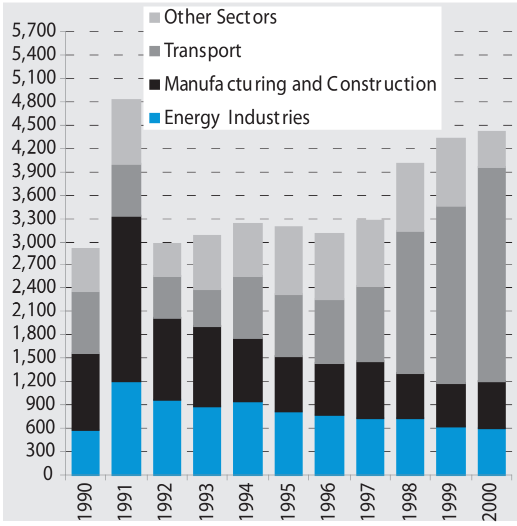


Figure 3-28: GHG from each sub-sector of Energy Sector, 1990–2000 (Gg)

3.5 GHG INVENTORY FROM LUCF IN 1990–2000

3.5.1 Description of the situation in LUCF Sector

The present state of the forests in Albania is a consequence of continuous over- exploitation for 60 years, and especially in the last 17 years. It reached a peak in 1997, when more than 550,000 m^3 timber was cut. Forests cover approx. 38 % of Albania. They consist of the high stem forests (45.7 %) and coppice (54.3 %). The single species forests occupy 72.3 % and the mixed species forests 27.7 %. According to their functions forests may be classified as production forests (86.0 %) and protection forests (14.0 %). Also, one may distinguish 91.2 % natural forests and 8.8 % man made forests or plantations. About 83 % of the forest area is covered by semi natural forests originating from natural regeneration, conserving the main species composition. In addition there are around 8.2 % or 84,841 ha of virgin/primeval forests, mainly located in the northern part of Albania. The rest (8.8 %) is covered by man made forests, an area that had been increasing until 1990 and after that it was suspended owing to lack of investments.

During the last 50 years the following phenomena were noticed:

- The area of arable land was increasing until the year 1990 and decreasing after that, reaching an area of approximately 120,000 ha abandoned arable land due to low potential for cultivating crops;
- The share of forests has decreased in the past 50 years owing to the deforestation in order to obtain more arable land, much less reforestation and formal changes in the land use inventory (much of the forest area is defined as pastures);
- The pasture area was decreasing until the year 1990 and increasing after that;
- The area, defined as »other use«, was decreasing until the year 1990 owing to drainage of the inland water area. This was to some extent offset by increase caused by construction of artificial lakes used for irrigation or for energy generation purposes. Drying of considerable inland water area has increased the quantity of organic soils with considerable CO_2 reserves.

Fires (mostly intentional) have caused considerable damage to forests and grasslands in recent years. The lack of investments and organizational measures for silvicultural work, for aforestation/reforestation, for combating pests, maintaining forest roads, for fire protection, etc., has caused the loss and degradation of the habitats of many vegetal and animal forest species. Recently forest protection has become better organized through the creation of communal forests around rural areas, which are managed by the communities. The pace of the creation of private forests should be accelerated.

The mountainous shape, different geological strata and types of soil, the overlapping of the Central Europe and Mediterranean climate systems, are the main factors contributing to the very high ecosystem diversity in the country (there are around 3250 plant species, from which about 330 species are shrubs and trees; 130 of the species are considered endangered) .

Annual biomass increment has been calculated multiplying the area of each species with annual growth rate per hectare and with a specific mass of dry wood (dried at 105 °C). Multiplying the above-mentioned data (annual biomass increment) with two factors - carbon fraction and conversion factor, the quantity of carbon and then CO_2 emissions have been calculated as a conclusion. The protection forest and fruit tree species have also been included in the calculations.

The biggest contributors on biomass production and on the quantity of CO_2 emissions for the years 1990–2000 are commercial forests and deciduous broadleaves species.

The amount of wood removed from forest clearing and total biomass consumption from stocks has also been calculated, starting from the data on forest harvesting and wood consumption. The negative value demonstrates that the wood cutting process in Albania was over three times higher than natural growth of the forests. The biggest contribution comes from non-registered cuttings (cuttings by farmers to fulfill their needs).

In putting together data for GHG emissions from the LUCF sector, the team has also considered the data from an energy survey performed for the fuelwood consumption in the households, services and small industry. Figure 3-29 presents the data on past fuelwood consumption and a forecast for the year 2025, differentiated by economic subsectors.

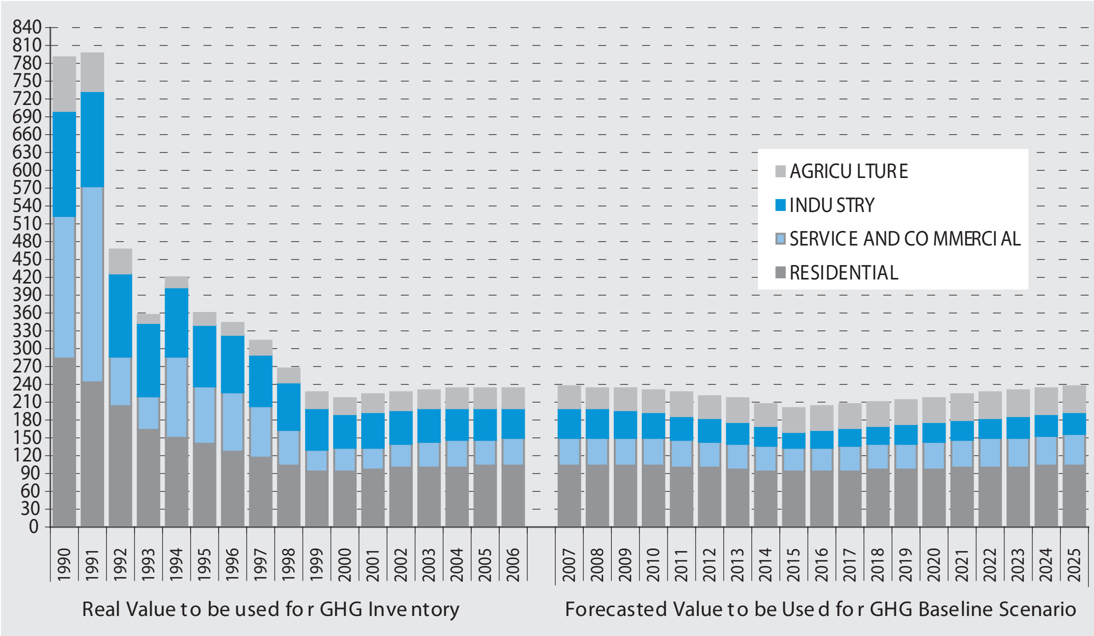


Figure 3-29: Forecast of fuel wood consumption by sectors

3.5.2 GHG Emissions

3.5.2.1 Forest and grassland conversion-CO_2 emissions from biomass

Forest burning to clear the land for agriculture is becoming a practice in Albania. The total annual carbon releases resulted to be 43.67 kt while the total annual CO_2 release was 160 Gg . The results of trace gas emissions from burning of forests are as follows:

CH_4	0.68 Gg
CO	5.98 Gg
N_2O	0.00 Gg
NO_x	0.17 Gg

3.5.2.2 Abandonment of managed lands.

The annual carbon uptake in aboveground biomass re-growth (for periods of 20 years and over) and total carbon & carbon dioxide uptake from abandoned lands are calculated. The results show that the total carbon uptake from abandoned lands is 124 Gg C, while the total carbon dioxide uptake is 286 Gg CO_2.

3.5.2.3 Change in soil carbon for mineral soil

Albania is categorized as a "warm temperate and moist" climate. Since the soil carbon level is dependent on agricultural practices, the relevant emission factors can be obtained by identifying cultivation system using the IPCC Methodology.

The changes in soil carbon for mineral soils are also calculated by multiplying the figures of change per area for each cultivation systems for each soil type, for time horizons of "t" and "t-20". As a result the Net Change in Soil Carbon of Mineral Soils is -124.86 Tg/20 yr. The negative value is explained by reduced areas of the broadleaf forests, increased pasture, grain with reduced tillage, non-grain crops with full tillage, fruit tree plantations, wetland and inland water.

3.5.2.4 Calculation of carbon emissions from organic soils

Based on USADA soil taxonomic groups, there is only the "Histosols" category of organic soil present in Albania. Having the land area and annual loss rate, the annual emissions from organic soils were calculated. Total CO_2 emissions from Land-use Change and Forestry are shown in Figure 3-30.

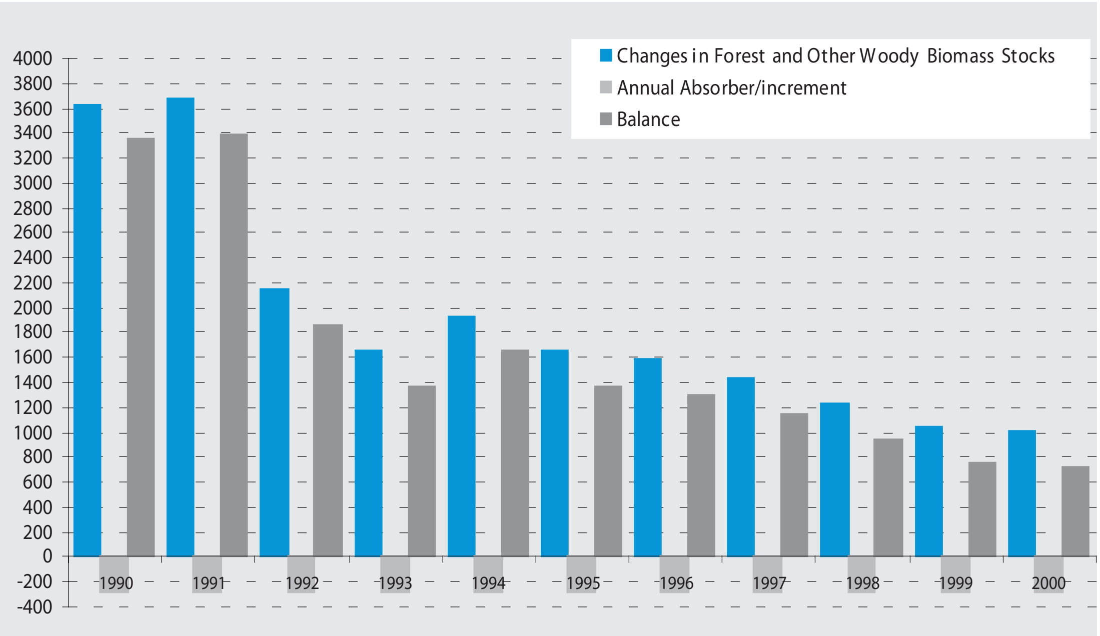


Figure 3-30: Total CO_2 gas emissions from Land-use Change and Forestry (Gg)

3.6 GHG INVENTORY FROM AGRICULTURE IN 1990–2000

3.6.1 State of the Agriculture Sector

The time-series of activity data in agriculture sector is presented in Figures 3-31 and 3-32.

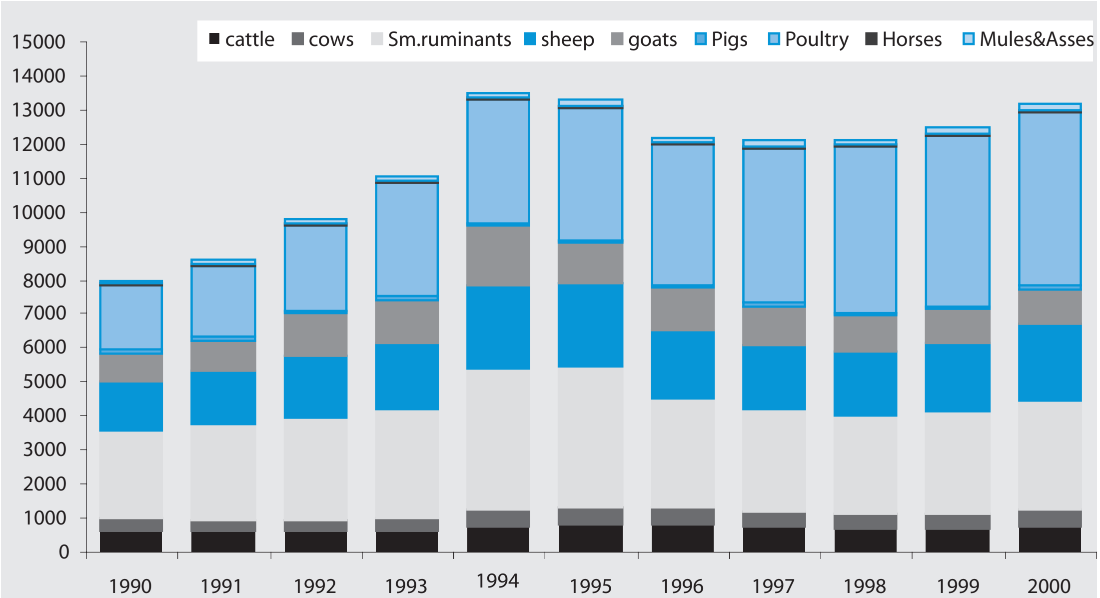


Figure 3-31: Activity data from Agriculture Sector (livestock)

The number of cattle heads as the main contributor of CH_4 to the GWP between the reference year 1994 and year 2000 has remained almost constant. The number of the small ruminant population has decreased by around 1 million heads in the year 2000 compared to the reference year 1994.

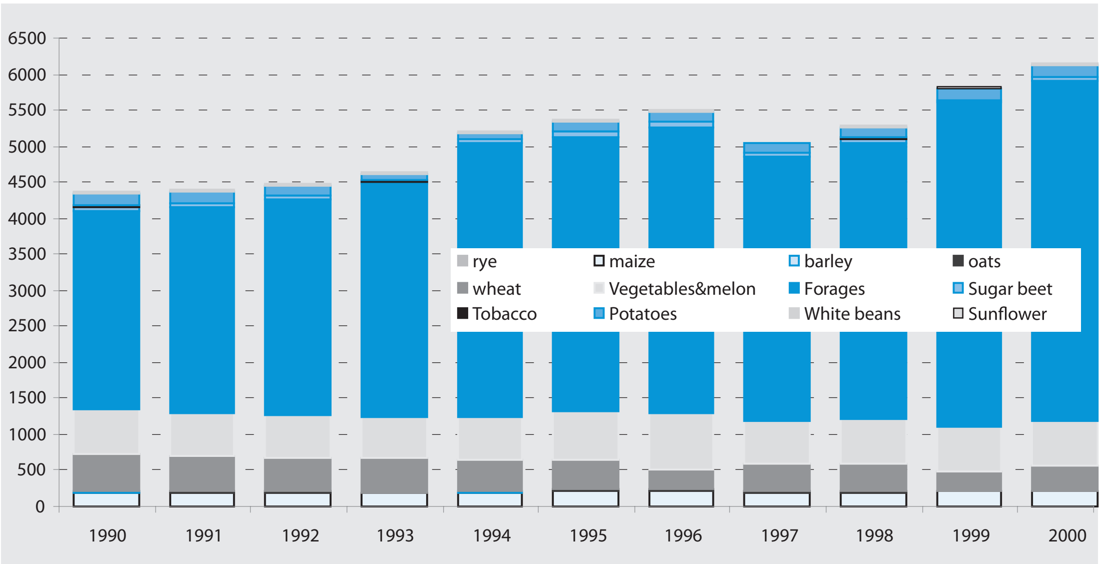


Figure 3-32: Activity data from Agriculture Sector (plants).

3.6.2 GHG emissions

The contribution of GHG emission from the agriculture sector is shown in the Figures 3-33 to 3-35. Sources of CH_4 emissions are mainly enteric fermentation and manure management. Cattle are the main contributor of CH_4 emissions from enteric fermentations followed by sheep. N_2O emissions from crops are mainly produced from the application of nitric fertilizers. The emissions of CH_4 and N_2O from crop management are insignificant as a result of burning of agricultural residues.

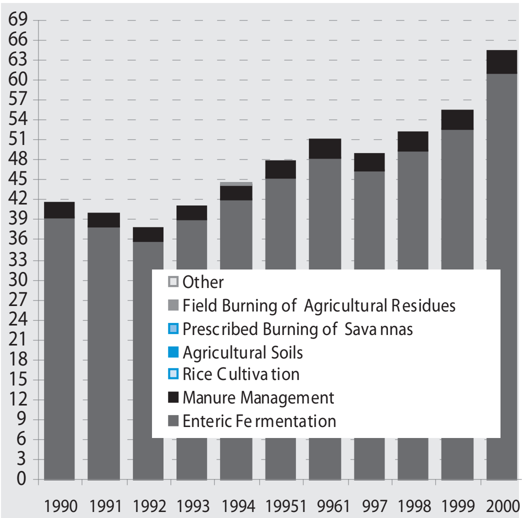


Figure 3-33: CH_4 emission from Agriculture by sub-sectors, 1990-2000 (Gg)

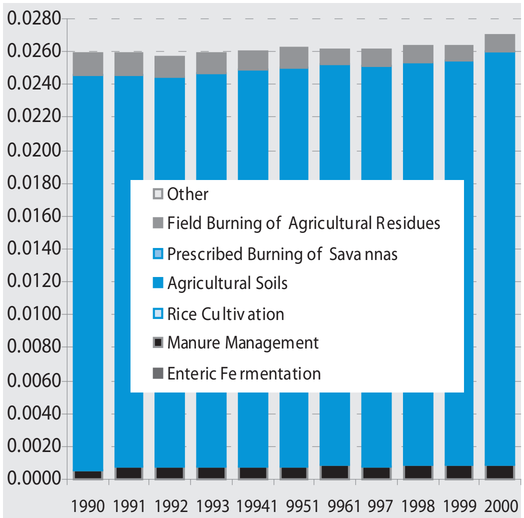


Figure 3-34: N_2O emission from Agriculture by sub-sectors, 1990-2000 (Gg)

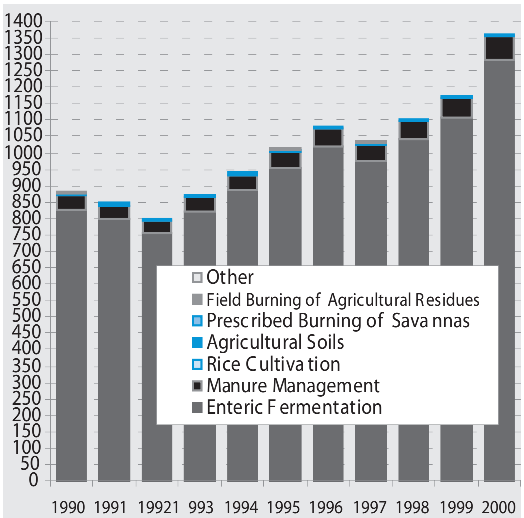


Figure 3-35: CO_2 eq emissions from Agriculture by sub-sectors, 1990–2000 (Gg

3.7 GHG INVENTORY FROM THE INDUSTRY AND SOLVENT SECTOR IN 1990–2000

3.7.1 Description of the situation in the Industrial Sector

Industry generated 58 % of GDP in Albania before the political changes, with its major branches like heavy industry, light and food industry, which accounted for 31 %, 28 % and 20 % of the GDP respectively. From the year 1990, the economic situation deteriorated rapidly and the GDP decreased 8 % in the year 1990 compared with 1989, while the decline was estimated at about 50 % by the year 1994 compared with 1989 and after that there has been modest recovery in the industry sector. The important sub-sectors like chemical, metallurgical and mechanical industry and other branches related to them, have reduced more than three times compared with 1990. In the following figures the time-series of activity data for the Industry and Solvent sectors are shown for the period 1990-2000 (Figures 3-36 to 3-41, all charts show production in tons).

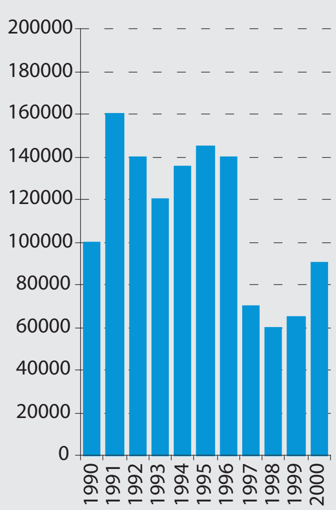


Figure 3-36: Clinker production

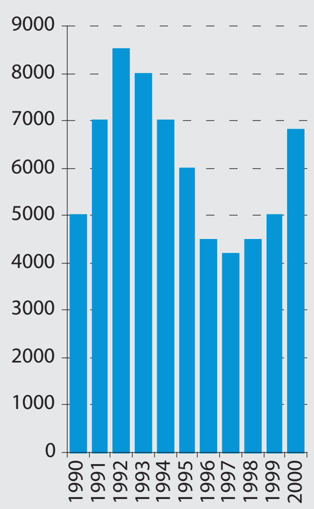


Figure 3-37: Cement production

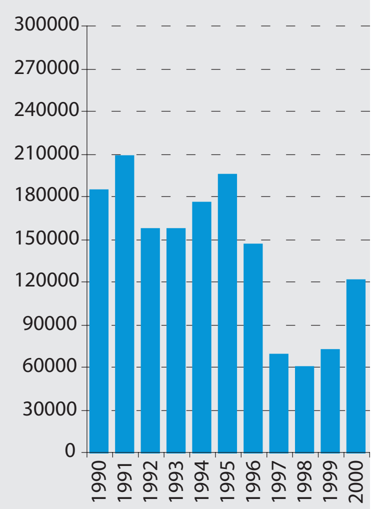


Figure 3-38: Dolomite use

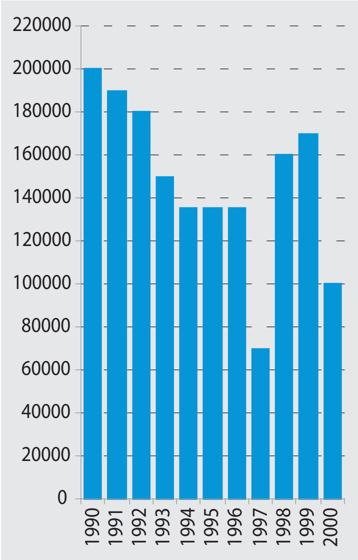


Figure 3-39: Lime production

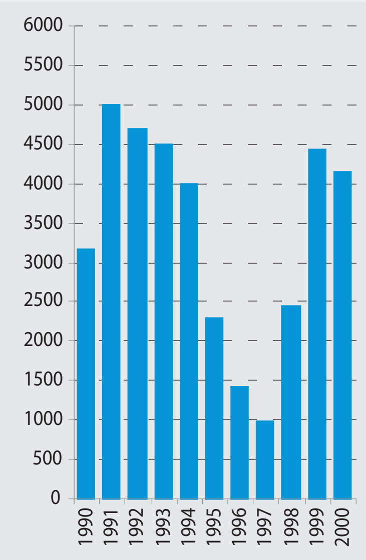


Figure 3-40: Soda ash use

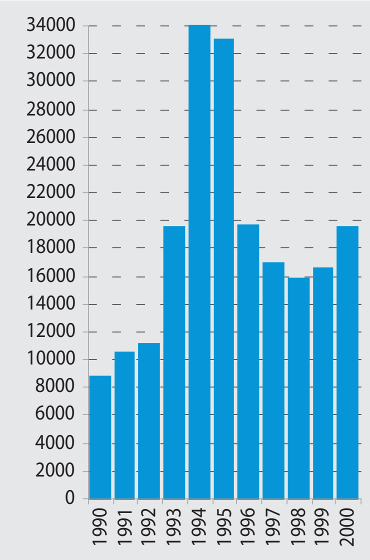


Figure 3-41: Asphalt Production

Quantities of main solvents consumed in different economic sectors of Albania during the period 1990-2000 are shown in Figures 3-42 to 3-44 (all quantities in tons).

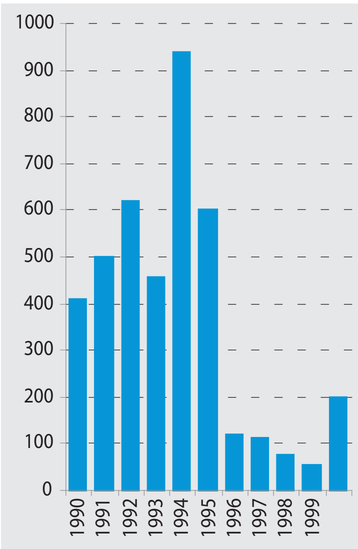


Figure 3-42: Ethylene use

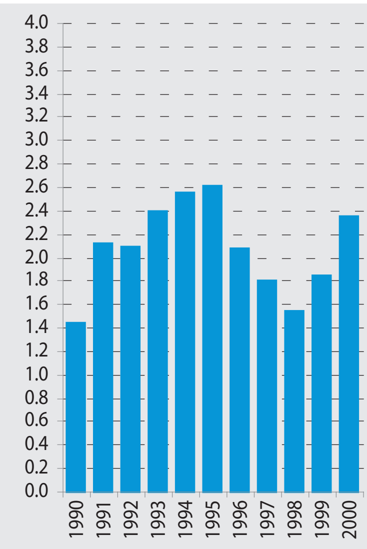


Figure 3-43: Propylene use

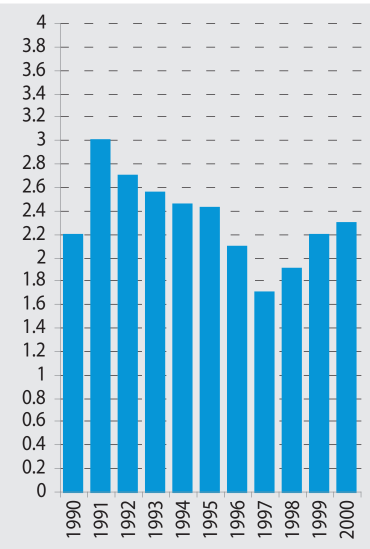


Figure 3-44: Butylene use

The Activity Data for the years 1990-2000 are gathered from: the "INSTAT- Annual Publications of Albania"; "Industrial Production in Albania 1990-1994, 1999-2000" of Ministry of Economy, Trade and Industry; General Directory of Customs, UNIDO-Ministry of Environment Project on Ozone depleting substances"; Institute of Environment; NGO-s, etc.

3.7.2 GHG emissions

The total GHG emissions from industy are shown in Figure 3-45. The main contributors of are industrial processes, mineral products and metal production.

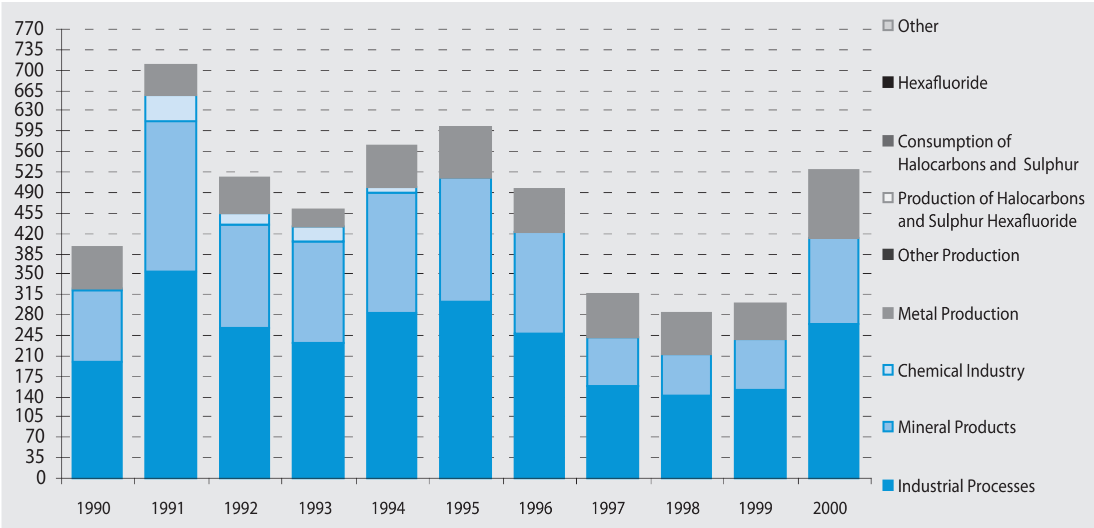


Figure 3-45: Aggregated GHG emissions in CO_2 eq from industrial sub-sectors

3.7.3 Indirect GHG Emissions

Solvents and related compounds are important for GHG emission inventories because they are a significant source of emissions of non-methane volatile organic compounds (NMVOCs), which are indirect greenhouse gases. No other GHGs are emitted in significant amounts from the use of solvents and related compounds.

The estimates for the "Solvent Use" were calculated as a product of activity data (for each sub-category of solvents) and emissions factors. NMVOCs emissions from different categories of solvents group are shown in Figure 3-46. The primary source is ethylene use, which was significantly reduced from 3350 Gg in 1990 to to 102 Gg in 2000.

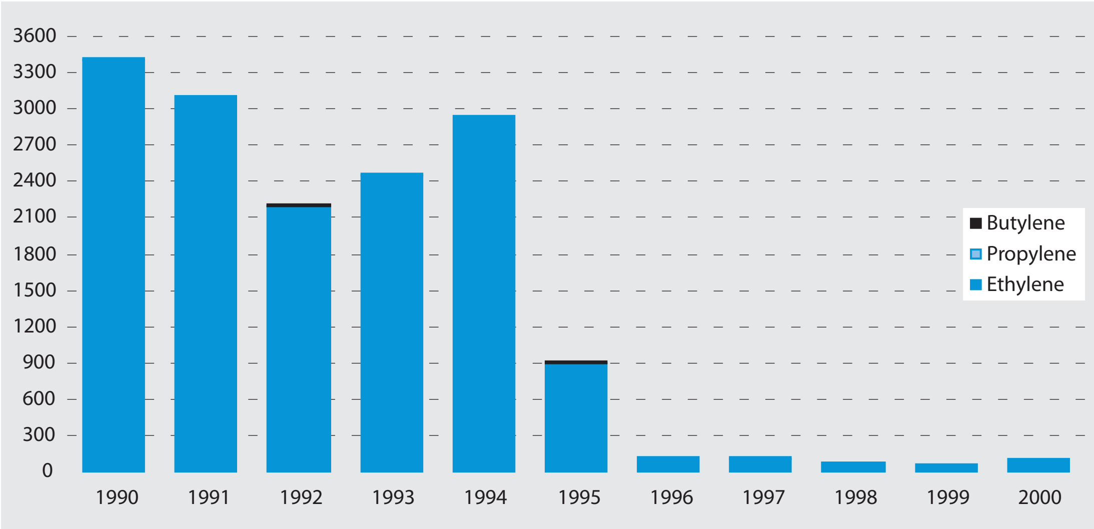


Figure 3-46: NMVOC emissions from solvent use in Albania, [Gg]

3.8 GHG INVENTORY FROM WASTE SECTOR IN 1990–2000

3.8.1 Description of the situation in Waste Sector

Solid waste management is not well developed and properly considered in the country. Separate collection does not exist; some separation is done by individuals at the landfills. Owing to an anticipated increase in quantities of waste together with poor waste management, higher environmental impacts could arise in the future. There is a growing awareness of the importance of environmentally sound waste management so several measures are planned to be implemented.

Data on generation of urban solid wastes show high specific production values. This is mostly due to the lack of an adequate monitoring system. There are three main driving forces that increase the pressure on waste disposal:

- Population growth of about 1–2 % annually,
- Rising standard of life and
- Consumption mentality.

Despite growing environmental awareness in recent years, the generation of household waste continues to increase. The existing solid waste disposal sites do not include methane recovery systems.

3.8.2 GHG emissions from Waste Sector

GHG emissions from the waste sector were calculated by the revised 1996 IPCC Guidelines using activity data and emission factors.

There are no emissions of HFCs, PFCs and SF_6 gases from the waste sector. CO, NO_x, SO_x and NMVOCs can be emitted from the Waste Sector, but mainly from the incineration of municipal solid waste. There is no plant for MSW incineration in Albania. The GHG Inventory for the

Waste Sector consists of the inventory of methane emissions from existing solid waste disposal sites, in each town. For the calculation of CH_4 emissions from solid waste disposal sites the following input data were used:

- total municipal solid waste (MSW) disposed to solid waste disposal sites (SWDS),
- Methane Correction factor (MCF),
- fraction of Degradable Organic Component (DOC) in MSW,
- fraction of DOC which actually degrades,
- fraction of carbon released as methane,
- conversion ratio.

The total municipal solid waste disposed to solid waste disposal sites was calculated from the quantity of municipal waste transported to the final disposal sites by the private or public companies (Figures 3-47 and 3-48). The main emission of GHG in the Waste Sector is methane emission from the SWDSs, while methane emission from domestic and industrial wastewaters and sludge is very small. The share of CH_4 emissions from solid waste disposal on land is increasing from 69 % in 1990 to almost 93 % in year 2000.

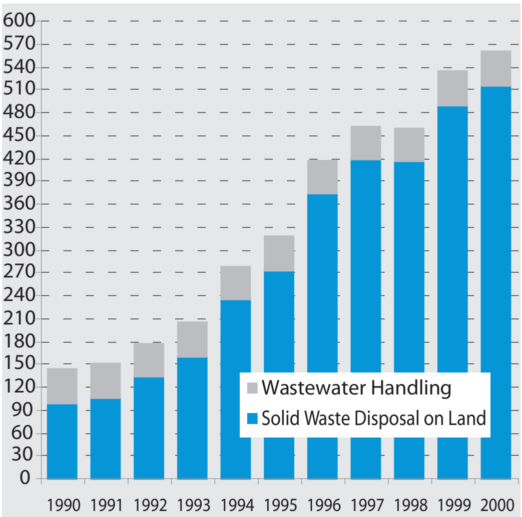


Figure 3-47: CH_4 emission from Waste sub-sector, 1990-2000 (Gg)

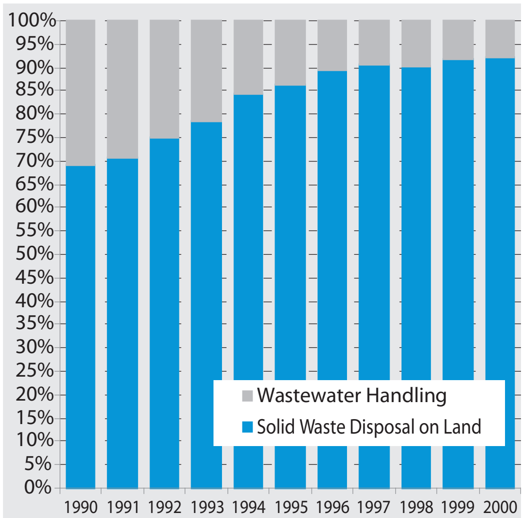


Figure 3-48: CH_4 emission from Waste sub-sector, 1990-2000 (%)

3.9 UNCERTAINTY ASSESSMENT

Uncertainty assessment was performed for the GHG inventory under the SNC. It was estimated, that the dominating sector in combined uncertainty of CO_2 emission as percentage of total national GHG emissions is Land-use Change and Forestry with 6.50 % followed by the Transport Sector with 2.12 %, and the sectors Emissions from Stationary Fuel Combustion, Energy Industries, Manufacturing Industries and Construction with 1.19 %. Other sectors have much lower GHG contributions, because their total contribution to CO_2 emissions is relatively small compared to the former sectors. Total uncertainty of CO_2 emissions is 5.10 %.

The uncertainty of CH_4 emissions arises mainly from the sector of Enteric Fermentation with uncertainty of 18.77 %, whereas the total uncertainty is 17.44 %.

The main source of uncertainty of N_2O emissions is the sector Emission from Stationary Fuel Combustion, Energy Industries, Manufacturing Industries and Construction with a total uncertainty of 39.66 %. However N_2O production has very low influence in overall national uncertainty because of the very small amount of production.

The overall national GHG Inventory uncertainty is 5.23 % and the main contributor is CO_2 emissions from fuel wood with 35.32 % of total value. This uncertainty is however almost two times lower compared to the GHG Inventory for the year 1994 from the First National Communication. The main source of uncertainty is an estimate of quantity of self-collected fuel wood in the rural areas. The uncertainty was reduced through a Fuel Wood Consumption Survey, which was used to correct the activity data for the fuel wood consumption.

Combined uncertainty has been calculated for the whole period 1990–2000. Figures 3-49 to 3-52 present the trend of uncertainty for each GHG and a combined uncertainty for CO_2 equivalent emissions.

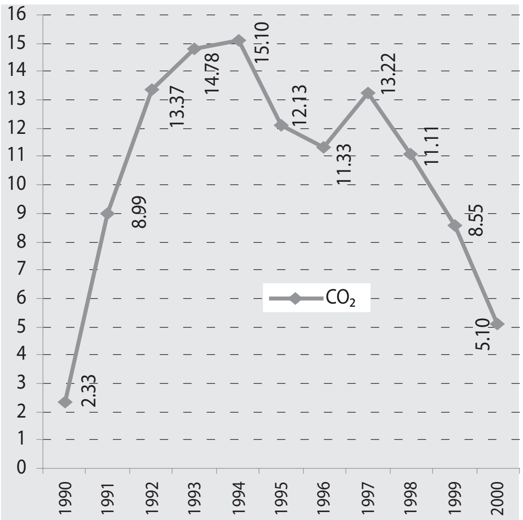


Figure 3-49: CO_2 - Tier 1 Uncertainty Calculation and Reporting for the whole period 1990–2000

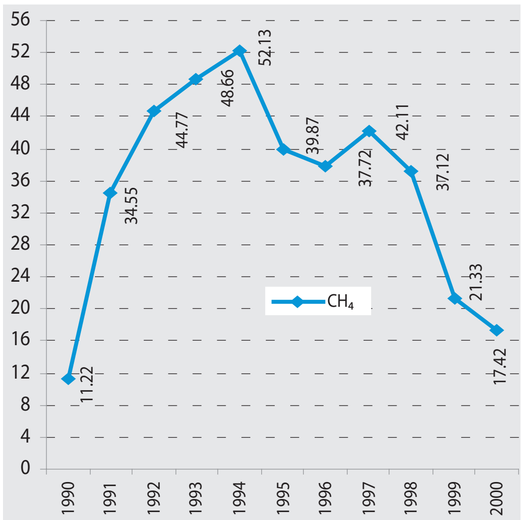


Figure 3-50: CH_4 - Tier 1 Uncertainty Calculation and Reporting for the whole period 1990–2000

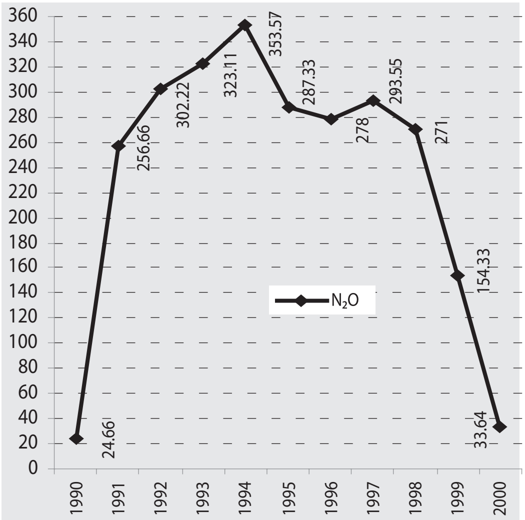


Figure 3-51: N_2O - Tier 1 Uncertainty Calculation and Reporting for the whole period 1990–2000

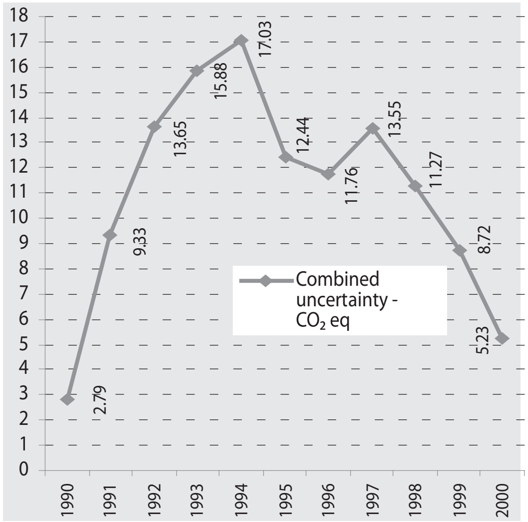


Figure 3-52: CO_2 eq - Tier 1 Uncertainty Calculation and Reporting for the whole period 1990–2000

The combined uncertainty level was minimal under the centralized economy. After the start of transition to the market economy the data were much more uncertain up to 1994, when it reached the maximum of 17.03% uncertainty. After this year, with the Law "Improvement of Energy Statistics" entering into force, the combined uncertainty has been reduced to 11.76% (1996). Owing to political unrest in 1997 the quality of data is weak, increasing uncertainty to 13.55%. During the period 1998-2000 combined uncertainty has been reduced to 5.23% owing to many steps undertaken by the Climate Change Unit, and to filling the data gaps in different economic sectors.

3.10 QUALITY ASSURANCE AND QUALITY CONTROL

When preparing the GHG Inventory for the year 2000 in Albania, a quality assurance and quality control (QA/QC) plan was prepared and several activities performed to assure data quality.

The following activities were performed internally:

- Check of methodological and data changes resulting in recalculations (temporal consistency of input data, consistency of method for calculation)
- Completeness checks,
- Check that assumptions and criteria for the selection of activity data and emission factors are documented,
- Check for transcription errors in data input and reference,
- Check that emissions are calculated correctly,
- Check that parameter and emission units are correctly recorded and that appropriate conversion factors are used,
- Check the integrity of database files,
- Check that the movement of inventory data among processing steps is correct,
- Check that uncertainties in emissions and removals are estimated or calculated correctly,
- Review of internal documentation,
- Check that uncertainties in emissions and removals are estimated or calculated correctly.

All information required to produce the national emissions inventory was documented and archived, including:

1. Assumptions and criteria for selection of activity data and emission factors;
2. Emission factors used, including references to the IPCC document for default factors or to published references or other documentation for emission factors used in higher tier methods;
3. Activity data or sufficient information to enable activity data to be traced to the referenced source;
4. Information on the uncertainty associated with activity data and emission factors;
5. Rationale for choice of methods;
6. Methods used, including those used to estimate uncertainty;
7. Changes in data inputs or methods from previous years;
8. Identification of individuals providing expert judgment for uncertainty estimates and their qualifications to do so;
9. Details of electronic databases or software used in production of the inventory, including versions, operating manuals, hardware requirements and any other information required to enable their later use;
10. Worksheets and interim calculations for source category estimates and aggregated estimates and any recalculations of previous estimates;
11. Final inventory report and any analysis of trends from previous years;
12. QA/QC plans and outcomes of QA/QC procedures.

The GHG Inventory was peer-reviewed by Dr. Carlos Lopez, from the Institute of Meteorology of Cuba under the National Communications Support Programme (NCSP).

CHAPTER 4

4 VULNERABILITY ASSESSMENT AND ADAPTATION OPTIONS

4.1 INTRODUCTION

Unlike the FNC, the assessment of vulnerabilities and adaptation options (V&A) is focused on the Drini River Cascade (area from Kukës up to the Lezha Plain. It was prioritized among three specific vulnerable areas by using a set of selection criteria, developed and agreed through broad consultations with stakeholders .

The study area is situated in three large geographic-natural units: The north mountainous region, which includes the districts of Tropoja, Has and the northern part of Shkodra districts; the Central Mountainous Region, which includes field-hilly coastal territories of the regions of Shkodra and Lezha. The coastal area corresponds with the estuary of the Drin river which is one of the largest bays of the eastern Adriatic sea (the length of coastline is 70 km).

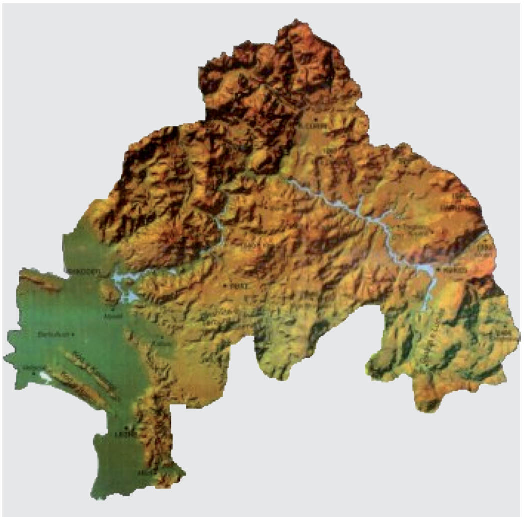


Figure 4-1: Study area

The lower part of the area, the Drini River delta is a compound system consisting of sandy belts, capes, bays, lagoons and island areas. The Kune-Vain protected area (with a total surface of approximately 2,300 ha) and the Kannalla lagoon lie within the Drini delta. The area has been recognized as an Important Bird Area (IBA) and is also recognized for its landscape values under the Ramsar Convention.

The area is very important for electricity generation, more than 95 % of the electrical energy in Albania is produced from hydro sources. The hydropower cascade of the Drini River has a total exploitable capacity of 1.7 GW and a generation potential of 6.8 TWh, accounting for the bulk of Albania's hydroelectric potential.

The area has economic development potential for agriculture, livestock, forestry, tourism, etc. The Shengjini beach is an attractive tourist destination , especially during summer time.

4.1.2 Scope of the V&A assessment

The aim of V&A analysis is an assessment of potential impacts of climate change in a selected area of Albania and identification of measures to be applied to the sectors/ systems to adapt to these changes. It is expected to enhance general awareness and knowledge of climate change-related and adaptation issues in Albania, and help considering them in the process of national planning and policy.

The assessment of vulnerability is sector–specific and considers the following related sectors: (i) water resources; (ii) agriculture; (iii) forestry; (iv) energy (v) tourism; (vi) population and settlement.

4.1.3 Methodology

V&A assessment is based on the Adaptation Policy Framework and Technical Papers. It consists of three main components briefly summarized below.

1. Assessment of current vulnerability, that addresses two key areas associated with current conditions: (i) vulnerability to current climate, and (ii) effectiveness of adaptation measures that may have already been implemented. It consists of:
   - assessment of current conditions within the priority sector/system: (i) water resources, (ii) agriculture, (iii) forestry, (iv) energy, (v) tourism and settlements.
   - assessment of current climate risks
   - assessment of socio-economic conditions within the priority sector/system(s).
   - assessment of vulnerability (to both socioeconomic conditions and climate).
   - assessment of adaptation experience.
2. Assessing Future Climate-Related Vulnerability consists of two basic elements – a set of future climate change scenarios and an analysis of vulnerability and associated risk.
   - Climate change scenarios are developed by using the updated version of MAGICC/ SCENGEN (version 4.1) by using the scenarios A1BAIM, A2ASF, B1IMA, B2MES (TAR,IPCC). The temperature and precipitation changes are generated for each emission scenario for years 2025, 2050 and 2100 using the GCMs: CSM_98, ECH395,

ECH498, GFDL90, HAD295, HAD300 .
- Expected impacts of sealevel rise are evaluated by running DIVA and MAGICC softwares. Some indicators are evaluated, such as net loss of wetland area, people actually flooded, coastal floodplain area and population, etc. The impacts of future climate in different fields are evaluated using models (rainfall – runoff model, Long Range Energy Alternatives Planning (LEAP) regressions), expert judgment, or analogue studies.

3. Assessment of adaptation measures. A set of adaptation measures needed to address the vulnerability system/ sector against climate change is identified. Their priority is further evaluated through the following criteria and sub-criteria:
   - Development benefits (job and wealth creation for the poor (- JW; food security -FS; health and environment improvement -HEI; capacity building - human, institutional, physical, environmental - CB; social acceptability and suitability - SA&S; economic and industrial efficiency improvement - EI; gender equality and empowering of women - GE)
   - Vulnerability Reduction (minimize risk from disasters - MRD; minimize economic losses -MEL; increase institutional response - IR).
   - Developing an adaptation action plan that implies the adaptation policy options and measures in response to current vulnerability and future climate-related risks.

4.1.4 Adaptation baseline

No direct climate change adaptation measures have been implemented so far in Albania. However, some actions taken during the second half of the 20th century for other purposes have indirectly contributed (and will contribute) to adaptation to climate change.

Most important measures are construction of flood protection systems in the lower part of the main rivers. Water retention reservoirs with substantial storage capacity were built on the Drini and Mati rivers.

Starting from the 1970s irrigation and drainage of agricultural land in the lower part of the Drini basin was being constructed. Although effective in general, most systems were abandoned in recent years and current systems do not satisfy the needs of agriculture. Most irrigation systems do not function and remaining pumping stations do not work all the time. Some measures were implemented for improvement of flow of Drini of Lezha. The most problematic are the drainage systems of Velipoje and Shengjin.

Protection was declared for part of the coastal zone (Kune-Vain), some forest areas (Velipoja, Thethi, Gashi river, Valley of Valbona river, Over white Drin river, etc.) and some protective works in the zone of Shëngjini port.

Deforestation of the littoral land during 1945–1990 and illegal cuttings are increasing coastal erosion. Many sand dunes in beaches of Velipoja, Vilun, Kune - Vain, etc. have been damaged.

4.2 CLIMATE CHANGE SCENARIOS

4.2.1 Current Climate

Despite its small area a considerable variability of climatic elements exists in the study area. There are two main factors that cause this variability: altitude above sea level and distance from the sea.

The annual mean air temperature shows a considerable variation. It varies from 8.9°C in inner part of the zone up to 15.4°C at the mouth of Drini River in Lezhe, while on the whole the mean value is 11.7°C (Figures 4-2 and 4-3).

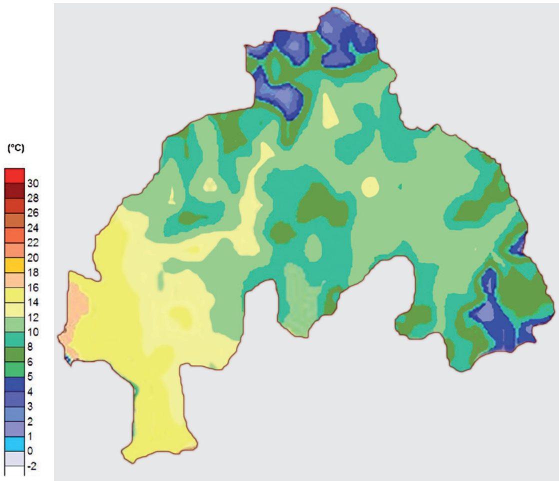


Figure 4-2: Yearly mean air temperature.

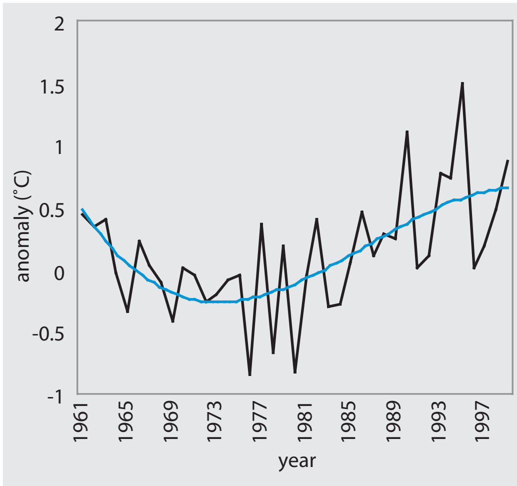


Figure 4-3: Yearly anomaly and the trend of air temperature (Shkoder)

Analysis of anomalies in 1961-2000 shows that in general annual mean temperature has risen by approx. 1.0°C for the entire zone. Figure 4-3 illustrates the yearly anomaly of mean temperature for Shkodra.

The amount of precipitation observed in this zone varies widely, from 910 mm in the eastern part (Kukës) up to 2260 mm in the Iballe, while on the whole the average precipitation is 1634 mm per year (Figure 4-4).

The highest amount of precipitation, about 66 % of the total, is recorded during the cold months (October-March),. The wettest months are November–December, while the driest are July-August. The number of rainy days with precipitation higher than 1.0 mm varies from 94 in eastern part up to 120 days in Iballe, while in the whole study zone the average is 103 days.

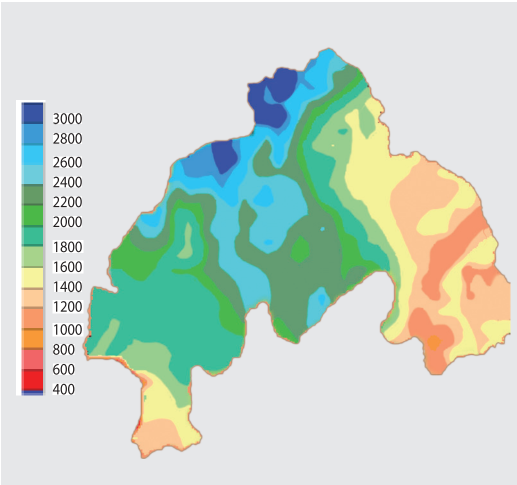


Figure 4-4: Distribution of annual precipitation total (1961–90)

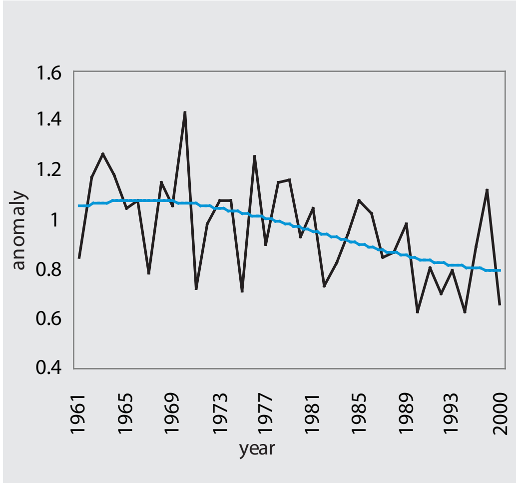


Figure 4-5: The annual precipitation anomaly and trend (Kukës)

The trend analysis for the period 1961-2000 shows that annual precipitation total is slightly decreasing (statistically non significant). Figure 4-5 illustrates the results for Kukës station.

4.2.2 Weather hazardous phenomena

4.2.2.1 Heavy rain

In general the area is characterized by heavy rainfall, e.g. heavy rain on 2 October 1946, when 398 mm fell in Shkodra in 24 hours. This amount of precipitation caused flooding of a part of Shkodra city and the fields around it. Other maximum values recorded were: 420 mm in Boge station (Albanian Alps) on 15 December 1963 and in Iballe 228.9 mm on 19 November 1969.

The eastern part of the study area is characterized by low values of maximum 24h precipitation (Kukës station), while the central and western parts have higher values. This indicator has reached the highest value in Shkodra station (345 mm/24h, decade 1991–2000).

4.2.2.2 Maximum and minimum absolute temperatures

The number of days, when the air temperature exceeds 35 °C or is lower than −5 °C, is an important indicator (Table 4-1). The temperatures above or below these thresholds influence the quality of human life as well as agriculture and other sectors/systems.

Table 4-1: Average number of days with T_{max} >35 °C or T_{min} <–5 °C and given minimum and maximum absolute temperatures

Decade	Maximum temperature				Minimum temperature			
	Kukës		Lezhe		Kukës		Lezhe	
	Nr.d T>35°C	Max. abs.	Nr.d T>35°C	Max. abs.	Nr.d T<-5°C	Min. abs.	Nr.d T<-5°C	Min. abs.
1951–60	3.6	38.7	1.7	37.5				
1961–70	1.7	39	0.7	38.3	25.5	-21.0	0.8	-10.0
1971–80	6	40.2	1.8	40.0	18.5	-19.4	0.3	-8.0
1981–90	3.8	40.2	1.9	37.5	22.2	-22.0	0.5	-6.7
1991–00	6	39	1.9	40.0	12.4	-18.0	0.4	-6.2

Low altitudes within the study area register the highest number of days with extreme temperatures, while high altitudes the lowest . This indicator has increased in the last two decades in the eastern part of the study area (B. Curri and Kukës).

Minimum absolute temperatures vary from –10 °C in the lower part of Drini River in Lezha, down to value –23.4 °C recorded in Dega station, which is also the lowest value observed in the study area. In the lowland, especially in Lezha, there are very few cold days, while in high altitudes the value of this indicator is higher, up to 25.5 days/year. In the last decade the value of this indicator has decreased.

4.2.2.3 Strong winds

The most frequent incidents of strong winds (speed ≥15 m/s) are recorded in Lezha (63 cases, 1983), followed by Puka, Kruma, Kukës, B. Curri and Shkodra stations. The number of incidents is generally reducing. In August 2007, the winds have spread human induced fires in the area.

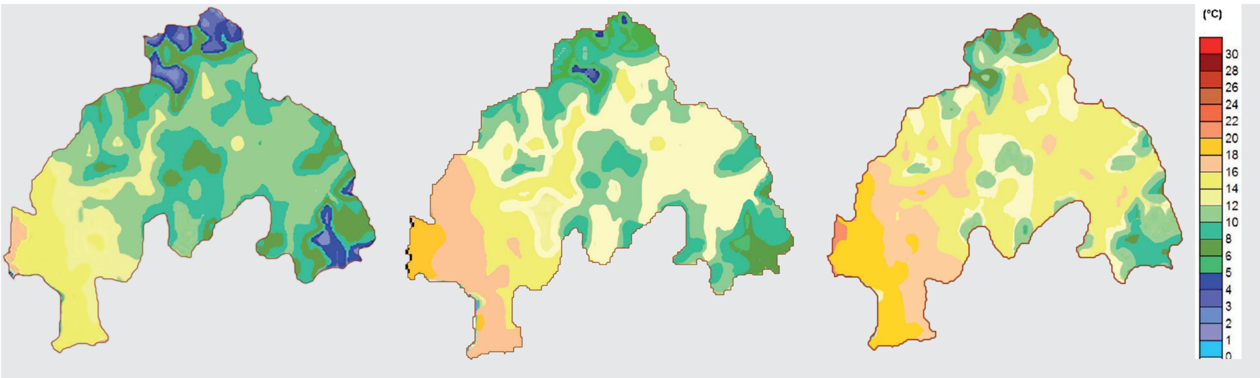
4.2.3 Climate change scenarios

Likely changes in temperature and precipitation developed for Albania (including the study area) are presented in Table 4-2. It is expected that temperature will increase and precipitation will decrease, leading to milder winters, warmer springs, hotter and drier summer and drier autumn. Figure 4-6 illustrates likely annual changes for the study area.

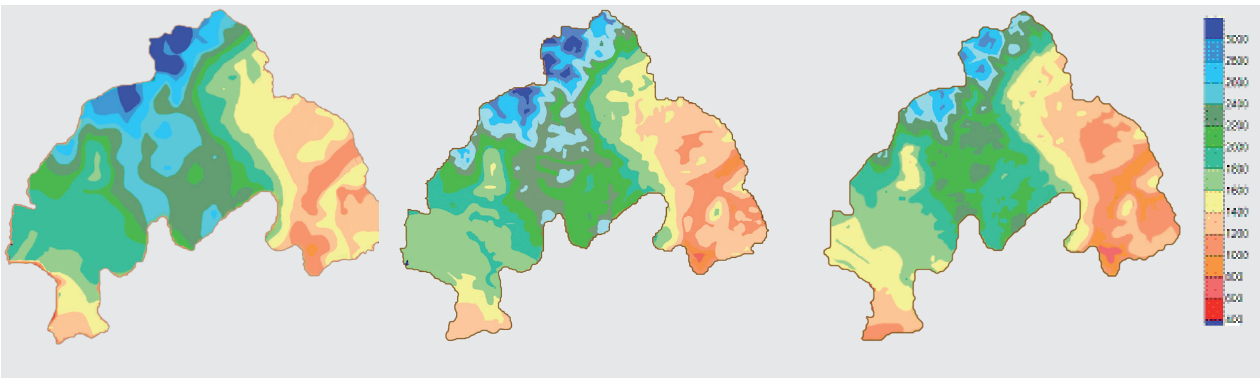
4.2.3.1 Likely changes in other climatic parameters

- Drought is expected during summer due to increased temperature (likely increase up to 5.6°C) and potential evaporation, not balanced by precipitation (reduction by 41%).
- Recent investigations show that increasing temperatures will be followed by increase of probabilities of extreme events and a higher intra-annual variability of minimum temperatures. Higher increase of daily minimum than maximum temperatures is likely to occur. More frequent and severe droughts with greater fire risk are likely.
- Decreased number of frost days (temperatures ≤ –5 °C) in high altitudes is likely to occur. Expected decrease is 4–5 days, 9 days and 15 days by 2025, 2050 and 2100 respectively.

Table 4–2: Climate change scenarios for Albania				
Scenarios for Albania		Time horizon		
		2025	2050	2100
Annual	temperature (°C)	0.8 to 1.1	1.7 to 2.3	2.9 to 5.3
	precipitation (%)	−3.4 to −2.6	−6.9 to −5.3	−16.2 to −8.8
Winter	temperature (°C)	0.7 to 0.9	1.5 to 1.9	2.4 to 4.5
	precipitation (%)	−1.8 to −1.3	−3.6 to −2.8	−8.4 to −4.6
Spring	temperature (°C)	0.7 to 0.9	1.4 to 1.8	2.3 to 4.2
	precipitation (%)	−1.2 to −0.9	−2.5 to −1.9	−5.8 to −3.2
Summer	temperature (°C)	1.2 to 1.5	2.4 to 3.1	4.0 to 7.3
	precipitation (%)	−11.5 to −8.7	−23.2 to −17.8	−54.1 to −29.5
Autumn	temperature (°C)	0.8 to 1.1	1.7 to 2.2	2.9 to 5.2
	precipitation (%)	−3.0 to −2.3	−6.1 to −4.7	−14.2 to −7.7



a. Expected changes in average temperatures (annual)



b. Expected changes in precipitation total (annual)
Figure 4-6 Expected changes in the Drini river cascade

- In the lowland, especially in Lezha, the value of this indicator is very low (less than one day/year), on contrary in high altitude the number of days < −5 °C is higher, up to 25.5 days/year (for more details see full report Chapter II, Table II.3) during the period 1961–70 .
- Owing to higher average temperatures expected in winter, more precipitation is likely to fall in the form of rain rather than snow, which will increase both soil moisture and run-off. Increase in total precipitation rate may induce greater risks of soil erosion, depending on the intensity of rain episodes.
- Increase in summer temperature is likely to result in increase in frequency and intensity of extreme weather events (heat waves).
- The number of days with the temperature ≥ 35 °C is likely to increase by 1–2 days by 2025 and by 3–4 days by 2050 compared to 1951–2000 average. By 2100 the expected increase is 5–6 days over the mountainous part, and up to 8 days in the low land.
- The expected changes in surface air temperature and humidity will lead to increases in the heat index (combined effect of temperature and moisture). More hot days and heat waves are very likely over nearly all of the study area. The increase will be the largest in the lower part of the study area where soil moisture decrease is likely.
- Although total precipitation is expected to decrease, an increase of intensive rain episodes is likely. The number of days with heavy precipitation (24hours maximum) , considered as hazardous phenomenon, is likely to increase by 1–2 days by 2025, 2–3 days by 2050, and 3–5 days by 2100 compared to 1951–2000 average.

4.3 EXPECTED CHANGES IN THE COASTAL AREA

Scenarios developed to assess the impacts of sea-level rise project an increase in losses of wetland area (around 1 km^2 by 2100), and as a consequence a decrease in total wetland area. It also projects increases in the coastal floodplain area (Table 4-3) and population (respectively around 66 km^2 and 4.6 thousands by 2100). Coastal forest area and low unvegetated wetlands area are likely to decrease.

Table 4-3: Expected Impact of Sealevel Rise (Lezhe area)

		2025		2050		2100	
Parameter		av.min	av. max	av.min	av. max	av.min	av. max
Net loss of wetland area	km^2	0.12	0.20	0.14	0.58	0.41	1.04
People actually flooded	thousands/ year	0.055	0.056	0.019	0.040	0.006	0.007
Coastal floodplain area	km^2	55.61	55.91	56.14	59.20	57.19	65.95
Coastal floodplain population	thousands	4.04	4.06	4.14	4.33	3.99	4.61
Total wetland area	km^2	4.52	4.44	4.5	4.06	4.22	3.60
Coastal forest area	km^2	1.144	1.137	1.14	1.01	1.12	0.91
Low unvegetated wetlands area	km^2	3.38	3.30	3.37	3.05	3.10	2.69

4.4 WATER RESOURCES

4.4.1 Hydrografic and hydrologic parameters

The hydrographic catchment of the Drini River, has a total area of 19.582 km² from which 14.173 km² belong to the Drini river (including catchments area of Prespa lakes, because they participate in the water flow of this river) and 5.187 km² to the Buna river.

The Drini River has a mean annual discharge of 680 m³/s, where 360 m³/s flows from the Drini river itself and 320 m³/s from the Buna River. The resulting specific discharge is about 35 l/s.km² and the run-off coefficient 0.74.

The climate is an important factor that impacts the water flow, but human influence cannot be ignored. The main water use from the Drini river up to 1969 used to be irrigation (when the first hydropower Vau Dejes, was constructed). The water for irrigation has been extracted through all its length, from the spring to the river mouth. During the period 1968–1985 three important dams (hydropower plants) were constructed in Vau Dejes, Koman and Fierza, covering almost all the length of the Drini River. As part of this programme there have been analyzed the long time records of selected hydrometric stations free of human influence (which means no effect from Hydropower Stations or reservoir etc).

4.4.2 Hydrological regime

4.4.2.1 Interannual flow distribution

Analysis of interannual distribution of the river flow anomalies reveals that a gradual growth of flow is observed after 1954. Such growth is more evident in the hydrological year 1963 that continues up to the end of 1966 and is diminishing after that (Figure 4-7). The period up to 1970, in general, is a wet period (with more values greater than the long term average). Before 1980 there are cycles with low water and cycles with high waters, but in total it is a period of positive trend. After 1980 there are regular consecutive cycles with high and low water but now the trend is negative. There are more consecutive years with low water (more than three) so the dry period is extended more than before the '80.

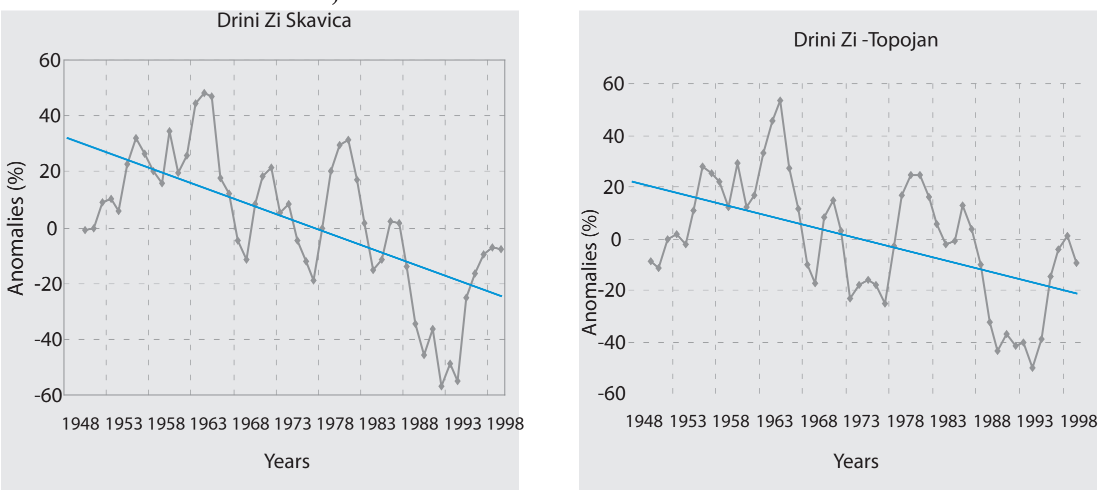


Figure 4-7: Yearly anomalies of some stations in Drini River basin

4.4.2.2 Flow distribution within the year

The water flow distribution in the river channel follows smoothly the precipitation and air temperature distribution. Monthly distribution of the river discharge for the entire Drini water basin, is a water regime with two maxima: one in the winter season (November-December) when the amount of precipitation has its maximum and the next at the end of spring (April-May) due to the melting of snow. This distribution has only one minimum, at the end of the summer that coincides with lower precipitation and maximum air temperature.

4.4.2.3 Analysis of trend of river floods and low flow

Detecting climate impact on river flow is complex, since the flow is dependent on multiple factors: precipitation inputs, catchments storage, evaporation losses and also physical measures and morphological processes changing the river structure (Pinter et al., 2003).

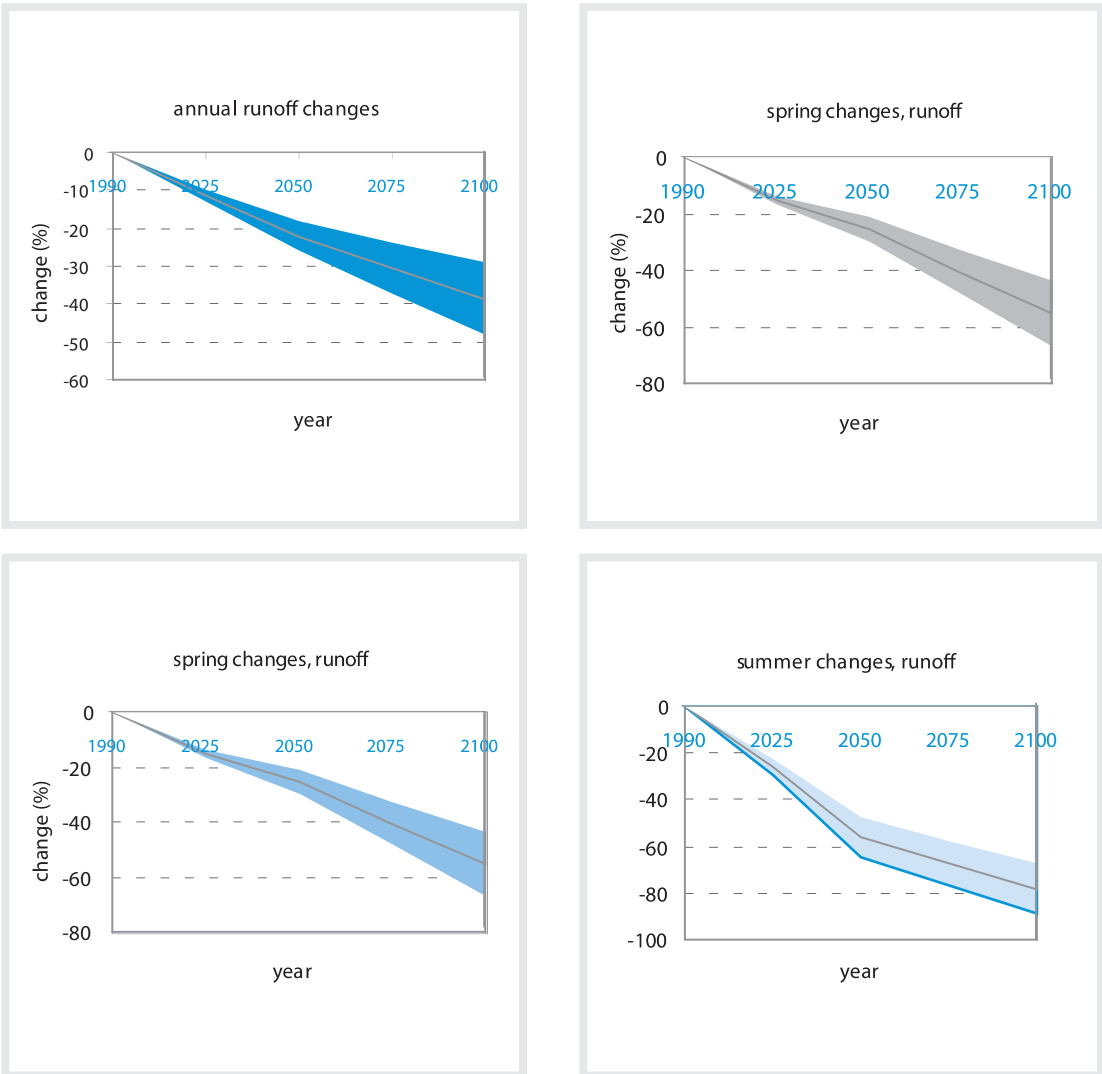


Figure 4-8: Expected runoff changes in DRA

Trends' analysis detects a negative trend of the flood index series (magnitude and frequency) for the stations stations in Drini Zi River, and negative or positive trends for stations in branches.
The number of floods in the lower part of the study area has increased in the last 15 years, due to human influence.

4.4.3 Expected impacts on water resources

The patterns of change are broadly similar to the change in annual precipitation: increases in high latitudes but decreases in mid-latitudes. But the general increase in evaporation means that a reduction in runoff is probable (Figure 4-8).

The precipitation regime over the Drini River watershed is characterized by snow during winter in the eastern and northern part and rain in the western part of it. For the catchments of most branches (Valbona, Shala, etc.) a major proportion of annual streamflow is formed by snow melting in spring. A rise in temperature would mean that more precipitation falls as rain and therefore winter runoff increases and spring snowmelt decreases. Increased temperatures also increase evapotraspiration and reduce the quantity of water stored in reservoirs during winter.

The likely impacts of climate change in the water sector are:

- Increase in long term mean annual and seasonal air temperature and decrease in mean annual and seasonal precipitation (combined with higher evaporative demand) will reduce long term mean annual and seasonal runoff for the Drini water basin (Figure 4-8).
- There are no significant changes for the winter for all time horizons, up to a maximum of 7% by 2100. The floods will still occurred during this season and the flood of spring time, will shift toward the winter.
- Higher temperatures will shift the snowline upwards; the seasonal patterns of snowfall are likely to change with the snow season beginning later and ending earlier. So, the spring runoff is expected to reduce noticeably. The maximum reduction accounts for 30% and 66% respectively by 2050 and 2100. It must be taken into consideration by the Hydropower industry.
- Riverine flood risk will generally increase, the time of greatest risk would move from spring to winter. Effects on groundwater recharge (a major resource of this catchment) could increase by climate change.
- Sea-level rise can cause several direct impacts, including inundation and displacement of wetlands and lowlands, coastal erosion, increased storm flooding and damage, increased salinity in estuaries and coastal aquifers, and rising coastal water tables.
- The ground water supply will be affected by decreased percolation of water due to decrease in the amount of precipitation and stream flow, and loss of soil moisture due to increased evapotranspiration.
- Reduction of ground water supply in combination with increased salinity of the ground water supply can cause shortage of drinking water of adequate quality.

4.5 AGRICULTURE

4.5.1 Agriculture and Livestock

The agricultural sector is one of the major branches of the national economy in Albania, contributing 24.7 % of GDP in 2003, 24 % of GDP and 58 % of employment in 2004. The main drivers are livestock and arboriculture (4.8 % and 15.5 % respectively in 2003).

Agriculture is more developed in Shkodra and Lezha than in other districts because the land is mostly flat and fertile. The agricultural land in these districts is around 79 169 ha, or 11.33 % of the total agricultural land in Albania.

The study area is mainly planted with cereals and forage (about 84,5 % of the agricultural land) and less with potatoes, vegetable and beans. fruit trees, etc. Cereals, mainly maize, is planted in all districts. The surface accounts for 35.48% of the agriculture land, but the major area is planted in Shkodra district, where the technical conditions, especially irrigation, are provided.

Livestock is the second activity in this region. Cattle, cows, sheep and goats, are the main groups of the livestock in a total number of 553 000, where sheep and goats reach around 62,55 % . The feeding is based on forage cultivation and grazing. For sheep and goats, migration in summer and winter meadows is being practiced in two directions: within the habitant area and outside habitant area.

4.5.2 Agriculture Policy and Legal framework

Until 2002 agriculture development has been oriented through the Strategy for Agricultural Development (the so called "Green Strategy"), but this strategy has not taken into consideration the impact of climate change on agriculture and livestock production. In 2002 a strategic document for the agricultural sector has been part of the national strategy for socio-economy development as a framework document aiming at poverty reduction in Albania. As a priority agriculture is considered also in the national program for the process of stabilization and association toward EU integration.

4.5.3 Agricultural development

In Albania, since 1945, the area of agriculture land has increased up to 710,000 ha, through the drainage of lagoons (~ 150,000 ha), deforestation, and by changing the winter and summer pastures into agriculture land.

As result of the intensification of agro-technical measures the yield of wheat is increased progressively 2–5 times and the yield of maize is increased 5–8 times compared with the year 1962. For that reason the impact of climate change has been not so evident on the crop yields.

Shkodra and Lezha are the districts were the agriculture is more developed than in four other districts, because of the land which is mostly flat and fertile. The agricultural land in these districts is around 98,534 ha, or 14.05 % of total agricultural land in Albania. Shkodra and Lezha districts both have about 50 % of the arable land within the Drini region.

4.5.4 Identification of the situation and trends for the period 1960–1990

The study is focused more in the main arable crops such as wheat and maize, not only because they have had a very important weight in the agriculture production for the period 1960–1990, but because cultivation of these crops, according to National Agriculture Development Strategy, will also remain as priority.

The wheat production for the different districts according to the landscape (lowland, hilly and mountainous areas) is represented in Figures 4-9 and 4-10. In the field zone of Lezha and Shkodra the wheat yield oscillates from 5.9 – 38.7 q/ha and from 7.3 – 38.1 q/ha in the hilly areas.

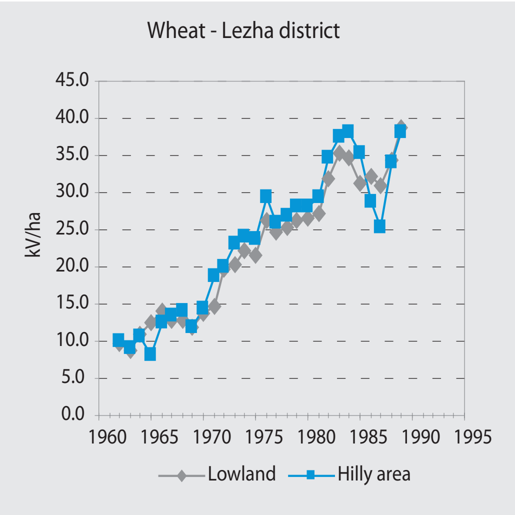


Figure 4-9: The yield of wheat (kv/ha) for lowland and hilly areas, Lezha district

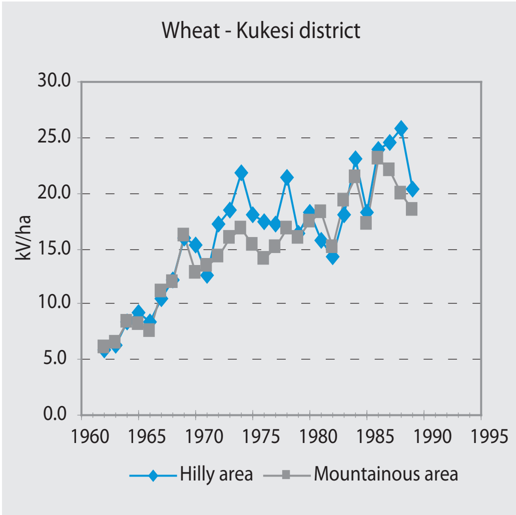


Figure 4-10: Yield of wheat (kv/ha) for hilly and mountainous areas of Kukësi district

The wheat yield oscillates from 5.8 – 25.8 kv/ha in hilly areas and from 6.1 – 23.1 kv/ha in the mountainous areas of Puka and Kukësi.

4.5.5 Impact of the climatic conditions on crop yield

The annual trend of the wheat yield in the study area shows a progressive increase. Now it is well known that agriculture production is conditioned by two main factors: agro technique measures (seeds, mechanization, fertilizers, irrigation, etc.) and climatic conditions.

The statistical analysis of annual trends for wheat (Figure 4-11) testifies that the impact of agrotechnical measures accounts for 53 % of the variance. The rest is climate impact.

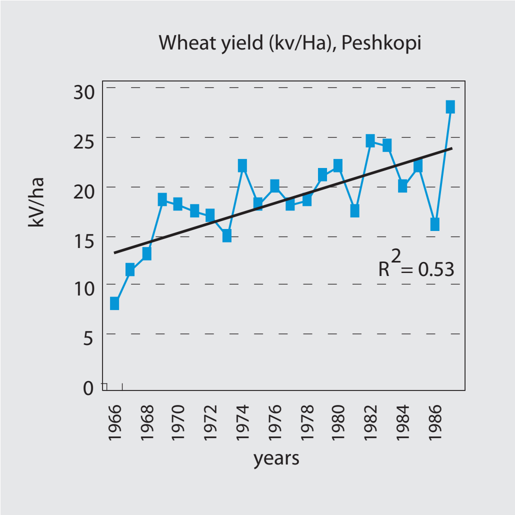


Figure 4-11: The annual wheat yield and linear trend, Peshkopi district

4.5.6 Expected impacts on agriculture

<u>Likely impacts on annual crops</u>

- The total growing season may be reduced for some crops owing to temperature increase. Cereal harvest dates would occur sooner.
- Lack of cold days during December-January could reduce vernalization effects and consequently lengthen the first part of the growing season for winter wheat. Air temperature in April could slow down the biomass growth and reduce wheat yield.
- Expected increase in temperature will cause faster rates of development and shorten the length of growing periods for some crops, consequently shortening the length of the grain-filling period.
- The total growing season for these crops may be reduced by 15-30 days, depending on the climate scenarios used. Cereal harvest dates would occur sooner.
- Temperature increase in spring and summer will accelerate the course of crop development, especially for short-cycle crops that are sown in spring rather than for winter crops.

<u>Climate risks</u>

Climate risks will be highly dependent on the expected pattern of time variability for weather variables.

- Increased temperatures during growth season will promote the development rate of all winter crops, which will therefore face extreme events (cold spells) at a later stage when they are more sensitive.
- Consequences depend on probabilities of extreme events and increased intra-annual variability of minimum temperatures-yielding a higher probability of crop failure from frost damage. The same problem arises with winter cereals, which face extreme temperature maxima in early summer during the grain-filling period.
- Higher summer temperatures (up to 5.5°C higher by the year 2100) should not be very detrimetary to summer crops (except spring cereals, if subjected to elevated temperatures during the grain-filling period) because they are more resilient than winter crops. Drought could be a major concern in the future

<u>Likely impacts on perennial crops</u>

Perennial crops are mainly fruit trees, grapevines, and grasslands.

- Higher temperatures in late winter and early spring will hasten development stages. They could be detrimental to flowering quality for cold-requiring species and therefore could reduce fruit production.
- Higher temperatures will be probably beneficial to grasslands, at least early in the season through increased early biomass production. Higher temperatures during the summer may decrease the growth capabilities of grass.
- Weeds are expected to benefit from higher CO_2 concentrations. The expect-

ed result of the crop-weed competition will depend on their respective reactions to climate and atmospheric fertilization.

- In general, increase of temperature may shorten the reproductive cycle of many pests, so, the risk of crop damage from pests and diseases increases under a warming of climate.

4.6 FORESTRY

About 58 % of the Drini River area is covered by forests (41.8 %) and pastures (16.2 %). Around 15.5 % consists of arable land and the rest (26.6 %) of water, stones, etc. The forest area comprises coniferous species or evergreen forests (about 14.5 %), broadleaves species or deciduous species (71.3 %) and shrubs (14.8 %).

To protect the wealthy biodiversity in the study area, about 51,500 ha are included in protection zones, as: Lumi i Gashit (Gashi River)-5900 ha, Tej Drinit te Bardhe (Over white Drin)-30 ha, Luzni-Bulac-5900 ha, Lugina e Valbones (Valbona valley)-8000 ha, Thethi-2630 ha, Lura-1280 ha, etc.

4.6.1 Conservation of Forest Biodiversity

Referring to the figures for the year 2000, Albanian forest standing stock has an area about 343.207 ha or one third of the Albanian forest area.

The forests' situation, after the species groups, is as follow:

- Conifers: surface 49.922 ha or 14,55 % (major coniferous species are Black pine, Silver fir, Mediterranean coniferous, and other coniferous).
- Broadleaves :surface 244.657 ha or 71,29 % (major broadleaves species are Oak species, Beech, Ash, Maples, Chestnut and other broadleaves etc.
- Shrubs: surface 48.628 ha or 14,77 % (major shrubs are hormbeam, juniper species, Briar, Sumac and Other shrubs etc.

4.6.2 Extension of the forests

Linear regression analysis (between each index of temperature and precipitation with elevations) is used to prepare a baseline scenario for calculation (step: every 50 m of elevation) and to investigate the climate impacts on forests.

Figure 4-12 illustrates the forest area (%) occupied by various vegetation flats. So, Lauretum (evergreen species) flat (L) occupies 19,1 %, Castanetum (Chestnut) flat (C) 26,0 %, Fagetum (Beech) flat (F): 32,4 %, Alpinetum (Alpine pastures) flat (A): 22,3 %. 0,2 % of forests in the study area consists of Picetum (Common spruce) flat (P).

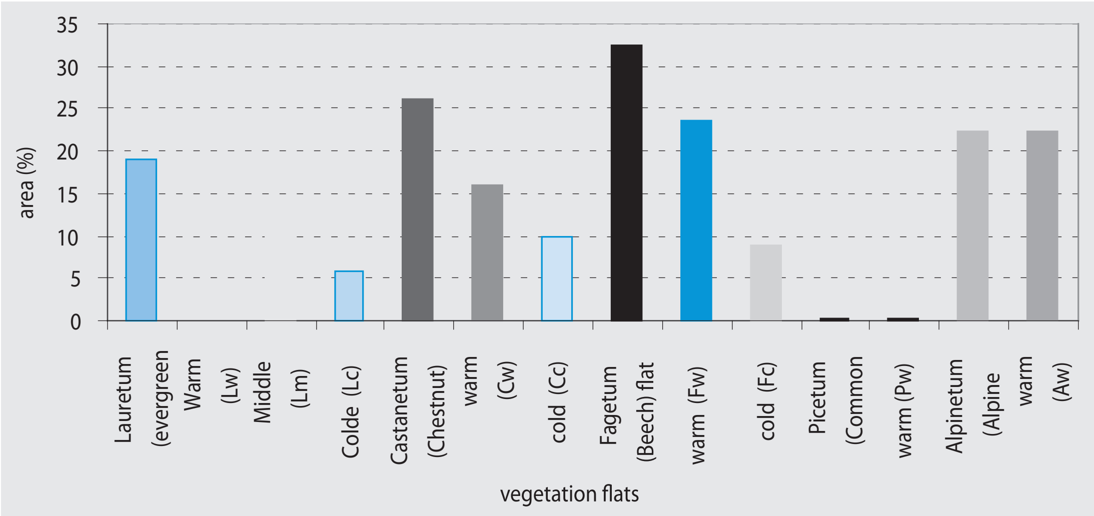


Figure 4-12: Area by vegetation flats

Extent of vegetation flats and their area was calculated according to MAYER-PAVAR classification by elevations for different districts of the study area.

4.6.3 Forest fires

Albania is exposed to forest fires. During the last three decades the occurrence of forest fires in Albania has increased in number but also in the size of area affected. Forests in Albania are especially fire prone at the end of spring and during unusually warm and dry summers. The main causes of fires are primarily of anthropogenic (human negligence, pasture burning, etc., and to a lesser extent due to arson) and natural (lightning) character . Most damages occur in the coniferous forests. During summer 2007 a significant number of human induced fires have been triggered. The extremely unfavorable climatic conditions (high summer temperatures and wind) influenced the extent to which they ocurred, in both space and time.

4.6.4 Erosion risk

According to evaluation of erosion risk the main feature of Albania's territory is the high potential risk of erosion. About 70 % of Albania forest area is included in the classes highly and extremely highly susceptible to erosion . The situation with pasture areas is similar.

4.6.5 Expected impacts on Forestry

Under climate change scenarios likely extension of vegetation flats and subflats and their spatial distribution were estimated.

In general, evergreen species and oak forests are expected to enlarge, while the area of beech forests, which are more important to produce wood, would reduce. Common spruce forest is expected to disappear while the alpine pasture on the top of high mountains would be limited (Table 4-4).

The species that resist high temperatures and severe long dry seasons would be able to survive; for those that need moisture (silver fir, etc.), the danger of being limited in distribution or disappearing does exist; the species that produce many small seeds and have a high distribution potential (Pinus etc.) would be able to survive and to spread at sea level, whereas oak species, which produce big seeds, would occupy new areas only very slowly.

In forests and pastures, fires would be more frequent and more dangerous; also, many pests that might appear and prosper in the warmer conditions would endanger some forest tree species (Cnethocampa pityocampa, Evetria buoliana, Limantria dispar, etc.).

Table 4-4. The vegetation flats and subflats areas (in %)

Forest Vegetation Flats Forest	Area in % by time horizons			
	2000	2025	2050	2100
-Lauretum (evergreen species) flat (L)	19.1	24.8	38.6	62.4
warm subflat (Lw)	0.0	3.0	15.1	21.8
middle subflat (Lm)	13.2	15.8	16.2	17.8
cold subflat (Lc)	5.9	6.1	17.2	22.8
-Castanetum (Chestnut) flat (C)	26.0	31.6	27.6	18.7
warm subflat (Cw)	16.0	20.2	18.9	13.8
cold subflat (Cc)	10.0	11.4	8.8	4.9
-Fagetum (Beech) flat (F)	32.4	30.2	25.3	16.7
warm subflat (Fw)	23.6	21.8	18.7	14.0
cold subflat (Fc)	8.8	8.4	6.6	2.7
-Picetum (Common spruce) flat (P)	0.2	0.1		
warm subflat (Pw)	0.2	0.1		
-Alpinetum (Alpine pastures) flat (A)	22.3	13.4	8.5	2.2
warm subflat (Aw)	22.3	13.4	8.5	2.2

Expected changes of forest flats due to projected changes in temperature are:

- The common spruce flat (Picetum) is likely to disappear after the 2025.
- The extension of the evergreen forest area (Lauretum) is likely to increase more than three times, from 19.1 % in 2000 to 62.4 % by 2100.
- The deciduous forest area (Castanetum) is expected to increase from 26.0 % in 2000 to 31.6 % by 2025 and after that would decrease to 18.7 % by 2100.
- The deciduous forest area (Fagetum) is likely to decrease from 32.4 % in 2000 to 16.7 % by 2100.
- The Mediterranean alpine pasture area is expected to reduce more than ten times from 22.3 % in 2000 to 2.2 % by 2100.

4.6.6 Sea level rise

The national parks of Kune-Vain (Lezha District) and Velipoja (Shkodra District) are located along the Drin and Buna river deltas, between 0.8 to 2 m and 0–1.2 m above sea level, respectively. According to sea level rise scenarios, the coastal forest area (Lezha coast) is likely to decrease from 1.14 to around 1 km^2 by 2100.

Likely enlargement of lagoons is expected to increase the staying capacity of migratory birds and change their composition. Change in water fauna and flora in favor of species that like more warmth and salinity, is likely as well.

4.7 ENERGY

Albania has a large hydropower potential, of which until now, only 35% has been utilized. The installed hydropower capacity is 1,446 MW. 90% of this energy is generated in three hydropower stations of the Drini cascade .

Until 1988, in Albania there were also 83 mini hydropower stations with a capacity that varies from 5 to 1200 kW and an overall capacity of 14 MW. Of these, 8 are constructed in the region of Shkodra with an overall capacity of 5.52 MW. The initial purpose for the construction of these hydropower stations was to provide power supply to the remote mountainous areas. Currently, all of these mini hydropower stations are in urgent need of rehabilitation.

4.7.1 Effects on energy consumption

The most significant impacts of climate on energy consumption are likely to be the effects of temperatures on the use of electricity and the direct use of fossil fuels for heating. Increases in extreme weather events might result in some regional changes in consumption. Climate variation is likely to affect the following major energy end uses: Space heating, Air conditioning, Water heating, and Refrigeration.

Figures 4-13 and 4-14 show the total electricity consumption in Drin River Region and its polynomial trend for the period 1980-2000, for winter and summer.

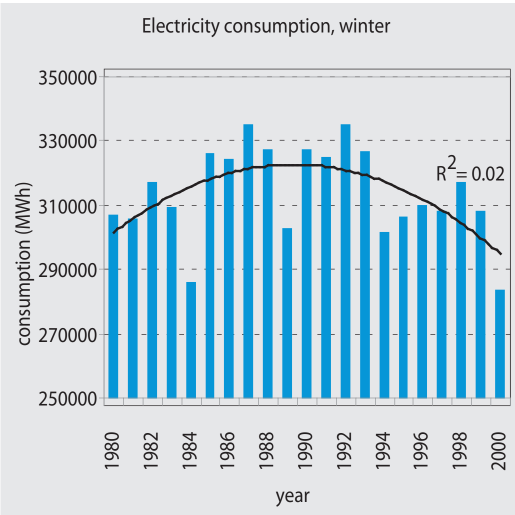


Figure 4-13: Electricity consumption during winter [MWh]

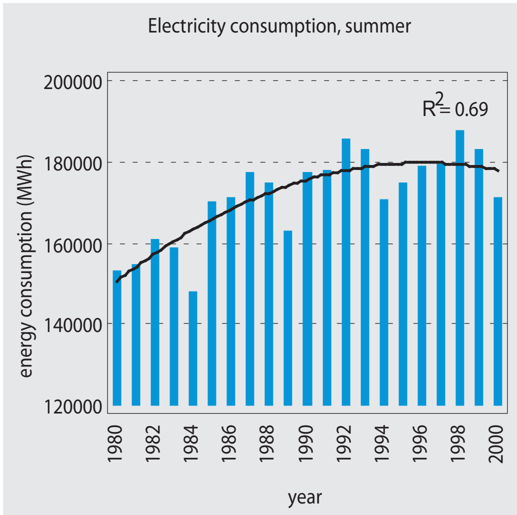


Figure 4-14: Electricity consumption during summer [MWh]

Taking into consideration only the winter months when electricity is needed for meeting all other services (cooking, hot water, lighting, radio/TV which are mostly constant) and space heating electricity demand, it is very difficult to assess any possible impact from climate variation in the energy consumption, because there has been load shedding in the whole of Albania and especially in our region.

The statistical analysis shows an increase in electricity consumption during the summer, and the correlation between consumption and air temperature is much stronger than in the case of space heating, because load shedding[3] is smaller during the summer than winter.

Table 4-5: Number of heating and cooling degree-days

Zone	No. of degree-days (1961–90)	
	heating	cooling
Shkodra	1692	890
Lezha	1451	930
Puka	2896	760
Kukes	2462	790
Tropoja	2594	787

The Energy and Environment Sustainable Development Center (EESDC) has carried out on 1999 and 2003 a service's energy survey for defining energy consumption for preparation of hot water. According to this survey, the main contributor for public buildings is fuel oil with 25–30 %. The second contributor is fuel wood, the third one is diesel and electricity is also contributing with 12–14 %. Regarding the private service building the main contributor is still fuel oil with 30–34 % and the second contributor is electricity with 16–20 %. Yearly energy consumption for hot water for service building and households in the region under the study doesn't show any correlation.

4.7.2 Effects on energy production

Changes in energy consumption as a result of climate variation will lead to changes in energy production. Climate variations may be seen primarily in electricity generation, including (i) Hydro Power Plants; (ii) Thermal Power Plants; (iii) Solar heaters Systems and (iv) Wind Power Plants.
The Region under study has a total exploitable capacity of 1.7 GW and a generation potential of 6.8 TWh and the Drin river cascade accounts for the bulk of Albania's hydroelectric potential. The exploitation of the cascade started in the 1960s marking a sharp turn to Albania's hydropower development. Actually 80 % of Drin hydro energy potential is presently exploited.

[3] Irregular electricity supply for some hours during the day due to lack of sufficient electricity generation and import.

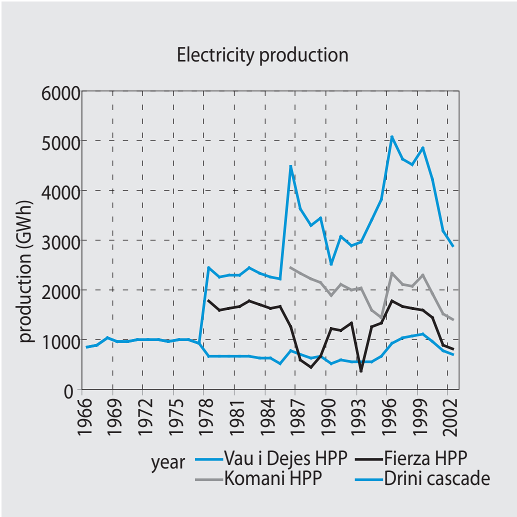


Figure 4-15: Electricity generation from Drin River Cascade (GWh/year)

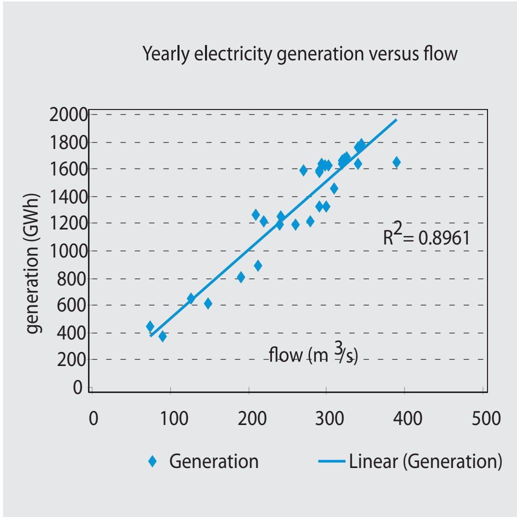


Figure 4-16: Trend of annual Electricity Generation (GWh) versus flow at Fierza reservoir

Figure 4-15 shows the interannual course of electricity generation in Vau i Dejes, Fierze Koman power plants and the whole Drini cascade as well. The variation of energy production through the years might be explained, among other factors, with the precipitation variability. So the decrease in production around 1990 is impacted from the reduction in the precipitation (refer to figures 4-4 and 4-5). A clear evidence of flow impact is shown in figure 4-16. There exist a strong correlation (r^2=0.89) between the electricity production and water flow, which on the other side is influenced by the climatic regime.

The total installed capacity of our thermo power plants is 224 MW: it should be stressed that most of them do not function because of they are old, have been very poorly maintened and have used old technology from the beginning (actually only Fier Thermal Power Plant is working with 8 MW capacity). Almost 80% of them are thermo power plants with back-pressure turbines, and the rest - almost 50 MW rely on the cooling towers for condensing process. In this situation, the impact of climate variation on thermal power generation in Albania is irrelevant.

4.7.3 Expected impacts on Energy

Climate change could have significant effects on the energy sector. Rising temperatures, changes of the amount of precipitation, and variation in humidity, wind patterns, and the number of sunny days per year could affect both consumption and production of energy in the whole Drini River Cascade Area . To evaluate the likely effects of climate change are established two scenarios: (i) without and (ii) with considering climate change effects up to the year 2025.

4.7.3.1 Effects on energy consumption

Climate change is likely to affect the following major electricity end uses: space heating, air conditioning, water heating and refrigeration. Of these end uses, air conditioning and space heating are those most likely to be significantly affected, since both are functions of the indoor-outdoor temperature difference. The assessment of expected climate impact for this sector expands up to the year 2025.

Energy scenarios: demand side

1. Space heating for residential sector.
The energy demand for space heating covers the biggest share of energy consumption in the residential sector. Because of projected increase in population and households both in urban and rural areas of Drini River Cascade Area, this demand, is expected to increase even without taking into consideration climate change effects.

Owing to likely temperature increases, a decrease in the number of heating degree-days is expected. It will be reflected in the decreases of energy intensities for space heating demand of dwellings for the entire study area (light and dark green lines in figures 4-17 and 4-18)
By comparing the outputs of two mentioned scenarios it is estimated that the space heating energy demand for households is likely to reduce by 10.6 %.

2. Space cooling for residential sector
The energy demand for space cooling is expected to increase because of projected increase in population and households both in urban and rural areas of DRCA.

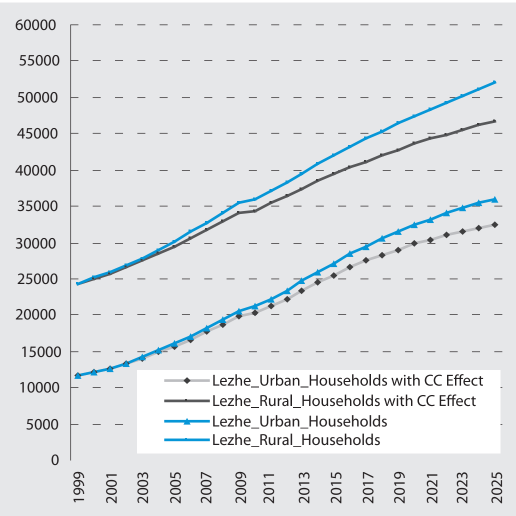


Figure 4-17: Space Heating Energy Demand for Residential Sector with/without CC effect in Lezha (MWh/year)

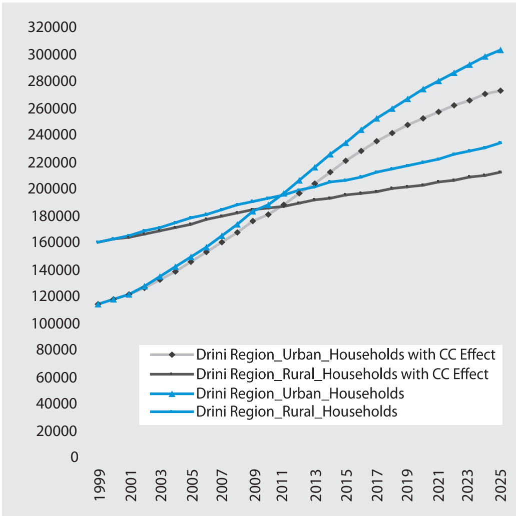


Figure 4-18: Space Heating Energy Demand for Residential Sector with/without CC effect in the Drini Region (MWh/year)

Table 4-5: Number of heating and cooling degree-days

Zone	No. of heating degree-days		No. of cooling degree-days	
	1961–90	2025	1961–90	2025
Shkodra	1692	1605	890	948
Lezha	1451	1376	930	991
Puka	2896	2780	760	800
Kukes	2462	2349	790	835
Tropoja	2594	2483	787	833

Taking into account the likely temperature increases in summer, late spring and early autumn the number of the cooling degree days is expected to change as well (Table 4-6). These changes are reflected in increasing energy intensities for space cooling demand of dwellings.

By comparing the outputs of two scenarios it is estimated that, taking into consideration climate change effect, the cooling energy demand is likely to increase up to 11.7 % related to current period for the entire study area.

Energy consumption in refrigerators and domestic hot water equipment is not going to be noticeably affected by climate change, since this equipment operates with higher temperature differences than space heating equipment.

4.7.3.2 Effects on energy production

A 20 % reduction in natural water run-off was projected to cause a reduction in power generation of 60 %, whereas a 20 % increase was projected to cause an increase in generation of 40 % (FNC).

Thus, a heavy reliance of hydropower may be good for reducing greenhouse gas emissions and improving air quality in Albania in general and the study area in particular, but can increase vulnerability to climate change.

Energy scenarios: supply side: Hydropower generation (2000 – 2025)

There are two scenarios developed for the assessment of climate change impacts on hydropower generation:

(a) ***power baseline scenario*** built under assumption that there will be no net-imports or net-exports of electricity from 2001. The electricity system is balanced, demand is met using certain standards of e.g. reserve margins, peak load etc. Increased production of electricity may either be a result of new capacity, improved efficiencies or increased maximum capacity factors.

(b) ***alternative energy scenario*** that considers Climate Change Effects.

By comparing outputs of baseline and alternative scenarios it is estimated that:

- electricity generation is likely to increase from 5850 GWh in 2000 to 13620 GWh by 2025;
- impact of climate change projects a likely reduction of 700 GWh (year 2025) or 10-12% of total hydro generation in 2025. In order to meet that demand, the capacity of thermal power plant needs to be increased to 700 GWh, equivalent of 120 MW;
- the contribution of the Drini River cascade HPP is evaluated to be very important for the Albanian Power Sector;
- the share between Hydro Power Plants and Thermal Power Plants will move in favour of thermal. Unlike electricity generation in the year 2000 (94 % from HPPs, 6 % from TPP) in 2025 Hydro Power plants will contribute with 5460 GWh or 40.10 % and Thermal Power Plants with 8709 GWh or 59.90 % of the total.

Thermal Power Plants will cover the major share of electricity generation in 2025. It will need to compensate for reduced levels of electricity not produced by Hydro Power Plants due to Climate Change impacts. This is a very important conclusion to be considered by energy decision - makers in preparing strategic plans for development of the power sector in the future. The calculated cost of meeting this demand is 13–55 MEURO (from the year 2008–2025).

4.7.3.3 Solar and Wind Power

Climate change may also affect the supply of energy from solar and wind power. An increase in the hours of sunshine will lead to increase of solar energy use for different energy services.

As an increase of wind speed is likely as well, this might encourage use of wind energy. To evaluate this opportunity more detailed studies are required.

4.8 POPULATION AND TOURISM

4.8.1 Socio-economic profile of the zone

The total surface of the study area is 5.860 km^2 or 20.38 % of the total surface of Albania. The population of the zone is about 400.000 inhabitants or 13% of the total population of Albania (INSTAT, 2001).

Until 1990 the population of this zone has had a high natural rate of increase. This was stimulated by the demographic policies of the state, aiming at a high birth rate and hindering the free movement of the population. Based on the data of the census of 1989, in the five districts of this zone there used to live 449,576 inhabitants or 14,12 % of the total population of the country. After 1990 the population number has been decreasing mainly owing to the movement of the population toward the other regions of Albania; emigration abroad and the decrease in the birth rate.

The density of the population per km^2 is less than the average density of Albania. The zone has low urbanisation level: 34 % of population of the zone lives in the urban area (42.2 % of the population of Albania as a whole lives in urban areas). The ratio male/female is in the favor of females, due to the emigration of the males out of Albania.

The active population of the zone is 41.14 %, of the population in working age. The districts Has, Pukë and Kukës have a lower index, because there predominates the population of young people (0–19 years old).

Unemployment is the main reason for the high poverty coeficient in this zone (60.4–80.8%), which is obviously higher comparing to the poverty coefficient at national level (58.3 %). Poverty is particularly emphasized in four mountainous districts: Has, Kukës, Pukë. Based on the data of 2002, provided by UNHCR, in Kukes county the poor people constitute 57.9% of the population, and the very poor people 36.6%. These percentages are twice as high as the respective average indexes at the national level. In Shkodra county (which includes the districts of Shkodër, Puka and Malësi e Madhe) the poor people constitute 35.3 %, and the very poor people 18.9 % of the population. In Lezha county, the poor people is 30.5 %, and the very poor people is 14,6% of the population. Poverty is more apparent in the rural areas than the urban ones (63.1/27.7% in Kukes county, 39.4/27.5 % in Shkodra county and 31.7/27.8% in Lezha county). Based on the data provided by the Ministry of Labour and Social Aid, in Kukes county 40 % of the families receive economical support; in Shkodra county 32 % of the families and in Lezha Country 21 % of families.

4.8.2 Tourism

Extending from the coast, Buna river and Shkodra lake in the west up to the border with Macedonia in the east, the zone has important potentials regarding the development of different kinds of tourism, starting from the tourism of sun and sea (Shëngjin, Velipojë, Shirokë etc.) up to ski tourism (Razëm, Valbonë, Shishtavec etc.). However, before 1990 little has been invested in tourism development.

After 1990 the infrastructure in tourism services has developed very fast, especially at the beach of Velipoja and Shëngjin. These represent today the two main centers of tourism of sun and sea in the region zone. The problem for these two tourist centers remains the potable water supply, the treatment of used waters and the disposal and treatment of municipal residues. So far the construction of tourist infrastructure has been made without considering the impact of climatic changes (floods, storms, coastal erosion, persistent dryness etc.) Consequently, the road infrastructure, water-supply, canalizations and electric energy supply have frequently been damaged, especially caused by marine floods (in cases of intense storms and tides) . On the coast of Kune (Shëngjin), where marine erosion is active, each year the sea advances, destroying hundreds of m2 of beach and drying and pulling down many pine trees.

4.8.3 Expected impacts on population and tourism

The expected climate change (temperature increase), and sea level rise will largely influence the distribution of the residential areas, population, their economic activity in general and tourism in particular (FNC).

Along the valley of "Drini" river (from Kukesi till "Vau i Dejes") settlements are rare and in the process of being abandoned owing to the harsh natural conditions and limited possibilities for living and working. Up to now, climatic changes have not influenced the demographical and migration process in this zone. In the future, as a result of the temperature increase, there might be a growing interest of the population of the coastal zones to settle in mountainous zones (cooler during the summer), not only for tourism, but also for living and other economical activities. This may occur only when the country's economy is consolidated and the road, economical and social infrastructure is completed. In this case the influence of the possible climate change is minimal.

The tourism activity so far has not been developed in this valley and it is not expected to be influenced by future climate change. If the number of the tourists will increase (mountain tourism) this will be positive phenomenon to the rural communities and perhaps this will have an influence on the return of the people back to this area.

So the further analysis is focused mainly in coastal part of the study area.

The likely changes are as follows:

- Considering an increase in temperature from 2.8 to 5.6 °C during summertime, there might be expected a general inclination of tourism towards the mountains or the lakes, instead of the beaches. The coastal tourism would be preferable at the end of spring and beginning of fall.
- The expected changes in surface air temperature and humidity are projected to result in increase of the heat index (which is a measure of the combined effects of temperature and moisture). These increases are projected to be largest mainly in the low part of the study area and are likely to influence especially the health conditions of the population.
- Increased frequency of extraordinary events (heavy rains, strong winds, droughts, flooding) might have a great influence in the settlement and tourists infrastructures.
- Coastal tourism is expected to suffer vulnerabilities caused by sea level rise. The possibility for new beaches to develop (in a natural way) does exist, but building a new tourism infrastructure would require huge investments (FNC). The population that moved from the high mountainous toward the coastal area after 1990, and settled in areas at or below sea level (mainly in the state properties of the ex swamps which were drained in the period 1950–1960) are continuously threatened by the flooding originating by the sea level rise or by the rivers'overflowing.
- A likely increase in loss of wetland area (around 1 km^2 by 2100), and as a consequence a decrease in total wetland area are projected . Most threatened are the habitations which are constructed close to the beach of Tale, and Kune-Vain lagoon (Lezha district); the habitations on the field of Nënshkodra (below the Lake of Vaut të Dejës), on the field of Kakarriq etc. The damage caused by the flooding during the last ten years make evident the risk which threatens these areas in the future, if no preventive measures are taken.
- At the beach of Shengjin the tourism constructions are all threatened by sea level rise in the coming 50–100 years.

4.9 HEALTH

Climate change will affect human health directly and indirectly. The Albanian population will not be spared. In collaboration with a recent appointed steering committee under the Ministry of Health WHO identified that an increase in frequency and intensity of heat-waves could be leading to additional summer heat related cardiovascular and respiratory deaths. Also, an increase of extreme precipitation events could aggravate current already existing problems in the area of water related diseases, accidents and injuries. Albania being in the Mediterranean area is subject to potential disease outbreaks of tropical origin such as Chikungunya, dengue and other diseases. The epidemiology of these diseases is currently under investigation. Climate change will further aggravate air quality related health problems in the major cities of Albania as well, but in particular in Tirana.

There is therefore a need to strengthen Albania's capacity in responding early to these threats including to the health related risks into national adaptation and mitigation plans. In particular, strengthening disaster response, the early identification of infectious disease, climate resilient health care facilities, the strengthening of climate change related health information, as well as strengthening win - win policies in the area of transport, energy and agriculture will be essential in protecting the health of Albanian citizens.

4.10 ADAPTATION ACTION PLAN

A set of adaptation measures needed to address the vulnerability of all sectors/systems against climate change is identified. It represents the range and type of measures that should be considered, even in the absence of climate change. Their priority is further evaluated through the criteria and sub-criteria cited in section 4.1.3.

Given the potential impacts of climate change, an adaptation Action Plan has been drafted taking into consideration the development strategies for Albania, such as National Strategy for Development and Integration (NSDI, 2007-2013), National Strategy for Socio-economic Development (NSSED), Albania National MDG Report, etc. The Adaptation Action Plan orders the proposed adaptation measures according to priority (short- and longterm) and to following types of adaptation policies for coping with the effects of climate change:

- Prevent the negative effects – anticipatory actions to reduce the susceptibility of an exposure unit to the impacts of climate
  - legislative, regulatory, and institutional
  - structural & technological (technological/engineering solutions)
- Avoid or exploit changes in risk
- Research into new methods/ technologies of adaptation
- Educate, inform, and encourage behavioural change- dissemination of knowledge through education and public information.

Both, the short-term (that already exist and that need to be addressed immediately) and the long-term adaptation measures are presented in Table 4-7.

The policymakers are strongly recommended to consider the proposed adaptation measures for the sustainable development and vulnerability reduction in the Drini River Cascade Area.

Table 4-7: Proposed adaptation policies/measures (short to medium term-up to 2025)	
Prevent the effects: legislative, regulatory, and institutional	• Include necessary adaptation measures for the protection of the beaches, threatened to disappear, in the New National Strategy for the Tourism Development • Integrate adaptation actions into development policy and planning at every level/sector. • Prepare disaster relief to hazard-reduction programs • Establishing new legislation for water use • Increase of forest area through reforestation especially on the eroded lands and abandoned agriculture lands (about 40.000 ha). Energy sector: • Increasing generation from new very efficient combined cycle thermal power plants in order to support reduction of all HPPs in general and Drin River Cascade in particular from the climate change; • Planning of the rehabilitation of Fierza, Komani and Vau i Dejes HPPs (Drin River Cascade) shall take into consideration the climate change, which is going to reduce their production and their availability; • Planning of the construction of small hydro power plants shall take into consideration the climate effect. • Regional development programs, plans and policies and climate change concerns in the Drin River Cascade integrated • Planning of the construction of new medium and large hydro power plants shall take into consideration the climate change, which is going to reduce their production and their availability; • Establishment of capacities to monitor and respond to anticipated climate change impacts in the Drin River Cascade at the institutional and community levels.

Table 4-7: Proposed adaptation policies/measures (short to medium term-up to 2025)	
Prevent the effects : structural& technological Technological/ engineering solutions	• Modification of existing infrastructure. • Modification of existing reservoirs. • Removal of sediments from reservoirs to increase water storage capacity. • Modification of existing irrigation system including pumping stations, water canals etc. • Controlling and eventually stopping the collection of solid materials from the river beds. (downstream of "Drini i Bashkuar" , below the "Vau i Dejës" dam , riverbed of Gjadri, Drin of Lezha and especially the riverbed of Mati river). • Modification of downstream river bed (Buna, Drini after Vau Dejes dam) in order to prevent the fields from flooding. Construction of new infrastructure. • Construction of new irrigation infrastructure • Construction of costal infrastructure • Maintenance or restoration of wetlands, marshlands and dune systems ("Building with nature") along the low coast from the delta of Buna up to Mati. • Protection of sandy dunes and dune management. (beaches of Shëngjin, Tale, and Velipoja). • Beaches refilling to hinder the further erosion. (Shëngjin). • Additional capital investment for flood protection
Avoid risk or exploit climate change	• Monitoring of coastal area (including monitoring of meteorological, maritime and shoreline indicators, geological surveys, beach profiling, emergency response systems). • Improve monitoring /warning systems for flood and drought. • Forestry: • Establishment of monitoring/warning systems to survey fires, insects, diseases and other disturbances in the forests. • permanent monitoring of forest health situation, of more important pests and diseases and fertilizer use, implementation of Good Plant Protection Practices and Integrated Pest Management approaches for pests and diseases control. Agriculture • Implementation of practices to conserve moisture (agro-technique measures like conservation tillage to protect soil from wind and water erosion; retain moisture by reducing evaporation and increasing infiltration of precipitation into the soil; • Active participation of farmers through Water User Associations

Table 4-7: Proposed adaptation policies/measures (short to medium term-up to 2025)	
Research	• Identification of existing practices and decisions used to adapt to different climates • Improve weather and seasonal climate forecasts Forestry: • Optimum Land Use Planning considering climate change impacts. • Erosion extension and how to prevent it. • Increase the protected forest area to 75 % of the total forest area • Projections of forests' extension and their likely composition change, to prioritize species to be used in reforestations. • Increase the area of protected forests to protect biodiversity in expected changed climate. • Preparation of management plans to conserve biodiversity, taking into account likely impacts of climate change on forestry. • Classification of forests according to fire hazard • Identifying adaptation to climate change capacity of different forest species
Education, behaviour	• Promote stakeholder awareness of environmental and socio-economic implications of climate variability and change . • Increase public awareness of the need to take individual actions to deal with climate change (e.g on health, home protection, landscape protection, biodiversity conservation) • Information, communication and training related to irrigated crops, promotion, and research

Table 4-8: Proposed adaptation policies/measures (long term)	
Prevent the effects: legislative, regulatory, and institutional	• Implementation of the Integrated Coastal Zone Management taking into consideration climate changes. • Changes in land use practices (crops with high interannual variability in production (e.g., wheat) may be replaced by crops with lower productivity but more stable yields) • Changes in farming systems • Microclimate modification to improve water-use efficiency in agriculture • Crop substitution (may be useful for conservation of soil moisture). • Increasing the share of forests in the area from 42 % to 80 % and increasing the share of coniferous/evergreen species from 15 % to 40 % • Increasing investments in reforestation, environmental protection areas and erosion prevention. • Increasing forest area by reforestation, using species that can adapt to expected climate change and ones more capable to capture CO_2, especially on eroded lands and abandoned agricultural lands (approx. 40.000 ha).
Prevent the effects : structural& technological Technological/ engineering solutions	• Modification of existing infrastructure. • Modification of downstream river bed (Buna, Drini after Vau Dejes dam) • Modification of the coastal infrastructure. • Preserving river beds (Drin of Lezha, Gjadri and "Drini i Bashkuar") and ensuring their further deepening (also as natural barriers to protect the soil from the sea advancement) • Construction of new infrastructure. • Construction of coastal infrastructure Agriculture • Change in planting dates and cultivars • Implementation of practices to conserve moisture (agro-technique measures like conservation tillage to protect the soil from wind and water erosion; retain moisture by reducing evaporation and increasing infiltration of precipitation into the soil; • Biotechnology -development of "designer cultivars" to adapt to stresses (heat, water, pests and disease, etc.) of climate change Forestry : • Preparing and applying of the seed stands and seed stand orchards designs to have the selected seeds of more adapted species to climate changes. • Experiment the adapted indigene and exotic forest species to rehabilitate burned different forest terrenes.

4.11 LIST OF PROJECTS PROPOSED FOR FINANCING

UNDP has been working closely with the Ministry Environment, Forests and Water Administration (MOEFWA), V&A Team and other key stakeholders improve/deepen the project proposals, and as a consequence, the very first project that addresses adaptation to current and future climate change impacts in Albania has been developed. In June 2008 a project funded by the GEF namely: "Identification and Implementation of Adaptation Response Measures in the Drini-Mati River Deltas" has been launched. The overall development goal of this project is to assist Albania in establishing a mechanism by which strategies to moderate, cope with, and take advantage of the consequences of climate change are enhanced, developed, and implemented.

The projects considered for financing, were identified based on vulnerability assessment and in Albania's Technology Needs Assessment (UNDP, 2005). The projects, considered for financing, are listed in Table 4-9.

Table 4-9: Climate change adaptation projects

Regional Cooperation	
Drought Management Centre for South-eastern Europe (DMCSEE)	• Integrated sub-regional program to coordinate and facilitate the development, assessment and application of drought risk management tools and policies in South-Eastern Europe with the goal of improving drought preparedness and reducing drought impacts (all hydrometeorological services in Southeastern Europe, leader Environmental Agency of Slovenia)
Technolgy Needs	
Data gathering	• Network of automatic meteorological stations • Network of automatic hydrological stations • Monitoring of sea and shoreline • Modernization of hydraulic laboratories • Satellite remote sensing • Geographical Information System (GIS)
Coastal protection technologies	Coastal defense structures • Construction of a series of dams parallel and perpendicular to the coastal line and refilling • Supplying the sea with the sediments to restore beaches (example Sochi/Batumi, Black Sea) • Building with "nature" techniques
Agriculture	• Land operations (leveling, terracing) • Conserving moisture (irrigation, adjustment of sowing dates etc.)
Livestock	• Microclimate in farmhouses • Disease control.
Fishery	• Warning system for abnormal phytoplankton blooms • Tests for toxins in shell species
Forestry	• Increasing the area of the protected forest zones to protect biodiversity. • Preparation of management plans to conserve biodiversity, taking into account the likely impacts of climate change. • Optimum Land Use Planning considering the impacts of climate change. • Likely erosion extension and ways to combat it.
Health	• Health information system (alert information system). • Civil emergency preparedness at all levels of health care system • Improvement of the potable water and urban waste water infrastructure coupled with the strengthening of the monitoring capacities.

CHAPTER 5

5 MEASURES TO MITIGATE CLIMATE CHANGE

5.1 INTRODUCTION

5.1.1 Introduction

As a part of the process of preparing the Second National Communication, a team of specialists has prepared an Analysis of GHG Abatement. The study has provided the most accurate national review based on the current GHG inventory and better input data than under the FNC. The proposed measures were assessed by a multi-criteria methodology used in the Albania's Technology Needs Assessment study and by the factor of cost per unit of emission reduction.

Proposed measures were discussed at various expert meetings and many of them were included in the National Energy Strategy.

5.1.2 Common Baseline for Scenarios

The baseline scenarios for sectors were based on the new GHG inventory for the year 2000 which is the starting point of all scenarios. The GHG abatement analysis is made for 25 years, i.e. by the year 2025, which is 5 years beyond the analysis carried out under FNC.

Macro-economic indicators show that since the year 2000 the Albanian economy has been strengthening, 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.

The Baseline and Abatement Scenarios are based on an assumption of +5 % annual growth of GDP. A breakdown of GDP structure shows that the main economic activity in the period 1996–2006 was in services (44.3 % of the GDP), especially in the period 1998–2003 when their share was 50–52 %. The sector of construction represented 16.3 % in 2003, a major increase from 5 % in 1996. Agriculture represented 36 % of the GDP in 1996, but it has reduced to 21 %. The share of industry did not significantly change in the last 10 years, it has only recently increased from 6.8 % in 2003 to 9.7 % in 2006. Transport has increased its share from 4.8 % in 1996 to 7.8 % in 2005. As shown in Figures 5-1 and 5-2, the major economic activity will continue to be agriculture, followed by the growing sectors of construction and services.

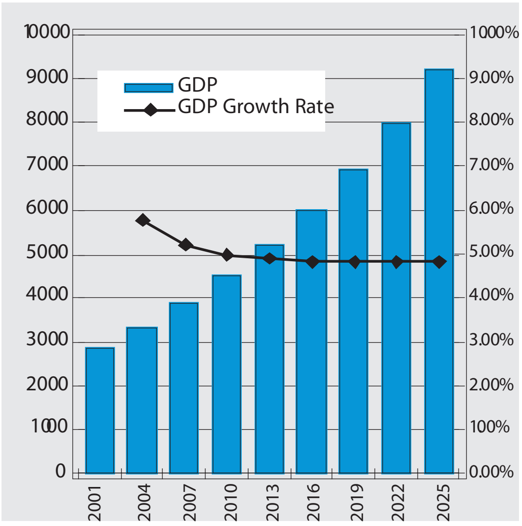


Figure 5-1.: Forecast of Total GDP and its growth rate (MEURO)

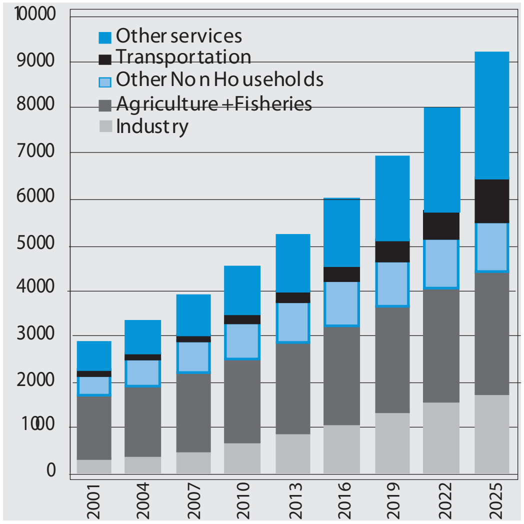


Figure 5-2: Forecast of contribution from each economic sector in GDP (MEURO

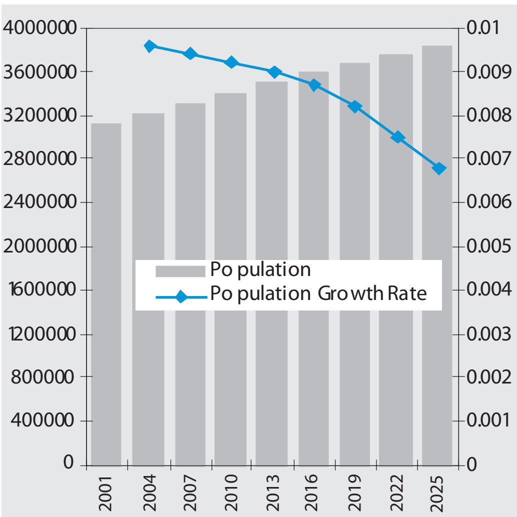


Figure 5-3: Trend of population and its growth rate

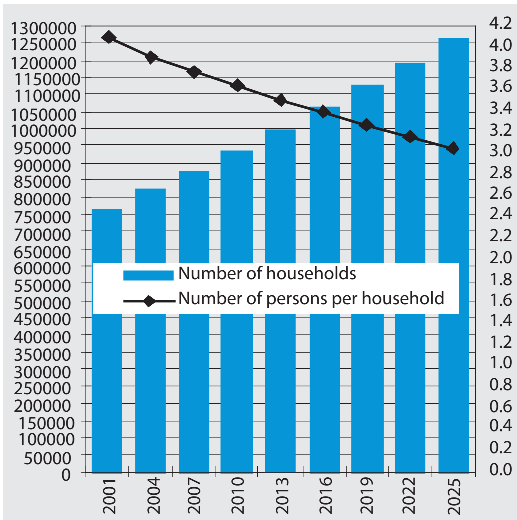


Figure 5-4: Trend of households and number of persons per household

Another important indicator for setting of baseline scenarios is population growth and the urban/rural ratio. A demographic trend for the period 2001–2025 is shown in Figures 5-3 and 5-4, the estimated growth rate is in the range 0.35–0.5% per year. The trends are based on expected migration from rural to urban areas. Migration also causes change of energy consumption patterns, increasing the demand for different kinds of energy, finally affecting the structure of energy demand.

5.2 ENERGY AND TRANSPORT SECTOR

5.2.1 GHG Abatement Measures in National Strategies and Action Plans

In the field of energy policy, the approval of the Updated National Energy Strategy on June 2003, for the first time ever since the constitutional change in 1990, is the most important development, which deals with two main issues:

- the energy supply-demand situation, as it may develop until 2025; and
- the institutional structure of the energy sector.

An Action Plan, based on the Strategy, contains several measures that have GHG abatement effect:

1. Thermal insulation of existing stock of public buildings based on a new code for building new stock
   a. Thermal insulation of existing building stock
   b. Implementation and improvement of the Energy Building Code
   c. Awareness raising about thermal insulation
2. Promotion of thermal solar energy use
   a. Installation of solar panels on private houses
   b. Installation of solar panels on public buildings and in private service buildings
3. Renewable Energy and Energy Efficiency Promotion Programme (improvement and extension of electricity supply, strengthened grid stability, reduced system losses, energy saving)
4. Encouragement of using efficient bulbs in households, service sector and industry
   a. Use of efficient bulbs
   b. Awareness campaigns on advantages of using efficient bulbs
5. Substitution of fossil fuels like coal, oil coke with Heavy Fuel Oil; Increasing Energy Efficiency of boilers/furnaces in industry & services sector.
6. Increase of power factor (cos j) in industrial companies
   a. Conducting energy audits for various industrial/service electricity consumers
   b. Penalty for non-complying consumers (cos ϕ < 0.9)
7. Improving energy efficiency of vehicle stock

5.2.2 Baseline Scenario

5.2.2.1 Approach to Scenario Development

The drafting of scenarios for the energy & transport sectors has been done using the software titled "Long term Planning with energy Scenarios" (LEAP Long Energy Alternative Planning) which ensures the necessary analysis and provides recommendations on an energy strategy that are close to reality, adjusted to the conditions of Albania. Markal Optimization Software (in evaluation of penetration rate for different technologies) and GACMO (the GHG costing tool) were used as well.

The main parameters which are used as driving factors for the calculation of energy needs in the sector of households are the number of apartments for the baseline year (2000) and their forecast for the future. This parameter is current and relies on the latest registration of INSTAT in 2001 and its forecasts for the future. The analysis of this indicator with development growth indicates that by 2025, there will be an increase of 37 % of the stock of apartments. A more detailed analysis, for the division of this parameter according to the climate zones and those urban or rural zones, has assisted in foreseeing the needs for energy in the household sector.
For the transport sector, two main indicators measure the demand for passenger and freight transport: Passenger-km and ton-km respectively. It is forcasted that ton-km is going to increase by 85% in 2025, compared to 1999, while passenger-km shall increase by 37 %.

5.2.2.2 Baseline Scenario of GHG Emissions for the period 2000 – 2025

The baseline scenario assumes the current structure of energy supply and demand in all economic sectors. It assumes a continuous prevalent use of electrical energy for heating and warm water in households and service sector. This scenario assumes that the planned short-term measures from the national action plan are not going to be strictly implemented. This scenario corresponds with the Passive Scenario in the Updated National Strategy of Energy.

The scenario assumes that a considerable part of the future demand for electricity will be covered through the extension of the thermal generating capacities (based on marine petroleum, solar, mazut and imported natural gas) and hydro energy.
5.2.2.3 Forecast of GHG Emissions for Energy in Households Sector (Baseline)
The demand for heating in households (and the service sector) is going to increase from heating of just one room to the heating of all rooms without any improvement in efficiency. Electrical energy remains the main resource for heating households, representing 60 % of all energy resources. The trend is shown in Figure 5-5.

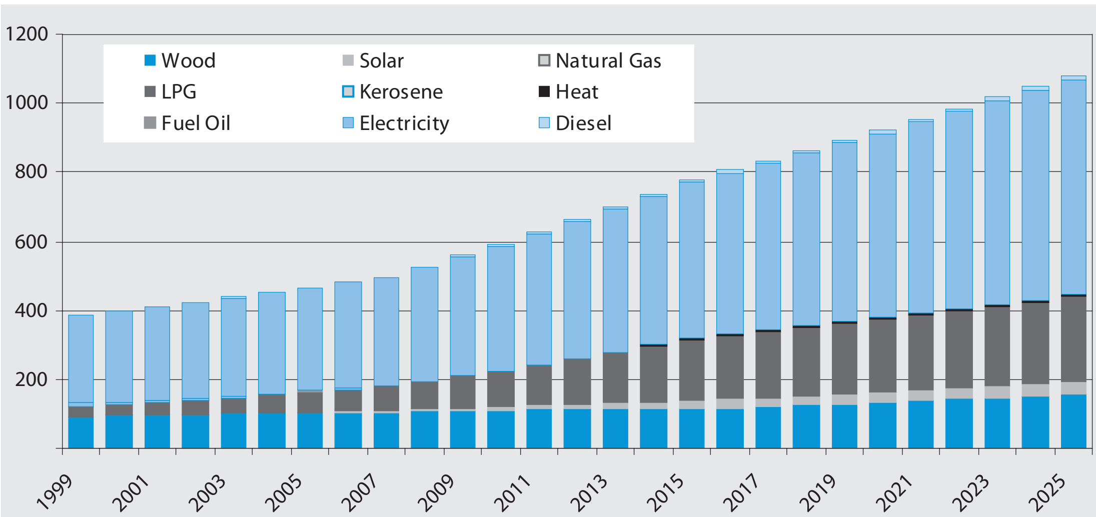


Figure 5-5: Trend of energy consumption for household sector (ktoe)

This sector is highly significant since it consumes more than a quarter of the total energy, while it also represents a major pressure for the overloaded electric distribution system.

Until 1990, the energy needs for heating, cooking and warming water were covered mainly by firewood. Since then, the structure of energy demand has significantly changed, mainly owing to a switch to electricity as the prime energy source for the urban population. In the rural area, firewood continues to cover an important part of the present energy needs. A considerable quantity of electrical energy consumption is not registered (illegal use).

A survey of fuel wood consumption in Albania was performed by sectors; the results are shown in Figure 5-6.

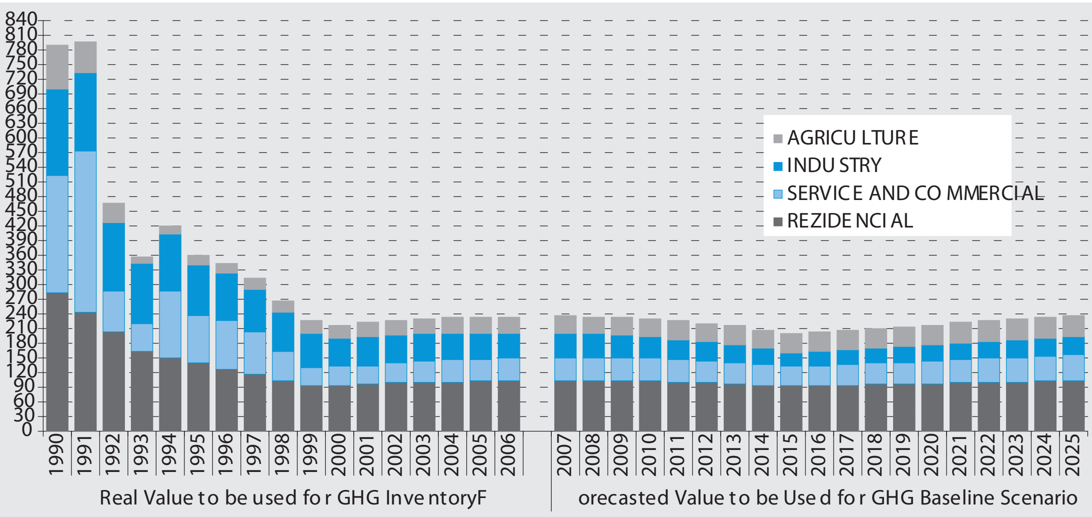


Figure 5-6: Forecast of fuel wood consumption by sectors

The forecasted GHG emissions of main gases (CO_2, CH_4, N_2O, expressed as CO_2 equivalent) are shown in Figure 5-7. The projection anticipates a 2.57 fold increase of GHG emissions from households from 2000 to 2025.

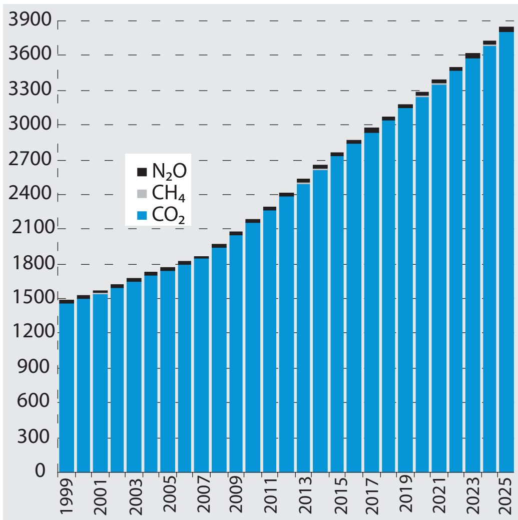


Figure 5-7: GHG emissions from households ($t\ CO_2$ eq)

5.2.2.4 Forecast of GHG Emission for Energy in the Services Sector (Baseline)

In order to calculate the energy needs and GHG emitted from this sector, the services sector has been divided into two branches:

- Public services;
- Private services.

The public services sector consumes 40 % of the energy and private buildings around 60 %.

The Public Services Sector includes mainly Health, Education, Culture and Administration. The Public services sector has typically outdated heating systems, there are only a few new installations. The trend of energy consumption for the services sector is shown in figure 5-8.

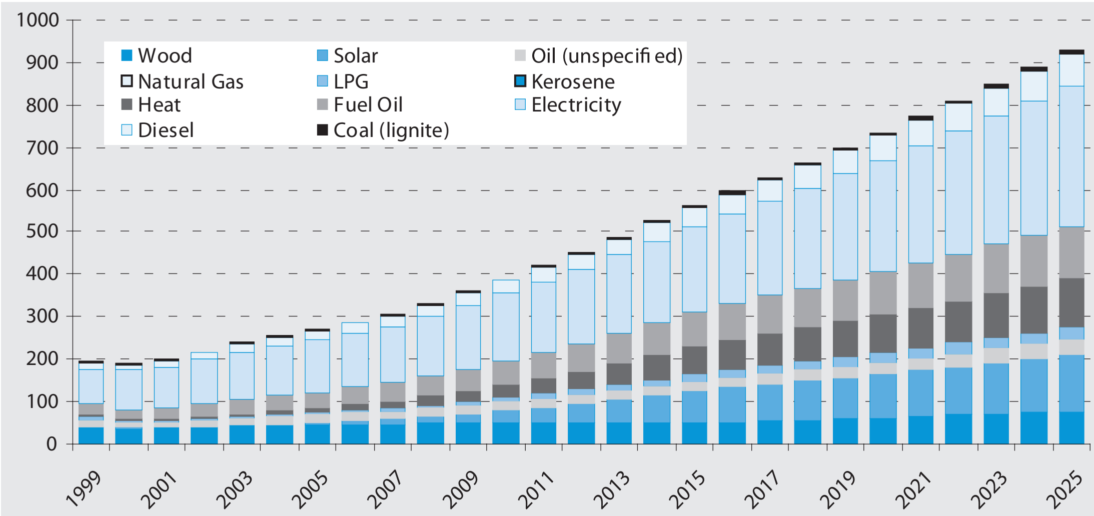


Figure 5-8: Trend of energy consumption for services sector (ktoe)

Buildings used by the private services sector mostly have modern installations, except some traditional services (repairs, small trade) that can not afford or do not require heating/air-conditioning. It is expected that the private services sector will modernize their energy use.

The Baseline scenario foresees a significant reduction of unheated areas in public buildings from 65 % (current) to 10 % in 2025. The services sector energy demand is going to increase by 10 % owing to an improved quality of service.

The forecated GHG emissions of main gases (CO_2, CH_4, N_2O, expressed as CO_2 equivalent) are shown in figure 5-9. The projection anticipates a 4.12 times increase of GHG emissions from service sector from 2000 to 2025.

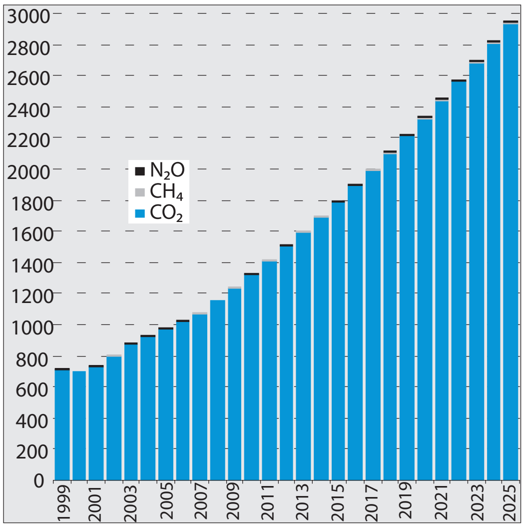


Figure 5-9: GHG emissions from service sector for ($t\ CO_2$ eq)

5.2.2.5 Forecast of GHG Emission for Energy in Industry Sector (Baseline)

The Industry Sector in the baseline has been split into some industrial sub-sectors: Metallurgical, Chemical, Construction Materials, Mines, Food/Drinks/Tobacco, Textile/Leather/Shoes, Wood/Paper/Printing/Mechanic industry. The GDP composition presented in Chapter 5.1 shows a reduction of the share of industry in GDP in the transition period. Recent development of the country is reversing the trend, so it is expected that the importance of industry will grow.

Industrial energy use is inefficient, energy intensity is very high both in physical production and economic terms. Energy intensity is 0.1 toe/ton or 0.81 toe/000 Euro. The trend of energy consumption for industry sector is shown in figure 5-10.

As is described earlier the main driving factor in forecasting energy demand in industrial sector is the contribution of Industry to GDP. The forecasted GDP is shown in figures 5-11 and 5-12.

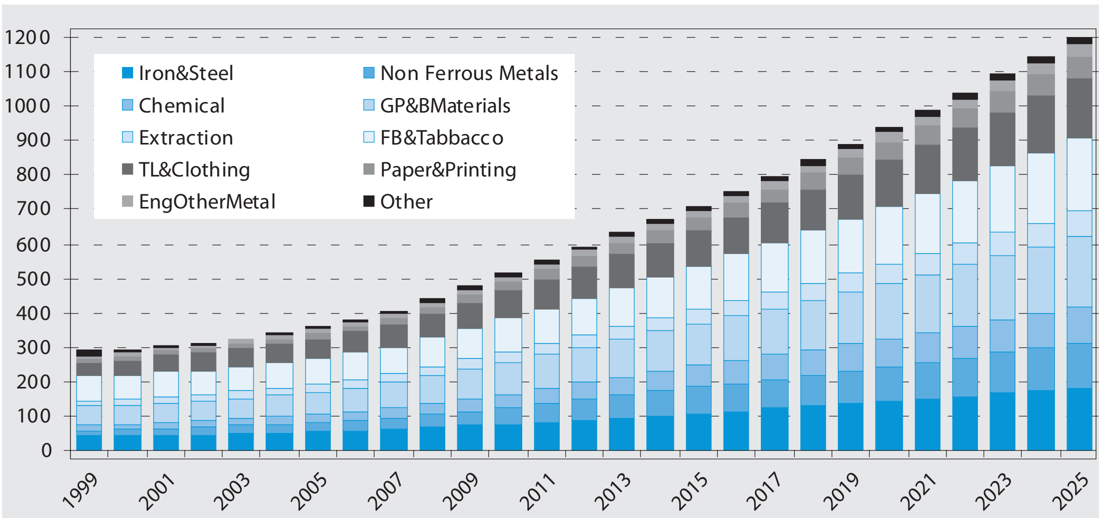


Figure 5-10: Trend of energy consumption for industry sector (ktoe)

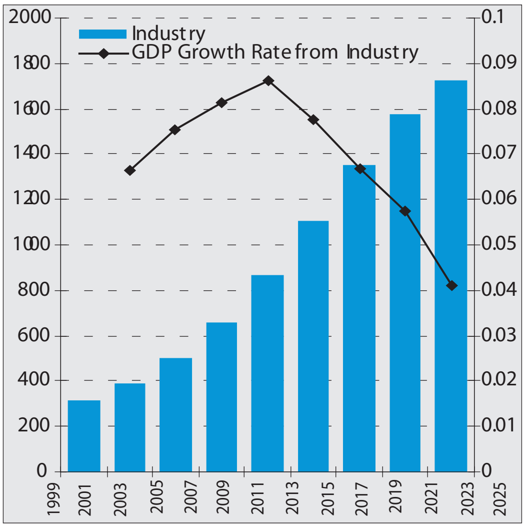


Figure 5-11: GDP from Industry in Albania (MEURO)

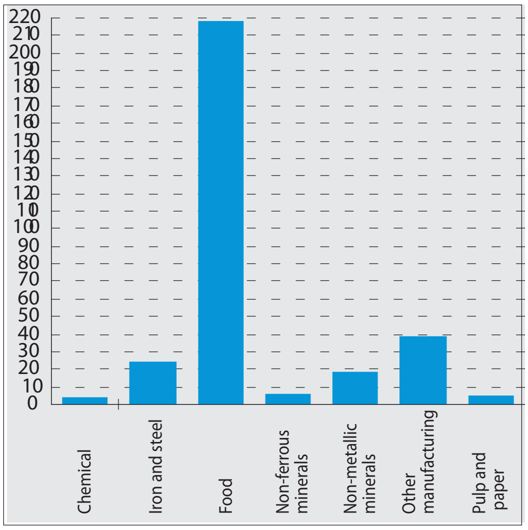


Figure 5-12: Contribution of each sub-industrial sector in total GDP (MEURO)

Energy forecast shows that the largest emissions will come from the sub-sectors of Food/Drinks/Tobacco, Metallurgy, Construction Materials and then the other sectors.

The forecasted GHG emissions of the main gases (CO_2, CH_4, N_2O, expressed as CO_2 equivalent) are shown in figure 5-13. The projection anticipates a 3.85 fold increase of GHG emissions from industry from 2000 to 2025.

5.2.2.6 Forecast of GHG Emission for Energy in the Transport Sector (Baseline)

The transport in the country has been increasing rapidly since 1990. Beside increasing number of vehicles the infrastructure is being improved so the total traffic load is increasing even more. The Transport Sector is consuming significant quantities of energy (mostly in the form of petroleum and gasoline). To calculate the needs of energy for the future, this sector has been divided into two sub sectors: transport of goods and passengers. The trend of energy consumption for transport sector is shown in figure 5-14.

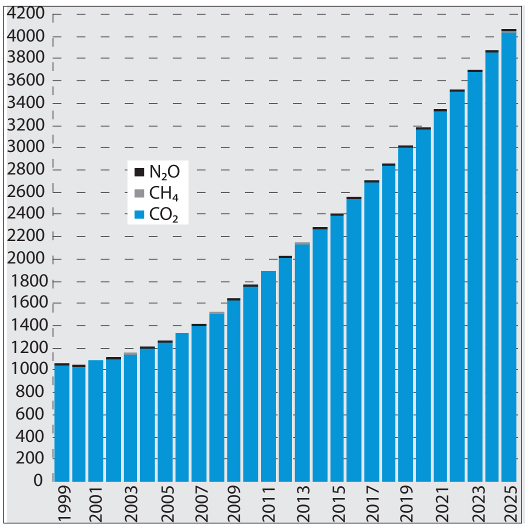


Figure 5-13: GHG emissions from industry sector (t CO_2 eq)

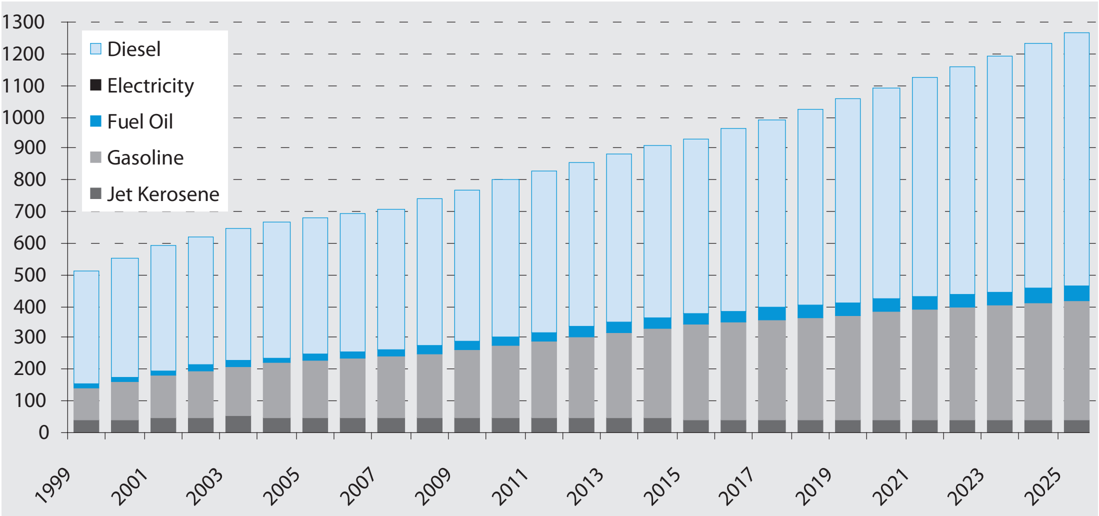


Figure 5-14: Trend of energy consumption for transport sector (ktoe)

GHG emissions from transport are calculated by using two basic indicators: ton-km for freight transport and passenger-km for passenger transport. The vast majority of transport is by road vehicles.

The forecasted GHG emissions of the main gases (CO_2, CH_4, N_2O, expressed as CO_2 equivalent) are shown in figure 5-15. The projection anticipates a 2.46 fold increase of GHG emissions from transport from 2000 to 2025.

5.2.2.7 Forecast of GHG Emission for Energy in the Agriculture Sector (Baseline)

Key issues that affect the agriculture sector in Albania are:

- farms are small and land is very fragmented;
- agricultural land ownership issues;
- demanding work with low use of machinery, unorganized and ineffective system of distribution of agricultural products;
- insufficient access to loans;
- insufficient agricultural machinery.

The fall of the share of agriculture in GDP from 36 % to 21.9 % in the period 1999–2006 was mainly due to insufficient access of small private farms to agricultural machinery and inefficiency of machinery operations on small and fragmented land. Because of high rents for agricultural machines many farmers still work by hand and use work animals. Agriculture therefore uses little energy and it has low energy intensity. In the baseline scenario it is projected that the energy intensity is going to increase, but not to the level of intensive agriculture. Projected growth for the sector is 1.7 fold in the period 2000–2025.

The forecasted GHG emissions of main gases (CO_2, CH_4, N_2O, expressed as CO_2 equivalent) are shown in Figure 5-16. The projection anticipates a 2.59 fold increase of GHG emissions from agriculture from 2000 to 2025.

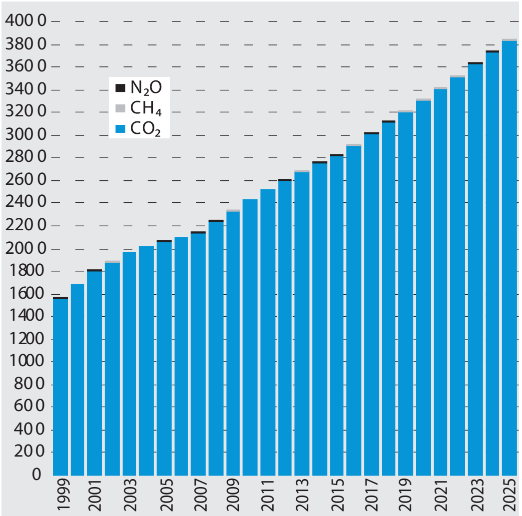


Figure 5-15: GHG emissions from transport (t CO_2 eq)

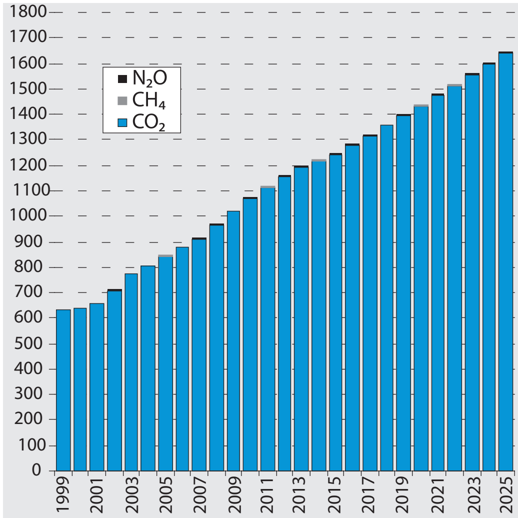


Figure 5-16: GHG emission from agriculture (t CO_2 eq)

5.2.2.8 Forecast of GHG Emission for Energy in All Consumption Sectors (Baseline)

By summing of baseline scenarios for each sector using LEAP software, a forecast for total GHG emissions from consumption sectors was made. The total emissions forecast is shown in the Figure 5-17. While all sectors will increase absolute GHG emissions, relative contribution of sectors will change as follows:

- share of households will decrease from 27.2% in the year 2000 to 23.5% in the year 2025;
- share of service sector will increase from 13.1% in the year 2000 to 18.0% in the year 2025;
- share of industry will increase from 19.3% in the year 2000 to 24.8% in the year 2025;
- share of transport sector will reduce from 28.7% in the year 2000 to 23.6% in the year 2025;
- share of agriculture will reduce from 11.6% in the year 2000 to 10.1% in the year 2025.

The projection anticipates a 2.99 fold increase of GHG emissions from all energy consumption sectors from 5456 Gg in 2000 to 16,445 Gg in 2025.

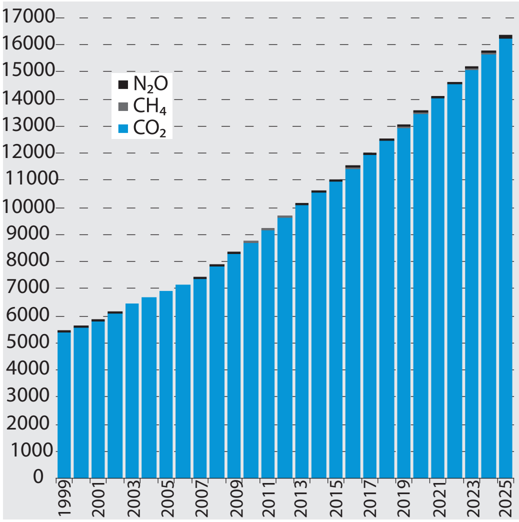


Figure 5-17: GHG emissions from all sectors (t CO_2 eq)

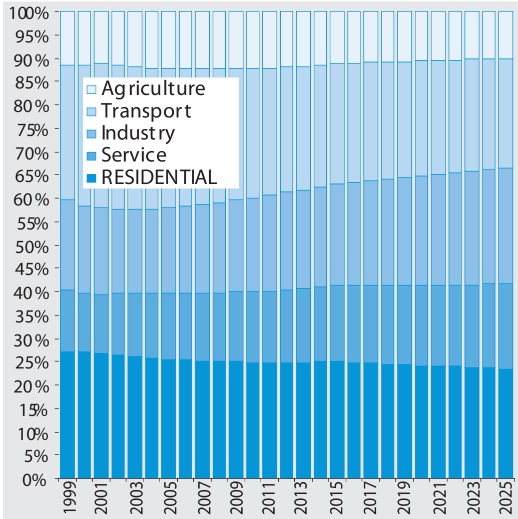


Figure 5-18: Share of sectors in the total GHG emissions

5.2.2.9 Forecast of GHG Emission for Energy Industries (Power Sector) (Baseline)

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 results in frequent power cuts. It assumes that necessary investments are going to be made to cover all electrical energy needs.

The forecasts of energy demand and resulting GHG emissions were calculated using LEAP software. The demand forecast has taken into account the effects of increasing the electricity tariffs as well as the problem of decreasing the non-technical losses. According to the model developed by the GHG Abatement study and a study of the World Bank, Albania's electrical energy demand will grow fast to support the economic development (Figures 5-19 and 5-20).

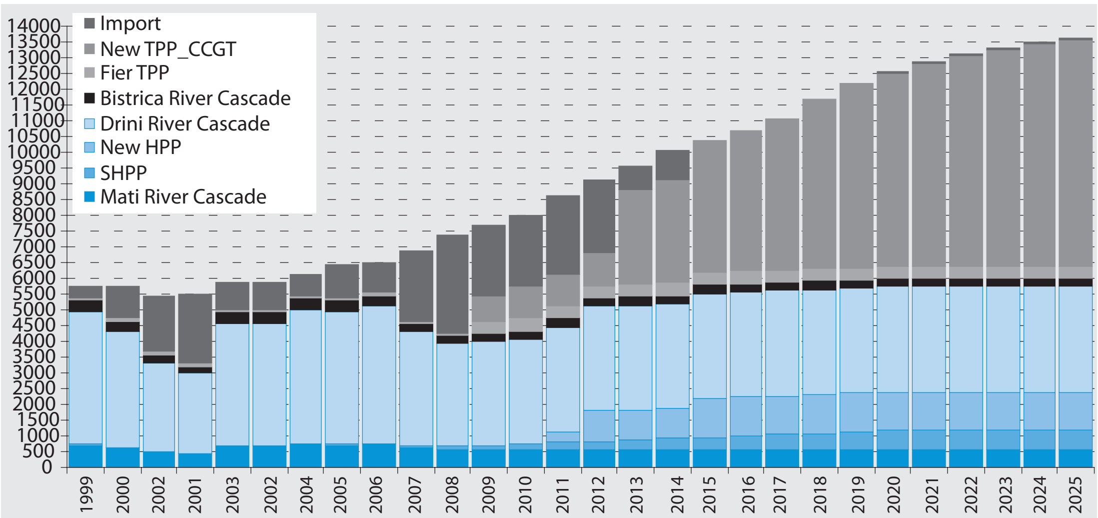


Figure 5-19: Master Plan of Power Generation for Albania (GWh)

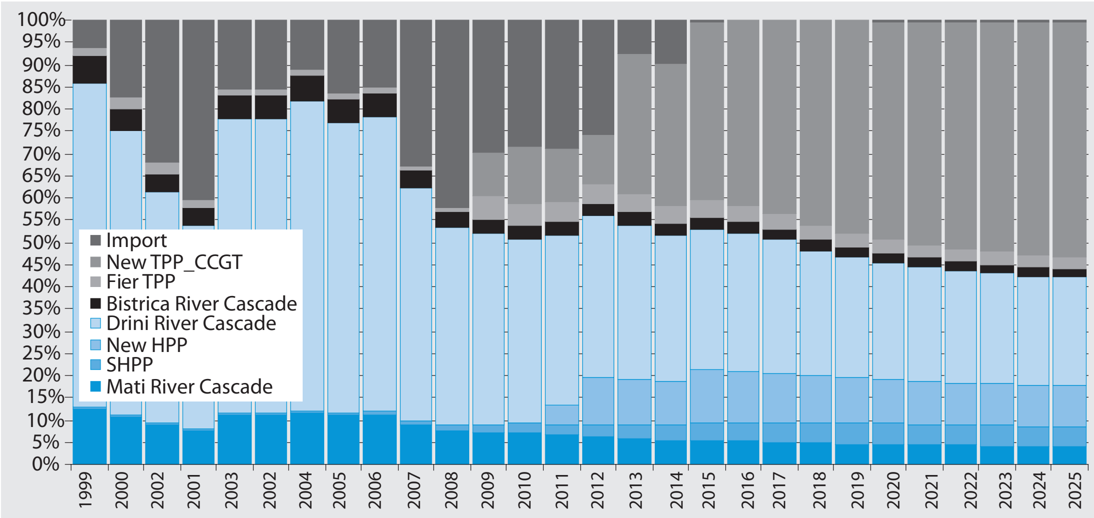


Figure 5-20: Master Plan of Power Generation for Albania (%)

The new power plants that are going to cover increased demand are planned on the least cost basis. Significant investment has to be made in the transmission and distribution system to reduce losses. The baseline scenario assumes gradual improvement of transmission and distribution efficiency that is going to reach 10% of loss in the year 2025. Estimated annual electricity demand in 2025 will be 13,533 GWh. Total electricity generation from all thermal power plants & imports and total hydro power plants is shown in figures 5-21 and 5-22.

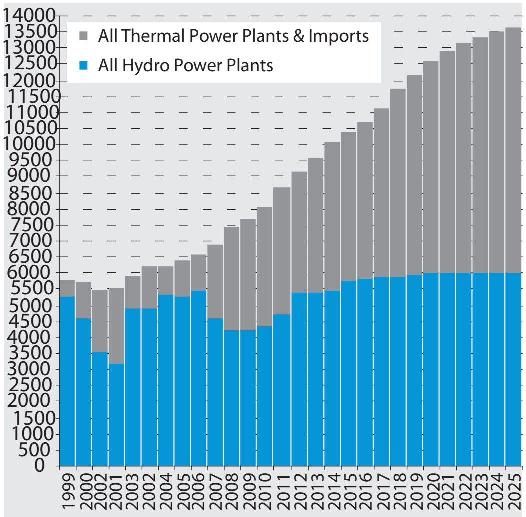


Figure 5-21: Thermal Power Plants and Hydro Power Plants Generation (GWh)

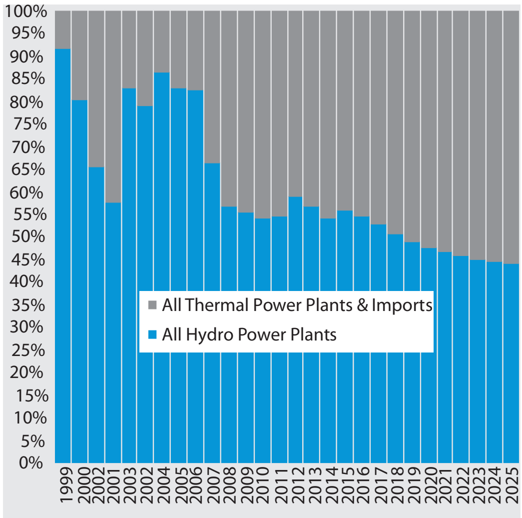


Figure 5-22: Thermal Power Plants and Hydro Power Plants Generation (%)

Albania is currently using most of the available hydro potential, which will not be able to accommodate the demand in the future. Increasing demand can be supplied with electricity from new thermal power plants, which will cause new GHG emissions.
The forecasted GHG emissions of the main gases (CO_2, CH_4, N_2O, expressed as CO_2 equivalent) are shown in figure 5-23. The projection anticipates a 2.54 fold increase of GHG emissions from the power sector from 1500 Gg in 1999 to 3812 Gg in 2025. The main contribution will come from planned higher efficiency thermal power plants.

5.2.2.10 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 5-24 and 5-25.

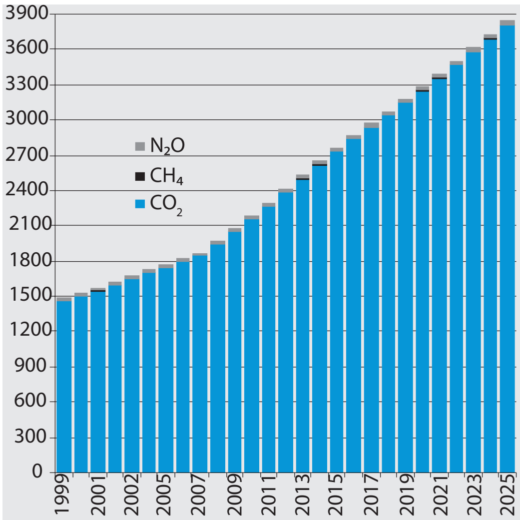


Figure 5-23: GHG emissions from power sector (t CO_2 eq)

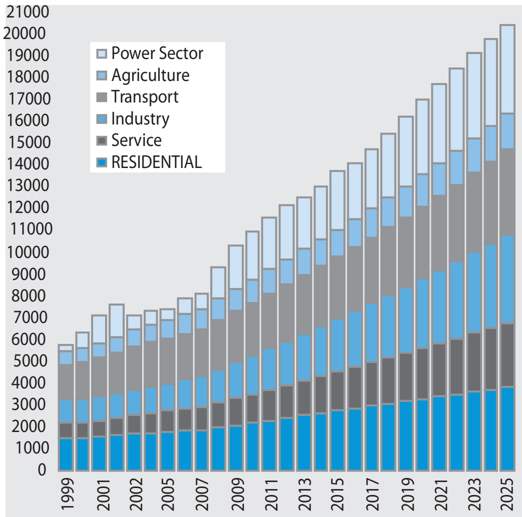


Figure 5-24: GHG emissions from all sectors (t CO_2 eq)

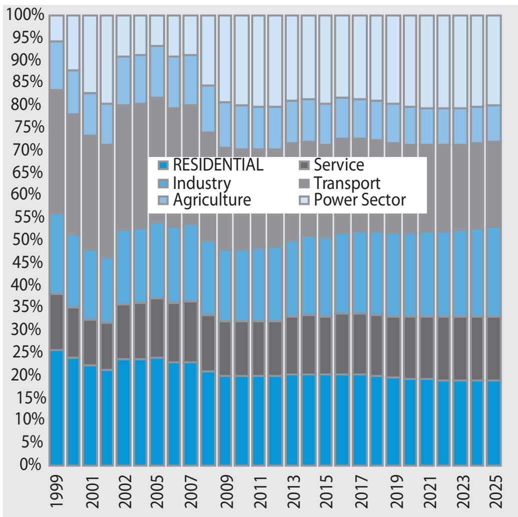


Figure 5-25: Share of GHG emissions (in t CO_2 eq) by sectors

Analysis also shows that the contribution of GHG emissions from the residential sector will be reduced from 25.2% in year 2000 to 18.8% in year 2025; GHG emissions from the service sector will be increased from 12.4% in year 2000 to 14.4% in year 2025; GHG emissions from the industry sector will be increased from 18.2% in year 2000 to 19.9% in year 2025; GHG emissions from the transport sector will be reduced from 27.1% in year 2000 to 18.8% in year 2025; GHG emissions from the agriculture sector will be reduced from 11.0% in year 2000 to 8% in year 2025 and GHG emissions from the power sector will be reduced from 5.7% in year 2000 to 20.1% in year 2025.
The total emissions forecast shows an increase in absolute GHG emissions, while the relative contribution of sectors will change as follows:

- share of households will decrease from 25.2% in the year 2000 to 18.8% in the year 2025;
- share of service sector will increase from 12.4% in the year 2000 to 14.4% in the year 2025;
- share of industry will increase from 18.2% in the year 2000 to 19.9% in the year 2025;
- share of transport sector will reduce from 27.1% in the year 2000 to 18.8% in the year 2025;
- share of agriculture will reduce from 11.0% in the year 2000 to 8% in the year 2025;
- share of power sector will increase from 5.7% in the year 1999 to 20.1% in the year 2025.

5.2.2.11 Evaluation of the Baseline Scenario from the First National Communication

According to Baseline and Abatement Scenarios prepared under the First National Communication, the emissions from the energy sector for the year 2000 were foreseen to be 24,800 ktons. The Baseline Scenario of the SNC shows 20,449 ktons. Both scenarios are presented in Figure 5-26. Analysis of the estimates shows difference of 11-32% that is primarily due to a higher GDP growth estimate in the FNC.

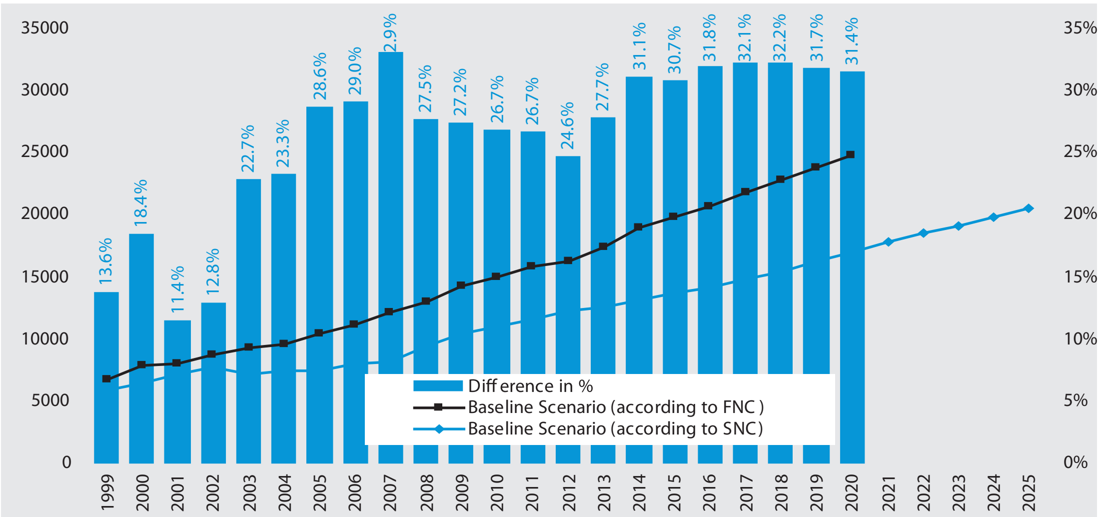


Figure 5-26: Baseline Scenarios for FNC and SNC (000 ton)

5.2.3 GHG Abatement Measures (Energy Sector)

5.2.3.1 Identified Abatement measures in energy sub-sectors

Household Sector

The following measures should reduce both energy demand and GHG emissions from households:

1. Thermal insulation of buildings,
2. Use of efficient refrigerators;
3. Use of efficient lighting in households;
4. Introducing Thermal time switches for electric boilers in households;
5. Introducing Prepayment Meters in households;
6. Introducing Solar Water Heaters for substitution of electric boilers in households.

The following measures do not reduce the demand but reduce GHG emissions:

1. Introduction of Central Heating Systems for substituting individual heaters in multi- storey 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.

Service Sector

The following energy efficiency measures should reduce both energy demand and GHG emissions:

1. Use of efficient refrigerators,
2. Use of efficient lighting;
3. Use of efficient electrical motors;
4. Introduction of Solar Water Heaters for substituting electric boilers in hotels, restaurants, hospitals etc.;
5. Thermal insulation of buildings;
6. Improved energy management to reduce the energy intensity of the service sector;
7. Introduction of Central Heating Systems for substituting individual heaters,
8. Introduction of District Heating Schemes in the service sector,
9. Introduction Total Energy Supply Schemes (Hydro/Solar Energy and Small Scale CHP based in Diesel Generators) for meeting electricity and heat demand in Tourist Villages,
10. Introduction of CHP and District Heating Schemes in the Service Sector.

Industry Sector

The following measures are selected for introduction into the industrial sector in order to reduce GHG emissions:

1. Introduction of Efficient Heavy Fuel Oil fired Boilers for industrial consumers;
2. Introduction of Efficient Coal fired Boilers for industrial consumers;
3. Introduction of Efficient Electrical Motors for industrial consumers;
4. Improvements of Power Factor for industrial consumers;
5. Introduction of Efficient Lighting for industrial consumers.

Identified measures for reducing energy demand which require financial support for industry:

1. Better management to reduce energy consumption;
2. Introduction of new industrial technology, which consumes less energy (lower energy intensity);
3. Introduction of District Heating Schemes in Industrial Zones;
4. Introduction of CHP and District Heating Schemes in Industrial Zones.

Transport Sector

Both 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 was increasing since 2000. The measures for increasing energy efficiency (reduction of fuel consumption) are:

1. Reconstruction of existing poor quality roads and construction of new roads;
2. Increasing the share of public transport for passengers;
3. Increasing the taxes for second hand category cars.

Energy Transformation Sector

The following measures are identified to reduce GHG emissions in the energy transformation sector (supply side). The main focus of the proposed measured is utilization of renewable energy resources. The proposed measures are:

1. Hydro power Plant instead of Heavy Fuel Oil Plant in the Albanian Power Sector;
2. Hydro power Plant instead of Natural Gas Plant in the Albanian Power Sector;
3. Gas Power Plant instead of Heavy Fuel Oil Power Plant in the Albanian Power Sector;
4. Minihydro versus diesel generator in the Albanian Power Sector;
5. Wind Turbines versus diesel generators in the Albanian Power Sector;
6. Wind Turbines versus natural gas power plant in the Albanian Power Sector;
7. Solar PV versus diesel generator in the Albanian Power Sector.

The proposed power plants are listed with nominal power and year of planned construction:

SHPP	210 MW	2009-2025
Bratila HPP	75 MW	2013
KALIVACI	HPP	80 MW
Bushati HPP	84 MW	2014
Vlora TPP	97 MW	2010
New TPP	373 MW	2013- 2016
Wind Power Plants	30-50 MW	2010-2018

5.2.3.2 Evaluation of identified measures

The financial efficiency of the 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 5-1 and 5-2.

Table 5-1: Cost of emissions reduction and rate of penetration for each proposed technology (year 2015)					
Selected abatement measures	USD/ t CO_2	Unit Type	Emission reduction t CO_2/unit	Units penetrating in 2015	Emission reduction in 2015 per option kt/year
thermal insulation of households-wood	–70.96	apartments	0.69	30,000	0.020750
thermal insulation of households-LPG	–108.82	apartments	0.51	40,000	0.020264
Power factor correction	–49.27	MVAR	499.61	110	0.054957
thermal insulation of households-elec	–102.68	apartments	–0.51	30,000	–0.015271
thermal insulation of households-ker	–118.56	apartments	0.54	700	0.000379
Gastaxies	–321.65	1 taxi	11.14	4,000	0.044557
Efficient lighting	–152.00	1000 Bulbs	0.15	750	0.000114
Efficient boilers fuel oil-diesel	–76.97	boiler	517.89	1,000	0.517889
Methane from sewage	–69.94	plant	820.52	1	0.000821
Efficient boilers coal	–64.02	boiler	1,167.82	50	0.058391
Thermal timeswitches	–65.52	units	1.18	70,000	0.082607
Prepayment meters	–48.91	apartments	1.06	80,000	0.084527
Wind turbines	–145.96	kW	1.59	50,000	0.079338
Hydro power	–112.36	kW	1.74	50,000	0.086902
thermal insulation of households-DH	–136.80	apartments	0.54	700	0.000380
Efficient motors	–32.09	kW	6.45	16,000	0.103189
Eff. refrigerators	–56.04	fridge	0.84	60,000	0.050593
Thermal Solar	–26.44	units	2.30	50,000	0.114889
Minihydro power	–210.02	kW	5.61	14,000	0.078559
Landfill gas plant with 70% recovery	29.90	Landfill plant	24,019.17	3	0.072058
Gas power plant	–53.67	kW	2.23	90,000	0.200627
Cogeneration-CHP	–115.75	kW	2.89	15,000	0.043382
District Heating-DH	–71.85	kW	5.97	8,000	0.047749
Central Heating- CH	–62.22	kW	3.52	15,000	0.052737

Table 5-2: Cost of emissions reduction and rate of penetration for each proposed technology (year 2025)					
Selected abatement measures	USD/ t CO_2	Unit Type	Emission reduction t CO_2/unit	Units penetrat-ing in 2025	Emission reduction in 2025 per op-tion kt/year
thermal insulation of households-wood	–70.96	apartments	0.69	60,000	0.04150
thermal insulation of households-LPG	–108.82	apartments	0.51	90,000	0.04559
Power factor correction	–49.27	MVAR	499.61	220	0.10991
thermal insulation of households-elec	–102.68	apartments	–0.51	150,000	–0.07636
thermal insulation of households-ker	–118.56	apartments	0.54	1,200	0.00065
Gastaxies	–321.65	1 taxi	11.14	15,000	0.16709
Efficient lighting	–152.00	1000 Bulbs	0.15	1,020	0.00016
Efficient boilers fuel oil-diesel	–76.97	boiler	517.89	2,100	1.08757
Methane from sewage	–69.94	plant	820.52	3	0.00246
Efficient boilers coal	–64.02	boiler	1,167.82	200	0.23356
Thermal timeswitches	–65.52	units	1.18	150,000	0.17702
Prepayment meters	–48.91	apartments	1.06	300,000	0.31698
Wind turbines	–145.96	kW	1.59	110,000	0.17454
Hydro power	–112.36	kW	1.74	220,000	0.38237
thermal insulation of households-DH	–136.80	apartments	0.54	2,000	0.00109
Efficient motors	–32.09	kW	6.45	29,000	0.18703
Eff. refrigerators	–56.04	fridge	0.84	280,000	0.23610
Thermal Solar	–26.44	units	2.30	150,000	0.34467
Minihydro power	–210.02	kW	5.61	90,000	0.50502
Landfill gas plant with 70% recovery	29.90	Landfill plant	24,019.17	12	0.28823
Gas power plant	–53.67	kW	2.23	650,000	1.44897
Cogeneration-CHP	–115.75	kW	2.89	75,000	0.21691
District Heating-DH	–71.85	kW	5.97	35,000	0.20890
Central Heating- CH	–62.22	kW	3.52	58,000	0.20392

The effect of GHG emission reduction measures in the energy transformation sector, considering the rate of penetration, is shown in figure 5-28. Introduction of natural gas power plants, mini hydro power plants and large hydropower plants have the biggest impact on reduction of GHG emissions.

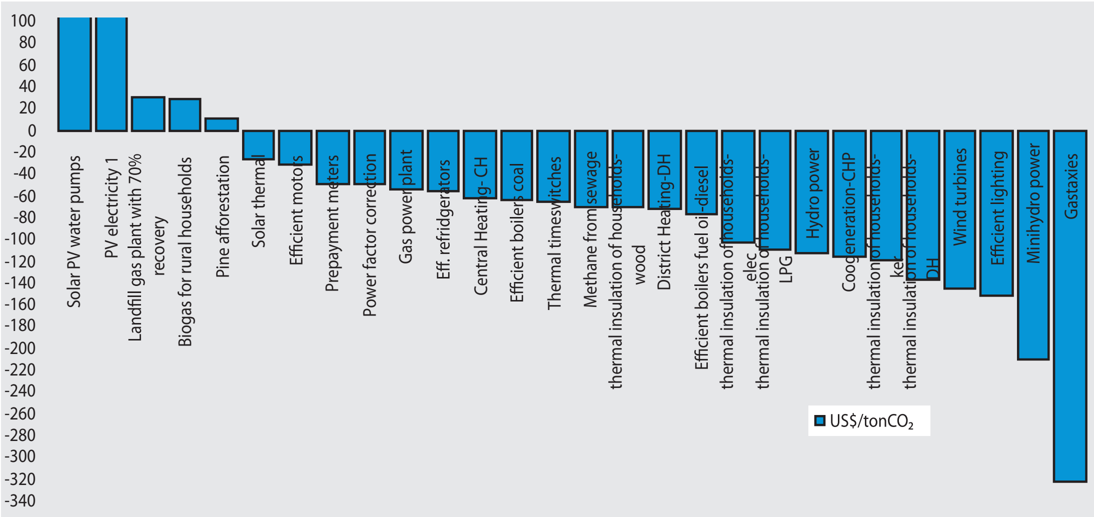


Figure 5-27: Comparison of selected GHG abatement measures, based on their cost of emission reduction (USD/CO_2 eq)

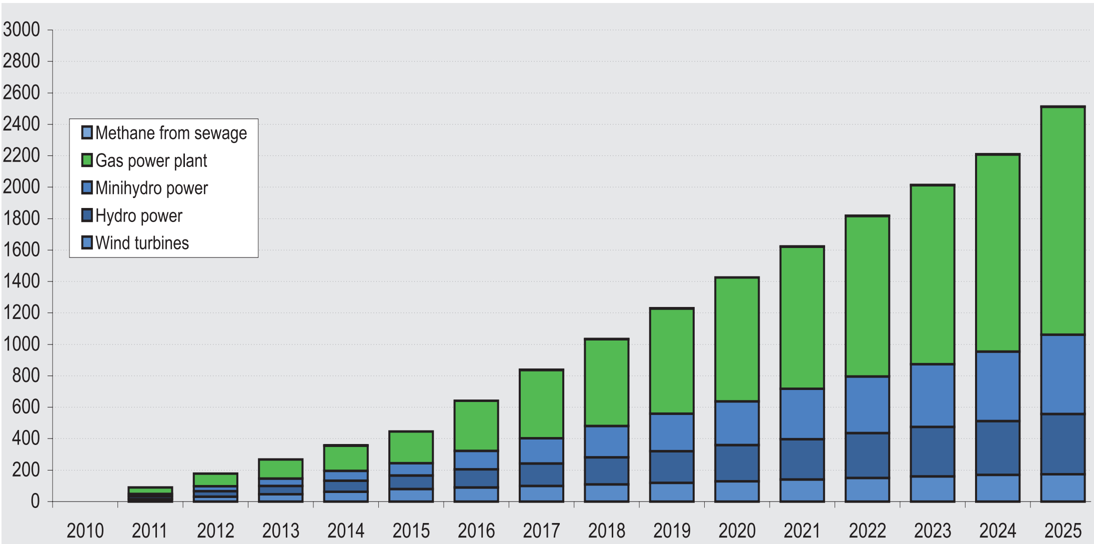


Figure 5-28: GHG abatement measures in Energy Transformation Sector (kton CO_2 eq)

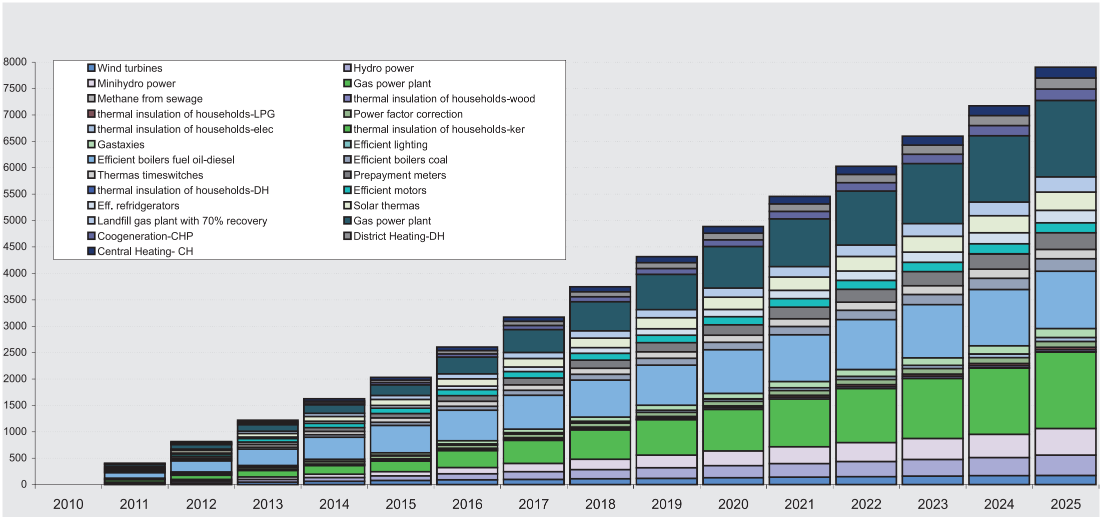


Figure 5-29: GHG abatement measures for energy sector (kton CO_2 eq)

In the figure 5-29, both supply and demand side GHG abatement measures are presented. It can be seen that GHG abatement measures in industry have the biggest impact on reduction of GHG emission among all sectors. They are followed by the measures in the household sector and only the third is the energy transformation sector. Demand side management is thus more effective in GHG emissions reduction than measures introduced at supply side (energy transformation sector).

Both Baseline and Abatement scenarios are shown in Figure 5-30.

The total effect of proposed measures that represent approx. 95 % of anticipated GHG emissions reduction is shown in Figure 5-31 and Table 5-3. The fist 17 measures in the table 5-3 have a combined effect of 95 % of the total reduction of GHG emissions.

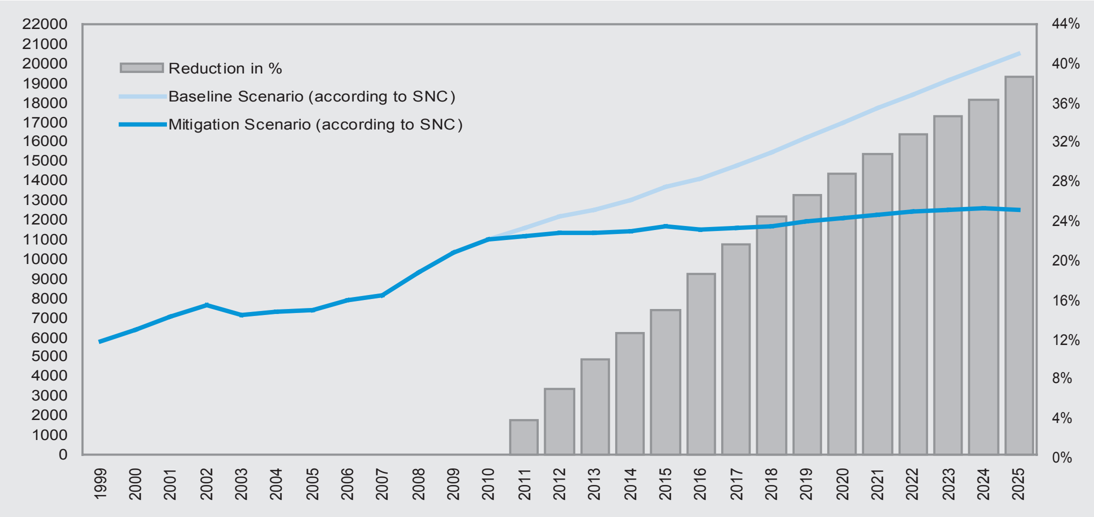


Figure5-30: Baseline Scenario, Abatement Scenario and the evaluated reduction of GHG emissions (kton CO_2 eq) from Energy & Transport Sector

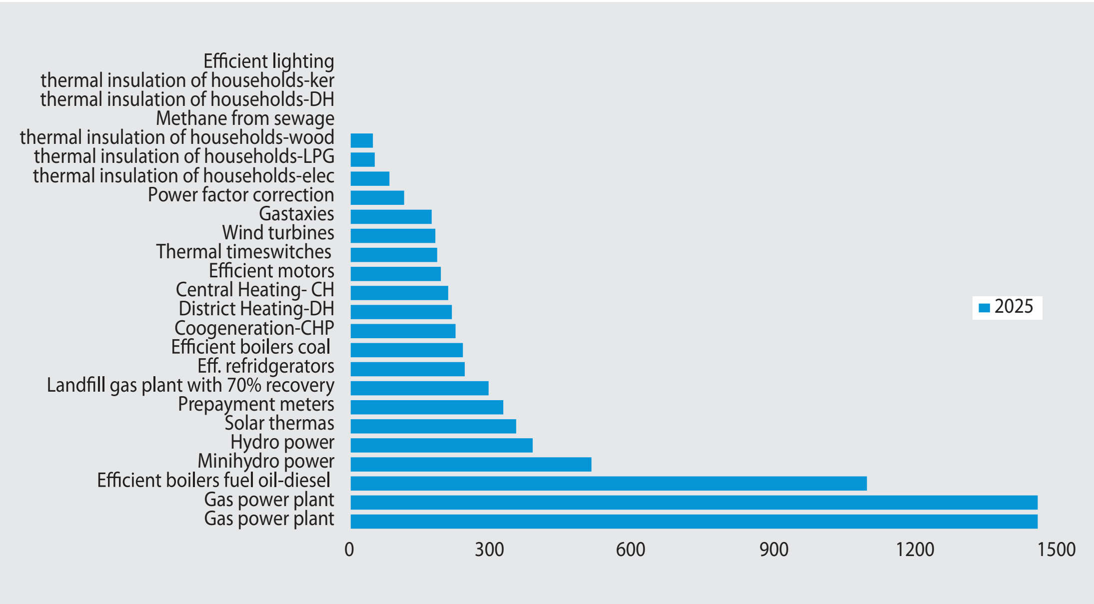


Figure 5-31: Cumulative effect of energy and transport abatement measures by the year 2025 (kton CO_2 eq)

Table 5–3: Cumulative effect of key abatement measures that represent 95 % of total reduction for the year 2025

Selected Abatement Measures		Reduction in 2025	Key abatement measures (which compose 95 % of total reductions)	Cumulative sum %
1	Gas power plant	1448.975	18.329 %	18.329 %
2	Gas power plant	1448.975	18.329 %	36.657 %
3	Efficient boilers fuel oil-diesel	1087.567	13.757 %	50.414 %
4	Minihydro power	505.024	6.388 %	56.802 %
5	Hydro power	382.368	4.837 %	61.639 %
6	Thermal Solar	344.667	4.360 %	65.999 %
7	Prepayment meters	316.977	4.010 %	70.008 %
8	Landfill gas plant with 70% recovery	288.230	3.646 %	73.654 %
9	Eff. refridgerators	236.102	2.987 %	76.641 %
10	Efficient boilers coal	233.564	2.954 %	79.595 %
11	Coogeneration-CHP	216.911	2.744 %	82.339 %
12	District Heating-DH	208.903	2.642 %	84.981 %
13	Central Heating- CH	203.918	2.579 %	87.561 %
14	Efficient motors	187.029	2.366 %	89.927 %
15	Thermal timeswitches	177.016	2.239 %	92.166 %
16	Wind turbines	174.544	2.208 %	94.374 %
17	Gastaxies	167.090	2.114 %	96.487 %
18	Power factor correction	109.914	1.390 %	
19	thermal insulation of households-elec	76.356	0.966 %	
20	thermal insulation of households-LPG	45.595	0.577 %	
21	thermal insulation of households-wood	41.500	0.525 %	
22	Methane from sewage	2.462	0.031 %	
23	thermal insulation of households-DH	1.085	0.014 %	
24	thermal insulation of households-ker	0.650	0.008 %	
25	Efficient lighting	0.156	0.002 %	
	TOTAL	**7.209**	**100.000 %**	

5.3 GHG EMISSIONS ABATEMENT ANALYSIS – AGRICULTURE

5.3.1 GHG Abatement Measures in National Strategies and Action Plans

Sector strategies related to agriculture development include the National Strategy on Social and Economic Development (NSSED), National Strategy on Agriculture and Food and National Strategic Plan for Rural Development (NSP).

The National Strategy on Social and Economic Development (NSSED) approved in 2001 details several national objectives for land protection, including:

- Promotion of good agricultural practices and the principles of sustainable development;
- Improving land management and ownership through functional land marketing;
- A need for landscape level conservation of biological diversity;
- Increasing investment in rehabilitating and improving irrigation and drainage systems and,
- Enhancing the institutional structures responsible for managing and monitoring the utilization of forest and pastures.

The "National Strategy on agriculture and food" is developed as an integral part of the National Strategy on Social and Economic Development. In the framework of an integrated rural development this strategy defined the main development objective of the agriculture and food sector, which are:

- Poverty reduction through a sustainable increase of agricultural, livestock, agro industry and fishery production;
- Improvement of food safety and quality;
- Marketing improvement of agricultural products and food staff;
- Sustainable management of natural resources such as land, water and biodiversity.

The National strategic plan for rural development (NSP) lays down the priorities of the rural development policy for the period 2007-2013.

The sector development strategies do not include all abatement and adaptation measures described in the National Climate Change Action Plan. Measures related to sustainable land management and consolidation of land management authorities have been implemented. Some measures related to the protection of soil from erosion are foreseen and implemented. Attempts are also made to improve the irrigation system and efficiency of water use. There are no measures yet to improve the crop mixture and use of pest resistant species. Also no important measures are taken to improve use and storage of fertilizers.

5.3.2 Baseline Scenario

5.3.2.1 Aproach to Scenario Development

<u>Emission factors for dairy and other cattle categories for 1994 and 2000 in Albania</u>

Owing to changes in the cattle breeding patterns in Albania the emission factors used for calculating methane release are slightly different between 1994 and 2000. For both categories of small ruminant species (sheep and goats) the selected emission factor used was 8. For poultry no emission factor has been established.

Conversion factors

The average methane conversion factors (MCF) were established after assessing the manure management practices for each animal category in Albania. The size of dairy cattle farms in Albania is small (on average 2–2.5 heads/farm). Therefore the use of liquid systems of manure management that generate high quantities of methane is almost inexistent. For this reason a higher MCF has been selected.

- For dairy cows the selected average MCF has been 0.59
- For sheep the average selected MCF has been 0.003
- For goats the average selected MCF has been 0.001
- For poultry the selected MCF has been 0.27

CH_4 emissions from the Agriculture Sector

In the year 2000, livestock emitted 73.74 Gg CH_4 from enteric fermentation and manure management. The main contributors are dairy cattle with 52 % and non dairy cattle with 22 %, the contribution of sheep is 14 % and goats 8 %. The emissions from enteric fermentation were 69.88 Gg (approx. 95 %) and Manure management 3.86 Gg (approx. 5%). During the period 1990–2000, the contribution of mules and asses was 2 %, and horses the same (2 %).

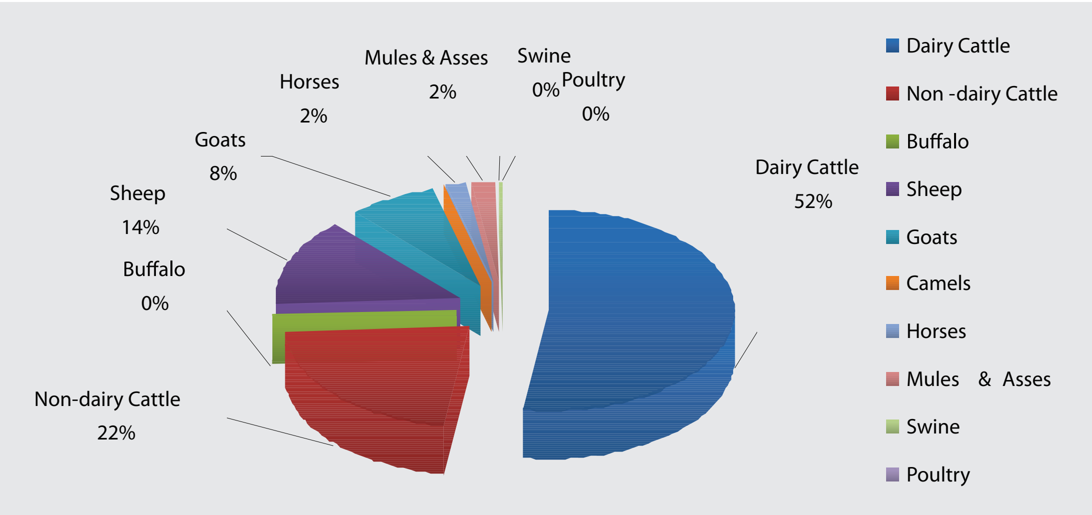


Figure 5-32: Annual emissions from livestock (year 2000)

N_2O emissions from the Agriculture Sector

GHG emissions from livestock waste come from several managed and unmanaged sources. Livestock waste is "unmanaged" when it is simply deposited and as a result, direct or indirect emissions of N_2O and CH_4 result from manure on pastures, range, or paddock (in aerobic conditions). Alternatively, livestock waste can be "managed" in storage and treatment systems, or spread daily on fields in lieu of long-term storage.

Unmanaged livestock waste deposited on pasture, range or paddock creates N_2O emissions as a result of adding nitrogen to soils. When added to soils, nitrogen provides the initial substrate for the natural cycle of nitrification and de-nitrification. N_2O is a by-product of this cycle; thus more nitrogen added to soils yields more N_2O released to the atmosphere. Some nitrogen in livestock waste leaches into groundwater and surface runoff, creating additional N_2O emissions.

Table 5-4 Nitrogen excretion from animal waste managemet systems (different sources)

Year	Total annual emission (kg/N/year)	Nitrogen excretion source					
		Anaerobic lagoons	Liquid systems	Solid storage & dry lot	Daily spread	Pasture & paddock	Other sources
2000	131611.2	1120	12591.1	22332.8	313.6	57396.3	37857.4

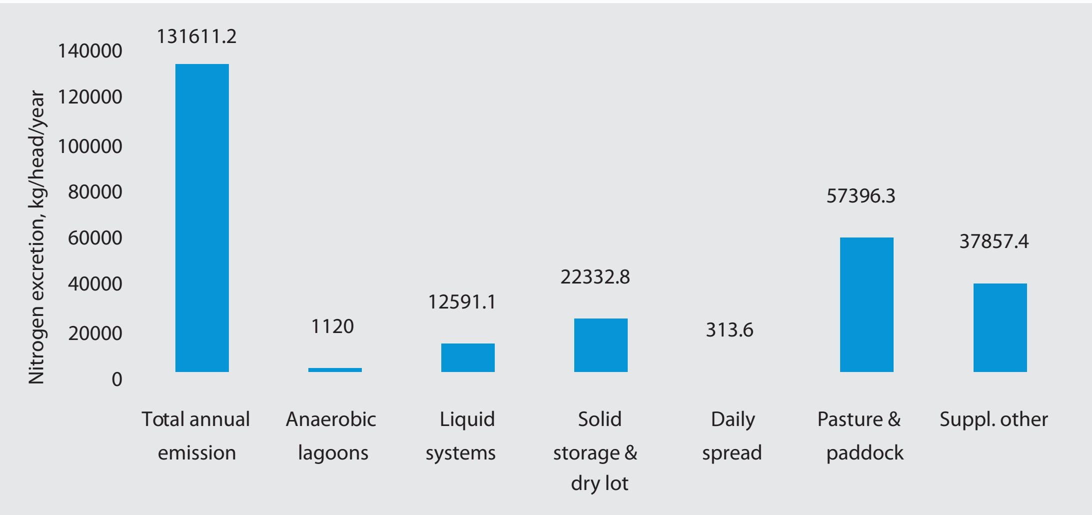


Figure 5-33: Nitrogen excretion from animal waste managemet systems (different sources)

Principal source of nitrogen gas emissions remain pastures and meadows, where a great number of animals from livestock farms are managed to graze free and not in stables. This category (pastures) includes also a large area of agriculture lands which are not cultivated but used as pastures.

Table 5-5: Nitrogen excrretion from animal waste management systems, by livestock type	
Livestock Type	year 2000
Non-dairy Cattle	14000
Dairy Cattle	25088
Poultry	3175
Sheep	31024
Swine	2081
Others	56244

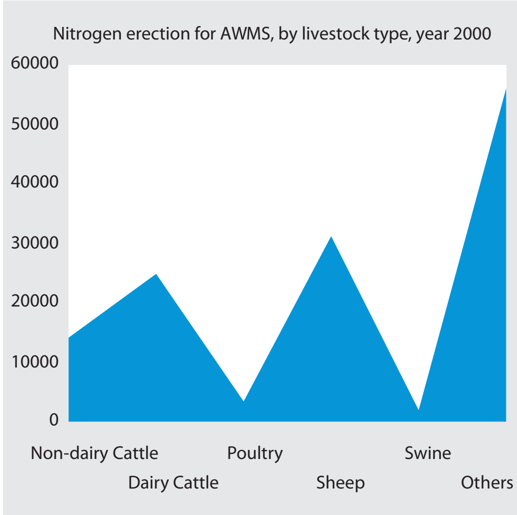


Figure 5-34: Nitrogen excrretion from animal waste management systems, by livestock type

5.3.2.2 Macro-economic data and assumptions

During the period 1990–94, the number of animals was growing rapidly to accommodate the demand, the number of many farm animal species (especially poultry and cattle) has more than doubled in the time period. Still, the domestic production was not sufficient and some livestock was imported. In the second period 1995–2000 there was no significant growth in farming due to severe economic crisis. The data on the number of animals in this period is shown in Table 5-7 and Figure 5-35.

Table 5-7: Number of animals (000 heads)

Livestock type	Number of animals (000 heads)										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Dairy Cattle	205	266	324	402	451	478	483	440	423	370	448
Non-dairy Cattle	195	235	292	307	323	325	323	297	282	277	280
Buffalo	0	0	0	0	0.8	0	0	0	0	0	0
Sheep	1159	1580	1796	2155	2460	2050	1982	1921	1872	1518	1939
Goats	895	1055	1234	1220	1194	1220	1250	1105	1051	860	1104
Camels	0	0	0	0	0	0	0	0	0	0	0
Horses	36	39	44	55	62	69	74	69	65	63	63
Mules & Asses	78	106	124	129	139	145	152	155	156	142	141
Swine	95	88	90	95	98	99	98	89	83	82	103
Poultry	1985	2065	2539	2855	3642	3951	4108	4456	4862	5023	5291
Total	**4648**	**5434**	**6,443**	**7218**	**8369**	**8337**	**8470**	**8532**	**8794**	**8335**	**9369**

The table indicates that the number of cattle, as the main contributor of CH_4 to the Global Warming Potential between the reference year 1994 and year 2000 is almost the same. The number of small ruminant population has decreased by around 0.6 million heads by the year 2000 compared to the reference year 1994. As shown in Table 5-8 and Figure 5-36 the production of forage has increased

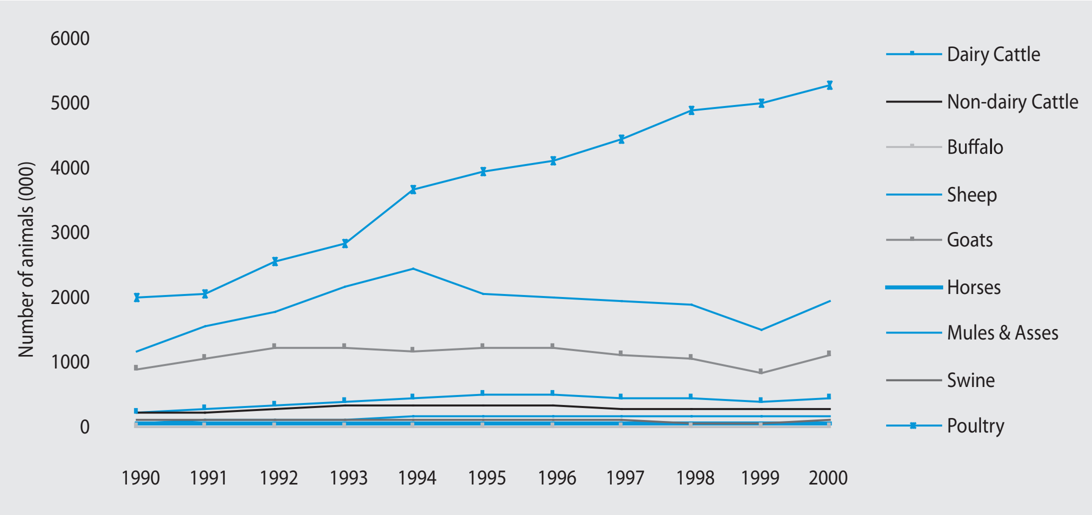


Figure 5-35: Number of animals for the period 1990–2000

by 172 % during the period 1990–2000 in total; during the period 1994–2000 it has increased by 124 %. This and an increase of maize production was caused by the increase of number of animals. The production of vegetables & melon is also gradually increasing. Production of other crops (wheat, rye, barley, oats, soy, sugar beet, tobacco, and sunflower) has decreased owing to high imports, small farms (1–1.2 ha) and the low level of agricultural mechanization.

Table 5-8: Annual crop production

Crop	Annual production (Gg)										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Rye	1.8	1.0	1.0	3.0	4	4.0	2.6	3.0	2.9	3.4	1.5
Maize	138.0	129.0	156.0	176.0	193	216.0	214.0	194.8	189.1	206.0	205.7
Barley	3.7	3.0	6.0	4.0	9	7.3	3.2	3.7	3.2	2.9	1.8
Oats	4.4	3.0	5.0	18.0	20	13.0	12.7	12.1	12.5	13.2	15.7
Wheat	644.0	297.0	252.0	464.0	420	405.0	271.2	388.4	395.1	272.0	341.1
Vegetables & melon	615.0	362.0	565.0	580.0	590.0	685.0	785.0	572.3	604.6	610.4	620.0
Forage	2755.0	2148.0	2991.0	3237.0	3800.0	3800.0	3970.0	3672.0	3844.0	4494.0	4730.0
Sugar beet	54.0	58.0	46.0	27.0	60.0	67.0	74.0	50.9	55.7	39.9	42.0
Tobacco	17.0	7.0	12.0	13.0	3.8	5.7	6.3	7.9	7.4	7.3	6.2
Potatoes	112.0	86.0	79.0	101.0	89.0	134.0	132.0	126.7	145.0	161.9	161.0
White beans	**18.0**	**13.0**	**25.0**	**23.0**	**18.0**	**25.0**	**25.0**	**20.0**	**22.7**	**26.0**	**25.2**
Sunflower	**11.0**	**5.0**	**3.0**	**2.0**	**1.0**	**1.6**	**1.5**	**2.2**	**2.6**	**2.7**	**2.9**
Soya	**4.5**	**3.0**	**2.0**	**1.0**	**0.1**	**0.2**	**0.3**	**0.2**	**0.1**	**1.2**	**0.6**
Total:	**4378.4**	**3115.0**	**4143.0**	**4649.0**	**5207.7**	**5363.8**	**5497.8**	**5054.2**	**5284.9**	**5840.9**	**6153.7**

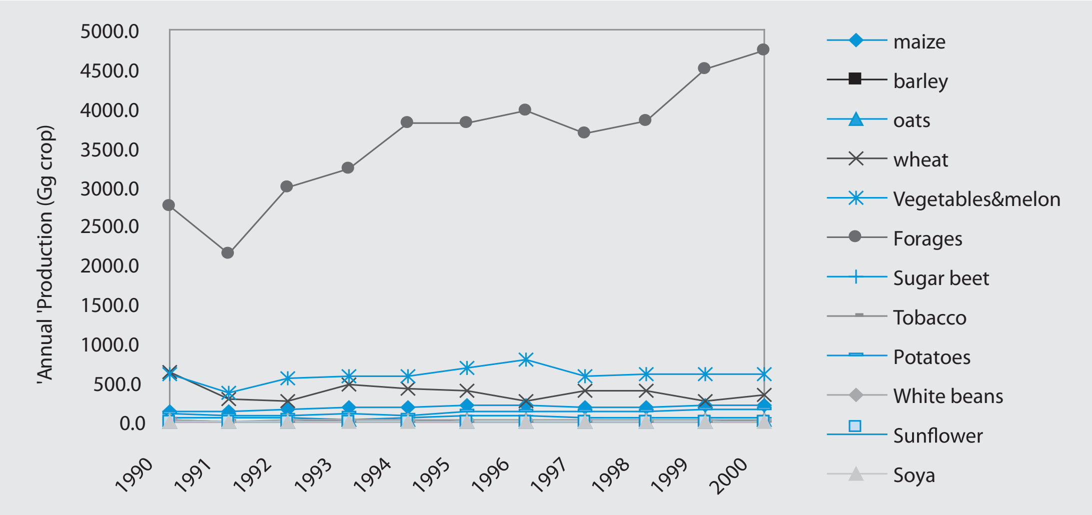


Figure 5-36: Annual Crop Production

Table 5-9 Area of cultivated land	
YEAR	Area cultivated (ha)
1990	515,000
1991	423,000
1992	429,000
1993	505,000
1994	531,200
1995	506,300
1996	444,300
1997	432,000
1998	440,300
1999	422,000
2000	429,800

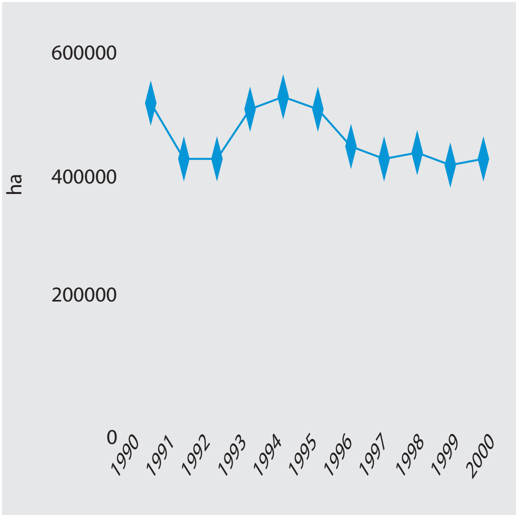


Figure 5-37: Area of cultivated land by years

In the period 1990–2000 the area of cultivated land has reduced by 16.5% (85,200 ha) as shown in Table 5-9 and Figure 5-37.

5.3.2.3 Development of the revised baseline GHG emissions scenario

Enteric fermentation is the major contributor to methane (CH_4) emissions from agricultural activity with about 69.88 Gg or 95% in 2000, while manure management systems contribute only 3.76 Gg or 5%.

The baseline emissions scenario of CH_4 emissions for 2000-2025 is based on the change of the number of animals in the period 1994 – 2004 as shown in Table 5-10 and Figure 5-38. The trend was calculated using the following rates:

- Cattle: -1.55 %/year;
- Sheep: -2.7 %/year;
- Goats: -1.1 %/year;
- Poultry: +23.72%/year

Table 5-10: The baseline CH_4 emissions scenario, based to the period 1994–2004						
Type of livestock	1994 census in 000 heads	CH_4 emissions [Gg]	2004 census in 000 heads	CH_4 emissions [Gg]	2025 census in 000 heads	CH_4 emissions [Gg]
cattle	774	57.52	654	49.2	372	27.65
sheep	2460	12.82	1794	9.35	401	2.09
goats	1194	6.23	944	4.93	407	2.12
poultry	3642	3.64	6275	6.27	19419	19.42
Total		**80.21**		**69.75**		**51.28**

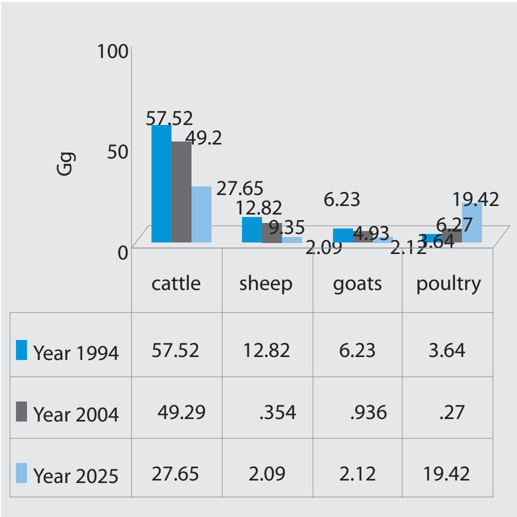


Figure 5-38: The baseline CH_4 emissions scenario, based to the period 1994–2004

Table 5-12: The baseline N_2O emissions scenario, based on the period 1994–2025				
	1994	2000	2004	2025
Nitrous oxide	0.030	0.025	0.024	0.026
Agriculture soil	0.026	0.021	0.020	0.021
Manure management	0.001	0.001	0.001	0.001
Residue burning	0.003	0.003	0.003	0.004

The baseline emission scenario for N_2O is based on the area of cultivated land and crop production. Considering existing data and agricultural strategies the area of cultivated land is expected to remain almost the same while crop production increases due to better production practices and the use of quality inputs. Table 5-12 and Figure 5-39 shows N_2O baseline scenario emissions for the period 1994–2025.

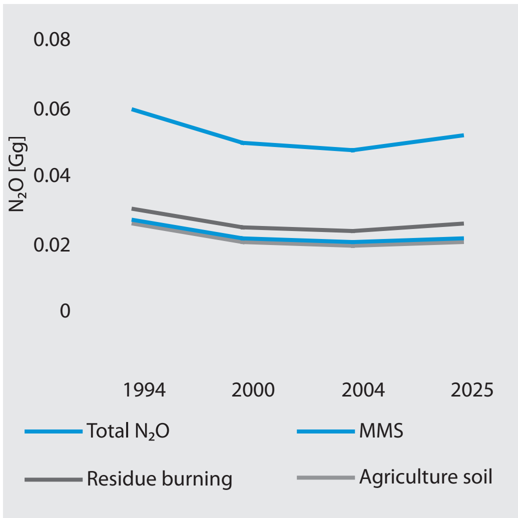


Figure 5-39: The baseline N_2O emissions scenario, based to the period 1994–2025

The CO_2 equivalent emissions calculated from CH_4 and N_2O emissions are shown in Table 5-13 and Figure 5-40. The decrease of emissions by 2025 (in CO_2 eq) is primarily due to the reduction of CH_4 emissions from enteric fermentation as a result of decreasing number of animals in livestock farming. It is assumed that the number of animals will continue to fall in the coming years and measures are taken to improve pasture management and digestibility by ruminants.

Table 5-13: The baseline CO_2 equivalent emissions scenario 2000–2025, based to the period 1994–2004

	1994	2000	2004	2025
CH_4	80.21	75.92	69.75	51.28
N_2O	0.030	0.025	0.024	0.026
CO_2 eq	1693.71	1602.07	1472.19	1084.94

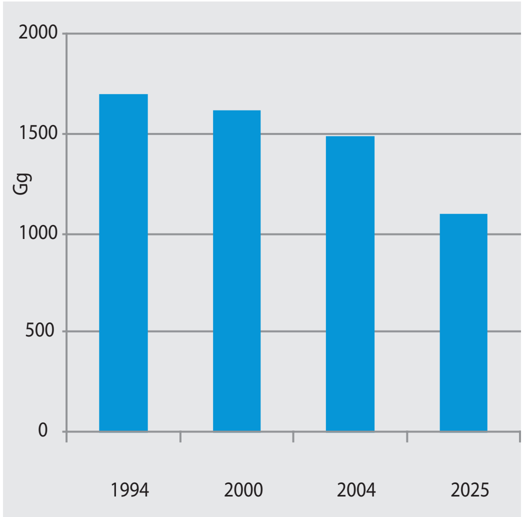


Figure 5-40: The baseline GHG equivalent emissions from agriculture scenario 2000–2025, based to the period 1994–2004, as CO_2 eq

5.3.3 GHG Abatement Measures

5.3.3.1 Identified Abatement Measures

Enteric fermentation

Emissions of CH_4 from enteric fermentation in ruminant and non-ruminant animals are dependent on the animal's digestive system and the amount and type of feed consumed. Emissions of CH_4 from domestic ruminant animals can be reduced as producers use improved grazing systems with higher quality forage, since animals grazing on poor quality rangelands produce more CH_4 per unit of feed consumed. Confined feeding operations utilizing balanced rations that properly manage digestion of high energy feeds can also reduce direct emissions, but can increase indirect emissions from feed production and transportation. CH_4 produced in animal waste disposal systems can provide an on-farm energy supply, and the CH_4 utilized in this manner is not emitted to the atmosphere. Other measures include:

- Increasing the digestibility of forage and feeds;
- Adopting a good manure nutrient management plan;
- Understanding of crop fertilizer needs;
- Soil testing;
- Use of manure as a nutrient source;
- Timing of manure application: Controlled-release fertilizers, nitrification inhibitors, the timing of nitrogen application, and water management should lead to improvements in nitrogen use efficiency and further limit N_2O formation;
- Determine amount of manure produced;
- Application of compost;
- Mineral additions to compost;
- Moisture and aeration.

Livestock waste management system

- Installation and use of anaerobic digesters for reduced CH4 emission from livestock waste;
- Separation, aeration, or shift to solid handling or storage management systems;
- Liquid manure systems (aeration of slurry, application of manure onto green manure crops);
- Improved animal genetics and reproduction.

Field burning of agricultural residue

Crop rotation such as wheat/peas, wheat/legume, provides several benefits and can also be profitable. Monoculture increases the risk for crop diseases, insect pests and even tougher weed control issues.

More producers are realizing the benefit of a proper rotation. It has to make economic sense, but as stewards of the land, producers also want to protect and enhance soil as a resource and the environment.

Proper technologies and practices should meet the following general guidelines:

- Sustainable agricultural production will be achieved or enhanced;
- Additional benefits will accrue to the farmer;
- Agricultural products will be accepted by consumers. Farmers have no incentive to adopt GHG mitigation techniques unless they improve profitability. Options for reducing emissions, such as improved farm management and increased efficiency of nitrogen fertilizer use, will maintain or increase agricultural production with positive environmental effects;
- Reversion and afforestation of abandonment areas;
- Management practices to increase soil carbon stocks include reduced tillage, crop residue return;
- Perennial crops (including agro-forestry practices), and reduced bare fallow frequency;
- Voluntary agreements (e.g., soil management practices that enhance carbon sequestration in agricultural soils);
- Supporting programs of technology transfer in agriculture;

However, there are economic, educational, and sociological constraints to improved soil management. To the extent that improved management is based on significantly increased fossil fuel consumption, benefits for CO_2 mitigation will be decreased.

5.3.3.2 Evaluation of Proposed Measures

In order to rank the proposed measures for abatement of GHG emissions from the Agriculture sector, a Matrix has been developed with a set of criteria used in Albania's Technology Needs Assessment , according to which a set of main sustainable development factor (the following four) were considered:

1. Contribution to the achievement of most of the MDGs (development benefits)
2. Social acceptability and suitability for country conditions (SA&S)
3. Market potential
4. Contribution to Climate Change

Based on this vision of sustainable development, general sub-factors are also defined for the contribution to the achievement of most of the MDGs:

- Job and wealth creation for the poor JW (MDG 1)
- Food security FS (MDG 1)
- Health improvements HI (MDGs 4, 5, 6)

- Capacity building (human, institutional, physical, environmental) CB
- Environmental sustainability ES (MDG 7)
- Economic and industrial efficiency improvement EI
- Gender equality and empowering of women GE (MDG 3)

For market potential:

- Capital and operating costs relative to alternatives COC
- Commercial availability CA
- Reliability and potential scale of utilization RPS

For the contribution to climate change:

- GHG emission reduction potential GR
- Adaptation potential AP

After filling the respective table for the Agriculture sector, the measures were evaluated as shown in Table 5-14:

Table 5-14: Ranking of the GHG abatement measures as per MDGs (Agriculture sector)

	Abatement measure	Development benefits	Market potential	Contribution to Climate Change	Total
1	The crop rotation	215	250	270	735
2	Perennial crops (including agro-forestry practices), and reduced bare fallow frequency	195	230	250	675
3	use of improved grazing systems with higher quality forage	170	210	240	620
4	Reversion and afforestation of abandoned areas	170	200	250	620
5	**Understanding of crop fertilizer needs**	**180**	**285**	**150**	**615**
6	**Adopting a good manure nutrient management plan**	**125**	**180**	**300**	**605**
7	**Voluntary agreements (e.g., soil management practices that enhance carbon sequestration in agricultural soils)**	**135**	**140**	**300**	**575**
8	**Determine amount of manure produced**	**85**	**230**	**250**	**565**
9	**Liquid manure systems**	**140**	**145**	**280**	**565**
10	**Supporting programs of technology transfer in agriculture**	**155**	**190**	**200**	**545**
11	**Improved animal genetics and reproduction**	**180**	**165**	**190**	**535**
12	**Timing of manure application**	**113**	**250**	**170**	**533**
13	**Using manure as a nutrient source**	**130**	**150**	**230**	**510**
14	**Application of compost**	**130**	**145**	**230**	**505**
15	**Separation, aeration, or shift to solid handling or storage management systems**	**130**	**140**	**230**	**500**
16	**Installation and usage of anaerobic digesters for reduced CH4 emission from livestock waste**	**93**	**105**	**300**	**498**
17	**Management practices to increase soil carbon stocks include reduced tillage, crop residue return**	**105**	**150**	**230**	**485**
18	**Increasing the digestibility of forages and feeds**	**115**	**140**	**200**	**455**
19	**Soil testing**	**130**	**140**	**50**	**320**

5.3.4 GHG Abatement scenario, Agriculture sector (2000–2025)

The most feasible measures having an important contribution to the abatement of GHG from the Agriculture Sector include crop rotation practices and use of perennial crops in agriculture, improved grazing systems and afforestation/reforestattion of abandoned areas.

Considering that enteric fermentation and manure management are the main contributors to CH_4 emissions from agriculture, use of improved grazing systems with higher quality forage will greatly contribute to the abatement of CH_4 emissions from agriculture. Emissions of CH_4 from enteric fermentation in ruminant and non-ruminant animals are dependent on the animal's digestive system and the amount and type of feed consumed. Emissions of CH_4 from domestic ruminant animals can be reduced as producers use improved grazing systems with higher quality forage, since animals grazing on poor quality rangelands produce more CH_4 per unit of feed consumed. Confined feeding operations utilizing balanced rations that properly manage digestion of high energy feeds also can reduce direct emissions, but can increase indirect emissions from feed production and transportation. CH_4 produced in animal waste disposal systems can provide an on-farm energy supply, and the CH_4 utilized in this manner is not emitted to the atmosphere.

The penetration level of this measure will depend on the area covered by this intervention and number of animals involved. In our calculation we have considered that this intervention will be implemented in the first phase on 20 percent of the pasture and grazing area, all over the country, directly effecting more than 30 % of livestock.

Table 5-15: The CH_4 emissions abatement scenario [Gg]

	2004	2025 *no abatement measures*	2025 *abatement measures*
Total agriculture emissions	69.75	51.28	45.37
Enteric fermentation	65.96	48.50	42.65
Manure management	3.79	2.78	2.72

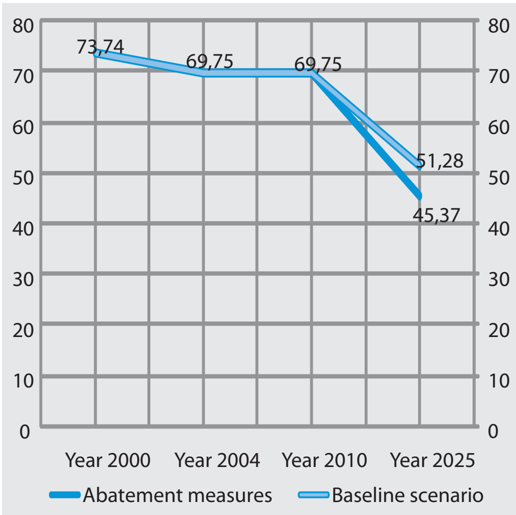


Figure 5-41: The predicted CH_4 emissions, GHG Baseline and Abatement Scenarios, Agriculture Sector

Interventions like afforestation/reforestation of abandoned areas, use of perennial crops in agriculture, and use of agro-forestry practices will improve emissions resulting from agriculture soil and field burning of agriculture residues, which is the main contributor to the nitrogen emissions from agriculture activities. Their implementation will make a contribution in the abatement scenario for nitrogen emissions.
Reversion and afforestation of abandoned areas: Afforestation with fast-growing and native species. There are about 100,000 ha of abandoned lands. The major problem on these lands is erosion. Also, in coastal zones there is another problem with the salinity and formation of saline areas which do not support any vegetation. Artificial and natural introduction of fast growing native species may improve the vegetal cover. Also the distribution of seedlings for planting on private/communal/state lands will promote the establishment of forest on these lands.

Perennial crops (including agro-forestry practices), and reduced bare fallow frequency. Perennial crops offer the best prospects for greenhouse gas abatement because they require very low fertilizer and pesticide inputs compared with annual crops. The crops are deemed to be "carbon-neutral" as the total CO_2 emissions resulting from their use is estimated to be sequestered again in new plant growth. Furthermore, the perennial crops can create additional ecological benefits, such as maintaining and enhancing biodiversity, watershed protection and prevention of soil erosion and degradation. The biomass of perennial crops can be used for energy production. That biomass energy has the potential to make a substantial contribution to energy needs without increasing climate change emissions or conflicting with other environmental policies. It may also bring additional benefits in term of habitat creation and enhancement and bring social benefits to communities.
Woody and perennial crops such as short-rotation trees have positive impacts on carbon sequestration and other fields for a number of reasons:

- Woody crops generally require less or no fertilizers and pesticides. This increases the overall environmental benefits and in particular helps reduce the overall carbon emissions from biomass production.
- Woody crops offer the opportunity for sustainable forest management.
- Woody crops require less irrigation which is particularly important for dryer areas.
- Woody crops have much higher energy (carbon) density per harvest per area and therefore are more efficient for energy use and to process.

Agroforestry practices such as establishing windbreaks, plantation of trees for agricultural uses and riparian forest buffers represent another potential carbon sink in cropland agriculture. Comprehensive data on agroforestry practices are not available to estimate the current national levels of carbon sequestration from such practices. The level of penetration of these measures will depend on the area covered by each. For the abatement scenario we have foreseen the aforestation of 50 % of abandoned land, and use of perennial crops at more then 15 % of agricultural lands.

Table 5-16: The N_2O emissions abatement scenario [Gg]			
	2004	2025 *no abatement measures*	2025 *abatement measures*
Total Nitrous oxide emissions	0.024	0.026	0.018
Agriculture soil	0.020	0.021	0.015
Residue burning	0.003	0.004	0.002

Based on the above projections on CH_4 and N_2O emissions from the agriculture abatement scenario it can be calculated that the reduction in GHG equivalent emissions for agriculture will be as presented in Table 5-16.

Table 5-17: The CO_2 equivalent emissions abatement scenario 2000–2025 [Gg]				
	1994	2004	2025 no abatement measures	2025 abatement measures
CH_4	80.21	69.75	51.28	45.37
N_2O	0.030	0.024	0.026	0.018
CO_2 eq	1693.71	1472.19	1084.94	936.47

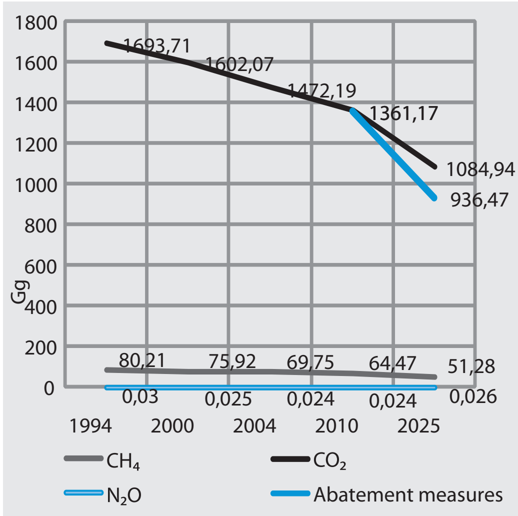


Figure 5-42: Total emissions (Gg) from Agriculture Sector as per the Baseline and Abatement Scenarios (2000–2025)

5.4 GHG ABATEMENT ANALYSIS – WASTE

5.4.1 GHG Abatement Measures in National Strategies and Action Plans

While the legislation on waste management has been adopted in recent years, there is no national waste management plan prepared yet. The National Strategy for Development and Integration 2007-2013 sets strategic goals to dispose of 50 % of non-hazardous waste on engineered landfills by 2010 and assure waste water treatment for 45 % of the population by 2013.

5.4.2 Baseline Scenario

5.4.2.1 Approach to Scenario Development

Population Projections

Population projections for Albania are presented in Figure 5-3 (chapter on Energy), estimated growth rate is 0.35–0.5 % per year.

Quantity of Disposed Waste

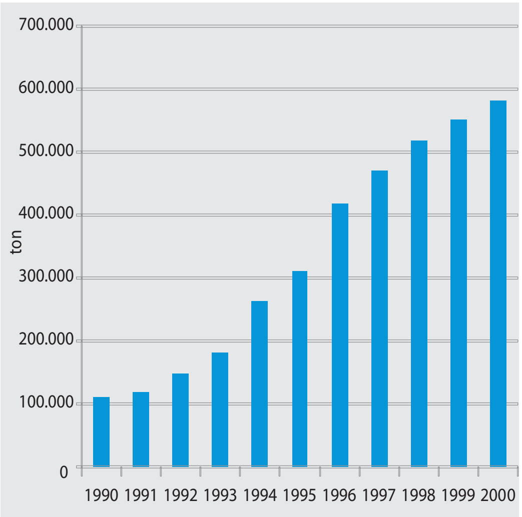


Figure 5-43: Amount of waste disposed in open dumpsites

During the period 1994-2000 the population has increased by approx. 6 %, while the urban waste generation has almost doubled.

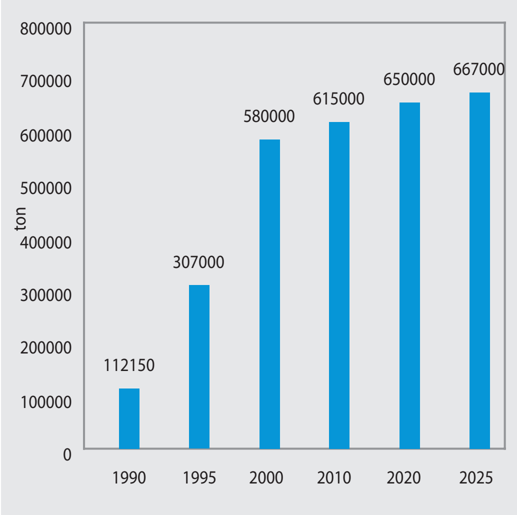


Figure 5-44: Projection of waste to be disposed of in solid waste landfills

Solid waste composition

Urban solid waste in Albania has high percentage of organic matter. There are no recycling methods (e.g. composting) to reduce the quantity of organic matter disposed of at the landfills. The content of organic matter is high, it ranges from 40–60 % in different cities. Organic matter, disposed in landfills, is the source of methane emissions. Existing solid waste disposal sites do not have methane recovery systems.

5.4.2.2 GHG Emissions Baseline Scenario

Methane and N_2O emissions for the whole analyzed period (1990–2000) are increasing, ranging from 339.15 Gg CO_2-equivalent in 1994 to 515.76 Gg CO_2-equivalent emission in the year 2000 (without N_2O).

Methane emissions contribute more than 85 % of the total GHG emissions (expressed in CO_2 eq), N_2O emissions contribute less than 15 %. The emissions arise mainly from the Solid Wastes Disposal Sites, the emissions from domestic and industrial wastewaters and sludge are very small.

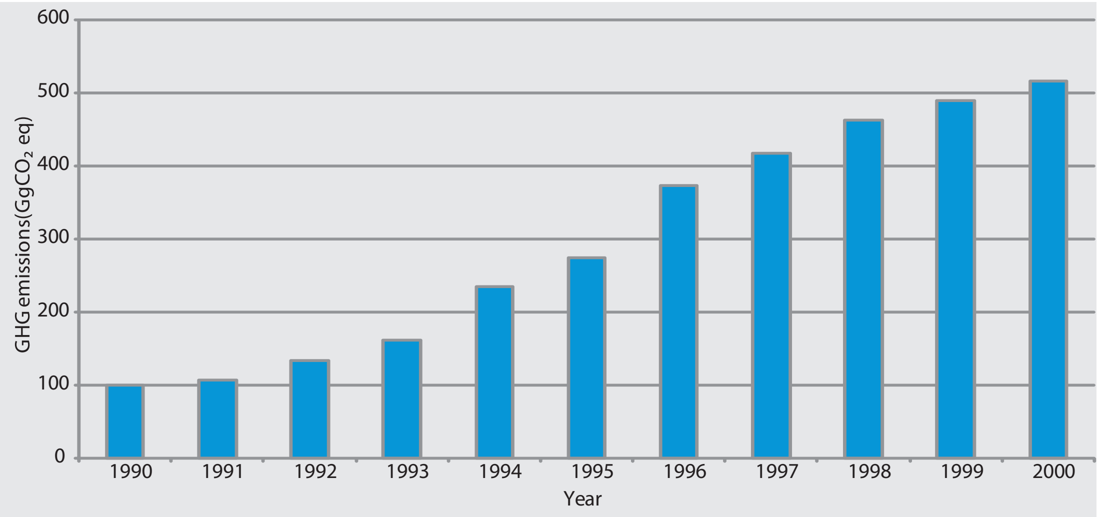


Figure 5-45: GHG inventory (1990–2000) for the waste sector [Gg CO_2 eq]

The current rate of waste generation is estimated to be 1.5 kg/capita/day. Under normal growth conditions, it is expected that this rate will increase. For the baseline scenario, it is assumed that the generation rate will increase by around 1.5-2 % annually. The baseline scenario, calculated under this assumption, is shown in Figure 5-48.

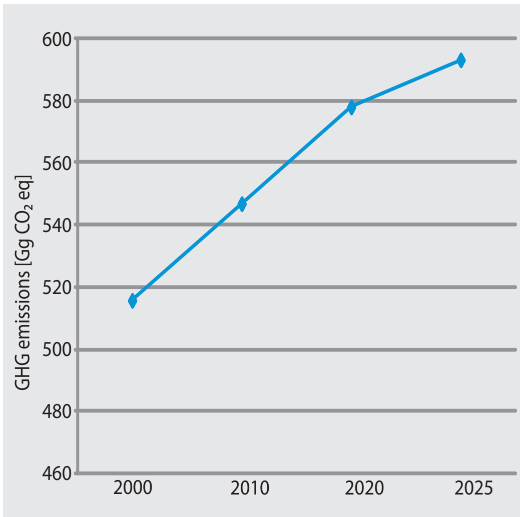


Figure 5-46: CH_4 emissions from the waste sector [Gg CO_2 eq] - Baseline Scenario

5.4.3 GHG Abatement measures

The most effective abatement measure as foreseen in the FNC is introduction of landfill gas recovery plants that should recover 70 % of methane. This measure is still not implemented and remains in the SNC.

Promoting sustainable waste management practices can also reduce GHG emissions. The main goals of integrated waste management are to:

- Reduce solid waste;
- Pursue recycling and reuse of material, and;
- Regulate the disposal of solid waste.

Recycling and composting should be the top priority measure to reduce GHG emissions in Albania

5.4.3.1 GHG Abatement Scenario - Landfill based

The first mitigation scenario assumes the construction of three landfills with energy recovery during the period 2010–2020. The first landfill having a capacity of 500 t/day (180,000 t/year) is supposed to start operating in 2010.

This measure will reduce the GHG emissions by about 13 % compared to the baseline scenario.

The most important step during the period 2010–2020 will be the construction of two other landfills (each with capacity of 300 t/day), which are supposed to start operating in 2020. This will reduce GHG emissions by around 30 % compared to the GHG emissions of the baseline scenario.

The GHG emissions calculations for the first abatement scenario are based on the assumption that the efficiency of methane recovery from landfill with energy recovery is 50 %.

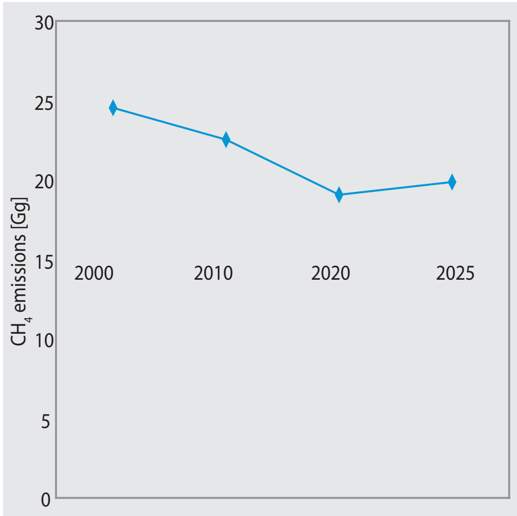


Figure 5-47: CH_4 emissions from Waste Sector – Abatement Scenario – Landfill based

5.4.3.2 GHG Abatement Scenario - Incineration based

A very effective means to reduce the GHG emissions is to incinerate the waste. This process is assumed to convert all carbon into CO_2. Thus the second abatement scenario is based on the construction of an incinerator with a capacity of 300 t/day (108,000 t/year), supposed to start operating in 2015.

The calculations of GHG emissions in this scenario are done upon the assumption that the efficiency of methane reduction from incinerator is 100 %.

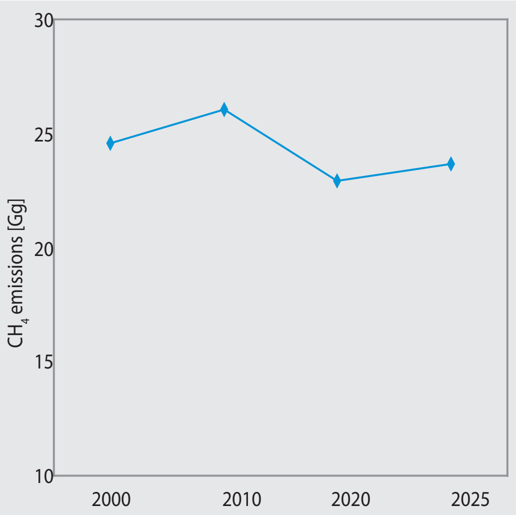


Figure 5-48: CH_4 emissions from Waste Sector – Abatement Scenario – Incinerator based

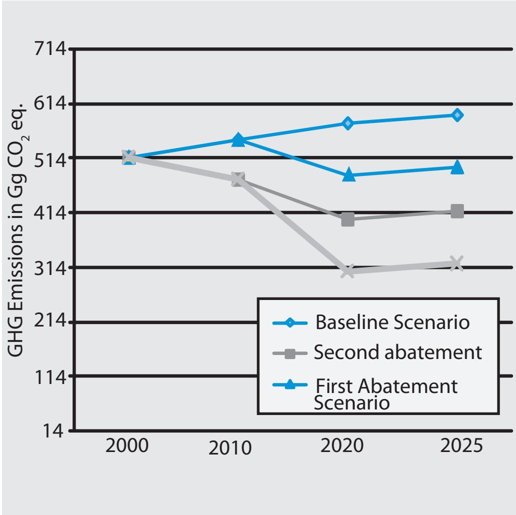


Figure 5-49: GHG emissions Baseline and Abatement Scenarios for the Waste Sector

Table 5-18 represents the GHG emissions for baseline scenario and the abatement scenario (based in two options as above mentioned) and the overall emissions of GHG based on both abatement scenarios.

Table 5-18: Comparison between GHG emissions foreseen as per the Baseline and Abatement scenarios for the Waste Sector {Gg CO_2 eq]

CO_2 eq Gg \Year	2000	2010	2020	2025
Baseline Scenario	515.76	546.84	577.92	593.04
1st Scenario	515.76	463.26	401.73	416.85
2nd Scenario	515.76	546.84	481.95	497.07
Reduction of CO_2 eq emissions from both scenarios	515.76	463.26	305.76	320.04

Implementation of both measures/technologies proposed for the waste sector in Albania would reduce the methane emissions in the year 2025 by 46 % compared to baseline scenario for this year.

5.5 LAND USE CHANGE & FORESTRY

5.5.1 GHG Abatement Measures in National Strategies and Action Plans

The National Forestry Strategy contains measures regarding reforestation and maintaining forest health. There is no strategic document related on land use change.

5.5.2 Baseline Scenario

5.5.2.1 Approach to Scenario Development

The baseline scenario was defined by polynomial extrapolation of the time series of key data from the period 2000–2005. The results are shown in Figures 5-50 to 5-54.

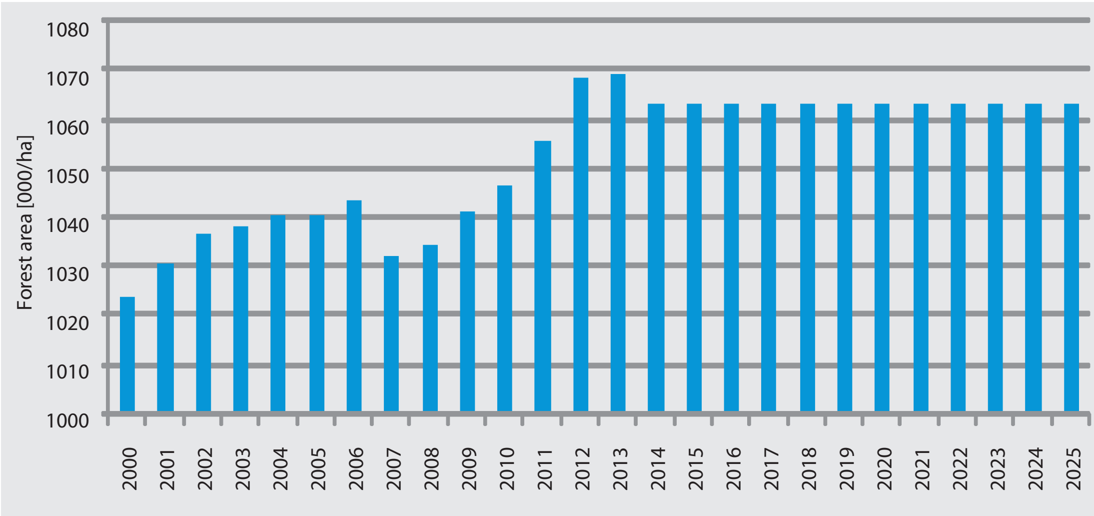


Figure 5-50: Forest area

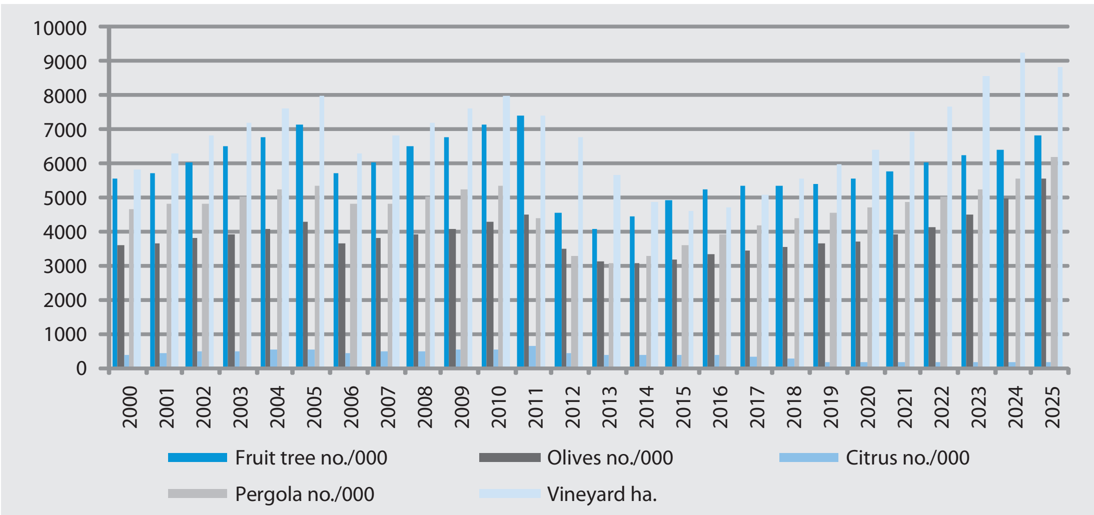


Figure 5-51: Fruit tree development

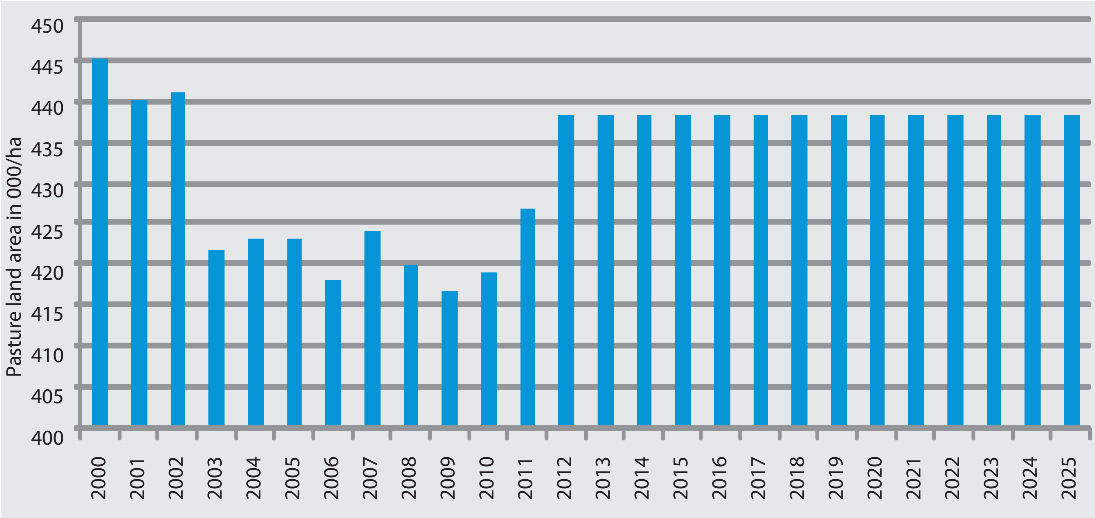


Figure 5-52: Pasture land area

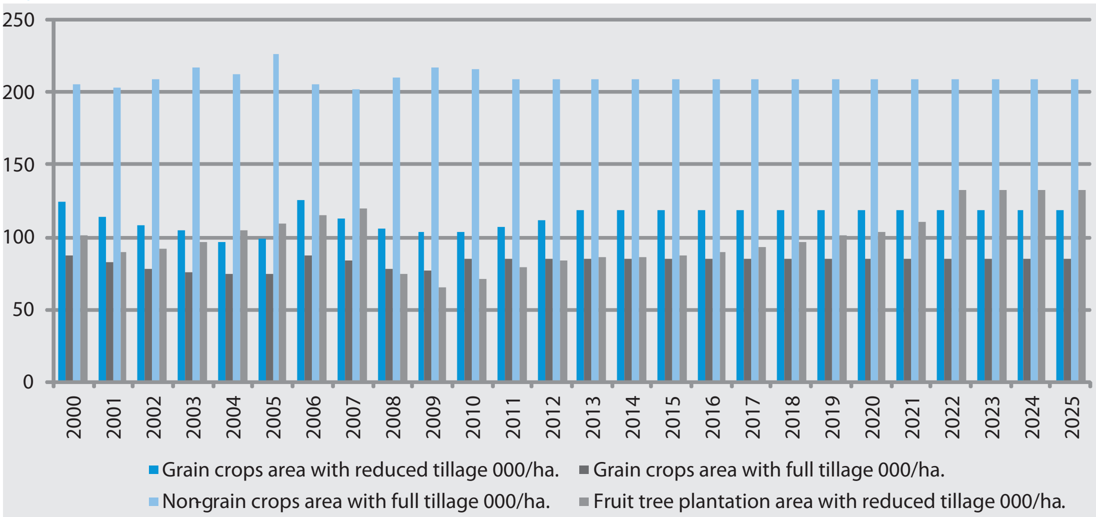


Figure 5-53: Grain crops with reduced and full tillage,non-grain crops with full tillage and fruit tree plantations with reduced tillage areas.

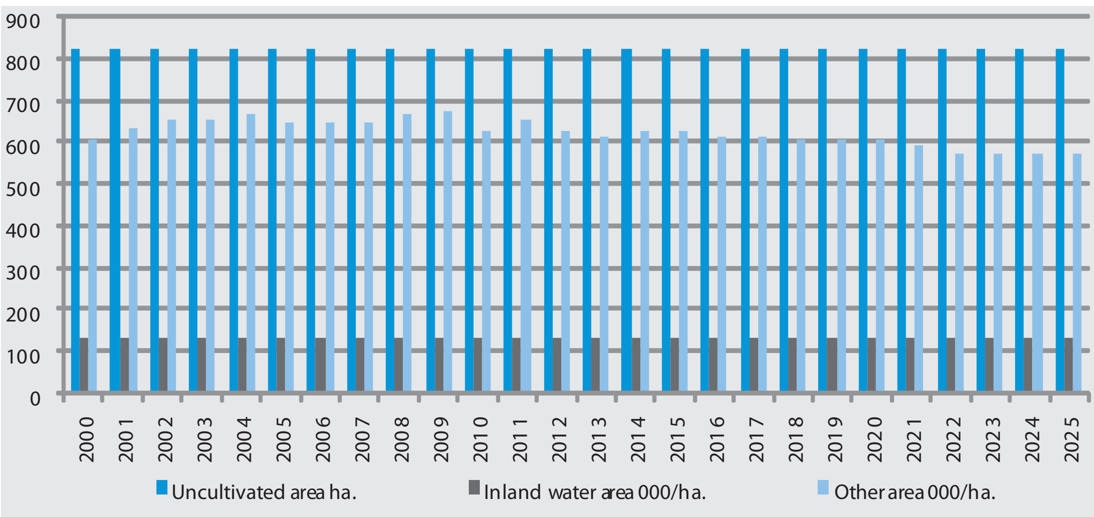


Figure 5-54: Uncultivated, inland water and the other areas

5.5.2.2 GHG Emissions Baseline scenario

CO_2 emissions/removals

Total CO_2 emissions/removals from LUCF sector, are expected to decrease from – 2,082.66 Gg (emissions) in 2000 to – 850.9 Gg (emissions) in 2025 as shown in Figure 5-55. Reduction of emissions is due to reduced wood consumption, increased carbon uptake of high activity soil, enlargement of non-grain crops and fruit tree plantation area and reduction of grain crops area.

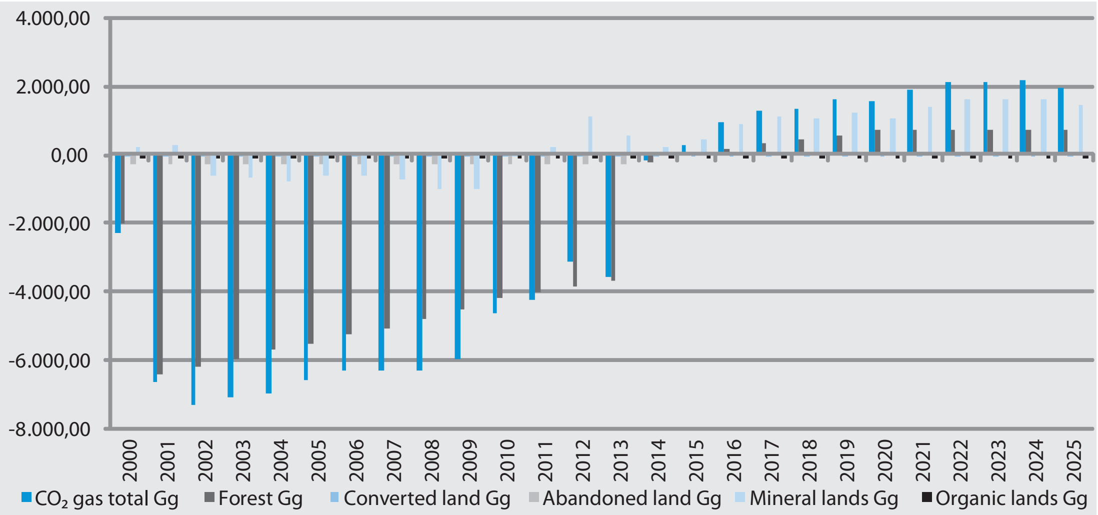


Figure 5-55: Total emissions of CO_2 and emissions by forests, converted lands, abandoned lands, mineral lands and organic lands.

Net change in soil carbon - mineral soils, high and low activity, sandy, volcanic and wetland (aquic) areas

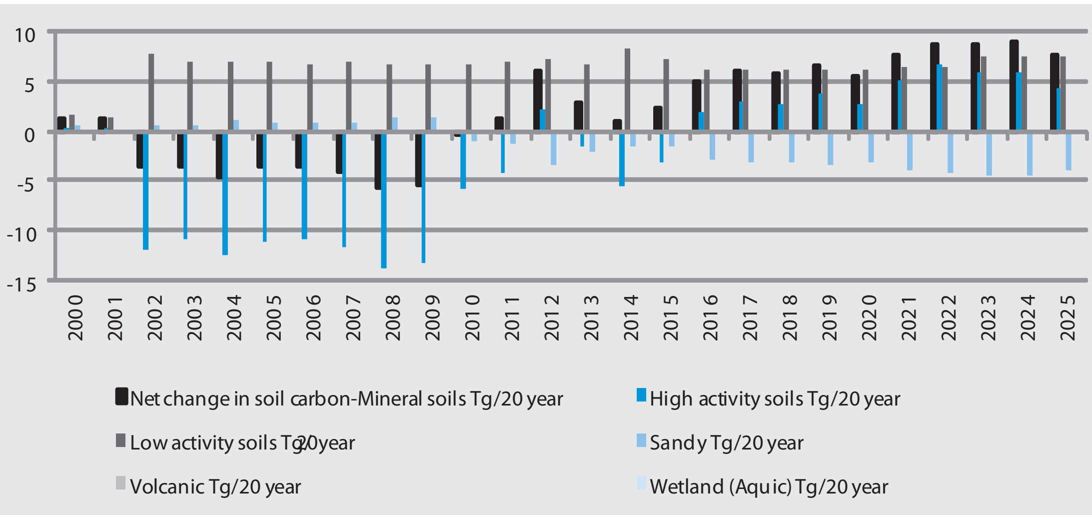


Figure 5-56: Net change in soil carbon

5.5.3 GHG abatement measures (LUCF)

5.5.3.1 Identified Abatement Measures

The following general measures were identified to mitigate climate change:

- Preparation of sustainable forestry development strategy and action plan, taking climate change into account;
- Integration of climate change into other development policies and action plans related to land use, forest management, aforestation/reforestation, forests protection against fires, etc.;
- New legislation and enforcement of existing legislation that prohibits illegal cuttings, regulates annual harvesting of forests, defines emergency response measures against forest fires, etc.;
- Identification and monitoring of vulnerable forest areas (fires, diseases);
- Research on adaption of forest species to climate change and sea level rise.

The following directly applicable measures were identified to mitigate climate change:

- Better management of pollarded forest areas for fodder (mainly for goats);
- Rehabilitation of degraded forests (10,000 ha/year for a period of 20 years);
- Increase of forest area by planting trees on abandoned agricultural land (90,000 ha in 20 years).

5.5.3.2 Evaluation of Proposed Measures

The measures were ranked using the same methodology as the measures for GHG abatement in the agriculture sector (see Ch. 5.3.3.2). The results are presented in Table 5-19.

Table 5-19: Ranking of the GHG abatement measures as per MDGs (Land Use Change & Forestry sector)

	Abatement measure	Development benefits	Market potential	Contribution to Climate Change	Total
1	Better management of pollarded forest areas for fodder (mainly for goats)	55	80	100	235
2	Rehabilitation of degraded forests (10,000 ha/year for a period of 20 years)	105	100	200	405
3	Increase of forest area by planting trees on abandoned agricultural land (90,000 ha in 20 years)	140	120	100	360

5.5.4 GHG Abatement Scenario

The GHG Abatement Scenario is set under an assumption that the proposed measures are implemented.

Total GHG emissions/removals from LUCF sector, are expected to change from – 2,082.66 Gg (emissions) in the year 2000 to + 3,426.76 Gg in the year 2025 (removals) as shown in Figure 5-57. Forestry is the key sector contributing to GHG emissions reduction and increase of sinks.

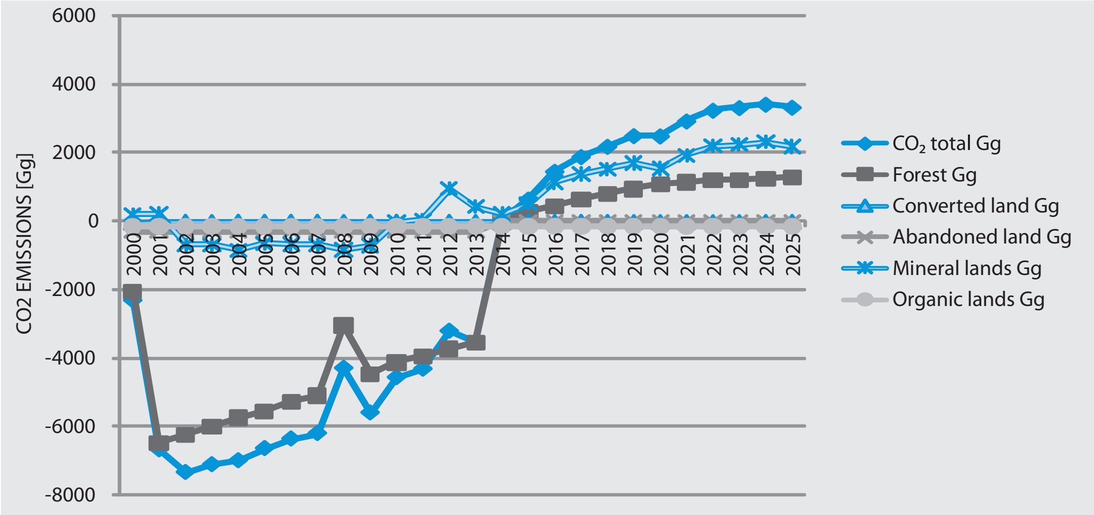


Figure 5-57: Balance of CO_2 emissions after the GHG emissions Abatement Scenario (period 2000–2025)
Note: the values for Organic lands, Abandoned land, Converted land and CH_4 emissions were too low to be presented in the chart

5.6 INDUSTRIAL SECTOR

5.6.1 GHG Abatement Measures in National Strategies and Action Plans

National Strategy on Social and Economic Development (NSSED) recognizes chemical industry, leather treatment and metallurgy as the most significant causes of environmental pollution. The strategy addresses environmental protection and proposes development and transfer of environmentally friendly technologies.

No regulation currently regulates GHG emissions from industrial activities.

5.6.2 GHG Emissions Baseline Scenario

5.6.2.1 CO_2 emissions

The baseline scenario for GHG emissions without mitigation measures anticipates growth of the industrial sector; the cement industry will continue to be the largest contributor in 2025 with around 619 Gg, iron and steel with 367 Gg, ferroallow with 63 Gg, while the total CO_2 emissions coming from the industry sector are expected to reach 1049 Gg. The emissions are presented in figures 5-58 and 5-59.

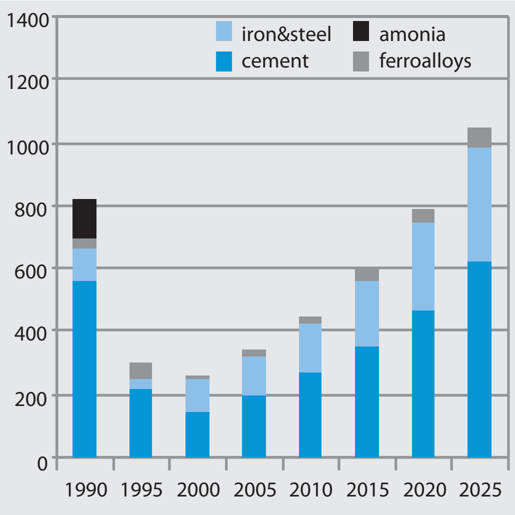


Figure 5-58: CO_2 emissions from the industry sector [Gg]

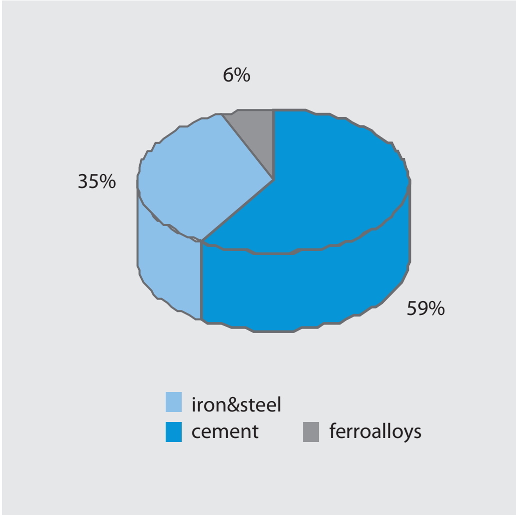


Figure 5-59: Share of CO_2 emissions from industry sector for year 2025

5.6.2.2 NMVOC from food and drink production

It is expected that food and drink production will increase proportionally with GDP until will the year 2025. The emissions of NMVOC in 2000 were 5 Gg, by 2025 they are forecated to be 18 Gg (Figure 5-60).

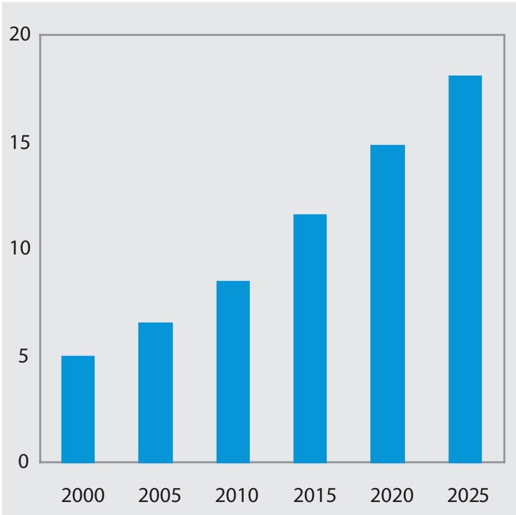


Figure 5-60: NMVOC emissions from food industry [Gg]

5.6.2.3 NMVOC from solvents

It is expected that use of solvents will increase by 6.5 % annually. The emissions trend by 2025 is shown in Figure 5-61.

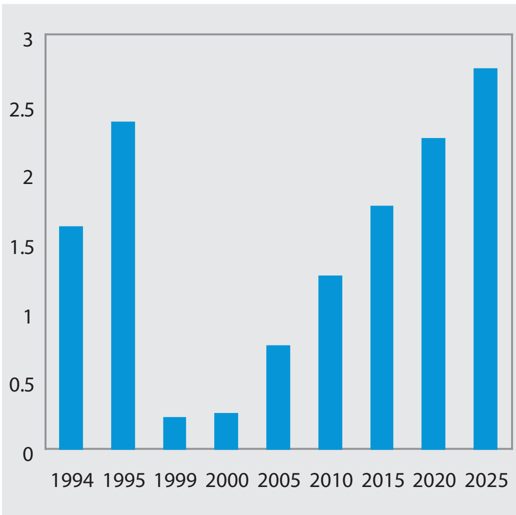


Figure 5-61: NMVOC emissions from solvent use [Gg]

5.6.3 GHG Emissions Abatement Scenario for the Industrial Processes Sector

GHG Emissions from industry in Albania are small compared to other sectors, therefore no explicit measures are anticipated for their reduction.

5.7 TOTAL GREENHOUSE GAS EMISSIONS SCENARIO

Combined GHG emissions by baseline and abatement scenarios are shown in Figure 5-62. The measures are not mutually exclusive therefore the combined scenario is achievable. By the year 2025, the emission reduction by abatement scenario shall reach 48 %.

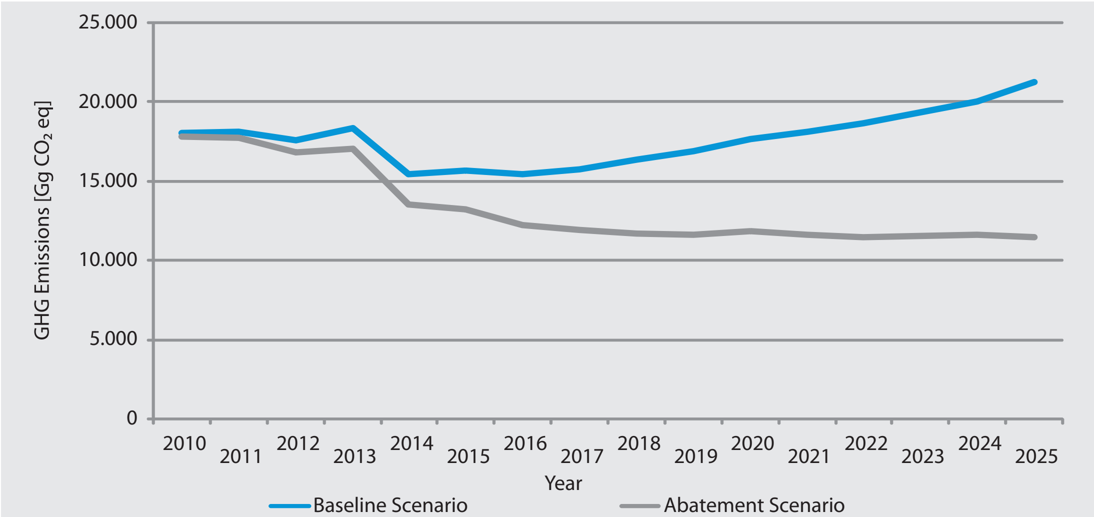


Figure 5-62: GHG Emissions by Baseline and Abatement Scenarios for 2010–2025 [Gg CO_2 eq]

6 OTHER INFORMATION

6.1 INTEGRATION OF CLIMATE CHANGE IN SOCIAL, ECONOMIC AND ENVIRONMENTAL POLICIES

The National Strategy for Development and Integration 2007–2013 (adopted in 2008) is a key national strategic document that harmonizes the perspective of sustainable economic and social development, integration into the European Union and NATO structures, as well as the achievement of Millennium Development Goals in a single strategic document. The NSDI sets clear medium- to long-term vision of development of the country, sets priorities and provides guidance for sectoral programs. The NSDI lists many concrete projects, provides general cost estimates, responsible bodies for implementation and monitoring procedure.

The NSDI recognizes that Albania has a relatively low impact on the global environment through low per capita GHG emissions, though there are several measures for climate change mitigation or adaptation already included in the strategy, e.g.:

- effective institutional and regulatory framework for energy management,
- efficient use of energy,
- increased use of renewable energy resources,
- reconstruction of existing and construction of new power plants (thermal and hydro power plants),
- use of clean fuels for vehicles,
- construction of environmentally sound solid waste landfills,
- construction of waste water collection and waste water treatment facilities,
- reconstruction of railways,
- construction of bus terminals,
- forest protection (management of forests and pasture, reforestation, protection from illegal logging),

- improvement of agriculture (management, technology, investment in irrigation and drainage infrastructure.

The NSDI is not addressing directly the issue of rapid growth of GHG emissions from road transport; there is still a need to improve awareness of sustainable transport and to introduce adequate measures. The first step towards reducing emissions from transport is a sustainable transport study that is being prepared for city of Tirana.

There is also no direct recognition of climate change vulnerability and adaptation measures in the NSDI, though several measures (e.g. agricultural infrastructure, diversification of electric power production) are supporting adaptation to climate change.

6.2 TECHNOLOGY TRANSFER NEEDS

Under Phase II of Climate Change Enabling Activities funded by UNDP – GEF a Technology Needs Assessment for Albania was prepared, identifying technology transfer needs for climate change mitigation and adaptation. The identified technology needs are listed in Table 6-1.

Table 6-1: Technology Needs for Climate Change
I. GHG Emissions Abatement
I.1 Energy
1. Thermal insulation of households/service (public buildings) which use fuel wood, LPG, electricity and kerosene as energy source to meet the energy demand for space heating
2. Combined heat and power plants in public buildings and private buildings (e.g. hotels) in service/industry sector
3. Solar water heaters to replace electric boilers in households/service sector
4. Public passenger transport with buses and trains instead of cars and mini buses
I.2 Land-use Change and Forestry
1. Technique of reforestation of abandoned agricultural lands with species that absorb more CO2
2. Monitoring of forest fires
I.3 Agriculture
1. Low cost bio-digesters for manure processing
2. Use of urea molasses blocks as a supplement in the diet of ruminants
I.4 Waste
1. Sanitary landfills with efficient gas recovery system
2. Municipal solid waste incinerator with energy utilization

Table 6-1: Technology Needs for Climate Change
I.5 Industrial Processes
1. Steel production from stock of scrap
2. Hermetic technology for cement production
II. Adaptation to Climate Change
II.1 Data Gathering Technologies
1. Network of automatic meteorological stations
2. Network of automatic hydrological stations
3. Monitoring of sea and shoreline
4. Modernization of hydraulic laboratories
5. Satellite remote sensing
6. Geographical Information System (GIS)
II.2 Coastal protection
1. Coastal Defense Structures
II.3 Agriculture
1. Drip Irrigation
II.4 Livestock
1. Rapid serological tests for animal diseases
II.5 Fishery
1. Warning system for abnormal phytoplankton blooms
2. Fast screening tests for detection of bio-toxins in shellfish species
II.6 Forestry
1. Technique for reforestation of burned forest area
II.7 Health
1. Health information system (alert system)
2. Water quality monitoring system (bacteria and virus containment control)

6.3 CLIMATE CHANGE RESEARCH AND SYSTEMATIC OBSERVATION

The key institution that conducts systematic observation of weather and climate is the Institute of Hydrometeorology Albania (today merged into the Institute of Water, Energy and Environment under the Polytechnic University of Tirana), that maintains a national monitoring network, consisting of a meteorological network (165 stations) and a hydrological network (107 stations).

The Institute of Water, Energy and Environment is the main research institution that is regularly conducting basic and applied scientific studies related to climate change. Currently their main activities are vulnerability and adaptation to climate change.

Climate change related research is also conducted at the Faculty of Natural Sciences of the University of Tirana and at some other Academia related centers.

6.4 EDUCATION, TRAINING, PUBLIC AWARENESS

Public awareness, exchange of information and communication are important components that are crosscutting through all issues Albania is dealing with when implementing the UNFCCC and Kyoto Protocol. Efforts to raise awareness on climate change have contributed positively to the climate change mainstreaming process.

Despite the increasing public awareness activity regarding environmental issues in general, the issue of climate change is still relatively dormant in Albania, and even at the level of policy makers one does not find very good understanding of climate change and related issues.

Public awareness activities on climate change have started during the first UNDP-GEF funded project "Enabling Albania to Prepare its First National Communication in Response to its Commitments under the UNFCCC" in 2002. Though the project was not directly aimed at awareness raising, the process of preparation of the National Communication has motivated stakeholders, enhanced knowledge on climate change related issues, strengthened the dialogue, and stimulated information exchange and cooperation among all relevant stakeholders, including governmental, non- governmental, and academic and private subjects.

While working with UNDP Albania as the implementing agency for climate change projects funded by GEF, all climate change project activities have been aligned with the UNDP country office policy and mission which consists of reaching the MDGs (Millennium Development Goals) and responding to other national priorities through the human development approach. Albania is a pioneer country in the preparation of a national MDGs monitoring report in Europe. As a consequence of a participatory process, the GHG reporting is integrated as a part of the MDG reporting system - the main GHG inventory indicators are integrated into the MDGs monitoring indicators, making the MDGs targets and indicators more country specific and measurable. Also the majority of the MDGs are used as tools /criteria for prioritization of technology needs for GHG mitigation. The Government of Albania is now for the first time including the MDGs into its national planning monitoring and evaluating system. In this context, the climate change strategy and related indicators are successfully addressed in the newly adopted National Energy Strategy, which is a part of the NSSED (National Strategy for Socio-Economic Development). This progress came also as a consequence of a broad participatory process and stakeholder consultation.

The publication of the main results and findings of Albania's FNC in the recent Status of Environment Report and inclusion of the Climate Change Action Plan into the revised National Environmental Action Plan are other indicators of a higher level of awareness among the environmental policy makers. The establishment of the National Climate Change Web Page has played an effective role in raising awareness about climate change.

To assess the level of public awareness and other relevant components addressed under Article 6 of the UNFCCC, a survey has been carried out under the Article 6 Project funded by United Nations Environment Program.

The purpose of the survey was to assess: the level of knowledge regarding Climate Change issues, UNFCCC and Kyoto Protocol in Albania, which will serve as basis for a national strategy formulation comprising flexible country-driven actions addressing specific needs required for implementation of the Article 6 of UNFCCC in Albania;

The survey was conducted to assess the needs and requirements for implementation of the Article 6 of UNFCCC. The method used in the survey comprises in-depth interviews through personalized questionnaires. A total of six hundred (600) questionnaires were administered and data collected were analyzed both quantitatively and qualitatively.

The target group of the questionnaire was different stakeholders coming from the public sector, private sector and NGOs. Different categories have been targeted. These categories belong to sectors that are affected or affect climate change such as energy, transport, industry, agriculture, land use change and forestry and waste.

Based on the survey a general conclusion emerges: More than half of the public is not aware of climate change and its threats. A higher share belongs to those who do not know about Albania's position, institutions and accomplishments under the UNFCCC and Kyoto Protocol.
The results of the survey show that despite of the efforts made on awareness and communication, training and education related to climate change, there is a need for additional major interventions. This has been started with a communication strategy designed around climate change issues, which after its implementation stage will bring change to our behavior and way of doing things. Climate change is a global problem; however each of us has the power to make a difference. Even small changes in our behavior can help prevent greenhouse

emissions without affecting our quality of life.Reducing our greenhouse gas emissions will require changes to the way we produce and use energy. And this can save us money.

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. Through an aggressive communications campaign that will accompany the process, the Government of Albania through its Ministry of Environment, Forests and Water Administration aims to attract the interest and attention of respective interest groups such as: the Albanian Government, private sector, civil society, media and Albanian general public. This strategy aims at gathering public support in order to achieve a successful implementation of the UNFCCC and a fruitful participation of Albania in the Clean Development Mechanism under the Kyoto Protocol and other climate change programs.
Specifically and in order of priority, this strategy will consist of the following key objectives:

- To communicate the reasons why climate change issues are of utmost importance to Albanian society and how they are likely to impact its development process. The outcome should be an improved understanding of climate change issues, which in turn will strengthen comprehension about its impact.
- To raise further awareness and encourage the Albanian government and parliament to take legislative actions in support of Climate Change mitigation and adaptation by reflecting at the same time national priorities and initiatives that could easily be supported by development partners;
- To promote partnerships, while instigating dialogue at all levels of society between policy-makers and the public on climate change issues, with a special focus on the private sector which is a key driver.
- To provide information about the issues of climate change in an attempt to educate the Albanian public about climate change issues with a specific focus on school curricula. To raise general awareness of the Albanian public about the fact that Albania is a signatory country of the Kyoto protocol, including benefits deriving from its flexible mechanism and obligations as well.
- To raise awareness among print and electronic media in the country on climate change issues, since the media have an instrumental role to play in the communication process.
- To generate debates and discussions among Albanian industrialists and /or private sector on the effects of GHG emissions and the possibilities offered by the Kyoto Protocol in project development.

6.5 CAPACITY-BUILDING

Important support to capacity building in the field of climate change were UNDP-GEF funded projects “Enabling Albania to prepare its First National Communication to the UNFCCC” with a follow-up Phase II of Climate Change Enabling Activities “Enabling Albania to prepare its Second National Communication to the UN-

FCCC". Within this framework projects, several specific studies were prepared.

UNDP has recently or is currently supporting the following climate related projects in Albania, that are all directly or indirectly building capacity:

- Market Transformation on Solar Thermal Water Heating
- Building Capacity to Access Carbon Finance in Albania
- Identification of adaptation response measures in the Drini - Mati River Deltas

A core team of national experts has developed through the work on national communications and other projects, representing a blend of experts from private companies, research instutions and independent experts working on project basis.

The UNDP Climate Change Programme in Albania used to be the focal point of climate change related activities in the country. The Programme is managing all UNDP executed projects and disseminating data and results in the field of climate change . It co-operates closely with the Ministry of Environment, Forestry and Water Administration as a de-facto national task force on climate change.

The main needs for capacity building in Albania are:

- Improvement of data collection and reporting on activity in the key sectors,
- Implementation of QA/QC procedures for GHG inventory,
- Capacity of research institutions for key climate change issues (energy efficiency, reforestation in changed climate, agricultural practice that minimizes GHG emissions, etc.).

6.6 CO-OPERATION WITH ANNEX II PARTIES AND INTERNATIONAL INSTITUTIONS

Albania is regularly receiving support from developed countries through various programmes. There were several projects financed also in the field of climate change by Annex II parties.

In the field of climate change Albania is regularly receiving support from UNDP (projects are presented in more detail in Chapter 6.5) and the European Commision.

6.7 PROPOSED PROJECTS FOR FINANCING

Table 6-1: Technology Needs for Climate Change		
Project	**Time line**	**Estimated cost**
Adaptation		
1. Plan and equipment for monitoring and response to anticipated climate change impacts in the Drin River Cascade at the institutional and community levels	2010-2013	$150,000
2. Integraded irrigation plan for agriculture in Drini and Mati delta	2012-2015	$350,000
3. Monitoring of coastal area	2011-2015	$150,000
4. Construction of Coastal Infrastructure: Feasibility study and design of of coastal infrastructure objects	2013-2014	$450,000
5. Public awareness of the need to take individual actions to deal with climate change	2011-2012	$100,00
6. Guidelines for agricultural practices in changed climate (crop selection/substitution, conservation tillage, etc.)	2012-2013	$70,000
7. Guidelines for reforestation in changed climate	2015-2016	$90,000
8. Tests for toxins in shell species	2012	$120,000
9. Water quality monitoring system (pilot project)	2015-2018	$550,000
Emission Abatement		
1. Small hydro power plants	2012-2020	(CDM project)
2. Energy efficiency in electrical distribution	2011	(CDM project)
3. Wind Farm	2012-2015	(CDM project)
4. Efficient Lighting	2011-2013	(CDM project)
5. Thermal Solar for Coastal Hotels	2011-2015	(CDM project)
6. National sustainable transport plan	2011	$450,000
7. Feasibility Study of Municipal Solid Waste Incinerator	2012	$350,000

ANNEX

A. Abbreviations	
DCM	Decision of the Council of Ministers
FNC	First National Communication of Albania to the Conference of Parties Under the UN-FCCC
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GHG	Greenhouse Gases
GWP	Global Warming Potential
HPP	Hydro Power Plant
IPCC	Intergovernmental Panel on Climate Change
RA	Republic of Albania
SNC	Second National Communication of Albania to the Conference of Parties Under the UNFCCC
TPP	Thermal Power Plant
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
WMO	World Metereological Organization of UN

B. Chemical Compounds	
CH_4	Methane
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2 eq	Carbon Dioxide Equivalent
N_2O	Nitrous Oxide
NMVOC	Non Methane Volatile Organic Compounds
NO_x	Nitrogen Oxides

C. Measures	
$	US dollars
g	grams
Gg	gigagram (109 g = 1 kt)
GWh	gigawatt - hour
ha	hectare (10,000 m2)
J	joule
km	kilometer
km2	square kilometer
km3	cubic kilometer
kt	kilotonne (103 t)
ktoe	kilo tonne oil equivalent (41.868 TJ or 11.63 MWh)
kWh	kilowatt – hour
m	meter
m3	cubic meter
mln.	million
mm	millimeter
Mt	megatonne (106 t)
MW	megawatt (106 W)
ppm	parts per million
t	tonne
thous.	thousand
TJ	terajoule (1012 J)
Wh	watt - hour

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