REPUBLIC OF ALBANIA
MINISTRY OF ENVIRONMENT

The First National Communication of Albania to the United Nations Framework Convention on Climate Change (UNFCCC)

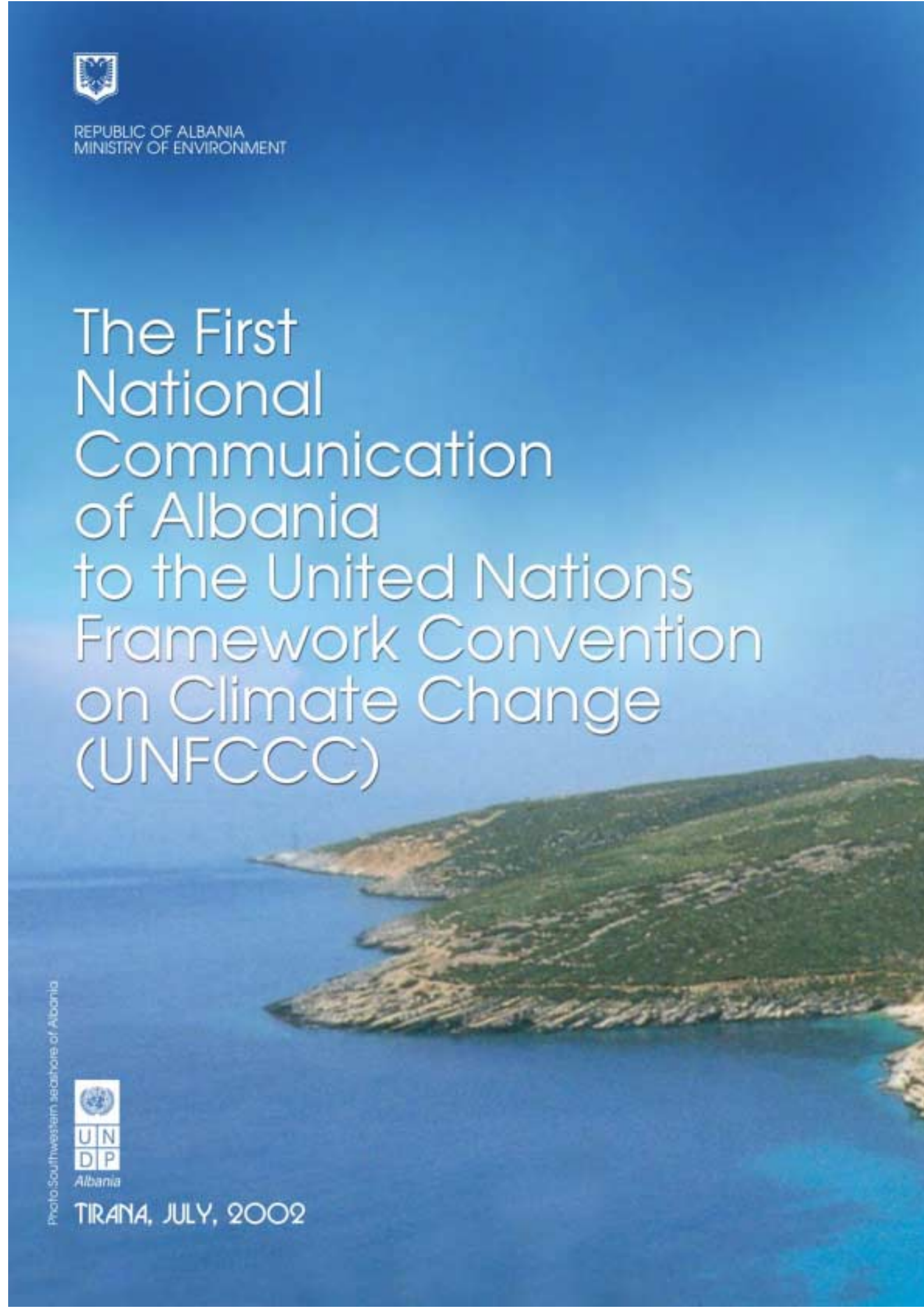


Photo: Southwestern seashore of Albania

UNDP Albania

TIRANA, JULY, 2002

Publisher
Ministry of Environment of Albania

Prepress
Ermira FIDA
Odeta Zheku
Melita Leka

Design
Petrit Pema
Gr.Pe&Pe

Front cover page
Admir Banaj
ADIZAJN

Printed by:
Publishing and printing house “FLESH”
Tirana, Albania

Republic of Albania

Ministry of Environment

The First National Communication of the Republic of Albania to the United Nations Framework Convention on Climate Change (UNFCCC)

Co-ordinated by:

Ermira Fida, National Project Manager
Tatjana Hema, National Project Director

Lead authors:

Besim Islami,
Mirela Kamberi,
Eglantina Demiraj,
Ermira Fida,

Contributing Authors:

Spiro Karadumi, Edmond Panariti, Pranvera Bekteshi, Emil Gjika, Gazmend Gjyli, Pellumb Berberi, Tatjana Mulaj, Vangjel Mustaqi, Liri Mucaj, Mirela Bicja, Agim Shehi, Sabri Laci, Alfred Mullai, Gani Deliu,Tatjana Dishnica, Irfan Tarelli.

Review Editors

Lirim Selfo, Narin Panariti, Drita Dade,
Katarina Mareckova, MilosTichy, Juan Zuak, Jan Van Drunen.

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. Three years after the ratification of the Convention, Albania was provided with financial assistance from Global Environment Facility for the preparation of the First National Communication.

I have the pleasure to present to you the First National Communication of Albania, as a response to the commitments of Albania to the UNFCCC.

The First National Communication of Albania is the first assessment of the 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 commitments of a non-Annex I Party, under the existing guidelines for the preparation of National Communications from non-Annex I Parties, as Albania is, to the UNFCCC. Albania, for the first time has developed the National Action Plan, which addresses the climate change issues as a part of the updated Environmental Action Plan, despite of its low level of contribution in greenhouse gas emissions.

Despite to the problems and constrains of development which have affected this exercise, a considerable experience has been gained, a national capacity has been built and many lessons have been learnt. It has become a useful tool and basis for the sustainability of the preparation process of future National Communications.

Finally, on behalf of the Government of Albania, I avail myself of this opportunity to express my highest appreciation to the Global Environment Facility, to UNDP as its implementing agency and Secretariat of the UNFCCC for their support to enable Albania to prepare its First National Communication to the UNFCCC.

Prof. Lufter Xhuveli, PhD

Minister of Environment

July 2002.

Acknowledgements

The First National Communication of Albania represents the input of a large number of stakeholders, involved during a three and a half years period, over which it was prepared.

The participation of numerous stakeholders from various economic sectors, ministries, non governmental agencies, community based organizations and funding agencies, was critical to the success of the process.The First National Communication of Albania succeeded due to the financial contribution of the Global Environment Facility (GEF), political, technical and financial support provided by the Ministry of Environment of Albania, on behalf of the Government of Albania, support provided by UNDP country office on the project implementation process, technical support provided by the National Communications Support Program (NCSP) and UNFCCC Secretariat, particularly the Implementation Program, non-Annex I Sub-program.

Special thanks must be made to the national experts who led the key teams, namely:
Besim Islami, PhD - Team leader of greenhouse gas inventory
Mirela Kamberi, MSc - Team leader of abatement analysis
Prof. Assoc.Eglantina Demiraj, PhD - Team leader of vulnerability assessment and adaptation

They were amply supported by the other members of the technical teams, namely: Prof. Spiro Karadumi, PhD - land use change and forestry expert; Prof. Edmond Panariti, PhD - livestock expert; Pranvera Bekteshi, PhD - solvents expert; Emil Gjika, PhD - industrial processes expert; Prof.Gazmend Gjyli, PhD - waste expert; Prof. Pellumb Berberi, PhD - uncertainty assessment expert; Prof. Assoc.Tatjana Mulaj, PhD - uncertainty assessment expert; Prof. Assoc. Vangjel Mustaqi, PhD - climatologist; Prof. Assoc. Liri Mucaj, PhD - climatologist; Mirela Bicja, PhD - hydrologist; Agim Shehi, PhD - health expert; Prof. Assoc. Sabri Laci, PhD - tourism and population expert; Prof. Alfred Mullai, PhD - biologist; Gani Deliu - expert for National Climate Change Action Plan; Prof. Assoc.Tatjana Dishnica, PhD - agriculture expert; Irfan Tarelli, PhD - agriculture expert; Vojo Spahiu, MSc - IT expert; Gerdi Leka - IT expert; Rezar Shehu, MSc - IT expert; Prof. Lirim Selfo, PhD - head of reviewing panel; Narin Panariti, PhD - reviewer; Drita Dade - reviewer; Katarina Mareckova - international reviewer, Slovak Republic; MilosTichy - international reviewer, Check Republic; Juan Zuak - international reviewer, Denmark; Jan Van Drunen - international reviewer, The Netherlands.

The role of the National Project Director in providing the governmental support to the project is worthy of special mentioning. Many thanks for their support to Maksim Deliana, PhD who was the National Project Director for the period 1998-2000 and to the Deputy Minister of Environment Tatjana Hema, PhD, the National Project Director from 2000-2002 and also the UNFCCC Focal Point. Furthermore, many thanks go to the Project Steering Committee members namely: Prof. Perparim Fuga, PhD; Marjeta Mima; Margarita Caci; Gjergj Simaku, PhD; Petraq Krastafillaku, PhD; Silvana Binaj, PhD; Prof. Mithat Sanxhaku, PhD; Prof. Assoc. Marita Nake, PhD; Prof. Efigjeni Kongjika, PhD; Prof. Assoc. Vasil Marku, PhD; Prof. Arqile Berxoli, PhD.

Special credits must be given to the support provided by the Ministry of Environment of Albania, especially to Ministers namely, Prof. Ethem Ruka, PhD and Prof. Lufter Xhuveli, PhD and the heads of their cabinets, respectively to Prof. Assoc. Vaso Qano, PhD; and to Sajmir Hoxha, MSc.

Many credits to the contribution of the UNDP country office, especially to H.E. Anna Stjarnerklint, the UN Resident Coordinator and UNDP Resident Representative; H.E. Parviz Fartash, Deputy Resident Representative; Vladimir Malkaj - program adviser; Irena Dule - programe specialist;

Etleva Vertopi - programe specialist; Guido Santini - environmental specialist; Merita Jorgo - head of project support unit; Arben Caslli, MBA - administrative specialist; Paul Brewah - operations manager; Ermira Basha - operations analyst; Ilda Frangu - finance specialist and Ermira Masha - finance specialist.

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

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

Ermira FIDA, MBA

National Project Manager

TABLE OF CONTENTS

EXECUTIVE SUMMARY

1. NATIONAL CIRCUMSTANCES

1.1 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). Albania has a surface area of 28,745 km^2. The general length of the state border is 1,093 km.

1.2 Climate profile

Albania belongs to the subtropical Mediterranean climate. It is characterized by mild winters with abundant precipitation and hot, dry summers.The annual mean air temperature has a wide variation over the territory. All the territory is characterized by the negative trend of annual mean temperature.This negative trend of mean temperatures comes out as a result of the influence of negative trend of minimum temperatures.

The mean annual precipitation total over the Albania is about 1,485 mm/year. The highest precipitation total (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 and August.

1.3 Natural resources

1.3.1 Water resources

The area surrounding Albania has relatively abundant fresh water resources. Seven main rivers run from east to west. The total volume of water flow is 39,220 x 106 m^3/year. 86% of the annual water flow is discharged during the wet period and 8% during the dry period. Ground water in Albania is the only source for drinking water. The most important factor on which ground water levels depend is precipitation.

1.3.2 Forests

The Albanian forests cover 36% of the territory. Although Albania has extensive forests, 30% have been declared damaged by the uncontrolled cutting of the past ten years. The damages caused by burning and windstorms in forest species is another phenomenon which shows a variation.

1.4 Economic profile

Between 1944 and 1991, Albania's Government was controlled by the Communist Party, known most of that time as the Albanian Party of Labor, where the state controlled economic activity. Private ownership and private enterprise were absolutely forbidden. The communist regime led Albania into deeper isolation.

The year 1992 for Albania was considered as the start of transition from a centralized economy to a market one. Until 1996, the achievements were positive. Rapid growth rates, 9% per year during 1993-1996, seemed to confirm the success of the reforms. At the end of 1996, many people invested all their savings in the "pyramids" schemes and also sold their homes to raise further cash, generating a considerable collapse for Albania. After this collapse, the Government of Albania aimed at accelerating banking sector reform and privatization and shifting the activity of small businesses from trade to production, thereby helping to reduce the high levels of unemployment.

1.5 Agriculture

Agriculture is the most important sector in Albania in terms of value added and employment. It contributes more than half of Gross Domestic Production (GDP). However this sector does still account for about 35% of the exports and 40% of employment, but also has the lowest share of services with 22%. The main emphasis remains the production of cereals, however its structure has shifted towards supplying of animal foodstuffs, instead of human consumption.

1.6 Livestock

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

1.7 Mining

Albania is rich in mineral resources, especially chromium, copper and iron - nickel. Before 1990, the mining sector accounted for a substantial share of export earnings and Albania was the world's third largest producer of chrome ore. It is one of the major countries in Europe with significant chrome reserves per capita. Production collapsed during the periods of upheavals in 1991-1992 and 1997.

Like the majority of Albania's industry, mining sector has been handicapped by the obsolete equipment and technology and lack of management expertise, as well as the disruption of production and supply lines caused by civil unrest.

1.8 Energy

Albania was largely self sufficient in energy resources and in most years (up to 1989) has been a net exporter of electricity and refined oil by products. Albania was rich with energy resources like oil, natural gas, coal, fuel wood, peat, and hydro energy, which contribute in different ways to meet energy demands in the country.

From a historic peak of 3.3 MTOE in 1989, when all the Albanian economy operated in its full capacity, the primary energy supply in Albania dropped by more than 50% or to 1.5 MTOE in 1992. Since then, the primary energy supply has remained relatively constant around the level of 1.6 -1.7 MTOE.

The country's needs for electricity are met mainly by the hydro power plants and in a small scale, by the thermo power plants. The hydro power plants provide about 94% of the produced electricity, while the rest is produced by thermo power plants. Except of the thermo power plant in Fier, which actually operates, the other plants are closed down. The total production capacity is 1,662 MW, where hydro power plants have a capacity of 1,444 MW.

After 1990, the domestic use of electricity received an immediate increase. The electricity was previously used only for lighting and communication means (radio, TV, etc.), while at present, its use for cooking and heating has become a concern. The increase of the demand for electricity from the household sector now occupies a growing share of the energy consumption: more than 1/ 3 of the total energy demand and 60% of the electricity demand.

1.9 Transport

Actually, the largest part of transport of goods and passengers is realized by road transport. A rapid expansion in private car ownership, prohibited in the communist era, has already placed great pressure on the road network. There are 447 km of mainline railway and 230 km of branch lines. The rail network deteriorated greatly in the 1990 particularly in the early part of the decade, when the track and signaling wires were plundered for scrap. Lately, the antiquated rolling stock is being updated with coaches donated by western countries.There are two major sea ports in Durres and Vlore, both being refurbished. The only commercial airport in Albania is 'Mother Teresa" located in Rinas, near Tirana.

1.10 Industry

Since 1994, the industry sector has accounted for a steady 12% of GDP. Albania's historical dependence on mineral extraction is owed to substantial commercially exploitable reserves. During the communist era, the "proletarian" 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. The equipment and manufacturing plants inherited at the start of the decade had mostly been supplied firstly by Soviet Union and then by People's Republic of China, little of which proved internationally competitive, when Albania was opened to world markets. Subcontracting for abroad has given new life to food, beverage and leather goods. Aggregate growth has been positive since its falling after the disorders of 1997 and was 5% in 2000.

1.11 Tourism

Tourism in Albania is only at a very early stage of development. Albania exhibits considerable potential for the development of tourism, because of its extensive coastline, the interesting scenery of Albanian lakes and mountain regions and the generally perfect countryside.

1.12 Population

Actually, the Albanian population counts 3,4 million inhabitants. Over 55% of the population live in rural areas. 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. The emigration of Albanians abroad is higher than the other countries of Central and Eastern Europe. The population migration has led to very disorganized and uncontrolled development, 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 abusive construction of new buildings, in most of the cases within the towns or in the suburbs, which of course is not supported by the respective infrastructure.

1.13 Public health

The universal provision of healthcare was a state obligation under communism. However, this policy denied doctors access to adequate medical equipment or modern pharmaceuticals. The healthcare system deteriorated after the fall of communism, mainly owing to funding pressures. External assistance from the World Health Organization (WHO) and the UN Children's Fund (UNICEF) has assisted the improvement of health facilities.

1.14 Education

Education is free and compulsory for 6 -14 years old and free until the age of 18. However, whereas in 1990 there was 93% enrolment of the 6 -18 age group, the rate is now little above 80%. The higher non attendance and drop out rates are attributable to poor maintenance of school buildings and equipment, the emigration of teachers and the pressure on the two-thirds of school age children who live in rural areas to work on the private holdings, where once the collective farm put them into school. Private education is still rare. A high rate of literacy has been inherited and is little below the European average, at 85% (identical for men and women). Graduates have been particularly prone to emigrate, according to a recent study that found that about 40% of Albanian graduates had left the country in the past 10 years.

1.15 Environment

Until 1998, the highest governmental body responsible for environmental issues in the country was the Committee for the Environmental Protection (CEP), as part of the Ministry of Health and Environment. The establishment of the National Environmental Agency (NEA), as a high state body depending directly on the Council of Ministers, represents an important step towards to the institutional strengthening and the process of the consolidation of the governmental structure, responsible of the environmental administration in the Republic of Albania.This step was accompanied by other significant steps, which shaped the structure of NEA and determined the internal regulations of the activity of the Agency and its components. These measures gave way to the strengthening of the authority and role of the Agency, and created the conditions for a normal development of its activity until October 2000, when the Ministry of Environment (MoE) was created.

In the light of the formidable social and economic challenges, Albania began to develop a framework for addressing the environmental problems that have emerged during the last decade. One of the priorities of the Environmental Strategy and National Environmental Action Plan (NEAP) has been the establishment of the respective legal framework, seeing it as an important instrument for the application of the environmental policies in the country.

Environmental monitoring is a weak link in Albania's environmental management chain. The monitoring responsibility is spread across several governmental institutions.

2. NATIONAL GHG INVENTORY

2.1 National GHG emissions in 1994

The greenhouse gases (GHG) inventory for Albania is developed according to the revised 1996, Intergovenmental Panel on Climate Change (IPCC) Guidelines. The base year used is 1994. It considers five main modules of the revised 1996, IPCC Guidelines: energy, industrial processes, agriculture, waste, land use change and forestry. Solvents are analyzed as well. The national greenhouse gases inventory represents emission data for three gases of direct greenhouse effect: CO_2, CH_4 and N_2O as well as the three other gases of indirect greenhouse effect like CO, NO_x and NMVOC. CO_2emissions released from energy and transport, are estimated by using two approaches: Top-Down and Bottom-Up. The estimations show that the difference between two approaches accounts for 3.01%.

Albania's total emissions for 1994 are 7,061.45 Gg of CO_2 equivalent (Tab.1). The estimations indicate that for 1994, CO_2 was the main greenhouse gas in Albania, with a share of 65.33%. (Fig. 2). The main source of CO_2 is energy sector with 62.95%. The main source of CH_4 emissions for Albania is agriculture sector with 77.74%. Moreover, agriculture is the main source of N_2O emissions with 69.45%. Figure 1 shows the shares of CO_2 equivalent emissions from economic sectors. It is noticeable that energy sector is the main source of these emissions with 44%, followed by agriculture sector with 27.12%.

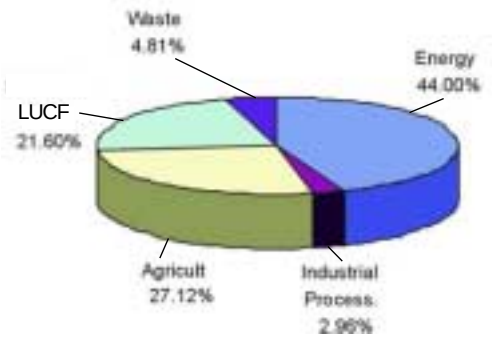


Fig.1 CO_2 eqv., emissions from economic sectors [7,061.45 Gg], 1994.

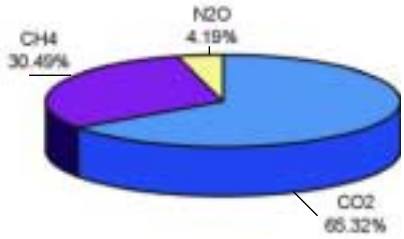


Fig.2 CO_2 eqv., emissions from each gas [7,061.45 Gg], 1994.

Source Category	CO_2	CH_4	N_2O	CO_2 eqv.
Energy	2,902.94	8.16	0.099	3,107.03
Industrial Processes	198.71	0.00	0.036	209.01
Agriculture	0	79.74	0.666	1,915.06
LUCF	1,509.68	0.68	0.005	1,525.27
Waste	0	13.94	0.152	339.65
Solvent Use	0	0.00	0.000	0.00
TOTAL:	4,611.33	102.52	0.958	7,061.45

Tab.1 Anthropogenic GHG emissions by source categories, 1994, [Gg]

Albania has a relatively low level of CO_2 emissions per capita (Fig. 3) and high CO_2 emissions per GDP (Fig.4)

Source: IAE

Fig.3 CO_2 emissions per capita for selected countries 1994, [ton CO_2 / capita]

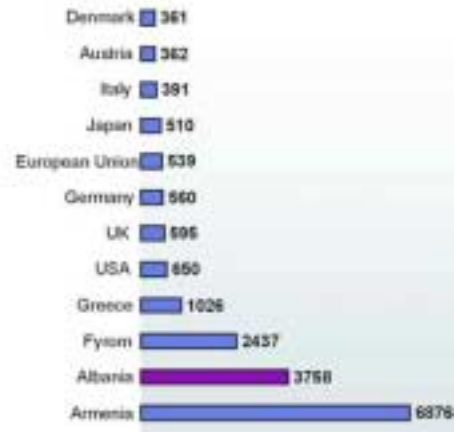


Fig.4 CO_2 emissions per GDP for selected countries 1994, [ton / Million.USD]

CO_2 emissions per capita in Albania are about 4 - 5 times lower than the total average, because: energy consumption per capita in Albania is the lowest between the selected countries; electricity generation is based almost on hydro energy sources (more than 94% of electricity is generated by hydro power plants); different energy services in residential sector like space heating, domestic hot water, and cooking are based almost totally in electricity (residential sector consumes 60% of total electricity); and industry sector went down in 1994 starting from 1990, in terms of energy consumption.

CO_2 emissions per GDP in Albania are about 10 -12 times higher than the average value for industrialized countries because: Albanian technology is very old; productivity of Albania's society is very low compared to industrialized countries; and a big share of energy sources is consumed in residential and service sectors and not in industry sector for producing higher value of GDP.

3. GHG EMISSIONS BASELINE SCENARIO

In terms of CO_2 equivalent, greenhouse gas emissions expected in 2020 from all economic sectors, will reach the amount of 37, 653 Gg, while the largest share towards 2020 is expected to belong to CO_2 emissions with 60%, followed by CH_4 emissions with 29% and then N_2O with 11%.

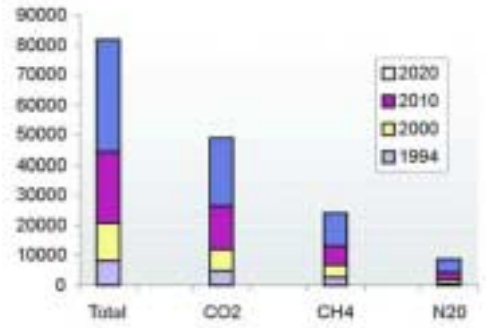


Fig.5 CO_2 eqv., emissions, [Gg]; GHG emissions baseline scenario.

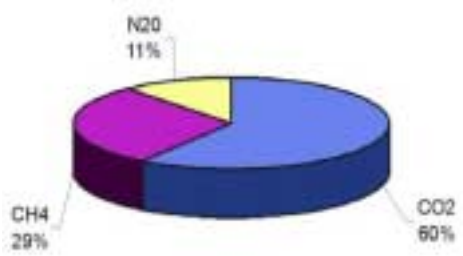


Fig.6 CO_2 eqv., emissions from economic sectors [37,653 Gg], 2020; GHG emissions baseline scenario.

These results indicate that even in 2020, the CO_2 is expected to be the main greenhouse gas in Albania due to energy and transport activities. Referring to the baseline greenhouse gas emissions scenario, it is expected that most of CO_2 emissions will be released from the energy and transport activities, which in 2020, will account for 83% of the total.

4. GHG EMISSIONS ABATEMENT SCENARIO

The greeenhouse gas abatement analysis is mainly focused on energy and transport sectors since these sectors are expected to account for 83% of the total emissions in 2020. The abatement scenario combines the emissions of baseline scenario with changes (i.e reduction) of emissions introduced by various abatement options being evaluated. The abatement scenario assumes a gradual implementation of energy efficiency measures in the household, industry, service and transport sectors which have the highest potential for energy efficiency improvement. The analysis performed shows that introducing measures in demand side gives more results in abatement of greenhouse gases than introducing measures in supply side.

Abatement measures introduced in industry sector are forecasted to have the largest impact on the reduction of greenhouse gas emissions from six economic sectors taken into consideration. The industry is then followed by household (residential) and energy transformation sector. All the proposed measures are given in figure 7.

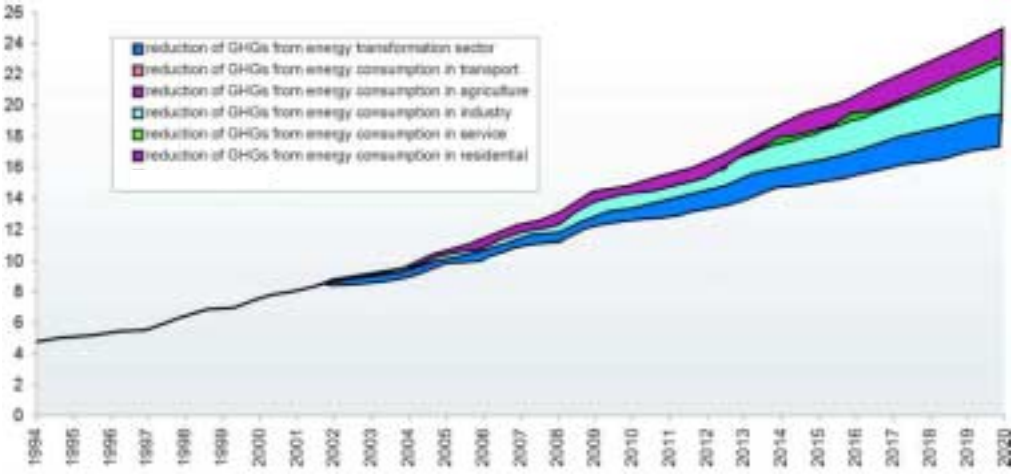


Fig.7 All GHG abatement measures to be introduced in energy consumption and transformation sector. (Million tons of CO_2 eqv.)

The proposed greenhouse gas abatement measures for energy sector, ranked in a decreasing order, as per their reduction potential, are presented in the figure 8.

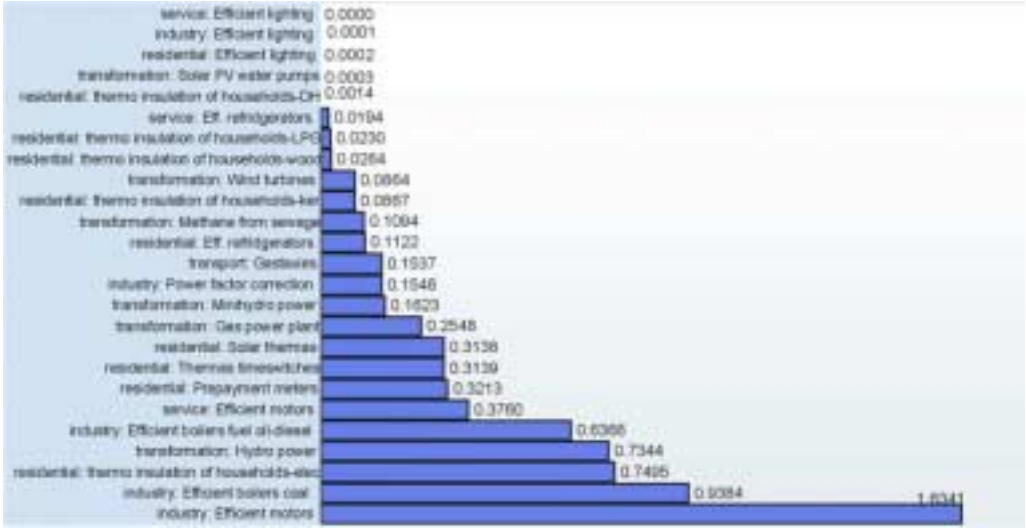


Fig.8 All GHG abatement measures to be introduced in energy and transport sector ranked in decreasing order, 2020, [Million tons of CO_2 eqv.]

The following figure represents the final analysis of comparing the abatement measures based on their cost per unit reduction of CO_2 equivalent.

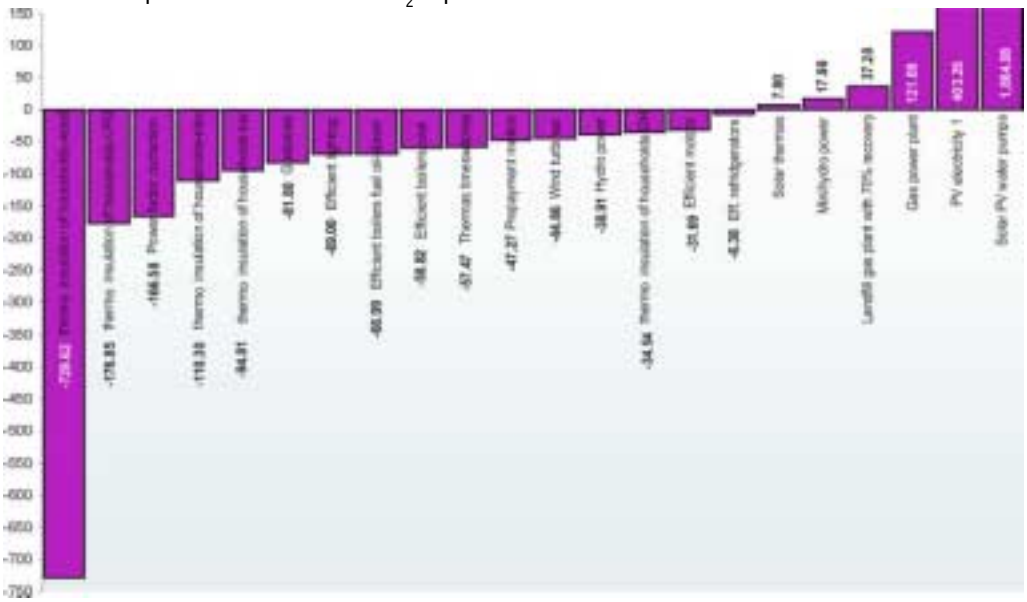


Fig.9 Comparison of selected GHG emissions abatement measures based on their cost of reduction [USD/CO_2 eqv.]

The most effective abatement measures, based on their cost of reduction of CO_2 equivalent , in the decreasing order, are as follows:

- Introduction of thermo insulation of households which use fuel wood as energy source for meeting space heating demand;
- Introduction of thermo insulation of households which use liquefied petroleum gas (LPG) as energy source for meeting space heating demand;
- Improvement of power factor in industrial and service consumers;
- Introduction of thermo insulation of households which use electricity to meet space heat ing demand;
- Introduction of thermo insulation of households which use kerosene to meet space heat ing demand;
- Introduction of gas-taxies versus gasoline taxies;

- Introduction of efficient lighting (incandescent lamps) versus fluorescent ones in house holds / service/ industry sector;
- Improvement of efficient boilers which use heavy fuel oil / diesel as fuel;
- Improvement of efficient boilers which use coal as fuel;
- Introduction of thermas time switches in electric boilers in household sector;
- Introduction of prepayment meters in household sector;
- Introduction of wind turbines versus diesel generators;
- Introduction of hydro power pants versus heavy fuel oil power plants;
- Introduction of thermo insulation of households which use heat generated from district heating plants as energy source for meeting space heating demand;
- Introduction of efficient electric motors in industry / service sectors;
- Introduction of efficient refrigerators in household / service sectors;
- Introduction of solar water heaters versus electric boilers;
- Introduction of mini hydro power plants versus diesel generators;
- Introduction of landfill gas plants of 70% recovery;
- Introduction of gas power plants versus heavy fuel oil power plants;
- Introduction of PV electricity versus diesel generators; and
- Introduction of solar PV water pumps versus diesel pumps.

5. VULNERABILITY ASSESSMENT

5.1 Climate change scenarios

The assessment of vulnerabilities is focused on the assessment of the expected climate impacts in hydrosphere, natural and managed ecosystems, energy, tourism, public health, population. The study area has covered the whole Albanian territory. Three time horizons are considered: years 2025, 2050 and 2100. The expected Climate Change Scenario for Albania (CCSA), including seasonal and annual changes, results to be as indicated in table.2

Scenarios for Albania		Time horizon		
		2025	2050	2100
Winter	temperature (°C)	0.8÷1.0	1.3÷1.8	2.1÷3.7
	precipitation (%)	-1.6÷0	-1.8÷0	-3.7÷0
Spring	temperature (°C)	0.7÷0.9	1.0÷1.5	1.8÷3.0
	precipitation (%)	-2.7÷-1.3	-3.6÷-2.1	-7.4÷-3.4
Summer	temperature (°C)	0.9÷1.2	1.2÷2.0	2.3÷4.1
	precipitation (%)	-8.0÷-5.6	-20.0÷-9.1	-27.0÷-14.4
Autumn	temperature (°C)	0.9÷1.1	1.1÷2.0	2.1÷3.8
	precipitation (%)	-4.3÷-3.4	-11.2÷-2.1	-16.2÷-8.6
Annual	temperature (°C)	0.8÷1.0	1.2÷1.8	2.1÷3.6
	precipitation (%)	-3.8÷-2.4	-6.1÷-3.8	-12.5÷-6.0
Sea level (cm)			20-24	48-61
Cloud cover (%)		-1.3÷-1.5	-2.6÷-2.0	-4.6÷-3.1
Wind speed (%)		0.7	1÷1.3	1.6÷2.3

Tab. 2 Climate change scenarios for Albania

The climate change scenarios for Albania leads to an annual increase in temperature up to 1°C, 1.8°C, 3.6°C respectively by 2025, 2050 and 2100 and a decrease in precipitation up to - 3.8%, -6.1%, -12.5% by the same time horizons. Cloudiness would decrease from -2.6% up to -4.6%

related to the 1990 year by 2050 and 2100 respectively. Wind speed is expected to increase up to 1.3 to 2.3% by 2050 and 2100 respectively related to the period 1961-1990, especially during summer, because of the increase in the land-sea temperature contrast. An increase in the global radiation and the sunshine hours might be expected due to the cloudiness decrease. Evapotranspiration is expected to intensify due to the temperature and wind speed increases. A decrease in the rainy days almost at the same range as the precipitation is expected. The total number of hailstorm days is expected to decrease, although an increase in such days during summer might be expected, owing to the temperature rise.

5.2 Water resources

The outputs of upheal models forecast a small decrease in the long term mean annual runoff, respectively from -9.8% to -13.6% and from -6.3% to -9.1%, for 2025. It would affect the surface water flow, reducing its amount. Under reduced surface water flow and increased evaporation, the storage of reservoirs will decrease.

The ground water supply will be affected by decreased percolation of water, due to decrease in the amount of precipitation, stream flow and losses of soil moisture from increased evapotranspiration. Reduction in ground water supply in combination with the increase of salinity of the ground water supply will bring shortage of adequate quality of drinking water.

A sea level rise of 48-61 cm for 2100 would result in direct flooding of coastal area. Due to the increasing of the sea level, flooding will be intensified both directly by the sea and indirectly by changes in water tables. In non protected lagoons, accretion is expected to occur, following destruction of the low strands separating them from the sea.

5.3 Agriculture

Agriculture will also be affected by expected climate changes. These changes will modify rainfall, evaporation and soil moisture storage leading to an increase of the irrigation requirements and a more decrease of the capacity of reservoirs and irrigation distribution systems. Available water resources will be sufficient for irrigation by 2025. Thus, no considerable impact to the yields of crops like wheat, maize, potato, vegetables, forages (alfalfa etc.) fruit trees etc., may be expected by 2025.

Referring to the other time horizons, 2050 and 2100, the impacts to be expected on agriculture sector are: the reduction of the extent of arable land due to soil erosion and alteration; the changes in the growth cycles, harvest time and the quality of the agricultural production, especially along the coastal area owing to an increase in salinity, due to the sea level rise and intrusion of salt water into the soil; the cultivation of early agricultural products in the open air or in greenhouses owing to an increase in winter temperatures.

5.4 Forests

As regards the forest sector, extensions of vegetation flats are expected by 2025, 2050, 2100. The species that resist high temperatures and severe long dry seasons would be able to over live. 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.

5.5 Energy

Climate change is expected to have significant impacts on the energy sector. The predicted raised temperatures, changes in the amount of precipitation, variation in humidity, wind patterns

and the number of sunny days per year could affect both consumption and production of energy. Climate change is likely to affect the major end uses such as space heating, space cooling, water heating and refrigeration. It is expected an increased energy demand for air conditioning in residential and service sector.

Changes in energy consumption as result of predicted climate changes, will lead also to changes to energy production. Climate changes may be seen primarily in power generation, including hydro power plants, thermo power plants, solar heater systems and wind power plants.

Albania is heavily reliant on electricity production by hydro sources. If a severe drought will happen, it will result in less electricity produced by the hydro power plants. Thus, a heavy reliance of hydro sources may be good for reducing greenhouse gas emissions and improving air quality in Albania, but can increase vulnerability to climate change.

It is expected that the share between hydro power plants and thermo power plants will lead to significant changes. So, in 1990, 94% of the electricity was generated from hydro power plants and only 6% from thermo power plants, while in 2025 hydro power plants are expected to contribute with 47.68% and thermo power plants with 52.32 % of the total.

Climate change may also affect the supply of energy from solar and wind power. A likely increase in the global solar radiation and the hours of sunshine will lead to an increase of solar energy usage for different energy services, especially for preparation of domestic hot water.

Since we are expecting an increasing of the wind speed up to 1.3 to 2.3 %, respectively by 2050 and 2100, compared to the period 1961-1990, it might be of interest to think about introducing wind power plants in the energy schemes in the future.

5.6 Public health

Referring to the likely changes of climate system, a series of impacts on public health are expected. Shortage of drinking water of and inadequate quality could be critical especially during summer. As a consequence, an increase in cases of contagious, digestive system diseases, etc., is expected.

The liquid and solid wastes, if discharged directly into the sea, would destroy or strongly modify the sea flora and fauna. If these problems are not solved, the impact of climate change would lead to the deterioration of the health of the Albanian population, living especially in the coastal zone.

The increase in temperature would affect the physiological and compensatory system of people. Thus, age groups like infants, children and elders where the decrease in compensatory system is common, will have changes in their health conditions. These changes would cause higher incidence of some diseases, influenced by the atmospheric changes. The infections in the respiratory system will be the most visible.

5.7 Population

The population living in coastal area, particularly in beach areas, is seriously threatened by the expected increase in the sea level. The entire dwelling places, hotels, roads and agricultural areas etc., situated in the lower zones of the Adriatic coastal line (excluding the territories under the effect of raising movements) will be flooded. The same lot is expected to affect the agricultural land (in the former swamps of Durrës, Myzeqe, Narta, Vrug etc.) as well as dwelling centers and rural infrastructure, which reach up to 50 cm above the sea level.

5.8 Tourism

Coastal tourism is expected to suffer the vulnerabilities caused by sea level rise. Considering the increase in temperature from 2.8 to 4.1°C during summer, a general inclination of tourism towards the mountains or the lakes, instead of the beaches is expected. The coastal tourism would be more preferable by the end of spring and beginning of fall.

6. ADAPTATION OPTIONS AND RECOMMENDATIONS

A set of adaptation options for each sector has been identified. The adaptation options are identified taking into consideration the principles such as prevention of loss, tolerating loss, sharing loss, changing use or activity, changing locations, research and restoration.

6.1 Water resources

The adaptation measures for water resources and marine waters include the following:

- Modification of existing physical infrastructure;
- Construction of new infrastructure;
- Water pollution control;
- Improvement of the monitoring and forecasting system for flood and drought;
- Drafting and approval of new legislation for water use;
- Setting a real water consumption fee;
- Implementation of the Integrated Coastal Zone Management Plan;

6.2 Natural ecosystems

Various adaptation measures are available to aid efforts to support the conservation of biodiversity in the face of climate change, including:

- The establishment and maintenance of protected areas (in-situ conservation);
- The active management of wild populations outside of protected areas (inter-situ manage ment);
- The maintenance of captive populations (ex-situ methods);
- Monitoring of species;

6.3 Agriculture

To adapt the likely impacts of climate change on agriculture sector the following actions are recommended:

- Afforestation and the setting up of the barriers to protect the arable land threatened by soil erosion and alteration;
- Planning of agricultural production toward xerophilic crops to allow adaptation to the higher temperatures and to the scarcity of water in summer. Agricultural development should be adjusted towards species that would better adapt to the expected soil and atmospheric conditions;
- A significant improvement of irrigation sector;

6.4 Forestry

To adapt the forests against the predicted impacts of climate change the following measures are proposed:

- Preparation of the Strategy on Sustainable Development of Forests;

- Preparation and implementation of the study research programs for forest management;
- Evaluation of the actual situation of each forest in relationship to the expected climate change;
- Increase of the protected forest areas;
- Reduction of the illegal cuttings of forest trees;
- Increase of the investments to implement more actions in existing forests;
- Implementation of the actions to increase the existing forest productivity;
- Increase of the forest area through reforestation;
- Monitoring of the forest health;
- Studying and monitoring of the fire situation in forests;
- Reduction of the wood consumption for energy;

6.5 Energy

The list of the most important adaptation options, especially related to the reduction of water flow on hydro power plants is as follows:

- Consider expected change in runoff / water flow rate in integrated resource planning;
- Account for the expected change in runoff / water flow rate in the design of thermo power facilities;
- Account for the expected change in runoff / water flow rate in the design of hydro power plants;
- Invest in energy conservation (Demand Site Management) measures for space cooling;
- Reduce energy subsidies;

6.6 Public health

To adapt to the impact of the expected changes, it is very important to take the necessary measures like:

- Permanent monitoring of the drinking water quality;
- Permanent monitoring of water supply and sewerage systems affected by salted water corrosion and intrusion in coastal areas;
- Permanent monitoring and drafting of a new law on air quality;
- Improvement of the solid waste collection and treatment technology;
- Compilation of long term plans for the urban development;
- Elaboration of a reliable medical and statistical program that will help in finding the cause consequence (climate changes - health) correlations.

6.7 Population, tourism

As expected by 2025, about 60% of population would be settled in the capital and the coastal area. The major economic sector which is expected to employ 40-50% of the active population in this region will be that of services.To have a good functioning of the services sector, the following measures need to be taken:

- The provision of new potable water supply resources and the construction of new water supply, filtration and distribution systems;
- The provision of new power supply resources and the rearrangement of the appropriate distribution system.
- The construction of new sewage systems for both households and industry, as well as of new processing units for all the urban solid waste

7. NATIONAL CLIMATE CHANGE ACTION PLAN (NCCAP)

Although Albania as a non-Annex I Party has no emission reduction targets under the UNFCCC, attempts to address the climate change issues are made. In Albania, no comprehensive national policy to address climate changes has been adopted to date. During the period of political, economic transformation and the development of a new state, a range of acts, regulations and measures, indirectly related to greenhouse gas emission reduction, are developed and even adopted like: the revised NEAP, Amended Law on "Environmental Protection", Energy Strategy, Strategy of Forestry Development, Urban Waste Management Plan, Strategy of Agriculture, National Action Plan for Health and Environment, Growth and Poverty Reduction Strategy, Biodiversity Strategy, Water Strategy.

Although climate change is not a priority for Albania, the effective implementation of the climate change measures may require the development of response measures that are primarily designed to achieve other development objectives. Fortunately, many mitigation and adaptation measures have multiple benefits and will contribute to the achievement of sustainable development goals.

Albania is addressing mitigation and adaptation measures through NCCAP, which consists on a set of priority actions to integrate the climate change concerns into other economic development plans, which seems to be one of be the most major challenges of this process, aiming at the reduction of the growth rates of greenhouse gas emissions and adaptation to expected climate changes.

The NCCAP is primarily focused on two directions and addresses:

- Measures to abate greenhouse gas emissions;
- Measures for adaptation to the expected climate changes;

Expected outcomes from this NCCAP are the following:

- Reduction of greenhouse gas emissions;
- Reduction of the vulnerability;
- Adaptation to expected climate changes;
- Promotion of sustainable development;
- Reduction of poverty;
- Protection of the environment;
- Institutional strengthening;
- Capacity building on climate change;
- Establishment of the legal framework to address climate change;
- Public awareness on climate change;

The NCCAP is designed in a sectoral approach where adaptation and abatement measures are addressed. A broad range of possible sectoral and cross sectoral issues are addressed and then the most appropriate ones for our circumstances are selected.

The selection of abatement and adaptation options is made on the bases of:

- Cost effectiveness (i.e. low or negative cost per ton of emission reduction);
- Emissions reduction potential (estimated total tons of emission reduction);
- Contribution to other national development goals;
- Technological benefit (potential to gain an early lead in new technologies);
- Level of barriers;

- Potential for GEF or other UNFCCC mechanisms support;
- Contribution to risk minimization;
- Contribution to minimization of economic losses;

The findings of the greenhouse gases inventory, abatement analysis and vulnerability assessment are the basic materials used for the compilation of this plan.

The implementation of the abatement and adaptation measures requires a coordinated action between the Ministry of Environment and other relevant ministries and governmental agencies, non governmental organizations and the public.

The main responsibility in the implementation process of the NCCAP belongs to the Ministry of Environment as the governmental body responsible for environmental administration in the Republic of Albania.

The establishment of Interministerial Climate Change Committee is the main step towards the implementation process of the NCCAP. This action plan is a long term one (up to 2020) and should be reviewed on regular basis, taking into account and monitoring such indicators as: new development plans for the economic sectors, changes in legal framework, state-of-the-art data on climate change, environmental strategy, future developments of the UNFCCC and negotiating process, eligibility of funds from UNFCCC financial mechanisms and other international sources, amount of the funds allocated for the implementation of the plan, level of public awareness on climate change.

7.1 Abatement policies and measures

The objectives of the abatement policy are focused primarily on the energy sector, as the main source category of emissions, which also possesses large abatement potential.

As concluded by the abatement analysis, the measures to be introduced in the energy sector consist in the increase of energy efficiency, increase and improvement of energy savings, use of economic, regulatory and legal instruments for energy efficiency and saving.

The development of a sustainable transport is the focus of the measures to be introduced in the transport sector.

With regard to the forest sector, the main policy goal is the preservation of forests and development of new management options.

In agriculture sector, the main tasks consist in the increase of production efficiency from the improvement of genetic parameters. The reduction of fertilizer amounts and development of ecologically - economically sustainable agriculture are the other main goals.

7.2 Adaptation policies and measures

The aim of the adaptation policy is to develop a climate change policy that is specifically geared towards more vulnerable sectors in the country, to establish a public policy which encourages and supports adaptation at local or community level and in the private sector.

8. PUBLIC AWARENESS, EDUCATION AND TRAINING ON CLIMATE CHANGE

8.1 Public awareness on climate changes

Despite the increasing public awareness regarding environmental issues in general, the issue of climate change in Albania is still relatively dormant, even the level of policy makers do not have

a very good understanding of the climate changes and related issues like, the implications of expected climate changes, potential benefits of the response measures for mitigation and adaptation to climate change and, the importance of meeting the commitments under the UNFCCC and achieving its ultimate objective.

Prior to the start up of the GEF funded project on National Communication, no public awareness activities have been organized in Albania. The preparation process of the First National Communication has also contributed to the enhancement of general awareness and knowledge on climate change related issues in Albania, strengthening of the dialogue, information exchange and cooperation among all relevant stakeholders including governmental, non governmental, academic and private sectors, and building national capacities.

The Project Steering Committee (PSC) meetings and joint efforts of ensuring the support from the governmental institutions for the project, have served as a way of raising awareness among policy makers, who represent different climate change institutions. These policy makers are expected to also provide support for the adoption and implementation of the National Climate Change Action Plan (NCCAP)

The workshops, organized in the frame of the GEF funded project on National Communication, have contributed to the same purpose of awareness raising.

The publication of the main results and findings of the Albania's First National Communication in the recent Status of Environment (SoE) Report and inclusion of the NCCAP into the revised NEAP, are indicators of a higher level of awareness among the environmental policy makers. The establishment of the National Climate Change web page and the publication of the project newsletter have played an effective role in awareness raising about climate change.

8.2 Education on climate change

A similar situation relates to education on climate changes. The level of education is low even for environmental education in general. The recent tendencies aim at including the environmental education into school curricula. Some progress has been achieved, but to a very low extent. Although there is no explicit reference to climate changes, main concepts have been introduced in some curricula of high education.

8.3 Training and capacity building

The project on the preparation of the First National Communication has also contributed to building of national capacities, through the compilation of the national greenhouse gas inventory, greenhouse gas abatement analysis, assessment of vulnerability and adaptation, and compilation of the NCCAP, as well as through the integration of these issues into other sectoral development plans.

The national capacities for the compilation of National Communications are built not only through the learning by doing process, but even through workshops (technical, national, regional, interregional), training and hands-on training sessions, and technical and consultative meetings, held during project phase-I cycle life.

9. PROBLEMS, CONSTRAINTS AND NEEDS

Albania as most of non-Annex I Parties is faced with a number of problems and constraints during the process of preparation of the First National Communication. Despite the fact that Albania has developed the First National Communication and the national capacities are being built, it is still overwhelmed by a number of problems and constraints. These problems and constraints are of institutional, technical, methodological and financial nature and remain considerable concerns, threatening the sustainability of this exercise.

9.1 Institutional problems and constraints

The following problems identified represent the institutional problems and constraints not only for inventory preparation process but for all components of the National Communication, which needs to be overcome and improved. Specifically, the problems identified are: lack of institutionalization and reporting obligations to enforce relevant state and especially private sector for provision data; lack of an appropriate support from the PSC; lack of awareness on climate change issues among different stakeholders; inflexibility of National Execution (NEX) modalities.

9.2 Technical problems and constraints

The technical problems and constraints, identified during the inventory exercise relate to the availability reliability and variability of activity data and emission factors. In some cases the lack of disaggregated activity data and inconsistency with IPCC format was identified. Also, most of the emission factors do not reflect the Albanian situation.

Regarding the abatement exercise, the problems and constraints identified were the lack of appropriate data to perform a quantitative analysis for the following measures (in residential and service sectors) like introduction of central heating (CH) plants, introduction of district heating (DH) plants, introduction of small scale combined heat and power (CHP) and DH plants, in new urban areas. Also the lack of adopted strategies for some relevant sectors and lack of predictions (scenarios) for future development of different sectors were another constraints.

With regard to the vulnerability assessment, the lack of sufficient data because of poor monitoring and the impossibility to develop baseline scenarios for sectors like agriculture, tourism, public health etc., due to the fact that their development before 1990 was dictated by political factors, was also identified.

9.3 Methodological problems and constraints

The methodological problems and constraints identified during inventory exercise relate to the discrepancy on local classification of forests to that of IPCC methodology. IPCC does not reflect the case of burning waste or open dump. Also the lack of a methodology for solvents is another constraint.

Regarding the abatement exercise were identified problems and constraints like: lack of explicit guidelines for abatement analysis; lack of models / software for scenario development for sectors other than energy and transport; lack of training on available models.

Regarding the vulnerability assessment there were identified problems and constraints like: lack of explicit guidelines for vulnerability assessment and adaptation; lack of a finer resolution for MAGGIC / SCENGEN software; lack of methods for simulation of extreme weather events; lack of models to perform a cost / benefit analysis.

9.4 Availability of resources

The lack of previous experience on the preparation of greenhouse gas inventories and abatement and the lack of a trained national team, are some of the constraints identified during the process of preparation of National Communication.

Regarding the vulnerability assessment, lack of experience for such a complex study and lack of appropriate financial resources for development of vulnerability assessment were identified.

CHAPTER I

NATIONAL CIRCUMSTANCES

National Circumstances			
ALBANIA			
Criteria	**1990**	**1994 Base year**	**1999**
Population (million)	3.286	3.202	3.373
Total land (km^2)	28,748	28,748	28,748
GDP total - at current price (USD billion)	2,1	1,9	3,9
GDP per capita - at current price (USD '000)	0,64	0,61	1,17
Share of industry in GDP (%)	37.2	12.5	11.8
Share of services in GDP (%)	12.7	19.8	18.7
Share of agriculture in GDP (%)	40.2	54.6	52.9
Share of transport in GDP (%)	3.3	3.4	3.2
Agricultural land ('000 ha)	704	702	700
Forest area	1,052	1,045	1,026
Urban population (% of total population)	36.1	42.4	47.7
Livestock population (in '000 heads):			
Cattle	616	820	720
Sheep	1,232	1,630	1,435
Pigs	90	98	81
Goats	857	1,100	795
Poultry	2,539	3,642	5,023

Source: INSTAT

1. GEOGRAFIC PROFILE

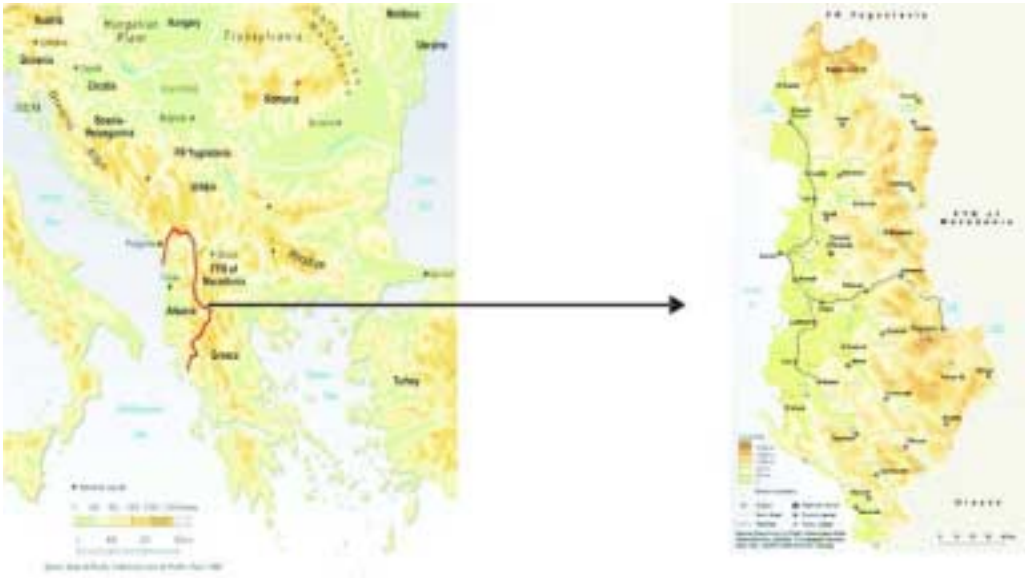


Fig.I.1 Map of Albania

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' (Konispol) and 42º 39' (Vermosh) and 19º 16' (Sazan island) and 21º 40' (Vermik village, Korça).

Albania has a surface area of 28,745 km^2. Its terrain is mountainous, where hilly and mountainous areas make up for 77% of the country's territory and the average altitude of 708 meters is double the European one. It is administratively divided in 12 prefectures, 36 districts, 315 communes and 2,900 villages.

The general length of the state border is 1,093 km, out of which 657 km land border, 316 km sea border, 48 km river border and 72 km lake border. North and northeast, Albania borders with Republic of Yugoslavia, east with Former Yugoslavia Republic of Macedonia, while south and southeast with Greece

Owing to the rugged relief of the land, rivers are torrential with high erosive power. A number of rivers flow into the sea such as Buna, Drini, Mati, Ishmi, Erzen, Shkumbin, Seman, Vjosa and Bistrica. Except Bistrica, which flows into the Ionian sea, the rest of the rivers flow into the Adriatic sea, forming a number of coastal lagoons and swamps. The rivers of Albania constitute 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. CLIMATE PROFILE [1]

2.1 Temperature

Albania belongs to the subtropical Mediterranean climate. It is characterized by mild winters with abundant precipitation and hot, dry summers. The annual mean air temperature has a wide

[1] An assessment of climate situation for a 30 years period (1960-1990) is made.

variation over the territory. These values vary from 7°C over the highest zones up to 15°C on the coastal zone, even in the southwest the temperatures reach up to 16°C (Fig.I.2). Along the lowland, almost a stable distribution of annual mean temperature (12-14°C) is observed.

All the territory is characterized by the negative trend of annual mean temperature. It indicates a negative trend of about 0.6°C for Vlora station, of 0.4°C for Shkodra and of 0.3°C for Korça, during 30 years (Fig.I.2). By analyzing the influence of maximum and minimum temperatures in the variance of mean temperatures, it is found out that the minimum temperature has a very distinguished influence than the maximum one. Thus, this negative trend of mean temperatures comes out as a result of the influence of negative trend of minimum temperatures.

2.2 Precipitation

The mean annual precipitation total over the Albania is about 1,485 mm/year. The highest precipitation total (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 and August. The number of rainy days (>1.0 mm) per year varies from 80-120 days/year. The south-east part of country receives the smaller amount of precipitation (annual value reach up to 600 mm/year), followed by the Myzeqeja field, that receives about 1,000 mm/year. The highest precipitation total is recorded in the Albanian Alps, whereas the values reach up to 2,800-3,000 mm/year. Another center with abundant rainfall is also the mountainous southwest zone, with a precipitation total up to 2,200 mm/year (Fig.I.3). Generally, the annual precipitation total shows a slight decreasing trend (Fig.I.3). It is the consequence of the decrease in precipitation, mainly during winter and spring.

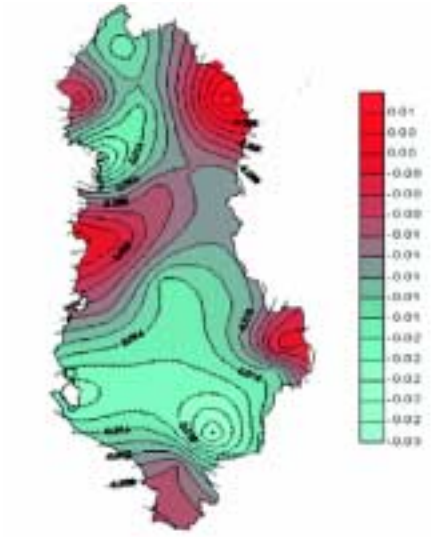


Fig.I.2 Annual temperatures (1960-1990)

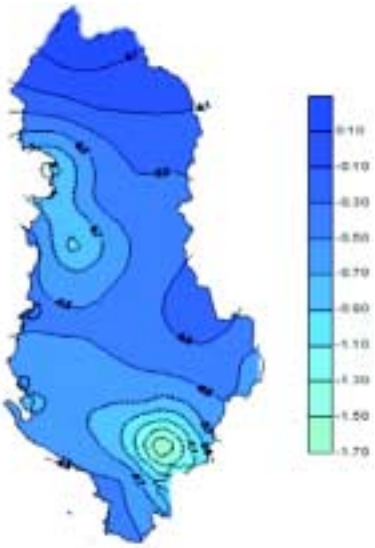


Fig.I.3 Annual precipitation (1960-1990)

An exception from this general trend makes autumn, where coastal stations (Shkodra and Vlora) indicates positive trend of precipitation. While Tirana, Korça and Kukesi stations display a very light decreasing trend.

3. NATURAL RESOURCES

3.1 Water resources

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 discharge 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 106 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. The following table represents long term runoff values for all the rivers discharge into the seas.

River basin	Drin	Mati	Ishmi	Erzen	Shkumbini	Semani	Vjosa	Bistrica	Pavla	Others	Total
Q (m^3/s)	675	87.4	19.8	16.9	58.7	86	189	32.1	6.69	72.1	1,244
Vx10^6 (m^3)	21,287	2,756	624	533	1,851	2,712	5,960	1,012	211	2,274	39,220
Q Discharge (m^3/s); Vx10^6 – Volume (m^3) per year.											

Source: Institute of Hydrometeorology

Tab. I.1 Long term runoff for all rivers discharged into seas

3.1.2 Ground water

Ground water in Albania is present in different sorts of rocks of different ages, from Palaezonic to Quarternary age. It is a very important resource because it is the only 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.

3.1.3 Marine water

Albanian coast is faced by the Adriatic and Ionain seas. Monthly variation in sea level is caused by non uniform influences on the hydrometeorological factors.The highest levels are observed during November - December because strong southern winds present at this time bring about elevation of the seal 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 great 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 the 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 minimal temperatures are observed in February.

3.2 Forestry and land use change

The forests in Albania have always been harvested for wood and non wood products as well as to profit from their functions and without thinking up to nowadays on their role towards CO_2 emissions balance in our earth. Forest harvesting in Albania has begun in ancient times (by Illyrians, Romans and Greeks). Due to over cutting and deforestation, too many forests have already disappeared. The names of some places, such as Shkozet (hornbeam forest), Terpan (forest place), Frasher (ash tree forest) or Orikum (port of wood), give evidence that forests had covered those places.

Mainly the Italian companies conducted the harvesting in the first half of this century. Deforestation and planting of the considerable areas with oranges, olives, fruit tree, agricultural crops, etc., in all districts, was established during the second half of this century.

The Albanian forests covers 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. Also 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 the production and protection role, to meet the needs of consumers for logs (wood industry, construction, etc.), and firewood and to perform other functions (erosion control, biodiversity conservation, relax, tourism, hunting, sports, etc.). The coastal forests perform even a protective function, preventing the salty sea winds from penetrating inland.

In the late of 50's, the plantations with Mediterranean pines (halepp pine, stone pine, seaside pine), and the man made forest massifes like those of Krasta and Mengel of Elbasani, the "Partizani" mountain of Berati, Krasta of Kruja and Miloti, "Large" mountain and Libohova hills of Gjirokastra, moutain of Saranda, the hills of Lezha, mountain of Taraboshi and Lodertunda hills of Shkodra, etc., were planted on lime stone, sandy and clay terns. Also, along the coastal zone a long shelterbelt was established, to prevent the salty sea winds. While, on the ultrabazic lime stone and clay terns, starting from the year 1955, the man made forests massive plantations of black pine are established as the hills of Puka and Fushe-Arrez, the hills of Morava-Korce, etc..

Albania has a hill mountainous relief, where the three-forth of which are hills and mountains and only one-forth is plane. Extension area after elevations is presented in the following figure.

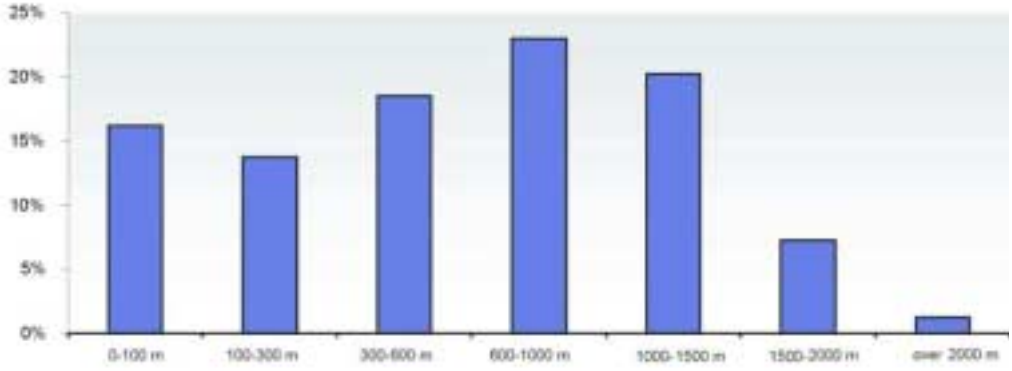


Fig I.4 Extension of land area after elevation

The shares of the land covers in the country for more than 40 years period, are as follows:

Classification	1950	%	1990	%	1995	%	1997	%	2001	%
Land total	28,745	100	28,745	100	28,745	100	28,745	100	28,745	100
Agriculture land	3,91	14	7,04	24	7,02	24	7,00	24	7,00	24
Forests	12,82	45	10,52	36	10,45	36	10,26	36	10,26	36
Pastures	8,16	28	4,17	15	4,28	16	4,45	15	4,45	15
Other land	3,86	13	7,09	25	6,93	24	7,04	25	7,04	25

Source: Ministry of Agriculture and Food

Tab. I.2 Structure of land cover ['000 ha]

During the last 50 years the following phenomena are noticed :

- The arable land up to 1990, has increased and after that decreased, reaching an area of approximately 120,000 ha abandoned arable land. Farmers have refused the abandoned arable land as unappropriate land to be cultivated with crops;
- The share of forests has decreased in the past 50 years due 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 has decreasied 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 forest and pasture areas compose over 50% of the total area of country. At present, the average productivity of forests is about 81 m^3 / ha (compared to 82 m^3 / ha that has been in 1982, with a 10 years deficit of 1,830,000 m^3). The high stem forests have a productivity of 139 m^3/ ha, coppice 35 m^3/ ha and shrubs 29 m^3/ ha, broadleaves high stem forests 158 m^3 / ha and coniferous 108 m^3 / ha.

Although Albania has extensive forests, in the mountainous northeast, where they cover nearly half the territory, 30% have been declared damaged by illegal cuttings during the past ten years. The damages caused by burning and windstorms in forest species is another phenomenon which shows a variation. There is an increase in 1994 referring to 1980, followed by a decrease in 1995 and an increase in 1996. The average damaged surface during 1990 -1996 accounts for 136.7 thousand ha / year. The damage caused by burning and windstorms is different. So, the volume of wood harvested from burning is increased while that from windstorm fluctuates.

4. ECONOMIC PROFILE AND SECTORS

Between 1944 and 1991, Albania's Government was controlled by the Communist Party, known mostly known as Albanian Party of Labor. During this period, the state controlled the economic activity. The private ownership and private enterprise were absolutely forbidden. The communist regime led Albania into deeper isolation.

Towards the end of 80's political upheavals swept across Central and Eastern Europe. Facing mounting political pressure, the Albania's Government restored religious and travel freedom and legalized opposition parties. 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 due 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. Privatization including vouchers for the population to buy a share in the assets being disposed of the growth of small business and a recession for state enterprises, resulted by 1996 in 75% of GDP being generated by the private sector. Rapid growth rates (9% per year during 1993-1996) seemed to confirm the success of the reforms.

However, apart from the growth of farm output following privatization, the achievements were retrospectively superficial. The financial sector remained undeveloped, and the apparent rise in living standards largely depended on remittances from foreign workers, large-scale smuggling and money laundering, as well as illusory, short-term profits from "pyramid" investment schemes. Many people invested all their savings in the schemes and also sold their homes to raise further cash, generating a collapse which began at the end of 1996.

After the collapse the Government aimed at acceleration of banking sector reform and privatization and shifting to the activity of small businesses from trade to production, thereby helping to reduce the high levels of unemployment. The initial impetus for economic growth came first from agriculture and then from services, stimulated partly by domestic demand financed by remittances from abroad. Manufacturing is being sustained by processing for abroad, but industry generally is lagging behind due to the obsolete legacy of communist period. A recovery in mining is being achieved by granting concessions to foreign firms for non ferrous metal ores and oil, exporting products for which world markets are likely to remain strong.

One of the important ways for the revival of the Albanian economy is the continuity of the public sector restructuring.The preparation of the Public Investments Program 1998 - 2001, responded better to the Albanian economy priorities and aimed at supporting the interventions for the stabilization of the crisis, as well as the creation of the necessary basic infrastructure for a normal and sustainable economic development.The share of the value added for economic sectors to GDP is given in the following table:

SECTORS (%)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Industry	37.2	32.1	16.9	13.9	12.5	11.7	12.5	12.4	12.4	11.8
Agriculture	40.2	42.5	54.2	54.6	54.6	54.6	52.8	56	54.2	52.9
Construction	6.6	6.6	7.6	9.1	9.6	10.3	11.4	11.2	12.5	13.4
Transport	3.3	3.3	3	3.1	3.4	3.5	3.3	2.7	3	3.2
Others	12.7	15.6	18.3	19.4	19.8	19.8	20	17.6	18	18.7

Source: Ministry of Finance

Tab I.3 Share of value added to GDP

4.1 Agriculture

Agriculture is the most important sector in Albania, in terms of value added and employment. Agricultural structure and production was heavily affected by the transitional turnover from the centralized economic system to the free market system. However, this sector does still accounts for about 35% of the exports and 40% of employment. It contributes more than half of GDP, but also has the lowest share of services with 22%. The main emphasis remains the production of cereals, however its structure has shifted towards supplying animal foodstuffs instead of human consumption.

Rice cultivation and production after 1990 practically stopped and therefore there are no reported statistical data of cultivation for this crop. Heavily affected by the transition period were the so called industrial plants such as sugar beet, cotton, beans and sunflower seeds whose production after 1990 was drastically reduced or stopped. Olives are considered a suitable product for export. There are around 6 million olive trees of which 4 million are productive. The following tables give an overview of arable production and fruit trees stock and production.

Arable Production	1995	1996	1997	1998	1999
Grains	4,080 (29)	2,710 (22)	3,884 (28)	3,951 (28)	2,720 (25)
Maize	2,160 (30)	2,140 (30)	1,948 (29)	1,891 (33)	2,060 (37)
Potatoes	1,340 (111)	1,315 (106)	1,260 (110)	1,450 (127)	1,619 (141)
Vegetables	6,850 (182)	7,850 (197)	5,500 (189)	6,046 (197)	6,104 (195)
Tobacco	57 (9)	63 (9)	58 (10)	74 (11)	73 (11)
Sugar beet	670 (329)	740 (349)	509 (304)	557 (305)	399 (303)
Dried beans	250 (10)	250 (11)	200 (8)	227 (11)	260 (11)
Fodder	130 (12)	127 (12)	121 (12)	125 (13)	132 (13)
Forage	38,000 (263)	39,700 (235)	36,700 (239)	38,440 (264)	45,000 (285)

('000 quintals; quintals / ha yield in brackets)

SOURCE: INSTAT

Tab. I.4 Arable production

	1995	1996	1997	1998	1999
Apples, pears, peaches & figs	4,061 (52)	4,012 (58)	4,107 (55)	5,147 (53)	5,160 (54)
Citrus	407 (4)	361 (3)	296 (3)	335 (2)	332 (3)
Grapes (pergola)	3,126 (38)	3,370 (40)	3,665 (45)	4,261 (40)	4,366 (41)
Grapes (ha of vineyard)	4,342 (18)	4,345 (19)	4,121 (22)	5,029 (28)	5,377 (29)
Olives	2,799 (39)	3,084 (28)	3,209 (33)	3,468 (47)	3,564 (42)

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

Source: INSTAT

Tab.I.5 Fruit tree stock and production

Particularly after 1992, the agricultural sector was heavily affected by input and foreign exchange shortages, social upheavals linked to the privatization of cooperative land and assets throughout the country and disruptions caused by the absence of an alternative mechanism to replace the collapsing centralized planning system. Social and economic chaos led to rapidly falling standards of living for the vast majority of the population, but especially in poor rural areas.

4.1.1 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. The anticipated continuous increase can create problems for the environment in the future, because the density of livestock per hectare of land is already very high. The high density of small ruminants in pastures and forests causes similar problems. An overview of the state of the livestock, their number and production are given in the following tables:

	1992	1993	1994	1995	1997	1998	1999
Cattle	616	655	820	840	806	705	720
Pigs	90	93	98	100	98	83	81
Sheep	1,232	1,415	1,630	1,736	1,453	1,395	1,435
Goats	857	948	1,100	1,150	895	764	795
Poultry	2,539	3,359	3,642	3,900	4,108	4,862	5,023

Source: INSTAT

Tab.I.6 Number of livestock ['000 heads]

	1995	1996	1997	1998	1999
Cattle	56	59	59	58	61
Pigs	20	9	10	10	10
Sheep & goat	37	33	31	33	35
Poultry	4	4	4	5	5
Wool (tones)	4	3	3	3	4
Milk (000 liters)	968	1,044	850	861	906
Eggs (million)	285	314	337	397	414
Honey (ton)	450	705	633	805	906

Source: INSTAT

Tab I.7 Production ('000 tones, live yield unless otherwise indicated)

4.2 Mining

Albania is rich in mineral resources, especially chromium, copper and iron-nickel. Before 1990, the mining sector accounted for a substantial share of export earnings, and Albania was the world's third largest producer of chrome ore. Albania is the one of countries in Europe with significant chrome reserves per capita. Production collapsed during the periods of insurgency in 1991-1992 and 1997.

The mining industry's workforce was halved to around 10,000 following the earlier outbreak, and the neglecting of mines that were already in poor conditions has resulted in further damages. Chrome mining and semi processing is based in the Dibra and Mat districts, copper in Mirdite and Puke, iron-nickel in Pogradec, nickel - silicate and coal in Korce, and phosphorite in Tepelene.

Like most of Albania's industry, the mining sector has been handicapped by obsolete equipment and technology and a lack of management expertise, as well as the disruption of production and supply lines caused by civil unrest. Production methods are labor intensive and referring to EU standards, often dangerous. Since the mid 90's, successive governments have laid their hopes on foreign assistance to help turning around the mines. Oil extraction is located in Fier, Lushnje and Kucove districts. The largest refinery is located in Ballsh district. Albpetrol, the former state oil company is undertaking a loan of USD million 250 investment program to rehabilitate existing oil wells and to explore new offshore wells. The following table provides data on minerals outputs:

Energy source / Minerals	1995	1996	1997	1998	1999
Energy					
Crude oil	521	488	360	365	323
Natural gas (m^3N)	28	23	18	17	14
Electrical energy (GWh)	4,414	5,926	5,184	5,068	5,396
Chromium ore	243	236	157	150	79
Copper	258	188	25	55	34
Lignite	120	113	40	49	33

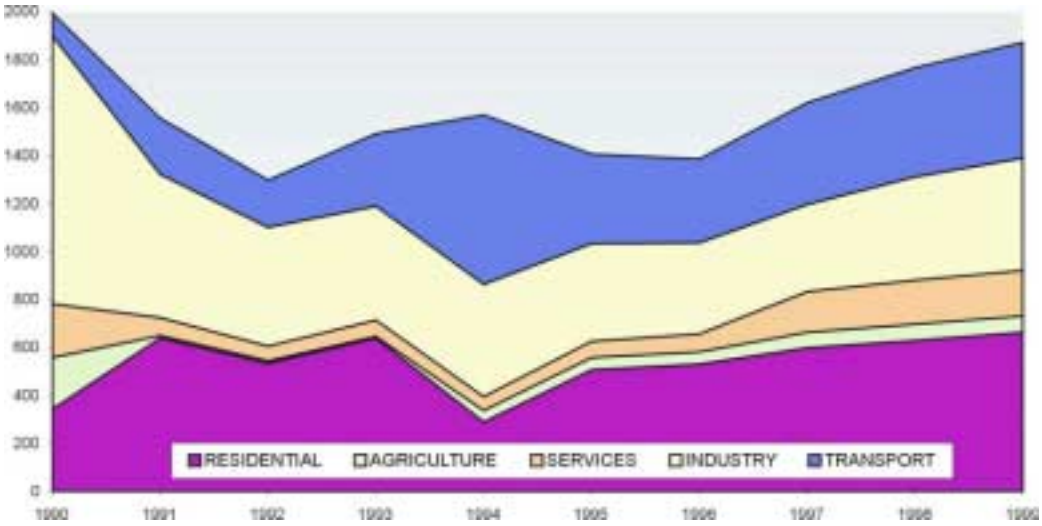
Source: INSTAT

Tab. I.8 Minerals production, state sector ('000 tons unless otherwise indicated)

4.3 Energy

4.3.1 Energy consumption

From a historical peak of 3.3 MTOE in 1989, when all the Albania's economy operated in its full capacity, the primary energy supply dropped by more than 50% or to 1.5 MTOE in 1992. Since then, the primary energy supply has remained relatively constant around the level of 1.6 -1.7 MTOE. The most drastic effects are however, the structural changes that have taken place as regards the shares of energy sources on the supply side and the final energy consumption by sectors and fuels. The following figure shows the change in the structure and level of energy consumption for all sectors of the country economy during the period 1990 - 1999.



Source: National Agency of Energy, 2000

Fig. I.5 Final energy consumption 1990-1999. [' 000 kTOE]

When focusing on the changes as regards the household's use of energy, the findings of a household energy survey[2] are striking. The structure of the consumption has changed especially in the urban areas where electricity now accounts for 60% of total consumtion or twice as much as fuel wood. In rural areas, the historic strong position of fuel wood is still prevailing, since almost 60% of total consumption is met by fuel wood and 30% only by electricity. The remaining consumption is mainly met by LPG and kerosene.

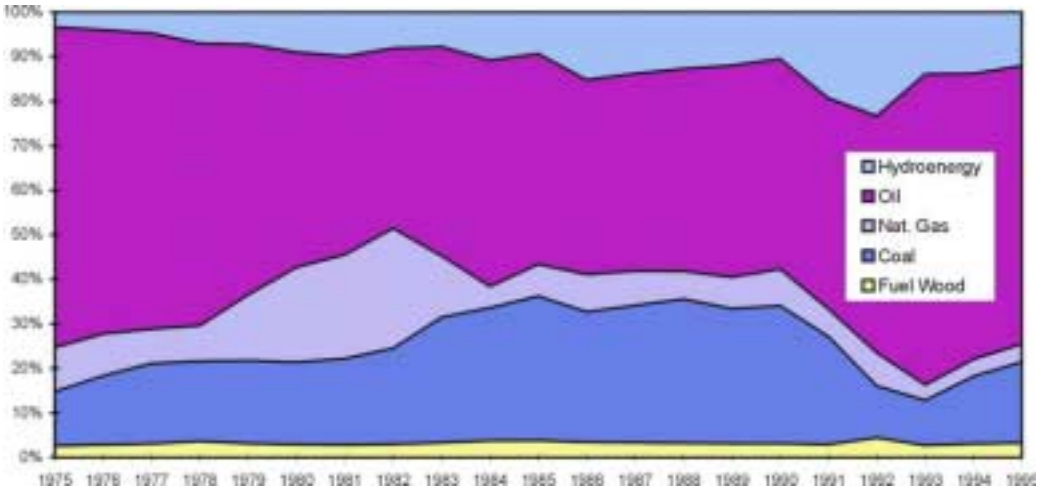
Lack of other beneficiary energy alternatives and other supportive frameworks has led to a boom in the use of electricity for space heating. The governmental decisions for fiscal facilities of the liquefied gas are a right step to well orient the policy of energy resources prices. The traditional way of heating only one room (typically by means of a stove) is rapidly changing into a completely new situation, where more or less all rooms are being heated by means of electric radiators, heat pumps, fans, etc., most of which have a minimal economic effectiveness.

4.3.2 Energy supply

The energy sector has historically played an important role in the Albanian economy. Albania was largely self sufficient in energy resources and most by 1989 has been a net exporter of electricity and refinery oil by products. Albania was rich in energy resources like 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.

The figure I.6 presents the primary energy sources shares for the period 1975 - 1995. It results that the share of fuel wood has been relatively constant (approximately 2.95%), that of coal has been increasing from 12.23% in 1975 to 32.4% in 1989, while afterwards it started to drastically decline to 10% in 1993. The share of natural and associated gas has been increasing from 9.4% in 1975 up to 26.9% in 1982, before the dramatic blowout of Krahas (Ballsh district) well in the subsequent year, which practically destroyed this industry and interrelated industries. As for the oil and its derivatives, their contribution has been decreasing from 72% in 1975 to 40.53% in 1982. Afterwards, during 1982 - 1990, their contribution has been stable with 47% with a tendency for increasing in the subsequent years. As for the hydro power, its contribution has been continuously increasing from 3.27% in 1975 to 14% in 1990.

[2] All figures and estimates are provided by a Household Energy Survey undertaken by the National Committee of Energy during October - November 1997. The survey comprised visiting and interviewing more than 1,600 families in three cities, (Tirana, Shkoder, Korca) and three villages (Gosa, Maqellara and Borshi)



Source: National Agency of Energy, 2000

Fig.I.6 Primary energy sources share, [%]

Ultimate recoverable oil resources are estimated to be as great as 450 Mt, out of which 340 Mt in sandstone deposits and 110 Mt in limestone deposits. Proven oil reserves are estimated as about 29 Mt. The total capacity of the oil refineries is 2.5 Mt per year, which is spread out among four refineries placed in the traditional places of the crude oil production (Cerriku, Fieri, Kucova Ballshi). Cerriku and Kucova refineries are closed after 1990, while Fieri refinery is working with the 20% of its capacity.

By the beginning of 1991, not with standing the slowdown in economic activity, Albania became a net importer of light distillates and this trend seems likely to be reinforced in the future with the foreseen vigorous growth of the transport sector.

Coal is one of Albania's most important energy resources. Total proven reserves based on geological data have been variously estimated between 350 and 720 Mt.

The total hydro power capacity surveyed in detail to date, amounts to about 2,850 MW with an annual generation potential of about 11.5 TWh.

Renewable energy sources in the form of hydro power and forest biomass already account for a very large share of Albania's total domestic primary energy production: 36% in 1989, a year when the economy was at its full operation capacity.

The country's needs for electricity are met mainly by the hydro power plants and in a small scale, by the thermo power plants. The hydro power plants provides about 94% of the produced electricity, while the rest is produced by thermo power plants that use residual fuel oil as fuel and in special cases use steam coal. Except of the thermo power plant in Fier, which actually operates the others are closed down. The electricity produced by these thermo power plants reached 10,1% of the overall production in 1990, 6% in 1996, 3% in 1997, while in 1998 the production was only 1,6%. The total production capacity is 1,662 MW, where hydro power plants have a capacity of 1,444 MW.

Drought in the last years reduced water levels for power generation (the Drini river, supplying 95% of hydro power, was at its lowest level for the last 30 years) to the point of severe and frequent power cuts last years.

A clear vision on the electricity supply and consumption in Albania is given in table I.9.

	1995	1996	1997	1998	1999	2000
Total supply	4,616.8	6,263.5	5,895.1	6,166.3	6,509.1	5,810.5
Domestic production	4,477.9	5,778.8	5,183.8	5,067.4	5,396.4	4,738
Thermo power plants	171.2	206.3	157.5	82.7	112.7	143.0
Hydro power plants	4,305.6	5,571.4	5,025.6	4,971.7	5,283.5	4,594
Other (pilot enterprises)	0.0	1.1	0.7	13.0	0.2	1
Import	138.9	484.7	711.3	1,069.9	1,112.7	1,072
Total use	4,616.8	6,263.5	5,895.1	1,069.4	6,509.1	5,810.5
Export	213.0	1,407.5	839.2	690.4	754.6	110
Network losses	2,347.3	2,547.6	2,913.1	3,180.3	3,047.5	3,031
Used by domestic consumers, of which:	2,056.5	2,308.5	2,142.8	3,180.3	2,707.1	2,641
Industry	505.5	540.8	364.6	383.1	453.6	546
Agriculture	39.1	46.2	26.2	29.3	34.5	41
Population	882.5	1,093.5	1,104.2	1,239.2	1,501.1	1,664
Others, not specified	629.4	628.0	647.2	627.3	717.8	390

Source: Ministry of Industry & Energy

Tab.I.9 Data on the electricity supply and consumption; [GWh]

4.4 Transport

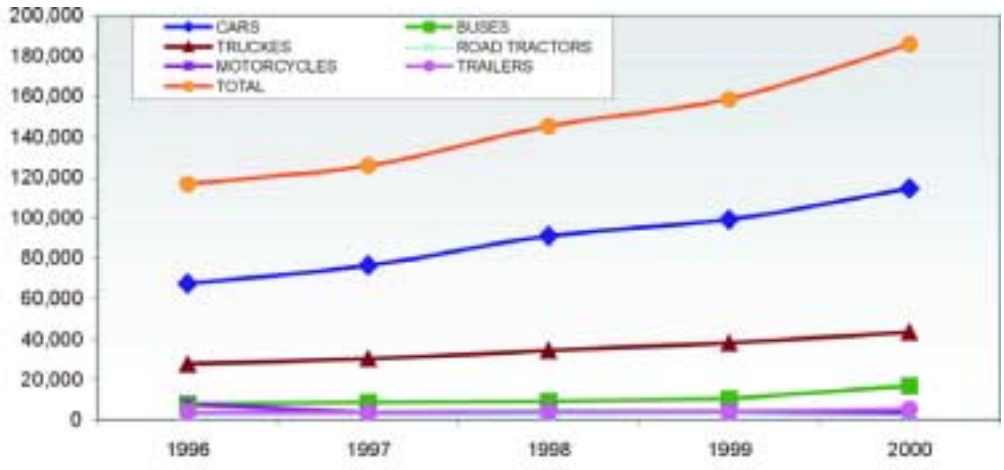
4.4.1 Road transport

Actually, the largest part of transport of goods and passengers is realized by the road transport. The country's 18,000 km of roads (only 6,000 km of which are paved) were constructed according to the engineering standards of the 1930 or earlier and some sections, such as the road from Durres to Kukes were damaged during the Kosovo conflict, due to heavy usage by NATO forces.

A rapid expansion in private car ownership, which had been prohibited in the communist era, had already placed great pressure on the road network. A direct consequence of the rather impetuous development of this sector is the large amount of various kinds of wastes (metallic skeletons, batteries, used car oil, etc.) generated every year and the increase on national scale of the number of accidents caused by vehicles.

On the other hand, a negative consequence that should not be neglected is the engine power of the vehicles imported recently. There is a preference that among various types of imported cars, the first place regarding the quantity is occupied by the vehicles of high engine power (from 1,500 to 2,500 cm^3), which means that they are vehicles, which consume a relatively large amount of fuels, and consequently they emit in the air larger amounts of pollutants.

Since the end of the war in Kosovo, NATO has rebuilt the roads that it used to supply its operation in the province, and western governments have offered funding for several other road construction projects.



Source : INSTAT

Fig.I.7 Road transport stock development

4.4.2 Railway transport

There are 447 km of mainline railway and 230 km of branch line in Albania. The rail network deteriorated greatly in the 1990, particularly in the early part of the decade, when the track and signaling wires were plundered for scrap.

Although the antiquated rolling stock is being updated with coaches donated by Italy and Austria, the poor quality of the track has restricted speeds to 40 km/h for passenger trains and 25 km/h for freight trains. However, following an assessment of the commercial viability of the railway network in 1998, the Government of Albania rejected the idea of closing it down and decided instead to rehabilitate and extend it. Albania's rail link with the European network, via Montenegro, has reopened.

4.4.3 Marine transport

There are two major sea ports, both being refurbished. The largest of these ports is at Durres, which has roll-on / roll-off ferry facilities. The smallest 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.

4.4.4 Air transport

Until the Kosovo air strikes, the only commercial airport was “Mother Teresa”, located in Rinas, near Tirana. It was partly rebuilt by funding provided from NATO, SIEMENS, and is being completed with US funding. Its access roads have also been improved according to international parameters.

4.5 Industry

Since 1994, the industry has accounted for a steady 12% 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 "proletarian" 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. Tirana, which contributed one-third of Albania's industrial output, had spare parts (notably for tractors), textiles and the country's sole pharmaceutical plant. Elbasan had a large chemical-metallurgical complex. Durres had mechanical and electrical engineering, small shipbuilding and chemical industries. Shkoder had copper wire and cables industry. Vlore produced electric light bulbs and chemicals while Korce was a centre for textiles and garment making. Among smaller locations currently in production, Kruje has cement and fertilizer production, Pogradec knitwear, Berat textiles and Gjirokaster footwear. The product mix greatly altered during the 90’s.

The equipment and manufacturing plants inherited at the start of the decade had mostly been supplied firstly by Soviet Union and then by People’s Republic of China, little of which proved internationally competitive, when Albania was opened to world markets.

Subcontracting for abroad has given new life to food, beverage and leather goods. Aggregate growth has been positive since its falling after the disorders of 1997, and was 5% in 2000.

4.6 Tourism

Tourism in Albania is only at a very early stage of development. However, Albania exhibits considerable potential for the development of tourism, because of its extensive coastline, the interesting scenery of Albanian lakes and mountain regions and the generally perfect countryside.

Tourism offers significant, although as yet largely unexploited opportunities for development. Its attractions include the largely unspoiled coastline, parts of which would be suitable for beach tourism, the rugged mountains and many antiquities, in Butrint, Apollonia and Durres. All but hardies, tourists have been deterred so far by the poor tourism infrastructure.

Tirana has many modern hotels, which have been refurbished with business travelers in mind. There are hotels of different standards there in Durres and along the Adriatic coast. During the last years substantial investment schemes for tourist facilities are launched at all tourist areas.

4.7 Fisheries

Fishing, as one significant activity in the coastal and inland waters, constitutes an important source of income and food for the inhabitants of the area and the population in general.

According to the data sources we can not speak about over fishing in our country, since there is no sufficient information on this issue, but there is uncontrolled fishing, which greatly damages the fish reserves.

Fishing is mainly organized in the continental shelf, which in the Adriatic sea extends to 25 miles and in Ionian sea to 2-3 miles. In the north of the country the shelf that is more suitable for trawl fishing to the isobar 300-400 m, prevails an important area for fishing. In the south, the depth of 200 m starts very close to the coast and has a lot of rocks along it, which makes the trawl fishing difficult.

The main species for fishing are sardines, anchovy, mullet, wrasse and some species of crustaceans. The fishing fleet comprises approximately of 155 boats, that are concentrated in four main ports: Durrës, Shëngjin, Vlora and Saranda.

5. RESOURCES AND INFRASTRUCTURE

5.1 Population profile

Actually the Albanian population counts 3,4 million inhabitants (without those who lives 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 reurbanization and the overpopulation are the main existing problems at local level in Albania. The emigration of Albanians abroad is higher than the other countries of the Central and Eastern Europe. A clear vision on the share of population is given in the following table:

Years	Total Population	Urban		Rural		Density
			%		%	Capita / km²
1923	804	128		676		28
1950	1,215	249	20.5	966	79.5	42
1960	1,607	474	29.5	1,133	70.5	56
1970	2,136	680	31.8	1,456	68.2	74
1980	2,671	897	33.6	1,774	66.4	93
1990	3,286	1,176	36.1	2,080	63.9	114
1992	3,190	1,165	36.5	2,024	63.5	111
1993	3,167	1,314	38.2	1,852	61.8	110
1994	3,202	1,345	42.4	1,857	57.6	111
1995	3,249	1,381	42.4	1,868	57.6	113
1996	3,283	1,445	44.0	1,838	56.0	114
1997	3,324	1,526	45.9	1,798	54.1	115
1998	3,354	1,543.0	46.0	1,811	54.0	116
1999	3,373	1,555.2	46.1	1,818	53.9	117
2000	3,401	1,598.6	47.1	1,802	53.0	118

Source: INSTAT

Tab. I.10 Annual average population ['000]

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 the urbanization growth, though it is a natural tendency, is presented very contradictory by 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 facing these movements economically and socially. Thus, the phenomenon of reurbanization 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 at working age, changing the balance in the job market, often by increasing the 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. The population migration has resulted 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.

5.2 Public health

The universal provision of healthcare was a state obligation under communism. In 80's, there were about two doctors or dentists and four hospital beds for every 1,000 inhabitants. However, this policy denied doctors access to adequate medical equipment or modern pharmaceuticals.

The healthcare system deteriorated after the fall of communism, mainly owing to funding pressures. The number of functioning healthcare facilities fell from 129 per 10,000 inhabitants in 1990 to a low of 85 per 1,000 in 1994, and the number of hospital beds declined from 58 to 30 per 10,000 inhabitants. External assistance from the WHO and the UNICEF has improved health facilities and thus it is reflected in infant mortality decrease to 26 per 1,000 live births by

1999, after rising from 31 in 1985 to 43 in 1994. Life expectancy estimated by the United Nations, has raised from 71.6 years in 1990 to 73.7 in 2000, still some way below the average for southern Europe (77.0).

Nearly all the population has access to a reduced water supply, accompanied with sanitation problems.The drainage of the marshes has eliminated malaria. Tuberculosis and endemic syphilis have also been eradicated. Deaths from cancer and AIDS are the lowest in Europe. Deaths from road accidents are high, because cars are poorly maintained, driving standards are low, and the roads are in a bad condition.

There is also a tendency for people to travel abroad for diagnosis and treatment, including for ailments that could be treated here given the professional level of Albanian doctors.

Health service is structured in all levels: primary (which mainly belongs to ambulatory health service), secondary (with hospital in each city), and thirdly (University Hospital Center "Mother Teresa" of Tirana).

	1994	1995	1996	1997	1998	1999
Hospitals	51	51	51	51	51	51
Medical centers without beds of which:	2,733	2,507	2,437	2,439	2,327	2,364
Clinics	58	53	53	53	50	52
Health centers	702	622	637	639	631	634
Ambulances	1,973	1,832	1,747	1,747	1646	1,678

Source: Ministry of Health

Tab.I.11 Patient health care indicators

5.3 Education

Education is free and compulsory for 6 -14 years old and free until the age of 18. However, whereas in 1990 there was 93% enrolment of the 6-18 age group, the rate is now little above 80% for both, girls and boys. High rates of non attendance and drop out are attributable to poor maintenance of school buildings and equipment, the emigration of teachers and the pressure on the two thirds of school age children, who live in rural areas to work on private holdings, where once the collective farm put them into school. Schools located in urban areas are over crowded and work double shifts.

Private education is still rare. Schools teaching in Greek or Macedonian have been opened. A high rate of literacy has been inherited and Albania is very close to the European average, at 85% (identically the same for men and women).

Tirana University and Polytechnic University are the largest high education institutions in Tirana. Also in other districts of Albania there are about 10 more high education institutions. Graduates have been particularly prone to emigrate, according to a recent study that found that about 40% of Albanian graduates have left the country in the past 10 years.

6. ENVIRONMENT

6.1 Environmental 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 NEAP[3] has been the establishment of the respective legal framework, it as an important instrument for the application of the environmental

[3] A revised National Action Plan is adopted by the Government of Albania in early 2002.

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 1997-1998, major legal documents such as the Constitution and the amendments of the law on "Environmental Protection" were developed.

The adoption of the Constitution of the Republic of Albania in November 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 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 No. 8364, dated 02.07.1998, amended the basic law on the "Environmental Protection" of 1993. This law addresses the full spectrum of the 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 2002, five SoE reports have been published.

During 1998-1999, other laws and by-laws were adopted to assist in a more qualified work for the environmental protection and administration. Worth mentioning is the law on "Urban Planning" (No. 8249, dated. 7.10.1997, which amended the law of 1993) and the respective regulation to enforce this law. Other important decisions, approved by the Council of Ministers, cover specific issues such as "The obligatory collection and the depositing of abandoned vehicles (No. 776, dated. 08.12.1998); decision on "The approval of the Waste Management Plan" that creates real premises for the treatment of urban waste, according to the contemporary technologies in 6 main cities of Albania, etc.

6.1.1 Major environmental laws of Albania

- Law on land and its distribution (1991);
- Law on forests (1992);
- Law on city planning (1993, amended in 1998);
- Law on environmental protection (1993, amended in 1998);
- Law on forest revenue (1993);
- Law on plant protection (1993);
- Law on the development of areas of tourism priority (1993);
- Law on the protection of medicinal and taniferous plants (1993);
- Law on construction, administration, maintenance, and operation of water and drainage systems (1994);
- Law on hunting and wildlife protection (1994);
- Law on mining (1994);
- Law on fishing and aquaculture (1995);
- Law on pastures and meadows (1995);
- Law on protection by radioactive radiation (1995);
- Law on the protection of fruit trees (1995);
- Law on public waste removal (1996);
- Law on water resources (1996);
- Law on water supply and sanitation regulation (1996);

6.2 Institutional framework

Until 1998, the highest governmental body responsible for the environmental policy in the country was the Committee of Environmental Protection (CEP), as part of the Ministry of Health and

Environment. The inclusion of CEP within the structure of the Ministry of Health was not in conformity with the interministerial nature of its fundamental functions.

The establishment of the National Environmental Agency (NEA) in 1998, as a high state body depending directly on the Council of Ministers, represents an important step in the institutional strengthening and process and consolidation of the governmental structure, responsible of the environmental administration as well. This step was accompanied by other essential steps, which shaped the structure of NEA and determined the internal regulations of the activity of the Agency and its components. These measures gave way to the strengthening of the authority and role of the Agency, and created the conditions for a normal development of its activity, until October 2001, when the Ministry of Environment (MoE) was created.

The MoE's principal functions are to:

- Define the nation's environmental strategy;
- Develop and implement nationwide environmental protection efforts, including steps to pro tect environmental media (e.g., land, air, water, biodiversity);
- Approve admissible limits for gaseous, solid and radioactive pollutants discharged into water, air and soil as well as harmful and toxic substances; and
- Coordinate activities with other governmental institutions responsible for environmental protection;

Today, despite the MoE's efforts, the pace of environmental protection and improvement remains slow. Revenues from fines and licensing fees are inadequate to fund important environmental investments. Plans to develop "eco-tax" were considered but not enacted.

Several other governmental entities have significant environmental policy roles: Ministry of Agriculture and Food, Ministry of Transport and Telecommunications, Ministry of Industry and Energy, Ministry of Health, National Water Council, Public Health Institute, Institute of Hydrometeorology Institute, Council on Territorial Adjustment and Institute of Soil Research.

Environmental monitoring is a weak link in Albania's environmental management chain. Responsibility of monitoring is spread across several governmental institutions. A result of this dispersion of responsibility is that data collection is often redundant and lacking in standard methodology.

6.3 Environmental situation

6.3.1 Waste

The absence of waste management is quite evident and extremely serious problem in Albania. After 90's, the country's production of solid waste grew significantly. A variety of imported products entered the Albanian market, rapid population growth, urbanization and a boom in construction put new significant stress on an already weak waste management system.

There are no properly managed dump sites or incinerators, no waste reduction targets and no monitoring programs to date.

Actually in Albania the urban solid wastes are disposed in open dumps only. The industrial and hazardous waste management is a serious problem as well. In many cases these wastes are stored without adequate safeguards and monitoring systems. Industrial and urban waste waters are discharged directly into surface waters, without any treatment.

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 waste supply. Monitoring is conducted for some fifteen physical and chemical parameters. A National Water Strategy is drafted in 1996 but not yet adopted by the Government.

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 were closed.

Today the major sources of air pollution are oil extraction and refining, mobile sources, district heating plants, domestic heating, cement production and unregulated garbage burning.

The mobile sources are increasing their contribution to air pollution. In 1989, there was a total number of 2,000 cars, in Albania. In 2000, there is a total of 120,000 cars nationwide. The fleet is generally old and uses leaded gas or diesel fuel. This rapid increase has lea to higher quantities of CO_2, N_2O, CH_4, NO_X, SO_2, CO, and particulate matters. There is not any air monitoring system within the country.

6.3.4 Soil

Soil erosion is a serious concern in Albania. The country's mountainous topography and weather patterns are natural causes of erosion. Human activity (e.g dredging of rivers for construction materials wood cutting, mismanagement of terraces, overgrazing,) is accelerating the problem and producing severe consequences. River dynamics are altered with negative impacts on water quality and flow regime.

6.3.5 Biodiversity

The mountainous relief, the different geological straits and tips of soil, overlapping of Central Europe with Mediterranean climate are the main factors for having such an ecosystem diversity and biodiversity (around 3,250 plant species live in Albania). Some of the 30% of the European plant species, and 42% of the European mammals can be found in the country. Albania's variety of wetlands, lagoons and large lakes also provide critical winter habitat for migratory birds.

Today Albania has one of the highest rates of biodiversity loss in Europe. Deforestation, soils erosion, uncontrolled land use, and pollution. All of these activities are rapidly destroying precious resources. Unsustainable levels of hunting, fishing and grazing are also threatening diversity. 36% of the country 's vertebrate species are endangered or threatened. Efforts are made to establish protected areas. 6% of the country is set aside for this purpose. Unfortunately, even the biological integrity of these areas is compromised several times by illegal activities. Also, monitoring of these zones is inadequate and management plans do not yet exist.

In 1999, a National Strategy on Biodiversity and a respective Action Plan was developed, under the GEF financial assistance. The Government has adopted the plan and started the implementation process.

6.4 Public awareness

There is a great need for improvement of environmental awareness in Albania. Given the country's economic hardships and civil disruptions, the attention has been focused on other concerns. The result today, however, is that Albanian citizens generally are not enough informed about the

risk of pollution, the relationship between the environment and public health, and the benefits of a clean environment to the economy and society, as a whole.

An information center for environmental issues is created within MoE. The publication of the SoE reports and other informational tools has helped build understanding of the country's environmental challenges. Environmental education in the country today is poorly funded and is only reaching a limited number of young Albanians.

The growth of the Albanian's environmental NGO community is a promising development. At present, however, the NGOs intend to be concentrated in Tirana. In several cases, they serve more as professional associations than as activist organizations. Environmental advocacy is not a firmly established approach.

CHAPTER II

NATIONAL GREENHOUSE GASES (GHG) INVENTORY

In accordance with Article 4 of the United Nations Framework Convention on Climate Change, "...all Parties, taking into account their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances, shall…develop, periodically update, publish and make available to the Conference of the Parties...national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, using comparable methodologies to be agreed upon by the Conference of the Parties."

The following chapter provides an inventory of greenhouse gases emissions and removals by sinks for Albania, developed for the base year -1994. With the purpose of revealing the dynamics of greenhouse gas emissions and removals by sinks, the calculations for period (1990-1994), are performed for energy sector only. The following greenhouse gases inventory is the first one for Albania, developed in the framework of the GEF funded project titled: "Enabling Albania to prepare its First National Communication in response to its commitments to UNFCCC".

1. METHODOLOGY

The greenhouse gases inventory for Albania is developed according to the 1996 revised IPCC Guidelines. The national greenhouse gases inventory for Albania considers five main modules of the 1996 revised IPCC Guidelines as energy, industrial processes, agriculture, waste, land use change and forestry. Since IPCC does not provide a methodology for solvents, the estimations are based on CORINAIR methodology and other countries experiences. The basic equation, used for the calculation of the emissions is:

$$\text{Emissions} = \Sigma \text{ (Activity data X Emission factor)}$$

In general, the IPCC default emission factors for all economic sectors are used. In some cases, the original methodologies or methodologies slightly different from that of the IPCC, are applied (e.g., for the estimation of the CO_2 absorption by fruit trees[1], CO_2 emissions from small industrial boilers[2] and emissions from burning of fuel wood in household stoves[3].

The national greenhouse gases inventory represents emission data for three gases of direct greenhouse effect such as CO_2 (carbon dioxide), CH_4 (methane) and N_2O (nitrous oxide) as well as for three other gases of indirect greenhouse effect such as CO (carbon monoxide), NO_X (nitrogen oxides) and NMVOC (non methane volatile organic compounds). The last ones are not greenhouse gases but indirectly contribute to the Global Warming Potental.

CO_2 emissions released from energy and transport, are estimated by using of two approaches: Top-Down and Bottom-Up. According to the first approach, CO_2 emissions are estimated for each fuel type, based on the total national consumption[4], and then the values are summarized (Top-Down). According to the second approach, emissions for each subsector and source category are estimated, and then emissions are also summarized (Bottom-Up).

The use of both approaches allowed us to judge on the fuel spectrum of the carbon dioxide emissions (Top-Down), and the distribution, according to the economic sectors (Bottom-Up). Since in both approaches, the default IPCC emission factors for each fuel type are used, we had the possibility of comparison between them. The final estimation shows that the difference between two approaches accounts for 3.01%. Also a very detailed analysis is performed for estimation of CO_2 emissions released from other economic sectors like industry, land use change and forestry.

[1] Activity data are developed in this case.
[2] Emission factor is developed
[3] Emission factor is developed
[4] Activity data on national consumption are taken from the national energy balance

CH_4 emissions are estimated for sources like energy and transport, industry, waste, land use change and forestry and for agriculture.

N_2O emissions are estimated for sources like fossil fuel combustion (coal, oil products and natural gas).

Also, emissions of indirect greenhouse gases such as CO and NOx are calculated according to the IPCC Methodology. NMVOC emissions are estimated not only for internal combustion engines but also for solvents, agriculture, land use change and forestry.

2. GHG EMISSIONS IN 1994

2.1 Direct GHG emissions

Albania's anthropogenic total emissions for the base year 1994, account for 7,061.45 Gg of CO_2 equivalent. Figures II.1, II. 2,and II. 3 show total emissions respectively for each greenhouse gas like CO_2, CH_4, N_2O and figure II.4, shows total greenhouse gas emissions expressed in CO_2 equivalent.

The main source of CO_2 emissions (Fig. II. 1) is energy sector with 62.95%, followed by land use change and forestry with 32.73% and industrial processes with 4.30%. The main source of CH_4 emissions (Fig.II.2) is agriculture sector with 77.74%. Agriculture (Fig. II. 3) remains as the main source of N_2O emissions as well, with 69.45%. Regarding the CO_2 equivalent emissions, (Fig. II.4) the shares of sources are energy with 44.00%, agriculture with 27.12%, and land use change and forestry with 21.60%.

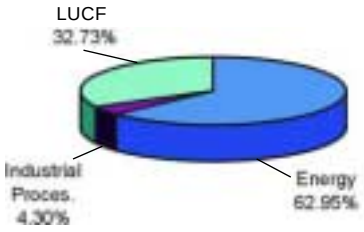


Fig.II.1 CO_2 emissions from economic sectors [4611.33 Gg], 1994

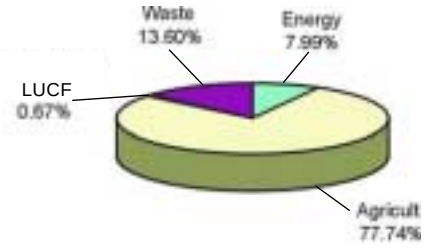


Fig.II.2 CH_4 emissions from economic sectors [102.52 Gg], 1994

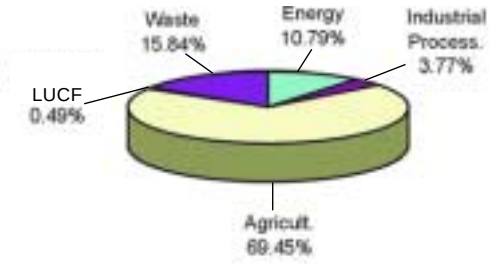


Fig.II.3 N_2O emissions from economic sectors [0.9581 Gg], 1994

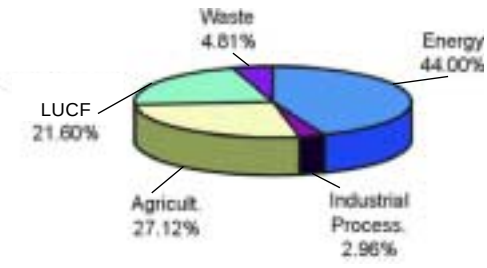


Fig.II.4 CO_2 eqv., emissions from economic sectors [7061.45 Gg], 1994

The presented data indicate that for the base year - 1994, CO_2 was the main greenhouse gas in Albania, with a share of 65.33%. The shares of CH_4 and N_2O are respectively 30.49 % and 4.18 %. The shares of each gas are shown in the figure II.5 and table II.1.

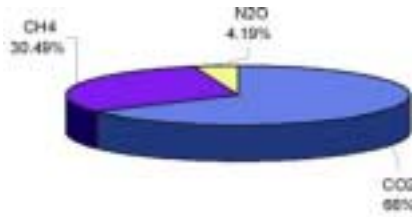


Fig.II.5 CO_2 eqv., emissions from each GHG. [7,061.45 Gg], 1994

Greenhouse Gas	Total Emissions, Gg	Emissions in CO_2 eqv., Gg	Share in total emissions, %
CO_2	4,611.33	4,611.33	65.33
CH_4	102.52	2,152.92	30.49
N_2O	0.95	295.68	4.18

Tab.II.1 The anthropogenic GHG emissions in Albania,1994; [Gg]

National greenhouse gas emissions, per source categories (economic sectors) for the base year -1994 are presented also in table II. 2 as follows:

Source Category	CO_2	CH_4	N_2O	CO_2 eqv.
Energy	2,902.94	8.16	0.099	3,107.03
Industrial processes	198.71	0.00	0.036	209.01
Agriculture	0	79.74	0.666	1,915.06
LUCF	1,509.68	0.68	0.005	1,525.27
Waste	0	13.94	0.152	339.65
Solvent use	0	0.00	0.000	0.00
TOTAL:	4,611.33	102.52	0.958	7,061.45

Tab.II.2 Anthropogenic GHG emissions from source categories, 1994, [Gg]

2.2 Indirect greenhouse gas emissions in 1994

The national greenhouse gases inventory includes also the emissions of indirect greenhouse gase: CO, NO_X and NMVOC. It is evident from the following figures that energy sector is the main source of three indirect greenhouse gas emissions, NO_X(18.01 Gg), CO (36.40 Gg) and NMVOC (30.265Gg).

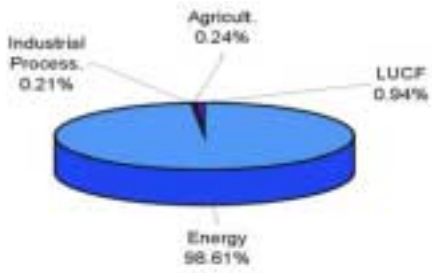


Fig.II.6 NO_S emissions from all economic sectors [18.01 Gg], 1994

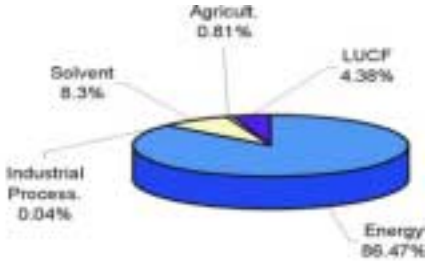


Fig.II.7 CO emissions from all economic sectors [136.40 Gg], 1994

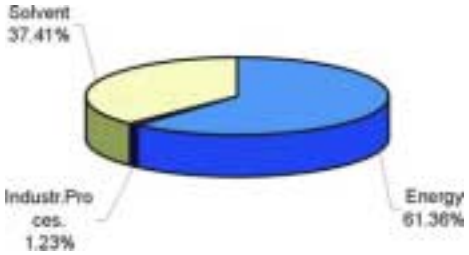
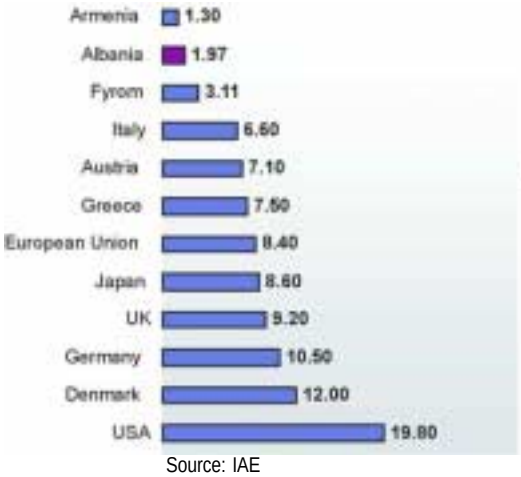


Fig.II.8 NMVOC emissions from all economic sectors [30.265 Gg], 1994

2.3 Main CO_2 emissions indicators

CO_2 emission indicators are of primary importance in the debate of Global Warming Potential (GWP) and may signal a significant change in the efforts, of all countries despite their economic development. Figures II.9 and II.10 show respectively the position of Albania among a number of different countries in terms of CO_2 emissions per capita and CO_2 emissions per GDP for the base year-1994



Source: IAE

Fig.II. 9 CO_2 emissions per capita for selected countries [ton CO_2/ capita], 1994

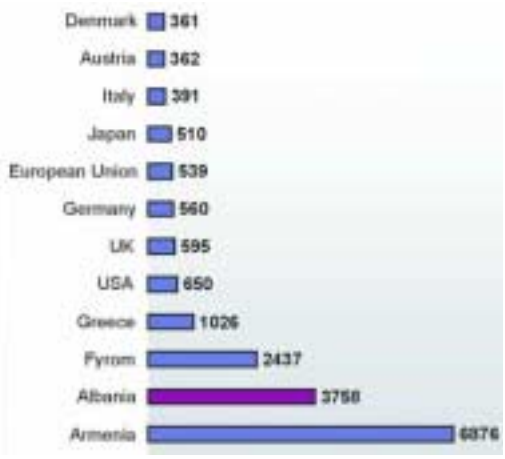


Fig.II.10 CO_2 emissions per GDP for selected countries [ton / Mil.USD], 1994

CO_2 emissions per capita in Albania are around 4-5 times lower than the total average, due to the following explanations:

- Energy consumption per capita in Albania is the lowest between the selected countries;
- Electricity generation is based almost on hydro sources (94% of electricity is generated by hydro power plants);
- Different energy services in residential sector like space heating, domestic hot water, and cooking are based almost in electricity (residential sector consumes 60% of total electricity);
- Industry sector went down in 1994, starting from 1990 in terms of energy consumption;

CO_2 emissions per GDP in Albania are around 10-12 times higher than the 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 sources is consumed in residential and service sectors for people comfort and not in industry sector, for producing higher value of GDP.

3. GHG EMISSIONS FROM ECONOMIC SECTORS

3.1 Energy sector

The energy sector has a share of 62.95% of total CO_2 emissions (Fig. II.1), 7.99% of total CH_4 emissions, due to fugitive emissions from fuel extractions (Fig. II.2) and around 10.79% of total N_2O emissions (Fig. II.3).

Although CO_2 emissions from fuel wood are reported under the land use change and forestry, as the IPCC methodology recommends, they are also reported under energy sector only for demonstration purpose, since fuel wood is still an important energy source in Albania and harvesting of fuel wood is not done properly. Albania has more cutting of wood than yearly yield intake from

forestry. So, if fuel wood emissions are reported under the energy sector, the contribution of the last one in GWP (CO_2 equivalent) will reach 65.39%.

The results show (Fig.II.4) that a share of 44.00% of the overall national greenhouse gas emissions, expressed in CO_2 equivalent, comes from the energy sector and the rest (56.00%) comes from other remaining sectors.

Figure II.11 shows the shares of CO_2 emissions from energy subsectors (end-users) due to fuel combustion activities. It is evident that the largest share comes from industry (manufacturing and construction) followed by transport sector (road, rail, marine, other). Figure II.12 shows the contribution of each fuel type in the CO_2 emissions, released due to fuel combustion activities. The main source is oil with 87.3% followed by coal with 11% and the last one is natural gas with 1.7%.

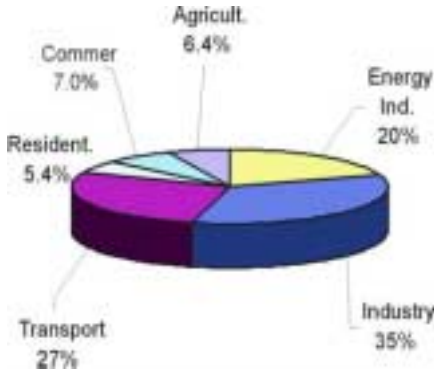


Fig.II.11 Shares of CO_2 emissions from energy subsectors due to fuel combustion activities [2,902.94 Gg], 1994

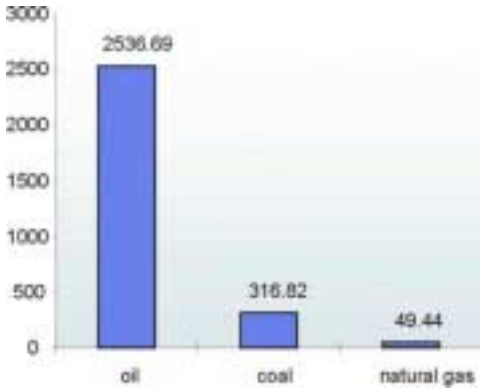


Fig.II.12 CO_2 emissions from each fuel type [2,902.94 Gg], 1994

According to the CO_2 emissions from transport subsectors, the largest share belongs to road transportation with 88.8% (Fig.II.13). The CO_2 equivalent emissions released from transport sector are shown in figure II.14.

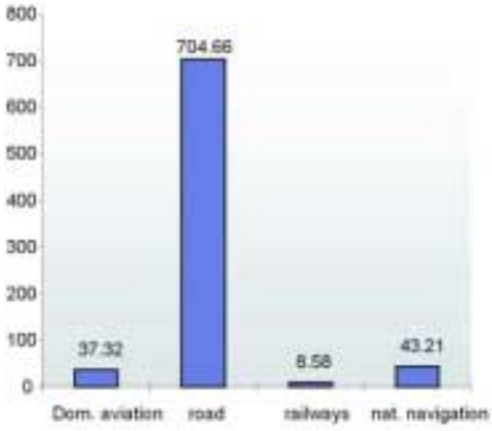


Fig.II.13 CO_2 emissions from transport subsectors due to fuel combustion activities,1994

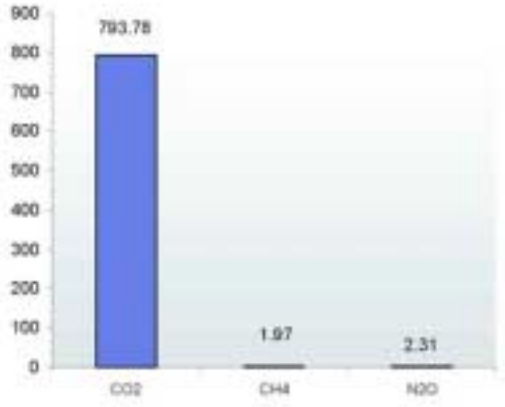


Fig.II.14 CO_2 eqv., emissions from transport sector, [798.06 Gg],1994

According to the IPCC methodology, the fugitive emissions from fuels are estimated by taking into account the releases of gases from anthropogenic activities. This group includes solid fuels, oil natural gas, venting and flaring. The results show that the largest share of CH_4 fugitive emissions by activity types, versus the total CH emissions, belongs to coal underground mining and post mining activities with 99.956%, followed by natural gas with 0.038%, oil with 0.003% and venting and flaring activities with 0.003%.

3.2 Industrial processes

The main source of CO_2 emissions released from industry is cement production. CO_2 emissions released from cement production process are 118.8 Gg or about 60% of total CO_2 emissions released from industry sector. Aggregated greenhouse gas emissions, expressed in CO_2 eqvuivalent, released from industrial processes are 205.28 Gg in 1994.

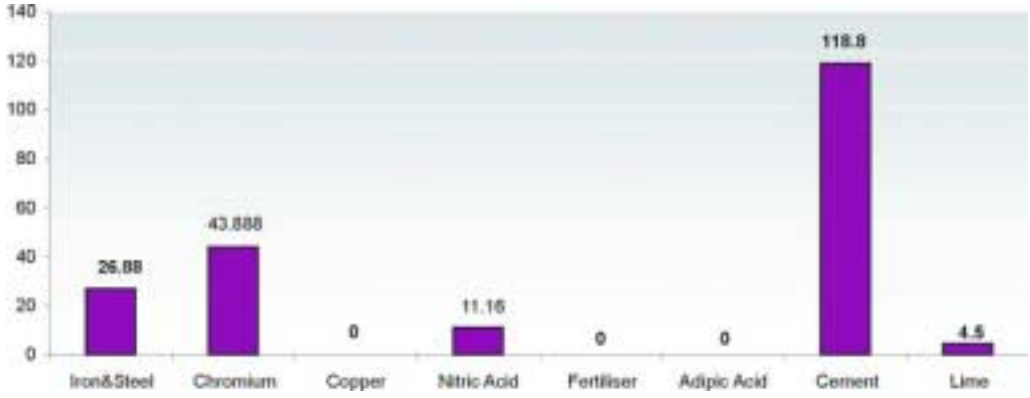


Fig.II.15 CO_2 eqv., emissions from industrial processes, [205.28 Gg]; 1994

3.3 Agriculture

The contribution of agriculture sector in GWP is 27.12% of total CO_2 equivalent for the year 1994 (Fig.II.4). The main contributor is CH_4 with a total value of 79.71 Gg. Source categories of CH_4 emissions are mainly enteric fermentation with 94.83% and manure management with 5.12%, as shown in the figure II.16. Cattle are the main source of CH_4 emissions from enteric fermentation with 72.26% (Fig. II.17), followed by sheep with 16.27%. N_2O emissions are mainly released because of application of nitric fertilizers (84.81%).

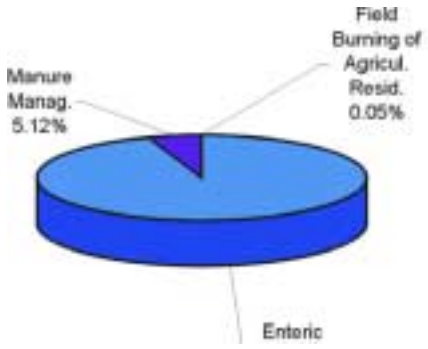


Fig. II.16 CH_4 emissions from agriculture sector [79.711 Gg], 1994

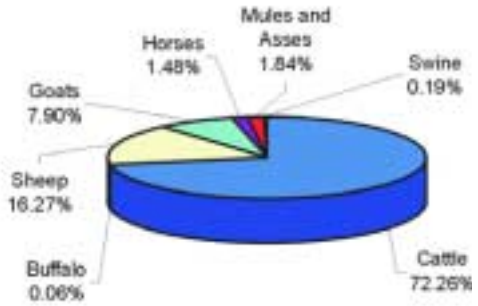


Fig.II.17 CH_4 emissions from enteric fermentation [54.619 Gg], 1994

3.4 Land use change and forestry

Albania's forest area is composed mainly of the broad leaf species, that are more capable to serve as sinks of CO_2 emissions.The total carbon uptake increment resulted in 615.36 carbon Kt.

The main source on biomass production and quantity of CO_2 emissions in 1994 are commercial forests and deciduous broad leaf species. The protection forest and fruit tree species are also considered in estimations. The total biomass consumption, annual carbon content and annual CO_2 emissions resulted to be respectively 2,054.76 dm Kt, 1,027.38 Kt of carbon and -1,510.73 Gg of CO_2. The last negative value demonstrates very clearly that wood cutting process

in Albania is higher (over three times) than annual increment of our forests. This is also demonstrated in figure II.18. The largest contribution comes from non registered cuttings (illegal cuttings). Anyway, a high uncertainty concerning the activity data for this category exists.

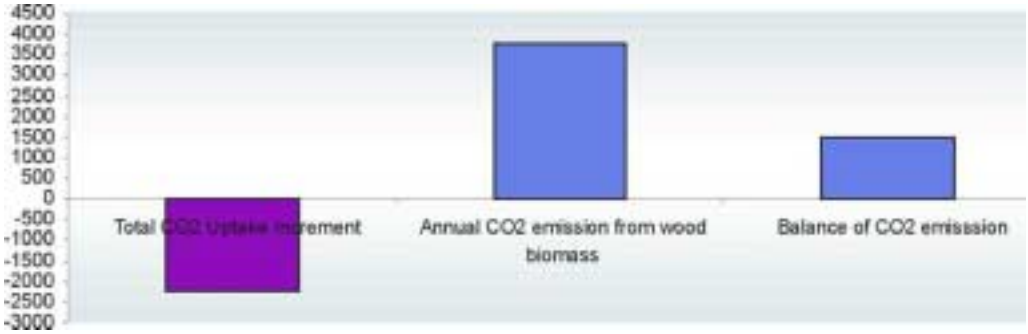


Fig.II.18 CO_2 emissions and sinks from forestry,1994; [Gg]

The results show (Fig.II.19) that the total carbon uptake from abandoned lands is 78.00 Kt carbon, while the total carbon dioxide uptake is 286 Gg. The changes in soil carbon for mineral soils are also calculated. As a result, the net change in soil carbon of mineral soils resulted to be -12.82 Tg/20 years. The negative value is explained by the reduced areas of the broadleaf forests, improved pasture, grain with reduced tillage, non-grain crops with full tillage, fruit tree plantations, wetland and inland water.

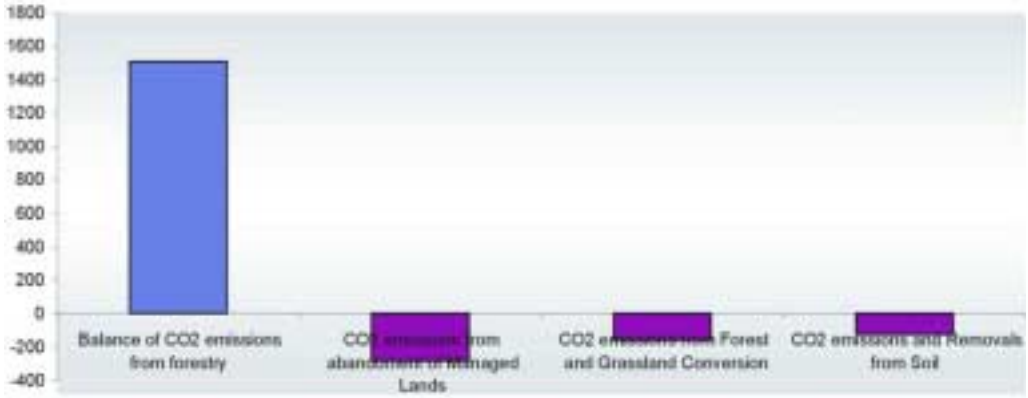


Fig. II.19 Total CO_2 emissions from land use change and forestry,1994; [Gg]

The annual emissions released from organic soils are calculated by using data on land area and annual loss rate. Net carbon loss from organic soils is 3,9780.00 Mg/yr. The total annual carbon emissions are 500.94 Gg. The total annual CO_2 emissions are 2,496.72 Gg (this is a cumulative value for 20 years).

3.5 Wastes

Albania has a unique system for waste water handling. Since the system is aerobic, the methane conversion factor (MCF) is equal to zero.

As for the waste sector, the net annual CH_4 emissions released by unmanaged landfills, are 13.18 Gg per year. This value constitutes about 4.81% of total CO_2 equivalent emitted for 1994, as shown in figure II.4.

N_2O emissions from human sewage account for 0.15 Gg per year. As shown in figure II.20, the share of N_2O emissions versus the total CO_2 equivalent emissions emitted from waste sector is 13.84%.

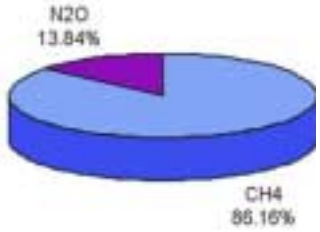


Fig.II.20 Shares of CO_2 eqv., emissions from waste sector 1994, [Gg]

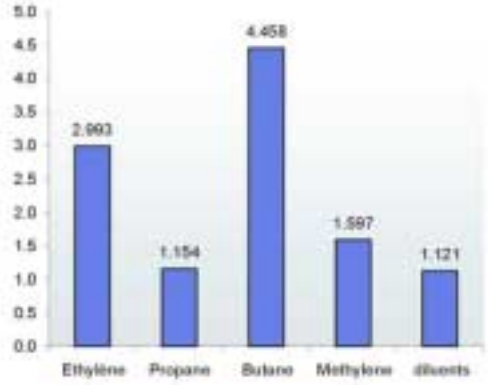


Fig.II.21 NMVOC emissions from solvents,1994; [Gg]

3.6 Solvents

For the purpose of classification of the activity data for solvents sector, the CORINAR nominations are used. The estimations for the solvents sector are based on other countries experiences. All NMVOC emissions from different categories of solvents are estimated and the results show that the largest share belongs to butane with 4.458 Gg, followed by ethylene with 2.993 Gg.

3.7 International bunkers

Since Albania has access to air and marine transport, estimation of emissions released from bunker fuels used on international air and marine transportation, are also performed. According to the 1996 revised IPCC Guidelines, emissions from bunker fuels are not included in the balance of the inventory.

In 1994, CO_2 emissions from international transportation via air and marine are respectively 61.50 Gg and 18.19 Gg. Other emissions like CH_4 expressed in CO_2 equivalent for international air and marine transport are respectively 0.0091 Gg, 0.5387 Gg.

The following figure shows the contribution of each gas in the total emissions released from international bunkers.

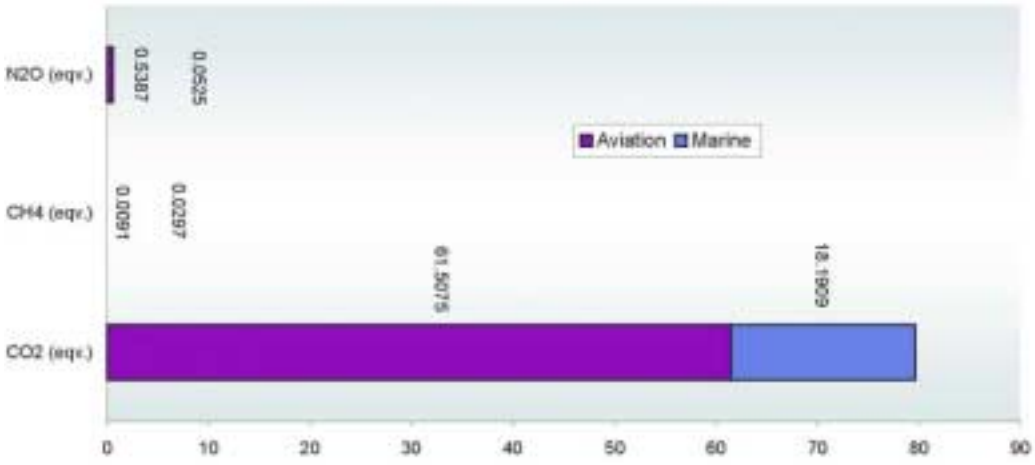


Fig.II.22 GHG emission from international bunkers,1994; [Gg]

3.8 Total GHG emissions for Albania, in 1994

Table II. 3 presents all greenhouse gas emissions in Albania by source categories in Gg, for the year 1994, while table II. 4 presents CO_2 emissions from fuel combustion for 1994.

Greenhouse Gas Source and Sink Categories	CO_2	CH_4	N_2O
ENERGY	**2,902.9506**	**8.1693**	**0.0990**
A. Fuel Combustion	2,902.9506	5.1116	0.0990
Energy and transformation industries	575.0695	0.0248	0.0050
Industry	990.1134	0.1356	0.0213
Transport	793.7790	0.0862	0.0055
Residential	156.6858	4.0946	0.0556
Commercial / Institutional sector	184.4600	0.0179	0.0015
Agriculture / Forestry / Fishing	202.8400	0.7525	0.0101
Other	0.0000	0.0000	0.0000
Biomass burned for energy	1,969.8700	0.0000	0.0000
B. Fugitive Emissions	0.0000	3.0477	0.0000
Oil and Natural gas system	0.0000	0.0013	0.0000
Coal	0.0000	3.0464	0.0000
INDUSTRIAL PROCESSES	**198.7100**	**0.0000**	**0.0360**
AGRICULTURE	**0.0000**	**79.7112**	**0.6624**
Enteric fermentation	0.0000	75.5860	0.0000
Manure management	0.0000	4.0831	0.0994
Field burning of agricultural residues	0.0000	0.0421	0.0012
Use of nitric fertilizers	0.0000	0.0000	0.5618
LAND USE CHANGE AND FORESTRY	**1,509.6800**	**0.6829**	**0.0047**
Changes in forestry and other woody biomass stock	1,510.7200	0.0000	0.0000
Forests and grassland convention	160.1100	0.6829	0.0047
Abandonment of managed lands	-286.0000	0.0000	0.0000
Agriculturally impacted soils	124.830	0.0000	0.0000
WASTE	**0.0000**	**13.9387**	**0.1517**
Landfills	0.0000	13.9387	0.0000
Wastewater treatment	0.0000	0.0000	0.1517
Waste incineration	0.0000	0.0000	0.0000
Other	0.0000	0.0000	0.0000
SOLVENT USE	**0.0000**	**0.0000**	**0.0000**
Different solvents	0.0000	0.0000	0.0000
TOTAL NET GREENHOUSE GAS EMISSIONS	**4,606.8400**	**102.4920**	**0.9638**
Emissions from International Bunkers	79.6900	0.0018	0.0019

Tab.II.3 GHG emissions in Albania by source categories, 1994; [Gg]

Fuel Types Emission Share	Emissions, Gg	Share, %
Solid	316.82	10.914
Liquid	2,536.69	87.383
Gaseous	49.44	1.703
TOTAL:	2,902.95	100.000

Tab.II.4 Anthropogenic CO_2 emissions from fuel combustion in Albania,1994; [Gg]

4. GHG EMISSIONS FROM ENERGY SECTOR FOR 1990-1994

In order to identify the dynamics of anthropogenic greenhouse gas emissions and their comparative changes, the CO_2 emissions from energy sector are estimated for the period 1990 - 1994. They are estimated according to the source categories, as presented in table II. 5 and figure II. 23. The Top-Down approach is used.

Source Categories	1990	1991	1992	1993	1994
Energy	7,134.22	5,023.17	2,670.28	2,875.08	2,902.95
Oil	3,517.25	2,794.90	1,923.21	2,392.65	2,536.69
Coal	3,422.86	2,088.91	618.89	390.07	316.82
Natural gas	194.11	139.36	128.18	92.36	49.44
Total	7,134.22	5,023.17	2,670.28	2,875.08	2,902.95
Fuel wood	5,164.45	3,685.07	3,013.09	1,898.96	1,989.88
International marine and air transport	15.81	13.03	8.75	50.26	79.7

Tab.II.5 Anthropogenic CO_2 emissions from fuel source,1990-1994; [Gg]

From the results it is obvious that the anthropogenic emissions, released by oil sources in Albania in 1994 have decreased by 28.8% compared to 1990. In 1994, we have a sharp decrease by 80.78% of emissions released from coal, compared to 1990. In 1994, we have a sharp decrease by 74.53%, compared to 1990 for emissions released from natural gas sources. The

CO_2 emissions released by fuel combustion are shown in figures II.23 and II.24.

As mentioned above, emissions from energy sector have been reduced from 1990 to 1994, but from the other side, emissions from international marine and international air transport have been increased with a very high growth rate. So, for 1994 international bunkers have emitted 79.7 Gg CO_2 or 5.04 times higher than 1990. Figure II.24, shows the trends of total CO_2 emissions from energy sector and from international bunkers for the period 1990-1994.

The most important greenhouse gas emissions indicators such as CO_2 emissions per GDP and CO_2 emissions per capita, are both shown on the yearly basis in figure II. 25. Both indicators have decreased for the same reasons, already mentioned in section 2.3 of this chapter.

Fig.II.23 CO_2 emissions from fuel combustion, 1990-1994; [Gg]

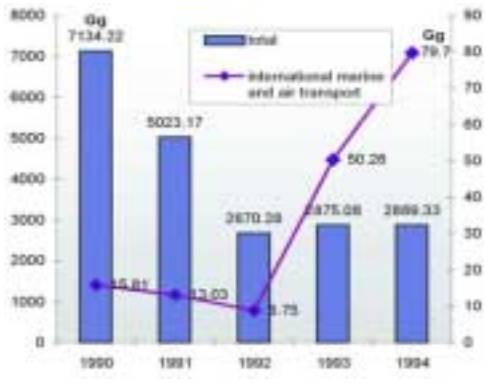


Fig.II.24 CO_2 emissions from international marine, air transport and from energy sector.

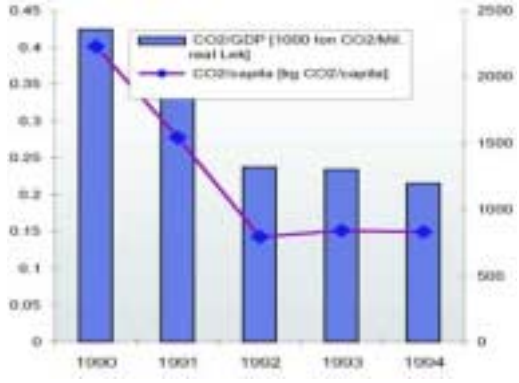


Fig.II.25 CO_2 emission per capita and GDP for the period 1990-1994

5. KEY SOURCES OF EMISSIONS

Based on the total emissions, the key source identification for GHG emissions for Albania is developed. Key sources represent the main sub categories which, in cumulative order make up to 95% of total CO_2 equivalent emissions. These key sources are presented in the following table:

Key source categories for GHG emissions, 1994			
Nr.	Items	CO_2 eqv.	Cumulative CO_2 eqv.
1	CH_4-Enteric fermentation	22.49	22.49
2	CO_2-Woody biomass burned for energy	21.40	43.89
3	CO_2-Fuel combustion in industry	14.03	57.91
4	CO_2-Fuel combustion in transport	11.24	69.16
5	CO_2-Fuel combustion energy and transformation industries	8.15	77.30
6	CH_4-Landfills	4.15	81.45
7	CO_2-Fuel combustion in agriculture / forestry / fishing	2.87	84.32
8	CO_2-Industrial processes	2.81	87.14
9	CO_2-Fuel combustion in commercial / institutional sector	2.61	89.75
10	N_2O-Use of nitric fertilizers	2.47	92.22
11	CO_2-Forests and grassland convention	2.27	94.48
12	CO_2-Fuel combustion in residential	2.22	96.70

Tab.II.6 Key source categories for GHG emissions, 1994; [%].

Referring to the above table, we found out 11sub categories identified as key ones which actually represents 94.48 % of the total emissions, expressed in CO_2 equivalent.

The following trend also shows the key source categories graphically. On the x-axis are placed all key source categories, according to the list of above mentioned table.

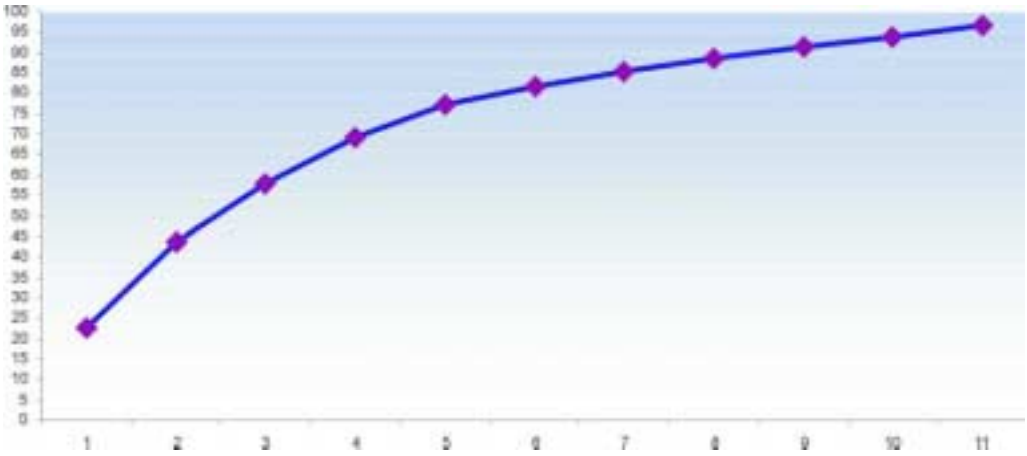


Fig.II 26. Key source categories for 1994

As a conclusion from the above analysis, the main key sources results the follows:

- CH_4 emissions from enteric fermentation (22.49%);
- CO_2 emissions from biomass burned for energy purposes (21.40%);
- CO_2 emissions from fuel combustion in industry (11.24%);
- CO_2 emissions from fuel combustion in energy and transformation industries (8.15%);
- The rest belongs to other categories.

6. UNCERTAINTY ESTIMATION OF GHG INVENTORY

The use of Top - Down approach and the statistical data on fuel energy balance enabled us to estimate the summarized values of emissions of gases of direct greenhouse effect (CO_2, CH_4 and N_2O). The application of Bottom - Up approach enabled us to make the clarification of the values of the main greenhose gas emissions, based on more detailed information.

The comparison of results, received by the above mentioned methods testifies their rather high degree of comparability. The application of the Top-Down and Bottom-Up approaches has enabled us to estimate rather fully and precisely the values of both emissions of CO_2 and CH_4 and

the total values of the emissions of gases of direct greenhouse effect. The estimated difference in values of considered parameters by two approaches mentioned above accounts for 3.01%.

Once the inventory was finished, an estimation of the range of uncertainties for greenhouse gas emissions and removals was performed. The uncertainty estimation was based on IPCC "Good Practice Guidance and Management of National GHG Inventory".

The pragmatic approach suggested by "Good Practice Guidance and Uncertainty Management in National GHG Inventory" to produce quantitative estimates, consists of using the best available estimates, a combination of available measured data and expert judgment. Tier 1 method uses aggregate production based on emission factors and national activity data for each activity.

Disaggregating is used where possible to help reduction of the level of uncertainty in industrial, energy and agriculture activities. In order to evaluate the highest possible level of uncertainty, most of the estimates are made using the highest limit of IPCC default values recommended by "Good Practice Guidance...". However, where possible, efforts are made by expert judgments to provide more realistic values of uncertainty for activity data.

The total combined uncertainty of CO_2 emissions is 19.375%. The most significant contributor in the combined uncertainty of CO_2 emissions is land use change and forestry, with a share of 18.52 0%, (95.58% of total value) followed by the category of emissions released by stationary fuel combustion, energy industries, manufacturing industries and construction which comprise a share of 4.8%. Other categories have much lower contributions, since their contribution versus CO_2 emissions is relatively low, compared to CO_2 emissions released by above mentioned groups.

The total combined uncertainty of CH_4 emissions, expressed in CO_2 equivalent, is 55.828% and this uncertainty comes mainly from the category of enteric fermentation with a share of 47.08% (84.33% of above mentioned value).

The total combined uncertainty of N_2O emissions expressed in CO_2 equivalent, is 391.002% and the main source of this uncertainty is the category of emissions from stationary fuel combustion, energy industries, manufacturing industries and construction, which comprise a share of 353.591%. However, N_2O emissions have very low influence in the overall national uncertainty because of the very small share (4.18%) versus the total CO_2 equivalent.

As a final conclusion, the overall uncertainty estimated for the national greenhouse gas inventory is 19.249% and the main contributor (with 79.23% of total value) on this uncertainty is the category of CO_2 equivalent emissions by fuel wood category. This comes especially from a large degree of uncertainty of activity data in this subcategory.

In order to reduce the uncertainties, special studies need to be carry out on improvement of data, according to the specific conditions of Albania.

6.1 Data gaps

The following is an identification of data gaps which need to be recovered.

Transport: Activity data for this sector exist in the form of total figures for the sector as a whole. Activity data for the road transport are characterized from a variability in the 90's. Activity data for the subsectors like cars, light duty trucks, heavy duty trucks, buses and motorcycles are very poor, due to the big changes occurred in the transition period in the transport sector. In order to overcome this activity data gap, we propose to carry out a pilot survey.

Industry (fuel consumption): Although activity data for the industry sector (fuel consumption)

exist for 1994, as reported in greenhouse gases inventory for Albania, there is a need for activity data on this category for years other than 1994, becasue the activity data for 1994 do not reflect the drastic structural changes among industrail subsectors. With regard to activity data for the industry sector (fuel consumption), for years other than 1994, only the total figures for the sector as a whole exist, but no divisions as per subsectors. As for getting the shares of fuels consumption among subsectors, we propose to carry out a pilot survey on a number of preselected industrial enterprises.

Traditional biomass burned for energy purposes: This category includes all greenhouse gas emissions released from the burning of fuel wood, charcoal, and vegetal wastes. The category of CO_2 emissions released from consumption of fuel wood comprise a share of 79.23 % versus the overall uncertainty estimated for the greenhouse gases inventory (the total value of uncertainty is estimated to be 17,03%). As mentioned in section 6 of this chapter, this happens due to a high degree of uncertainty of activity data for this subcategory, mainly data which belong to rural areas. There are no official data on fuel wood consumption for years other than 1994. What is already known is that the historic strong position of fuel wood is still prevailing, especially in rural areas where a large source of fuel wood is provided by illegal cuttings, not yet reported officially. So it is very important to have a clear situation concerning fuel wood consumption in different economic sectors especially in households and service. In order to reduce the uncertainty factors, a special survey need to be undertaken.

Agriculture: In early 90's, following the destruction of the state livestock farms, the agriculture cooperatives and the finalization of the privatization practices, the livestock breeding shifted from intensive to extensive. The data are very fragmentized and the establishment of a data base on manure management is needed, in order to have a clear picture of this category, which remains the first key source of emissions.

CHAPTER III

GHG ABATEMENT ANALYSIS

Projections of greenhouse gas emissions for Albania are mainly based on energy and non energy sectors. An abatement assessment normally includes two scenarios: baseline and abatement scenario. All greenhouse gas source categories such as energy and transport, land use change and forestry, agriculture, waste, industrial processes and solvents are considered. The greenhouse gas emissions baseline scenario is a description of a plausible future in which no specific policy measures are taken to encourage actions that reduce greenhouse gas emissions. The greenhouse gas emissions abatement scenario assumes a gradual implementation of measures for reduction of greenhouse gas emissions.

1. GHG EMISSION BASELINE SCENARIO

1.1 Methodology

The software used for development of greenhouse gas emissions baseline scenario for energy and transport is Long-range Energy Alternatives Planning[1] (LEAP) system, version 95.0, which is a computer based accounting and simulation tool, designed to assist policy makers in evaluating energy policies and developing sound, sustainable energy plans.

LEAP, as an integrated planning tool, can help in the developement of more rational and environmentally beneficial energy policies, since it expands the boundaries of analysis in two important ways. First, demand-side measures for improving efficiency are placed on an equal footing with energy supply options. Second, environmental effects are explicitly considered in the evaluation of alternative energy plans.

Traditionally, the future energy requirements in Albania are projected within each economic sector (households, industry, agriculture, services, transport, etc.) based on the level of economic activities and elasticities. Often this approach is referred to as aTop-Down approach. However, the developed long-term scenario, uses a Bottom-Up approach, comprising a detailed layout of energy demand by sectors, end-uses and technologies.

Concerning the non energy sectors[2], the 1996 revised IPCC methodology is used for development of baseline emission scenarios.

1.2 General data and projections

The base year data used for the development of the greenhouse gas emissions baseline scenario are identic to those of inventory. The greenhouse gas emissions baseline scenario includes sufficient details about the energy consumption trend in the future, energy sources production systems, the technologies used, the production of main industrial products, the population number and how it is distributed in the cities and in the countryside, the number of transport vehicles, the demand for agriculture and animal products, and data concerning forests and land use, the forecasts on wastes produced and the way of their disposals, etc.

The development of the baseline scenario is based even on a number of assumptions for economic and demographic parameters, legal framework and the prices policy, assumptions which on the other hand are based on the macro economic projections of the country as a whole, as well as on the development plans of the economic sectors, taken in particular.

The greenhouse gas emissions are expressed in physical units and in percentage for each year up to the end of the year 2020, selected as time horizon.

The following tables represent general data and projections on GDP, value added, population growth rates, cost parameters and exchange rates, as important driving components for development of baseline GHG emissions scenario.

[1] Developed by the Stockholm Environment Institute - Boston (SEI-B) with support from the UNEP and other agencies

[2] Exception is made for solvent use sector. The prediction of NMVOC emissions up to 2020, is based on CORINAR methodology

GDP- development (Million leks)	1994	Future years (baseline)
Agriculture	8.245	3.4%
Industry	3.324	9.0%
Services	3.537	4.4%
Leks/capita	4.650	4.3%
Total GDP	15.105	5.5%

Source: INSTAT

Tab.III.1 Total GDP and value added by economic sectors and projections

(Million)		Future years (reference)
Population	3.202	1.10%
Households	0.785	3.11%

Source: INSTAT

Tab.III.2 Growth rate and its projections

Parameter	Value
Real discount rate	10% p.a.
Inflation rate	15% p.a.
Monetary base year	1994

Source: INSTAT

Tab.III.3 Cost parameters

Year	Exchange rate Leks - USD
1990	8
1991	14.6
1992	74.5
1993	102.4
1994	94.7

Source: Ministry of Finance

Tab.III.4 Exchange rate

1.3 Energy and transport sectors

The CO_2 non biogenic emissions (emissions from fuel combustion activities), CH_4 and N_2O, released due to energy activities are estimated for such sectors as residential, agriculture, services, industry, transport, non energy use, and transformation industry. While CO_2 biogenic emissions released from traditional biomass burned for energy purposes, are also calculated for demonstration purposes only. They are reported under the land use change and forestry sector.

1.3.1 CO_2 non biogenic emissions

Figure III.1 shows the CO_2 non biogenic emissions released from energy sector during 1994 - 2020.

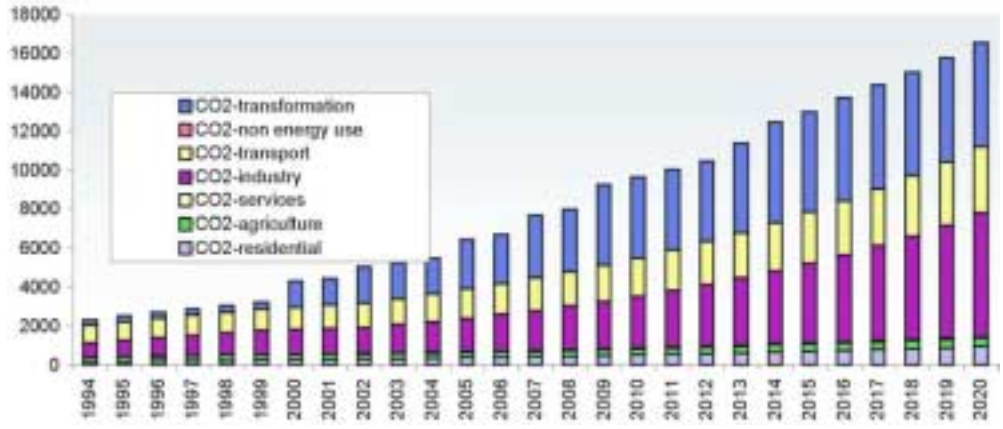


Fig. III.1 CO_2 non biogenic from energysector, 1994 - 2020; [Gg];
GHG emissions baseline scenario

Table III. 5 shows the growth rates of CO_2 non biogenic emissions (in percentage) released from different sectors, respectively in the years 2000, 2010 and 2020, with reference to the base year, 1994.

	2000	2010	2020
CO_2-residential	44	188	427
CO_2-agriculture	27	49	102
CO_2-services	114	501	1244
CO_2-industry	70	255	741
CO_2-transport	22	114	272
CO_2-non energy use	22	109	257
CO_2-transformation	450	1540	2029
CO_2-total	74	276	546

Tab.III 5 Growth rates of CO_2 non biogenic emissions released from all energy subsectors in 2000, 2010, 2020, compared to 1994; [%]

It is evident that in 2020 the largest share of CO_2 non biogenic emissions is expected to belong to the industry sector. Estimations show a value of 6,630 Gg or 35% of the total CO_2 non biogenic emissions, expected to be released from energy sector (Fig.III. 2). This will happen due to the fact that the value added from industry sector is expected to be increased by almost 9% per year.

The second contributor is expected to be the transformation sector (electricity and heat production, petroleum refining, solid fuel transformation and other energy industries) which shows a value of 3,420 Gg of CO_2 non biogenic or 29% of the total.

According to the table III.5, the CO_2 non biogenic emissions expected to be released from this subsector, will also have the largest growth rates (around 2,029 %), compared to 1994, due to the contribution of the thermo power plants of a capacity 700 - 850 MW, foreseen to be installed up to 2020. The aim is to meet the ever growing demand for electricity and to change at the same time, the existing share between the electricity generated by hydro power plants and thermo power plants, in order to enhance the security of the supply. In 1994, the above mentioned share has been 94% with 6% in favor of hydro power plants, while in 2020, the share of thermo power plants is expected to grow up to 37 - 40%. On the other hand, this will be accompanied by the negative effects of CO_2 non biogenic emissions, released by fuel combustion. A much less share belongs to transport sector with 19% of the total, followed by non energy use with 10%, residential sector with 5%, agriculture with 2% and services with 0.3 %.

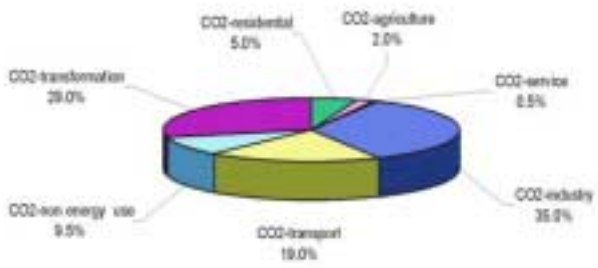


Fig.III.2 Shares of CO_2 non biogenic emissions as per energy subsectors; 2020; Baseline GHG emission scenario

The total CO_2 non biogenic emissions expected to be released from energy and transport sectors, according to baseline emission scenario in 2020 will reach the amount of 18,439 Gg compared to 2,851Gg in 1994, knowing a growth of 546%, compared to1994.

1.3.2 CH_4 emissions

Figure III.3 shows the CH_4 emissions released from all energy subsectors according to the baseline scenario, developed for the period 1994 - 2020.

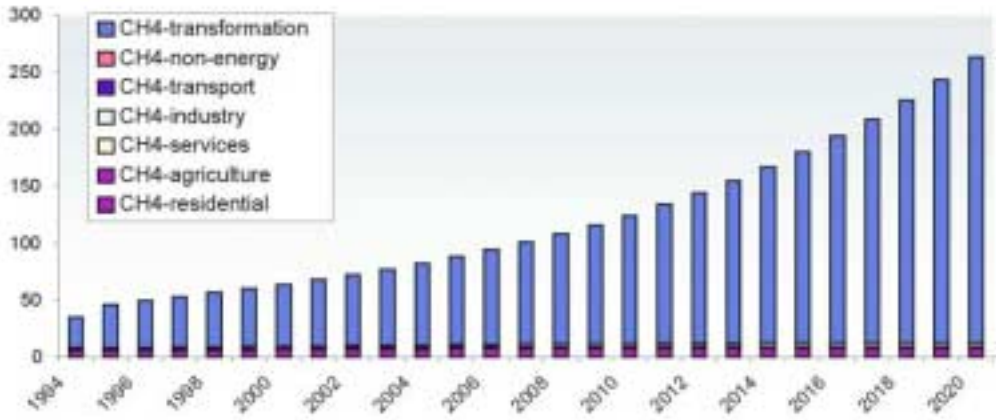


Fig.III.3 CH_4 from energy sector, 1994-2020; [Gg]; GHG emissions baseline scenario.

Table III.6 shows the growth rates of CH_4 emissions in percentage, released from energy subsectors in 2000, 2010 and 2020, with reference to the base year - 1994, according to the baseline scenario.

	2000	2010	2020
CH_4-residential	15	33	31
CH_4-services	17	49	82
CH_4-industry	41	131	203
CH_4-transformation	100	315	821
CH_4-total	82	256	653

Tab.III.6 Growth rates of CH_4 emissions from energy activites; [%]

It is evident that the largest share of CH_4 emissions towards 2020, is expected to belong to the energy transformation activities. Estimations show a value of 250 Gg or a share of 95 % (Fig III.4).The energy transformation activities include electricity and heat production, petroleum refining, solid fuels transformation and other energy industries.The largest share of CH_4emissions is dedicated to fugitive emissions released from the following activities:

- Coal underground mining and post mining activities;
- Oil and natural gas exploration, production / processing, transmission / distribution, refining, other leakage;
- Oil and natural gas venting and flaring;

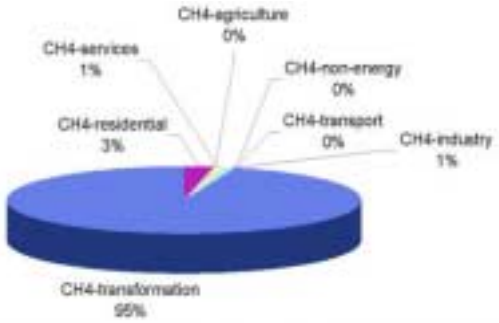


Fig.III.4 Shares of CH_4 emissions as per energy subsectorss; 2020; GHG emissions baseline scenario.

Figure III.4 shows the shares between energy subsectors.The total CH_4 emissions from energy sector according to the baseline emission scenario in 2020, are expected to reach the amount of 263 Gg, compared to 35 Gg in 1994, having an increase of 653%.

1.3.3 N_2O emissions

Figure III.5 shows the N_2O emissions released from energy sector according to the baseline scenario, for the period 1994 - 2020, while table III. 7 shows the growth rates of N_2O emissions in percentage released from all energy subsectors in 2000, 2010 and 2020 with reference to the base year - 1994.

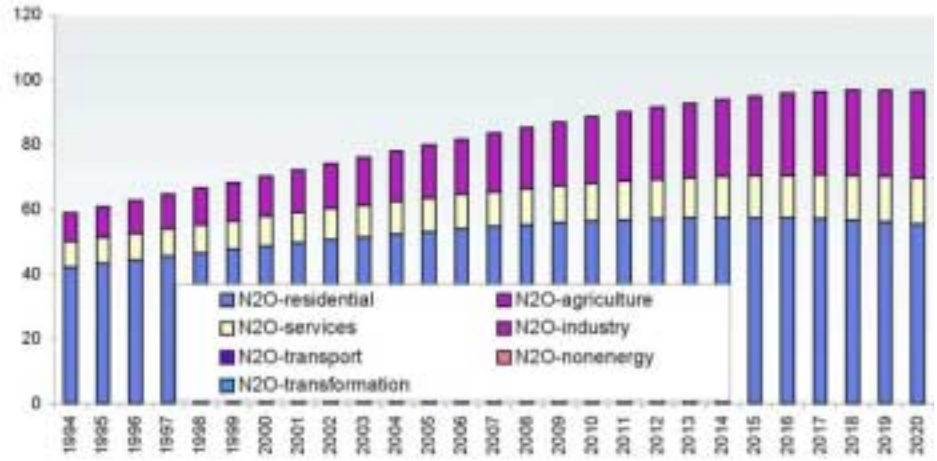


Fig.III.5 N_2O emissions from energy sector, 1994 - 2020; [Gg];
GHG emissions baseline scenario

	2000	2010	2020
N_2O-residential	15	33	31
N_2O-services	17	49	82
N_2O-industry	41	131	203
N_2O-total	19	50	64

Tab.III.7 Growth rates of N_2O emissions released from energy subsectors in 2000, 2010, 2020, compared to 1994; [%]

As shown in figure.III.5 and III.6, it is evident that the largest share of N_2O emissions towards 2020, is expected to belong to the residential sector. Estimations show a value of 55 Mg or 57% of the total, followed by industry sector with 27 Mg or 28% of the total N_2O emissions from energy sector. A much less share belongs to service sector with 14 Mg or 15% (Fig III.6).

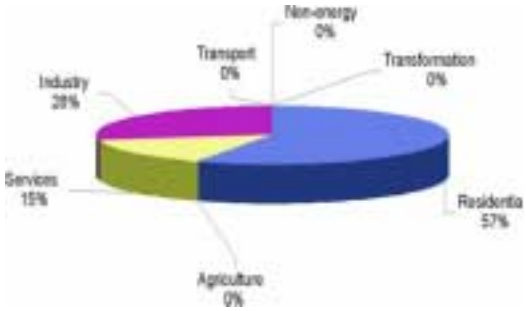


Fig.III. 6 Shares of CH_4 emissions as per energy subsectors; 2020
GHG emissions baseline scenario.

1.3.4 CO_2 biogenic emissions

Figure III.7 shows the CO_2 biogenic emissions released from all energy subsectors, according to the baseline emission scenario, developed for the period 1994 - 2020, while table III. 8 below

shows the growth rates of CO_2 biogenic emissions in percentage, released from all energy subsectors in 2000, 2010 and 2020, with reference to the base year 1994.

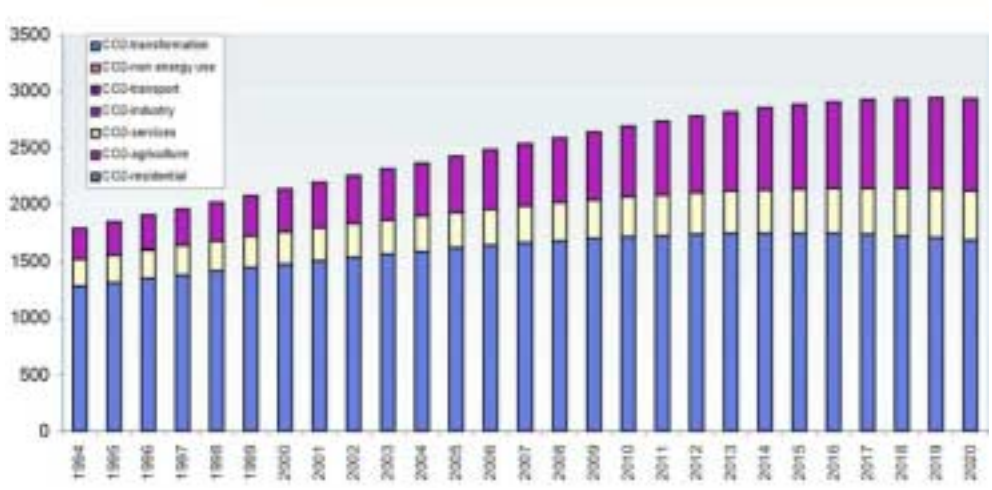


Fig.III.7 CO_2 biogenic emissions released from energy subsectors;1994 - 2020; [Gg;]
GHG emissions baseline scenario

	2000	2010	2020
CO_2-residential	15	33	31
CO_2-services	17	49	82
CO_2-industry	41	131	203
CO_2-total	19	50	64

Tab.III. 8 Growth rates of CO_2 biogenic emissions released from all energy subsectors in 2000, 2010, 2020 compared to 1994, [%]

Results show that the most significant share towards 2020, is expected to belong to the residential sector with 686 Gg or 57% of the total, followed by industry with 817 Gg or 28% and services with 433 Gg or 15 % .

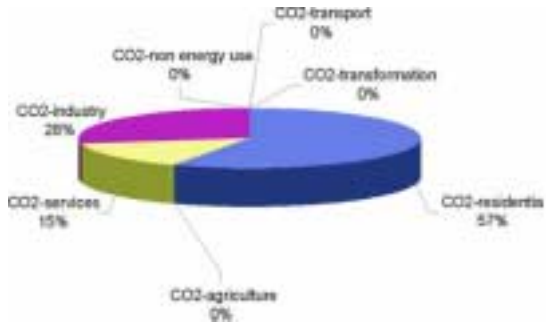


Fig. III.8 Shares of CO_2 biogenic emissions as per energy subsectors;
GHG emissions baseline scenario; 2020

From table III. 8 and figure III.8, it is noticeable that the growth rates of emissions which belong to residential sector, from 2010 up to 2020 are expected to be lower compared to1994 up to 2010. This happens due to the expected decrease of the share of fuel wood for meeting the energy demand in the economic subsectors. This share is expected to be substituted by electricity. The reasons for that are:

- Bad behavior of using electricity in residential sector even for space heating, which means a higher growth rate of expected electricity demand, during the period 2000 - 2020;
- Fuel wood harvesting is not done properly. Cutting of fuel wood is higher than the annual yield intake from forestry.

1.3.5 Total emissions from energy and transport

The total emissions of gases with direct greenhouse effect such as CO_2 non biogenic, CH_4 and N_2O, expressed in CO_2 equivalent, for the period 1994 - 2020, are reported under energy and transport sector. Figure III.10, shows the baseline scenario for energy and transport sector.

The conclusion which we derive to from that chart is that towards 2020, the CO_2 non biogenic is expected to remain the main greenhouse gas in Albania, with a share of about 77% of the total greenhouse gas emissions from energy and transport sector. The shares of CH_4 and N_2O are expected to be respectively 23% and 0%. (Fig.III.9)

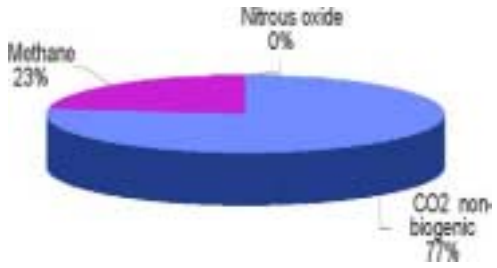


Fig.III. 9 Shares of GHG emissions from energy and tansport sectors; 2020

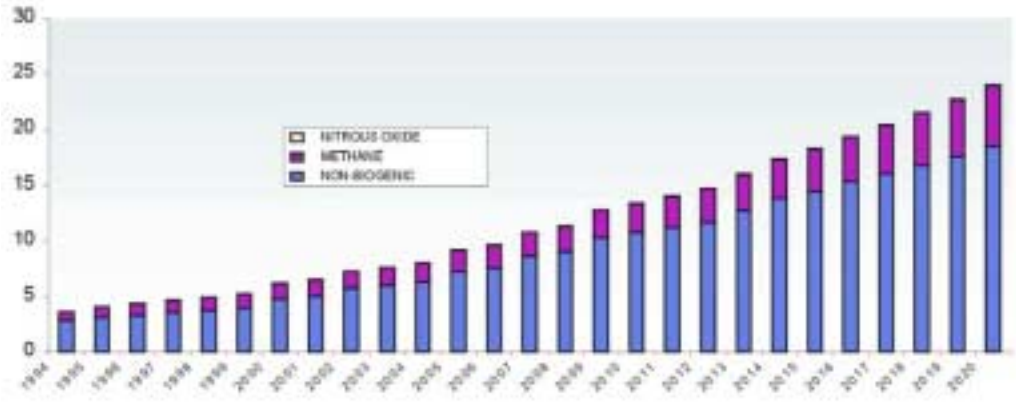


Fig.III.10 Total GHG emissions from energy sector, 2020, [million tons of CO_2 eqv.];
GHG emissions baseline scenario,

According to the results of the baseline greenhouse gas emissions scenario, the total net greenhouse gases emissions from all energy subsectors, for the year 2020, are expected to be about 24 million tons of CO_2 equivalent, as shown in figure III.10. The share of CO_2 emissions are expected to be 18.46 Million ton.

1.4 Land use change and forestry sector

1.4.1 CO_2 emissions

Total CO_2 uptake from land use change and forestry sector, are expected to change from 236.24 Gg in 1994 to 1,526 Gg in 2020, as shown in figure III.11.

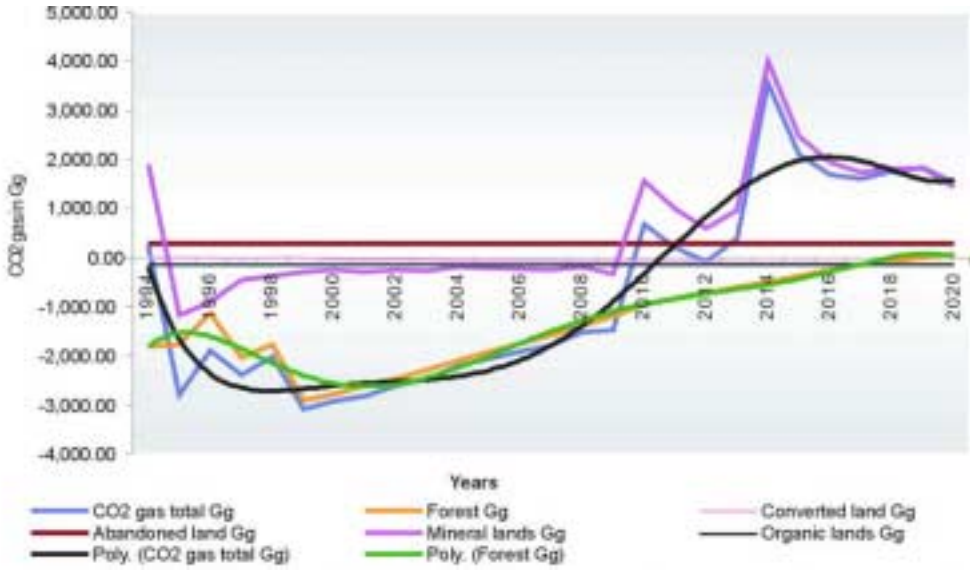


Fig.III.11 Total CO_2uptake from land use and forestry sector, [Gg]; GHG emissions baseline scenario

In 2020, the total CO_2emissions from fuel wood burning are expected to reach the amount of 2,940 Gg compared to 1,871 Gg in 1994, as shown in figure III.12.

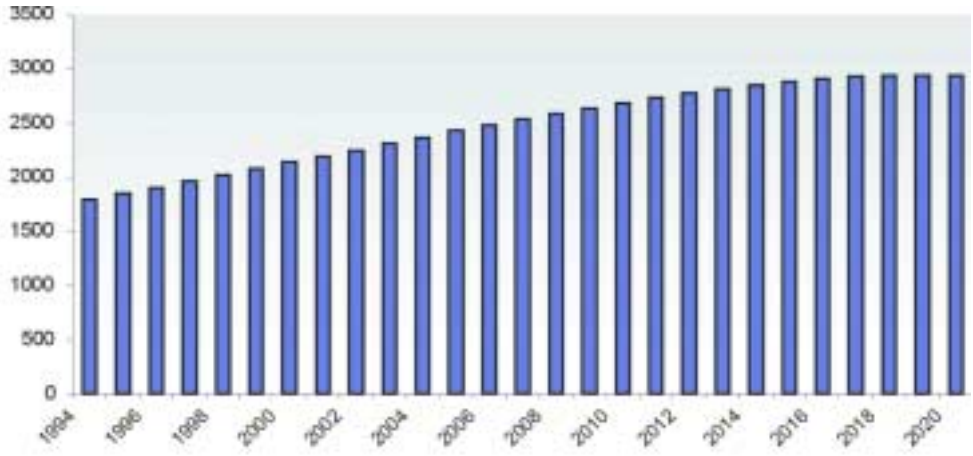


Fig.III. 12 Total CO_2 emissions from fuel wood burning, [Gg]; GHG emissions baseline scenario

The total CH_4 emissions from land use change and forestry are expected to reach the amount of 0.29 Gg in 2020 compared to 0.01 Gg. in 1994, as shown in figure III.13.

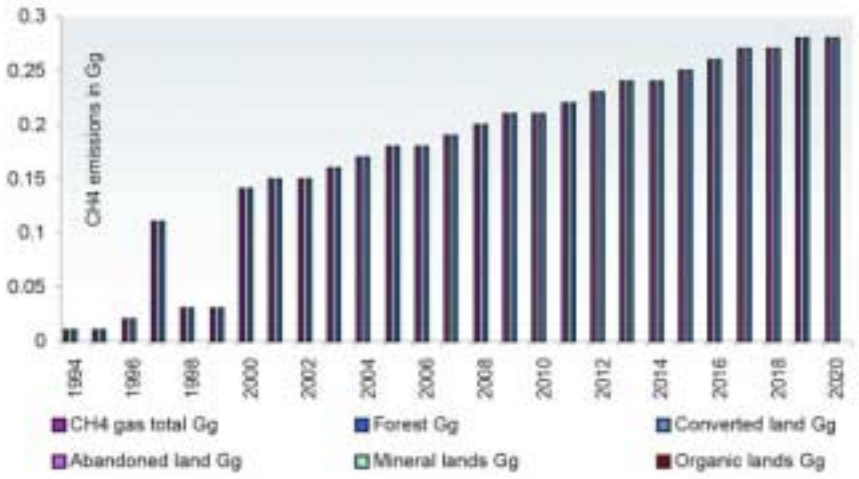


Fig. III. 13 CH_4 emissions, [Gg]; 2020; GHG emissions baseline scenario

The total NO_x emissions from land use change and forestry will continue to have a very negligible effect even in 2020. (Fig. III.14).

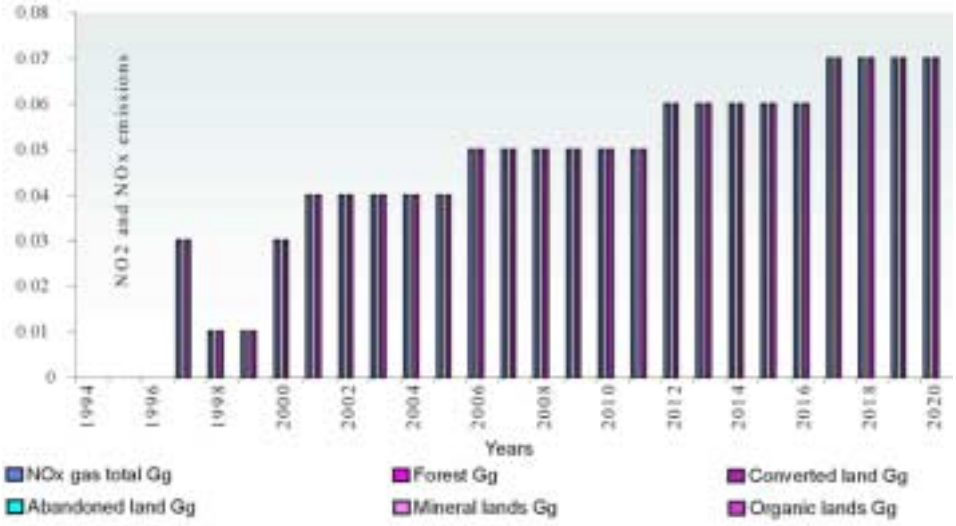


Fig. III.14 NO_x emissions, 2020; [Gg]; GHG emissions baseline scenario.

1.5 Agriculture sector[3]

1.5.1 CH_4 emissions

Table III.9 and table III.10 present the baseline emissions scenario, developed for agriculture sector.

Species	1994 census in 000 heads	CH_4 emissions Gg	2020 census in 000 heads	CH_4 emissions; Gg
cattle	774	57.52	929	101.84
sheep	2,460	12.82	3,690	19.22
goats	1,194	6.23	1,791	9.34
poultry	3,642	3.64	5,463	5.92
Total Emissions		**79.91**		**114.16**

Tab.III.9 Expected CH_4 emissions from the livestock sector in 2020, compared to 1994; [Gg]

Manure Management Systems	CH_4 emissions, 1994; Gg	CH_4 emissions 2010, Gg	CH_4 emissions 2020, GgS
	4.08	32	40

Tab.III.10 Expected CH_4 emissions from the MMS, in 2020, compared to 1994; [Gg]

1.5.2 N_2O emissions

The following figure shows expected N_2O emissions released from Manure Management Systems (MMS), application of nitric fertilizers and agricultural soils, compared to 1994.

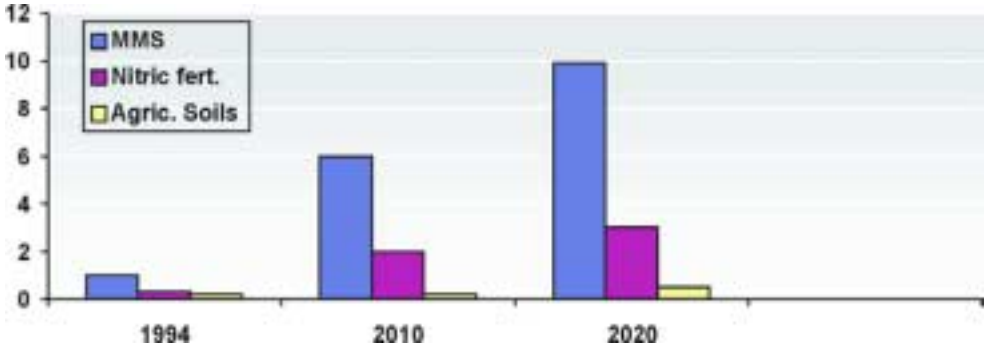


Fig.III.15 Expected N_2O emissions from agriculture [Gg]; GHG emissions baseline scenario

[3] Emissions are estimated for 2010 and 2020, according to the 1996 revised IPCC Methodology

1.6 Waste sector

1.6.1 CH_4 emissions

The results of the baseline greenhouse gas emission scenario for waste sector are given in the following figure.

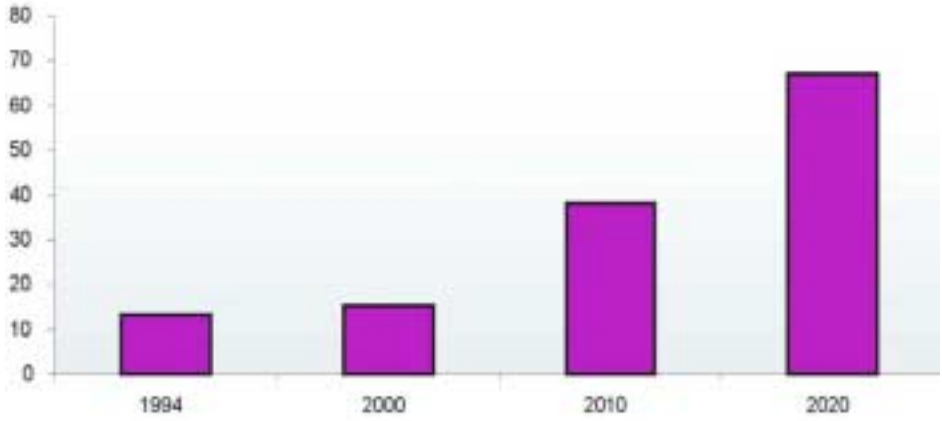


Fig.III.16. CH_4 emissions from waste sector, [Gg];
GHG emissions baseline scenario

In 2020, the annual CH_4 emissions from waste sector (landfills) are expected to increase to 66.97 Gg or around five times more, compared to the base year 1994.

Also, the N_2O emissions from waste sector (human sewage) are foreseen to reach an amount of 0.267 Gg for the year 2020 compared to 0.15 Gg in 1994. Their contribution in terms of CO_2 equivalent is expected to be around 6% of the total greenhouse gas emissions expected from waste sector in 2020.

1.7 Industry sector

1.7.1 CO_2 emissions

The cement industry will continue to be the largest contributor with around 817 Gg in 2020, while the total CO_2 emissions coming from industry sector are expected to reach the amount of 992 Gg. This is evident in figure III.17.

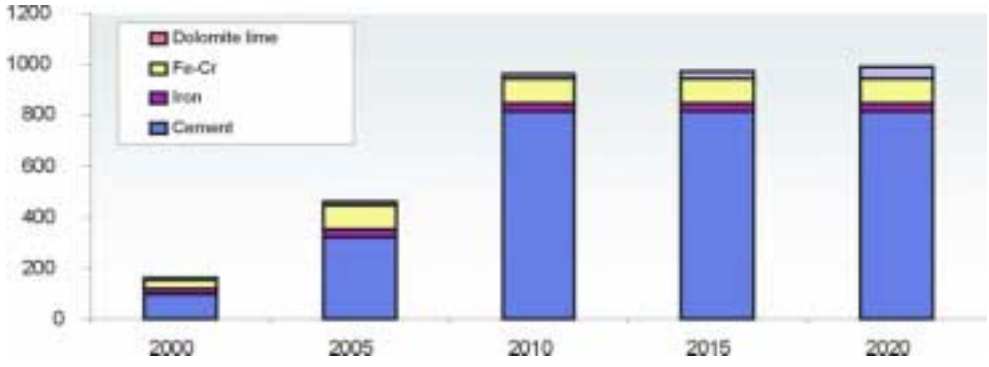


Fig.III.17 CO_2 emissions from industry sector; [Gg];
GHG emissions baseline scenario

1.7.2 Other emissions

The estimated amounts of SO_2 and NMVOC emissions, foreseen to be released in 2020 from industry sector are relatively small, respectively only 0.6 Gg and 1.19 Gg.

1.8 Solvents sector

1.8.1 NMVOC emissions

The forecasted amount of NMVOC emissions from solvents sector compared to the year 1994 (4.5 Gg) will be 6 Gg. This is evident in the trend shown in figure III.18.

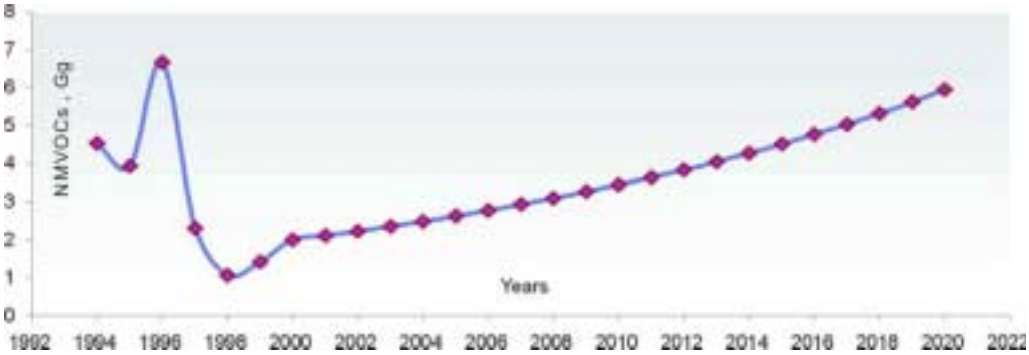


Fig.III.18 NMVOC emissions from solvents towards 2020, [Gg]; GHG emissions baseline scenario

1.9 Aggregated emissions from all economic sectors

The following table shows the total emissions of gases of direct greenhouse effect like CO_2, CH_4 and N_2O and their values in CO_2 equivalent for the year 2020, according to the baseline scenario.

GHG	Total emissions	CO_2 eqv., emissions	Shares versus total emissions, %
CO_2	22, 371	22,371	59.4
CH_4	524.53	11, 015	29.2
N_2O	13.76	4,267	11.3

Tab.III.11 The total anthropogenic GHG emissions, 2020; [Gg]

In terms of CO_2 equivalent, the greenhouse gas emissions expected in 2020 from all economic sectors will reach the amount of 37, 653 Gg. The largest share towards 2020, is expected to belong to CO_2 emissions with about 60 %, followed by CH_4 emissions with about 29% and then by N_2O with about 11 %.

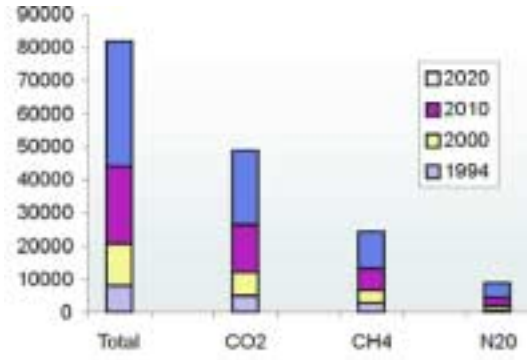


Fig. III. 19 CO_2 eqv. emissions; 2020; [37653 Gg], GHG emissions emissions scenario

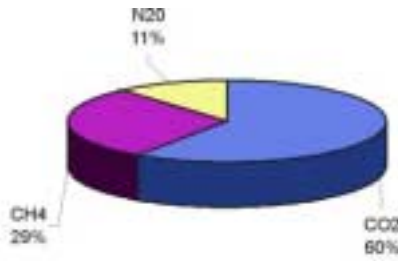


Fig. III.20 CO_2 eqv. emissions from economic sectors; GHG emissions baseline scenario

These data indicate that even in 2020, the CO_2 released due to energy and transport activities is expected to be the main greenhouse gas in Albania.

2 GHG EMISSIONS ABATEMENT SCENARIO

Referring to the greenhouse gas emissions baseline scenario, it is expected that most of CO_2 emissions will be released from the energy and transport activities, which in 2020 will account for 83% of the total.This is the reason why we decided to analyze in detail and in a quantitative way the energy and transport sectors, during the development of the abatement analysis. As for the other sectors, they are analyzed qualitatively.

2.1 Methodology

With regard to the energy and transport sectors, the development of GHG abatement analysis is based on GACMO software, which is a greenhouse gas costing model, developed by the UNEP Center for Energy and Environment. The greenhouse gas emissions abatement scenario combines the emissions in the baseline scenario with the changes (i.e., reductions) of emissions introduced by various abatement options being evaluated. For each abatement option, the technologies that deliver energy services in the reference option are changed.

An abatement unit of emissions from these new technologies offsets a unit of energy consumed in the baseline scenario. A very important assumption made is that the level of energy service delivered by the baseline option and the abatement option does not affect the demand for the energy service. For each abatement option, a "unit" measure for the new technology has to be defined. Furthermore the penetration of the abatement option in the country is measured.

At the end, the model enables the calculation of the greenhouse gas emissions reduction associated with different options, as well as the average abatement cost in USD per ton of CO_2 equivalent emissions reduced, for all kinds of abatement options.

The greenhouse gas emissions abatement scenario assumes a gradual implementation of energy efficiency measures in the household, industry, service and transport sectors.

Selection of measures for energy and transport sectors is made taking into account the actual situation of energy sector in Albania, key sources of greenhouse gas emissions (refer to the national greenhouse gases inventory) and greenhouse gas emissions baseline scenario for energy and transport sectors.

2.2 Household sector

The following sections describe all abatement measures and their penetration into Albanian energy market. The main feature in the greenhouse gas emissions baseline scenario for energy and transport is that space heating demand in households will be developed in an irregular manner, because no efforts will be made to curb the energy demand growth.

According to the greenhouse gas emissions abatement scenario, by implementing a set of energy efficiency measures in Albanian households through a proper norm of penetration estimated for each measure, the energy demand will be reduced, bringing about at the same time the abatement of greenhouse gases released from this sector. The proposed measures are:

- Thermo insulation of households, in case when the main energy sources are electricity, fuel wood, LPG, kerosene and, when a district heating system is applied;
- Introduction of efficient refrigerators in household consumers;
- Introduction of efficient lighting in household consumers;
- Introduction of thermas time switches for electric boilers in household consumers;
- Introduction of prepaid metres in household consumers;
- Introduction of solar water heating system versus electric boilers in households.

2.1.1 Thermo insulation of households

The analysis on energy consumption from the household sector is based on the extent that basic energy end uses differ from which other. The basic energy end uses are: space heating, air conditioning, water heating, cooking, lighting, and electric appliances.

Up to 1990, the supply and demand for space heating, cooking, domestic hot water and fuels balance (mainly wood) were more or less in balance. After 1990, there was a large reduction of fuel wood supplied by the state enterprises to the urban area. As a result, there was an over cutting of trees (much of which is illegal), overloading the electricity distribution system and too many environmental problems.

Starting with the period after the Second World War, Albania had a very large housing problem. An extreme demand for modern dwelling existed. The requirements for a short construction time, unrealistic low energy prices and lack of appropriate building materials has resulted in buildings with low levels of thermo insulation, little or no means of regulating the heating levels and individual metering or billing of energy consumption. This led to a high level of energy consumption especially for pre-fabricated buildings.

The increase of the level of insulation and reducing the losses from both natural and mechanic ventilation can significantly reduce the energy consumption at a building. If a building will be renovated due to deterioration (replacement of old windows, improvements to the roofs, etc.), it is reasonable to combine these measures with an energy efficient renovation, since the decrease in energy consumption can reduce the payback period significantly.

As it is described in the baseline scenario, the Albania's household consumers use different kind of energy comodities, in order to meet their energy needs for space heating. Due to the collapse of industries and the increasing energy consumption by households, the electricity demand from the household / service sector now occupies a significant share: more than 60% of the total energy demand and 62% of the electricity demand.

The following paragraphs describe in detail the effects of reduction of greenhouse gas emissions, by introducing thermo insulation in existing and new stock of buildings, when different energy sources meet space heating demand.

In Albania's households which use electric radiators for space heating (the largest consumers of electricity), the electricity consumed is estimated to be about 4,265 kWh/year, compared to only 2,973 kWh/year (average moderated value for Albania) expected to be consumed from a thermo insulated one. Based on the average number of the heating degree days for Albania, the utilization time considered in our estimations is 3,100 hours.

Box 1 shows an example of the greenhouse gas abatement analysis for improving energy efficiency by introduction of thermo insulation in household sector, which use electricity as energy source for space heating. This is a demonstrative example of calculation of reduction potential for above case. This methodology is used for each measure quantitatively analysed. Besides these measures, there is a set of other measures which are qualitatively analysed, due to lack of necessary data. They are subject of a quantitative analysis in the future.

From the analysis shown in the Box 1, it is evident that this measure will reduce CO_2 equivalent by 0.94557 Gg / (year, household), while it has a negative cost of -110.30 USD/(tons of CO_2 eqv.). The negative cost means that this measure is a cost - effective one. In order to estimate all greenhouse gas emissions reduction resulted from the implementing of this measure, its rate of penetration in 2010 and 2020 is also calculated (number of households, which will be insulated). The rates of penetration are shown in the Box 2.

Box 1: GHG abatement analysis of introducing thermo insulation in households which use electricity for space heating

Electricity used for space heating			
Costs in USD	**Abatement**	**Baseline**	**Increase**
Total investment	264.8		264.8
Project life (years)	40.0	40.0	
Ann. Levelized investment	15.4	0.0	15.4
Ann. O&M	0.0	0.0	0.0
Lev. inv. in power plant	90.5	129.9	-39.3
Ref. power plant O&M	16.9	24.3	-7.4
Ann. Fuel cost	168.1	241.1	-73.0
Total annual cost	291.0	395.3	**-104.3**
GHG Emissions (Mega grams)			
Ann. Emissions (tons)	**Abatement**	**Baseline**	**Reduction**
Fuel CO_2	2.17	3.11	0.94
Fuel N_2O	0.000017	0.000024	0.00
Fuel CH_4	0.000056	0.00	0.00
Total CO_2 eqv.	2.1763161	3.1218863	**0.95**
Tons CO_2 reduction / unit			0.94557
USD / ton CO_2 equivalent			**-110.30**

Abatement option: thermo insulated households		
Technology	thermo insulation	
O&M	0	
Activity	1	household
Utilization time	3,100	hrs
Annual electricity used	2,973.40	kWh
Capacity needed	0.96	kW
Baseline option: households without thermo insulation		
O&M	0.05	
Activity	1	kW of power
Original inv. in space heating equipment	421	USD
Utilization time	3,100	hours
Annual electricity used	4,265.28	kWh
Capacity needed	1.38	kW
General inputs:		
1 ton CH_4 =	21	ton CO_2
	310	
1 ton N_2O =		ton CO_2
1 USD =	1	USD
Discount rate	0.05	
Fuel CO_2 emis. factor	77.366	kg CO_2 / GJ fuel oil
Fuel CH_4 emis. factor	0.002	Kg CH_4 / GJ fuel oil
Fuel N_2O emis. factor	0.0006	Kg N_2O / GJ fuel oil
Invest. in the reference power plant	1,000	USD/kW
	20	
Life time of power plant		years
Capacity factor	3100	hours
Coal to elec. efficiency	0.449	
Electricity transfer losses	0.15	
Ref power plant O&M	0.015	

Box 2: Rate and units of penetration of thermol insulation in Albanian households which will use electricity for meeting space heating demand

year	2010		2020	
	Rate of penetration	Units of penetrating	Rate of penetration	Units of penetrating
Value	55.04%	683,027	55.04%	792,680

2.3 Service sector

The main feature of the greenhouse gas emissions baseline scenario for energy and transport is that energy demand in service subsectors will be developed in an unregulated manner because no efforts will be made to curb the energy demand growth. According to the abatement greenhouse gas emissions scenario, a set of energy efficiency measures in service sector is expected to be introduced through a proper norm of penetration. The energy demand is expected to be reduced bringing at the same time abatement of greenhouse gases from this sector. The measures proposed are as following:

- Introduction of efficient refrigerators in service consumers;
- Introduction of efficient lighting in service consumers;
- Introduction of efficient electrical motors in service consumers;

However, the measures towards reduction of greenhouse gas emissions in service sector are not limited to the above selected ones only. The following measures may also produce a great reduction of greenhouse gas emissions, but to analyze them in detail, more information is needed. For that reason, they remain as a subject of future analysis.

- Introduction of solar water heater systems versus electric boilers in service consumers (ho tels, restaurants, hospitals);
- Thermo insulation of stock of buildings which use (electricity, firewood, LPG, kerosene) for meeting space heating energy demand;
- Establishment of a scenario aiming at a 20% reduction of energy intensities in the service sector, due to a better management of the energy sector which will gradually start to operate in 2002;
- Introduction of central heating plants versus individual ones;
- Introduction of district heating plants in service sector;
- Introduction of total energy supply schemes (hydro / solar energy and small scale combined heat and power, based on diesel generators) for meeting electricity and heat demand in tourist villages;
- Introduction of combined heat and power and district heating plants in service sector.

2.4 Industry sector

Historically, Albania's energy intensity in industrial subsectors has been very high. This means that the macro economic output normally denounced by the GDP (especially from industry sector), has been low compared to the overall energy consumption. The reasons are the same as for the other Central and Eastern European Countries (CEEC), which have been oriented towards energy intensive industries such as mining and metallurgy, and where low energy prices have been prevailing. The following measures are selected for introduction in industrial sector, in order to reduce the greenhouse gas emissions:

- Introduction of efficient heavy fuel oil fired boilers in industrial consumers;
- Introduction of efficient coal fired boilers in industrial consumers;
- Introduction of efficient electrical motors in industrial consumers;
- Improvement of power factor for the industrial consumers;
- Introduction of efficient lighting in industrial consumers.

Finally, such interventions including direct financial support by means of international and governmental funds will be necessary, even to curb more the growing demand in the coming years. The following measures are also expected to have a reduction potential of greenhouse gas emissions. However, to analyse them in detail, more information is needed.

- Improvement of energy consumption through of a better management;
- Introduction of new industrial technology, which consumes less energy sources (lower en ergy intensity);
- Introduction of district heating plants in industrial zones;
- Introduction of combined heat and power and district heating plants in industrial zones.

2.5 Transport sector

Both greenhouse gas emissions baseline scenario and projections of the sector itself, assume that the energy demand for the transport sector will continue to develop with the same trends that have been prevailing since 1994. The qualitative measures proposed for this sector, aiming at energy efficiency and the reduction of fuel consumption, within the normal standards, are the following:

- Improvement of the difficult situation of the existing roads and construction of new ones;
- Increasing the share of public transport for passengers and goods;
- Introduction of non-motorized modes of transport;
- Introduction of carbon tax system;
- Increasing the taxes for second hand category cars; etc.

These measures will regulate the amount of pollution from cars associated with a considerably reduction of fuel consumption.

2.6 Energy transformation sector

Up to now, we described and analyzed the abatement measures for reduction of greenhouse gas emissions in energy demand side as per all economic sectors. Besides them, the proposed greenhouse gas abatement measures related with energy transformation sector are also very important. Main efforts in this category of abatement measures will be focused on power sector and utilization of renewable energy sources. The following measures will be introduced and analyzed in details in the following section:

- Introduction of hydro power plant versus heavy fuel oil plant in Albania's power sector;
- Introduction of hydro power plant versus natural gas plant in Albania's power sector;
- Introduction of gas power plant versus heavy fuel oil power plant in Albania's power sector;
- Introduction of mini hydro power plants versus diesel generator in Albania's power sector;
- Introduction of wind turbines versus diesel generators in Albania's power sector;
- Introduction of wind turbines versus natural gas power plant in Albania's power sector;
- Introduction of solar PV versus diesel generator in Albania's power sector;

2.7 Overall abatement potential for energy and transport sectors

The development pattern that Albania has followed under the conditions of centrally planned economy was highly energy intensive. The energy intensity of GDP was more than twice higher compared to the west European countries due to the prevailing share of industry in the GDP structure, while the energy intensity of the industrial output was 68% higher.

The performed analysis shows that energy intensity of Albanian economy as a whole is expected to decrease driven by structural changes among economic sectors and within sectors, high prices of energy and penetration of new state-of-art technologies. According to the recent projections, the share of industry within GDP structure is expected to decrease from 39% in 1990 to 14% in 2000. However, the industry and transport sectors are wxpected to have the highest potential for energy efficiency improvement. For that reason, different abatement measures and specific projects are directed towards these important energy consumption sectors.

Concerning the energy supply side, the share of renewable sources in Albania is about 18-22% in primary energy balance. This is very high compared to many other countries, because electricity generation in Albania is based in hydro sources. According to the abatement greenhouse gas emissions scenario, more hydro power plants will be introduced, compared to the greenhouse gas emissions baseline scenario.

Different parts of the country are suitable for implementing different types of renewable technologies. For example, most of high mountainous regions along with the Ionian coastline are appropriate to install wind mills and small hydro power plants. Solar energy may be utilized in southern and central part of the country, while biomass resources related to agricultural production are most widely spread in the central and northeastern part of the country.

Expert estimates indicate that a significant drop in renewable technology investments, for a unit of installed capacity is expected due to the increase of their market share. This tendency, together with an expected increase of GDP, will speed up the penetration of renewable energy sources in Albania.

Referring to figure III. 21, the abatement measures introduced in industry are predicted to have the most significant impact on the reduction of greenhouse gas emissions from six economic sectors taken into consideration. The industry is then followed by household and energy trans-

formation sector. This conclusion shows once more that introducing measures in demand side management gives more results in the abatement of greenhouse gas emissions than introducing measures in energy transformation sector.

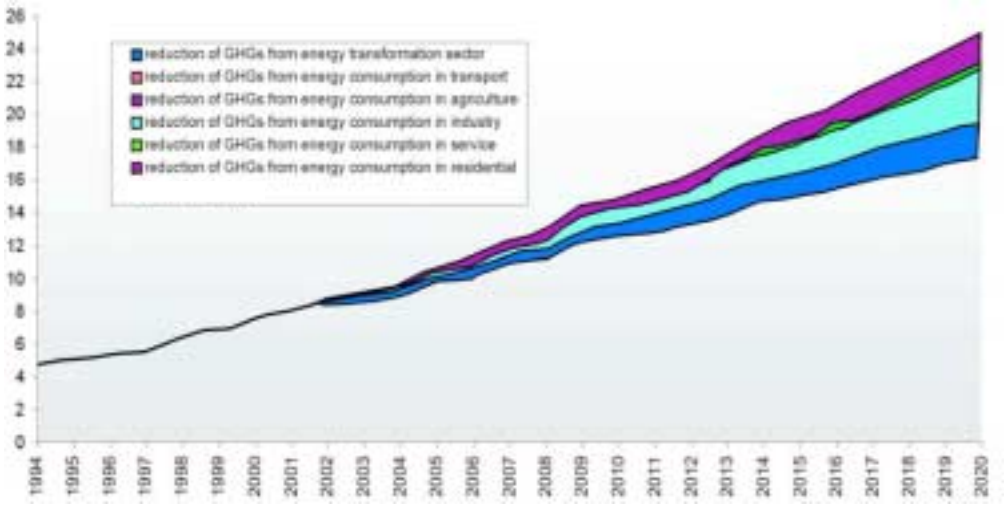


Fig.III. 21 All GHG abatement measures to be introduced in energy consumption and transformation sector. (Million tons of CO_2 eqv.)

Figure III. 22 shows the reduction potential of greenhouse gas emissions from energy demand side and energy transformation sectors as well. Also two scenarios, baseline and abatement one are shown in this figure

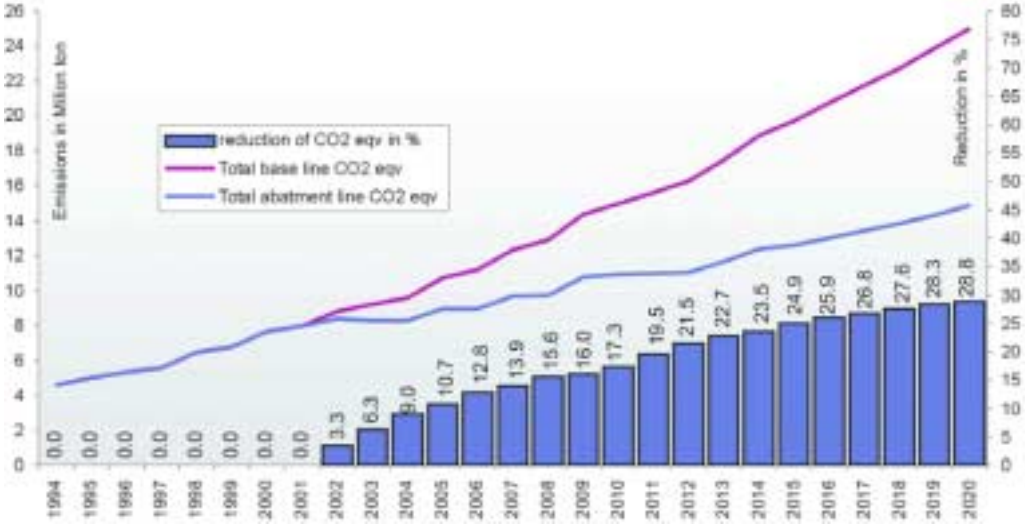


Fig.III.22 Baseline scenario, abatement scenario and amount of reduction of GHG emissions, from energy and transport sector; [Million tons of CO_2 eqv.]

Based on the analysis of each economic sector, all measures already mentioned in this section are disaggregated according to the list of measures mentioned in the section 3.1.1. The following figure shows each of these measures, disaggregated according to each economic sector. It is worth to be mentioned that the total reduction potentail of these measures is the same compared to those shown in the figure III.21.

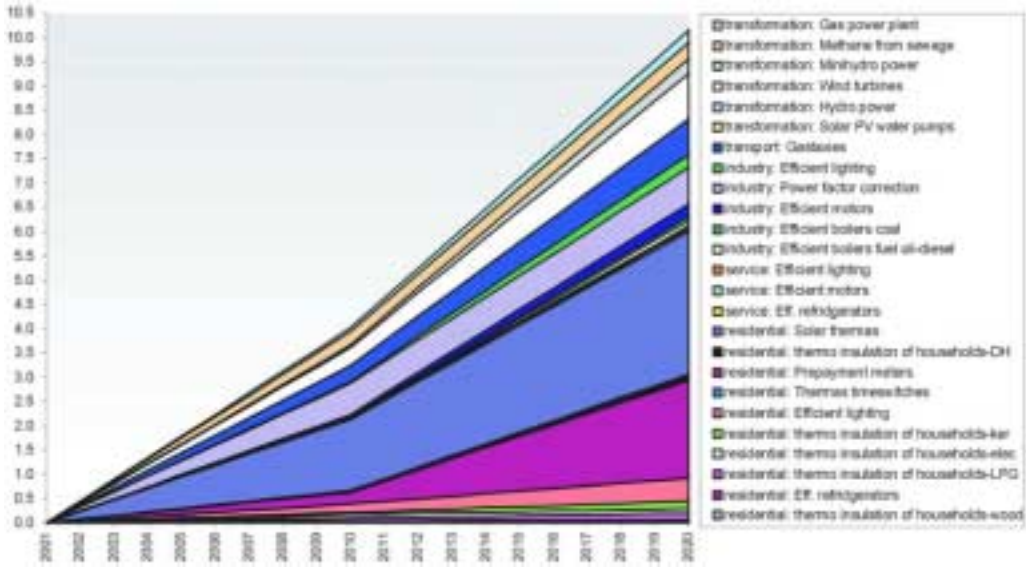


Fig. III. 23 All energy and transport abatement measures, 2001-2020; [Milion tons of CO_2 eqv.]

The proposed energy abatement measures ranked in a decreasing order, as for the emission reduction potential are presented in the figure III.24, while table III.12 shows all key abatement measures of greenhouse gas emissions which, in cumulative order comprise around 95% of total reduction for the year 2020. The same approach, as for the identification of the key source categories of emissions is used for the identification of the key abatement measures as well.

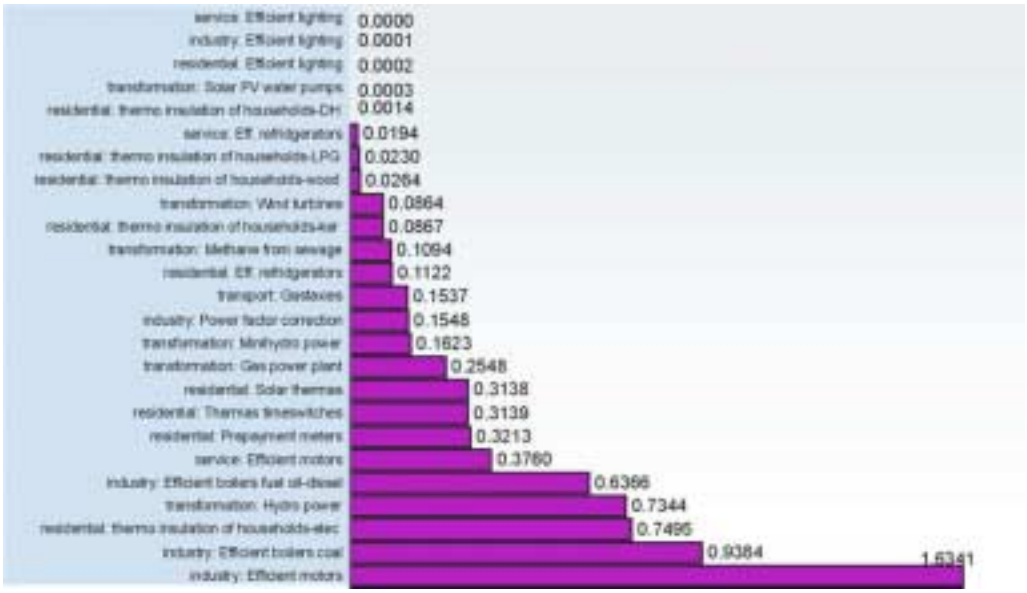


Fig. III. 24 All energy and transport abatement measuresfor ranked in the decreasing order; up to 2020; [Million tons of CO_2 eqv.]

	Selected abatement measures	Reduction potential; 2020; Million Ton	Reduction potential 2020; % of the total	Cumulative; %
1	Industry: Efficient motors	1.6341	22.66845	22.66845
2	Industry: Efficient boilers coal	0.9384	13.01666	35.68511
3	Residential: Thermo insulation of households-electricity	0.7495	10.39734	46.08245
4	Transformation: Hydro power	0.7344	10.18679	56.26924
5	Industry: Efficient boilers, fuel oil-diesel	0.6366	8.83015	65.09939
6	Service: Efficient motors	0.3760	5.21522	70.31462
7	Residential: Prepayment meters	0.3213	4.45666	74.77127
8	Residential: Thermo time switches	0.3139	4.35443	79.12570
9	Residential: Solar water heaters	0.3138	4.35305	83.47876
10	Transformation: Power plant gas	0.2548	3.53446	87.01321
11	Transformation: Mini hydro power plants	0.1623	2.25087	89.26408
12	Industry: Power factor correction	0.1548	2.14691	91.41099
13	Transport: Gas- taxies	0.1537	2.13228	93.54328
14	Residential: Efficient refrigerators	0.1122	1.55611	95.09938
15	Transformation: Methane from sewage	0.1094	1.51776	
16	Residential: Thermo insulation of households-kerosene	0.0867	1.20229	
17	Transformation: Wind turbines	0.0864	1.19896	
18	Residential: Thermo insulation of households-wood	0.0264	0.36566	
19	Residential: Thermo insulation of households-LPG	0.0230	0.31891	
20	Service: Efficient refrigerators	0.0194	0.26918	
21	Residential: Thermo insulation of households-DH	0.0014	0.01945	
22	Transformation: Solar PV water pumps	0.0003	0.00432	
23	Residential: Efficient lighting	0.0002	0.00246	
24	Industry: Efficient lighting	0.0001	0.00137	
25	Service: Efficient lighting	0.0000	0.00026	
	Total	7.2089	100.0000	100.0000

Tab.III.12 All key GHG abatement measures that in cumulative order comprise 95% of total reduction; up to 2020.

The following figure represents the final analysis of comparing the abatement measures based on their cost per unit reduction of CO_2 equivalent. The selected abatement measures of green-house gas emissions are those ranked firstly in figure III.24 in a decreasing order.

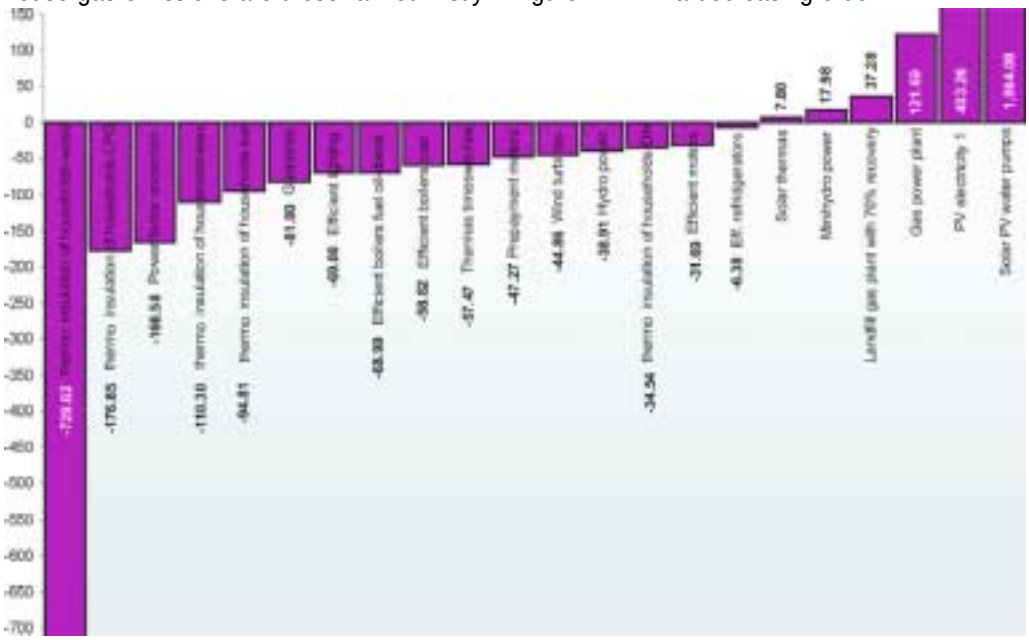


Fig. III. 25 Comparison of selected GHG abatement measures, based on their cost of reduction [USD/CO_2 eqv.]

The most effective abatement measures, based on their cost of CO_2 equivalent reduction, in the decrease order, are as follows:

- Introduction of thermo insulation of households which use fuel wood as energy source for meeting space heating demand;
- Introduction of thermo insulation of households which use LPG as energy source for meet ing space heating demand;
- Improvement of power factor in industrial and service consumers;
- Introduction of thermo insulation of households which use electricity to meet space heating demand;
- Introduction of thermo insulation of households which use kerosene to meet space heating demand;
- Introduction of gas-taxies versus gasoline taxies;
- Introducing of efficient lighting (incandescent lamps versus fluorescent ones) in house holds / service / industry;
- Improvement of efficient boilers which use heavy fuel oil / diesel as fuel;
- Improvement of efficient boilers which use coal as fuel;
- Introduction of thermas time switches in electric boilers in household sector;
- Introduction of prepaid metres in household sector;
- Introduction of wind turbines versus diesel generators;
- Introduction of hydro power plants versus heavy fuel oil power plants;
- Introduction of thermo insulation of households which use heat (from DHP) as energy source for meeting space heating demand;
- Introduction of efficient electric motors in industry / service sectors;
- Introduction of efficient refrigerators in household / service sectors;
- Introduction of solar water heaters versus of electric boilers;
- Introduction of mini hydro power plants versus diesel generators;
- Introduction of landfill gas plants with 70% recovery;
- Introduction of gas power plants versus heavy fuel oil power plants;
- Introduction of PV electricity versus diesel generators;
- Introduction of solar PV water pumps versus diesel pumps.

2.8 Land use change and forestry sector

2.8.1 Selected measures to reduce GHG emissions from forestry sector

The selected of abatement measures to be introduced in forestry sector from 2002-2020, is based on the criteria for screening options. Specifically they are as follows:

- Reforestation.
  The predicted reforestation in an area of about 15,500 ha, would lead to a reduction of rates of decrease of the forest area from 1,024. 616 ha in 2001 to 993.323 ha in 2020. The average rate of reforestation would be about 775 ha/year.

- Implementation of the forest improvement operations
  Implementation of the coppice forest conversion using the same or fast growing species to high stem forest in a forest area of about 100,000 ha, with an average annual rate of 5,000 ha/ year.

2.8.2 GHG abatement projections for land use change and forestry sector

According to the 1996 revised IPCC Guidelines, the results of the analysis of projected green-house gas emissions, released from land use change and forestry sector for each year, from 2001 up to year 2020, compared to the results of baseline emissions scenario for this sector are presented in figure III.26 and commented as following:

- The total CO_2 emissions, from land use change and forestry, would change from -2,732.72 Gg in 2001 to an uptake of 2,886.84 Gg in 2020.
- The total emissions of CH_4, from land use change and forestry would change from 0.15 Gg in 2001 to 0.29 Gg in 2020.
- No emissions of N_2O from land use change and forestry. The value of 0 Gg. in 2001 will remain the same in 2020.
- The total emissions of NO_X from land use change and forestry would change from 0.04 Gg in 2001 to 0.07 Gg in 2020.

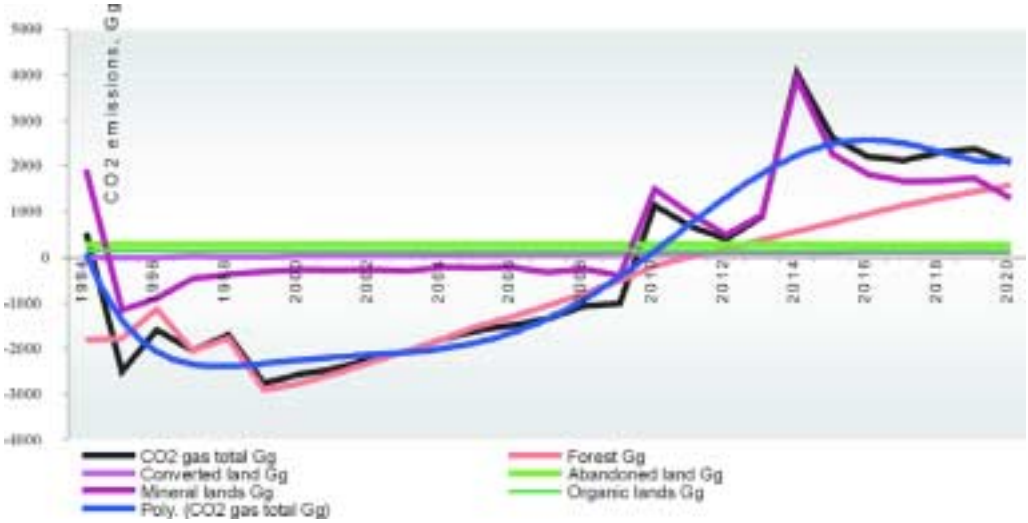


Fig.III.26 CO_2 emissions in after cultivation systems; [Gg]

As a conclusion, after the application of the selected options from the year 2001, the forests are expected to serve in 2020 as a sink of CO_2 emissions. However, there is a clear need for investments in order to apply the proposed recommendations. A detailed cost-benefit analysis of these measures is needed as well.

2.9 Agriculture sector

It is difficult to evaluate the costs of implementing policies to control greenhouse gas emissions released from the agriculture sector in Albania, since costs depend on the type of policy instrument used and the extent of changes desired. On the other hand, the damage costs of greenhouse gas emissions are unknown, likewise are the abatement costs of introduction of policies that reduce greenhouse gas emissions. This means that it is very difficult to choose a policy option that will have the lowest net cost to society or the largest net benefit.

However, several greenhouse gas abatement options are considered for possible implementation in the Albania's agriculture sector for the time period 2000-2020. The following are thought to have a likely impact on the reduction of greenhouse gases:

- Better management of pastures and the adjustment of the stocking rates.
  This measure will principally affect the population of small ruminants (sheep and goats), which extensively use the pastures for grazing with a potential reduction of 20% in CH_4 emissions. This could be achieved with little or no loss of productivity by improving pasture management and adjusting the stocking rate. That implies a potential reduction of 1.88 Gg from the envisaged increase of 9.5 Gg in CH_4 emissions from this category, by the end of 2020 as compared to 1994;

- The improvement of digestibility by ruminants
  This measure can be reached by promoting the use of food additives, which are considered attractive by many animal's breeders for increasing profitability. Using of molasses-urea as feed supplement and especially using of straw treated urea, has been largely promoted and used by the former state owned bovine breeding farms during the period 1980-1988. It has been interrupted ever since due to the radical changes affecting agriculture sector, which resulted in the dissolving of the state owned breeding units.

The establishment of private bovine breeding enterprises appears to be a trend for the future development of the livestock sector in Albania. A large scale resumption of the use of molasses -urea fed to bovines as well as the use of the urea treated straw for the same purposed is expected. These measures comprise a potential of 30% of CH_4 emissions reduction, by the end of 2020.

Regarding the cattle category, this implies an overall CH_4 reduction of 6.614 Gg from the expected amount of 22.16 Gg of CH_4 emissions, compared to the reference year 1994.

2.10 Waste sector

2.10.1 GHG abatement options

The problems to which wastes give rise to, are both specific and relatively complex. Waste sector is not only a potential source of pollution, but it can also constitute secondary raw materials. Waste management and wastewater treatment represent subsectors where measures to abate CH_4 emissions have sense. The main objectives concerned are the reduction of the waste production quantity, recycling and the minimization of the environmental impact of waste disposal and waste treatment.

In order to make abatement projections for the period 2001-2020, for the waste sector, the following abatement options are considered:

- Construction of new sanitary landfills: the gas generated from the landfill will be utilized;
- Construction of a new Municipal Solid Waste (MSW) incinerator with energy utilization;

- Extending the collection and utilization of secondary resources through the application of separated collection to reduce the amount of MSW;
- Reduction of organic substances stored in landfills;
- Construction of new sewerage systems with waste water treatment plants.

The problem of defining which options are the most effective is relatively complex. Based on the criteria for screening the options, the following are selected as more optimal:

1. Construction of new sanitarys landfills: the gas generated from the landfill will be utilized for energy generation purposes.
2. Construction of a new MSW incinerator with energy utilization.

2.10.1.1 Construction of new sanitary landfills

The construction of sanitary landfills is necessary for the principal districts of the country, like Shkodra, Elbasani, Fieri, Vlora and Korca.

This option has a high potential for CO_2 equivalent emissions reduction and is a sustainable long term option, in consistency with national development goals. Also, the above mentioned option will have its positive impact on environment. However, the cost of its implementation is rather high.

Up to 2010, only two new sanitary landfills in the watershed of Elbasan and Vlore are foreseen to be constructed. In 2010, the population of the Elbasani and Vlora districts is expected to be about 17% of the urban population of the country.

The change of situation compared to the baseline scenario is reflected on the calculation of MCF, based on 1996 revised IPCC Guidelines. The gas generated from these two landfills is foreseen to be utilized for energy purposes (electricity generation). Estimations show that in 2010 (baseline scenario) will be emitted 38.15 Gg of CH_4, while in the same year considering the 1^{-rst} option, from waste sector will be emitted 6.59 Gg of CO_2 and 31.57Gg of CH_4 (669.24 Gg CO_2equivalent).

Concerning the projections for 2020, three other new sanitary landfills in the basins of Shkodra, Fieri and Korca are foreseen to be put in place. The five sanitary landfills are considered in the estimations, presented in table III.13. In 2020 (baseline scenario) 66.917 Gg of CH_4 will be emitted, while in the same year considering 1^{-rst} option, 23.6 Gg of CO_2 and 43.3 Gg CH_4 will be emitted from the waste sector.

2.10.1.2 Construction of a new MSW incinerator with energy use

The second abatement option considers the construction of a new incinerator in Tirana area. This zone covers Tirana, Durresi, Shijak and Kavaja. The 2^{-nd} option has also a significant potential of reduction of CO_2 emissions on the air compared to the 1-^{rst} option proposed, being at the same time a long term sustainable option in consistency with national development goals. On the other side, the implementation cost of this option is higher compared with the first one.

According to the estimations, in 2020, the implementation of the 2^{-nd} option will bring an amount of 41.02 Gg of CH_4 emitted and 25.88 Gg of CO_2 emitted versus 66.917 Gg of CH_4, as foreseen in the baseline scenario.

The implemenation of both abatement options in 2020, will bring an amount of 17.14 Gg of CH_4 and 49.48 Gg of CO_2 or 414.7 Gg of CO_2 equivalent, versus 66.917 Gg of CH_4 (or 1,405.7 Gg of CO_2 equivalent) emitted in emissions baseline scenario.

Years & Options	CH_4 emissions without options; Gg	CH_4 emissions with options; Gg	CO_2 emissions with options; Gg	CO_2 eqv emissions with options, Gg
2000	15.3	–	–	321.29
2010	38.15	31.57	6.59	669.24
Option 1				
2020	66.97	–	–	1,4057
Option1		43.3	23.6	932.46
Option2		41.02	25.88	886.88
Option 1& 2		17.4	49.48	414.71

Tab. III.13 Expected GHG emissions after implementation of proposed abatement options in waste sector.

2.11 Industrial processes and solvents use

The options for reduction of greenhouse gas emissions, released from industrial processes and solvents sectors, even though analyzed in a qualitative way are more theoretical ones. Since the contribution of such sectors in the national greenhouse gases inventories towards 2020 is not significant, and the lack of more precise data to analyze them in detail, enforced us to judge them as inappropriate to be included in the list of measures for abatement of greenhouse gas emissions.

CHAPTER IV

IV

VULNERABILITY AND ADAPTION

The UNFCCC calls on all Parties to "...formulate, implement, publish and regularly update national and, where appropriate, regional programs containing measures to ... facilitate adequate adaptation to climate change."

This chapter examines vulnerability to meet this commitment under the UNFCCC. The main objectives of the assessment are: identification and evaluation in a scientific manner of the implication of expected climate changes in hydrosphere, natural and managed ecosystems, population and other human activities; determination of areas or systems which appear to be most vulnerable to expected climate change; provision of a mode of analysis that will enable policy makers and decision makers to chose among a set of adaptation options; and the development of a set of alternative suggestions / recommendations that must be taken into consideration during the process of preparing the national strategies for each sector.

1. METHODOLOGY

The assessment of vulnerabilities and adaptation options is carried out in accordance with the IPCC guidelines (IPCC, 1994). The study is focused on the assessment of the expected climate impacts on hydrosphere, natural and managed ecosystems, energy, tourism, health and population. The study area has covered the whole Albanian territory.

Three time horizons are considered: years 2025, 2050 and 2100. Although the year 2100 is fixed as upper horizon, in some cases such as in socio economic assessments, projections are not reliable for more than a few years ahead. For cases like energy, population, etc., the team has considered the year 2025 as the upper level. For others like natural ecosystems, forestry, etc., that have longer response, the vulnerability assessment is extended up to 2050 and 2100 horizons.

A variety of analytical methods in climate impact assessment (CIA) is selected. Among others worth mentioning are: experimentation, impact projections, empirical analogue studies and expert judgment.

MAGGIC/SCENGEN package is used to prepare the climate change scenarios for the mentioned time horizons. The LEAP model is used to evaluate the likely impact of climate change in energy sector. For the other sectors, statistical models are developed or empirical analogues are used (regional analogies of present climate and regional analogies of future climate).

Before the evaluation of the climate change impacts, the present situation of all sectors is analyzed[1].Three types of "baseline" conditions are specified (climate, environmental, socio-economic), for a comparison with future projections. As the climatologic baseline, a 30 years period (1961-1990) defined by WMO as 'normal period', is accepted. Environmental baseline refers to the present state of non climatic environmental factors, that affect the area under study. The socio - economic baseline refers to the present state of non environmental factors, that affect the area under study.

After the evaluation of climate change impacts, a set of adaptation options for each relevant sector is identified.The most important measures are further selected, by using screening, effectiveness and multicriteria analysis.

2. EXPECTED CLIMATE CHANGE SCENARIO

The expected Climate Change Scenario for Albania, (CCSA) including seasonal and annual changes, is indicated in table.IV.1.

[1] The present situation of all climate change relevant sectors is developed under the National Circumstances - Chapter I of National Communication.

Scenarios for Albania		Time horizon 2025	2050	2100
Winter	temperature (°C)	0.8÷1.0	1.3÷1.8	2.1÷3.7
	precipitation (%)	-1.6÷0	-1.8÷0	-3.7÷0
Spring	temperature (°C)	0.7÷0.9	1.0÷1.5	1.8÷3.0
	precipitation (%)	-2.7÷-1.3	-3.6÷-2.1	-7.4÷-3.4
Summer	temperature (°C)	0.9÷1.2	1.2÷2.0	2.3÷4.1
	precipitation (%)	-8.0÷-5.6	-20.0÷-9.1	-27.0÷-14.4
Autumn	temperature (°C)	0.9÷1.1	1.1÷2.0	2.1÷3.8
	precipitation (%)	-4.3÷-3.4	-11.2÷-2.1	-16.2÷-8.6
Annual	temperature (°C)	0.8÷1.0	1.2÷1.8	2.1÷3.6
	precipitation (%)	-3.8÷-2.4	-6.1÷-3.8	-12.5÷-6.0
Sea level (cm)			20-24	48-61
Cloud cover (%)		-1.3÷-1.5	-2.6÷-2.0	-4.6÷-3.1
Wind speed (%)		0.7	1÷1.3	1.6÷2.3

Tab.IV. 1 Climate change scenarios for Albania

The climate change scenarios for Albania leads to an annual increase in temperature up to 1°C, 1.8°C, 3.6°C respectively by 2025, 2050 and 2100 and a decrease in precipitation up to -3.8%, -6.1%, -12.5%, by the same time horizons.

3. THE EXPECTED IMPACTS OF CLIMATE CHANGES

3.1 Temperature

An annual temperature around 15 - 17°C will be expected along the coastal zone, by the year 2050, pursuing by values between 14 - 16°C over the low and hilly areas. Moving toward mountainous zones, the expected temperature will be up to 11 - 13°C. The highest mountainous zones are expected to have a mean annual temperature, up to 9°C. Expected seasonal changes of temperatures and annual temperatures along three time horizons are given respectively in figure IV.1 and figure IV.2.

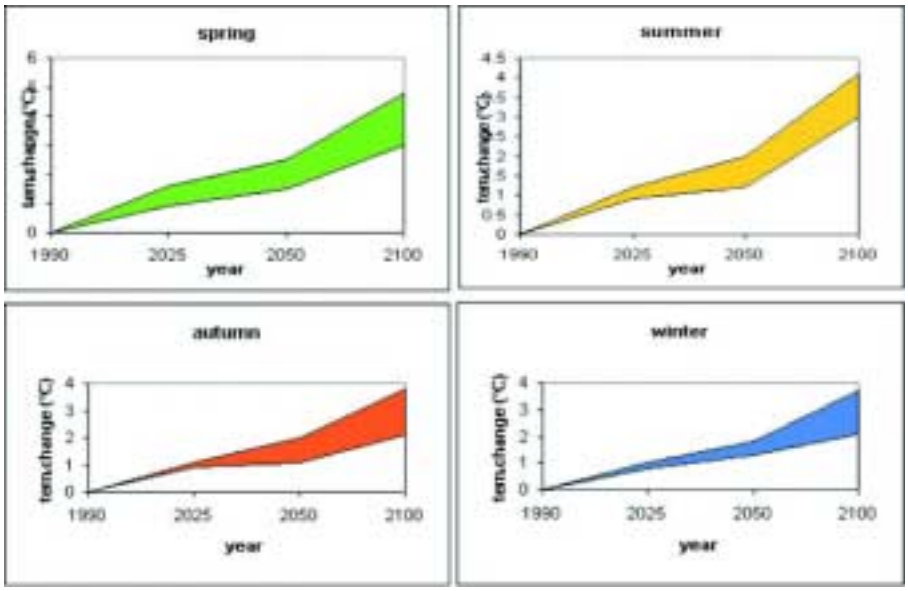


Fig.IV.1 Expected seasonal temperature changes

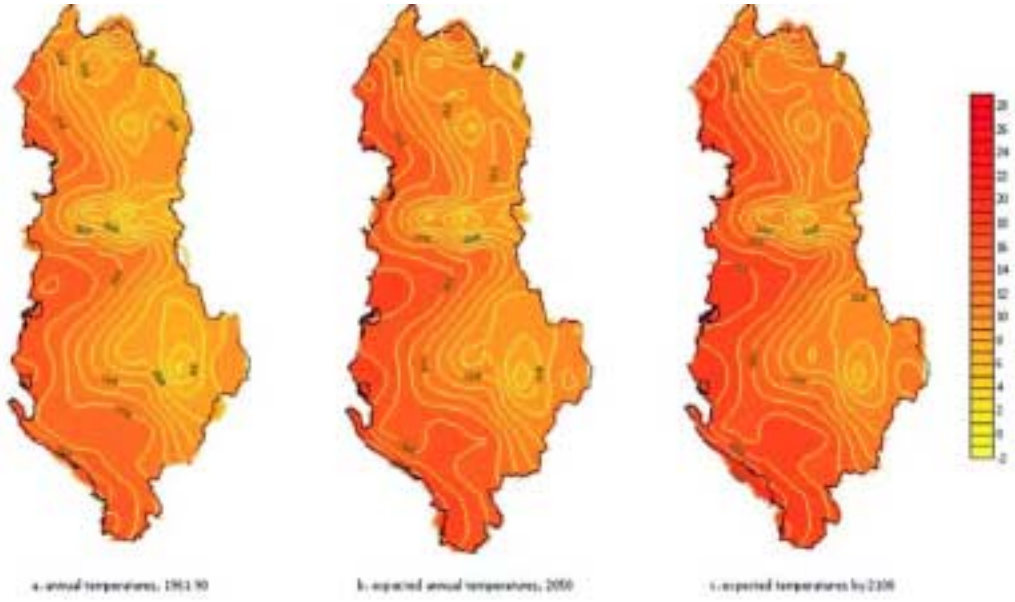


Fig.IV.2 Expected annual temperature changes

3.2 Precipitation

By 2050, the lowest value of annual precipitation total (about 570 mm) is expected to be registered in the southeast of the country, followed by Myzeqeja zone located in the west, with 950 mm, the southwest area with 2,100 mm. The highest value, about 2,650-2,850 mm, is expected to be registered again over the Alpine zones.The same distribution is likely expected by 2100 (the expected change is -12.5 ÷ - 6%, related to baseline). So, these values will be 55 mm, 900 mm, 2,000 mm and 2,500-2,700 mm respectively for Myzeqeja, southwest and Alps zone. The expected seasonal and annual changes are represented respectively in figure IV.3 and figure

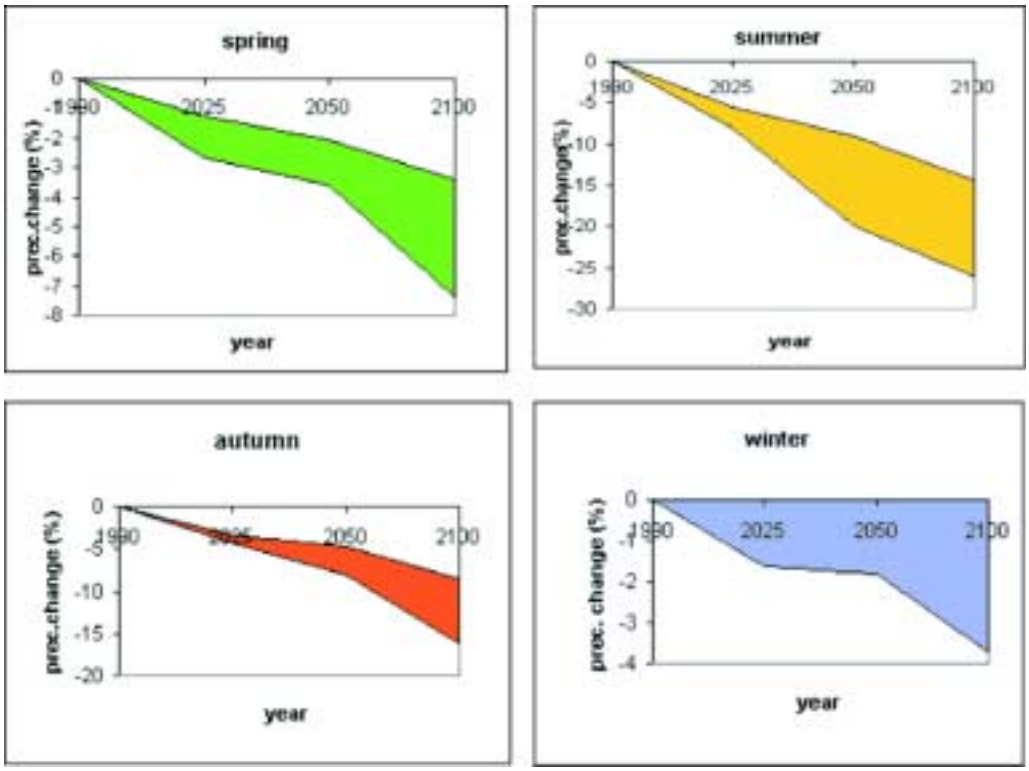


Fig.IV.3. Expected seasonal change of precipitation

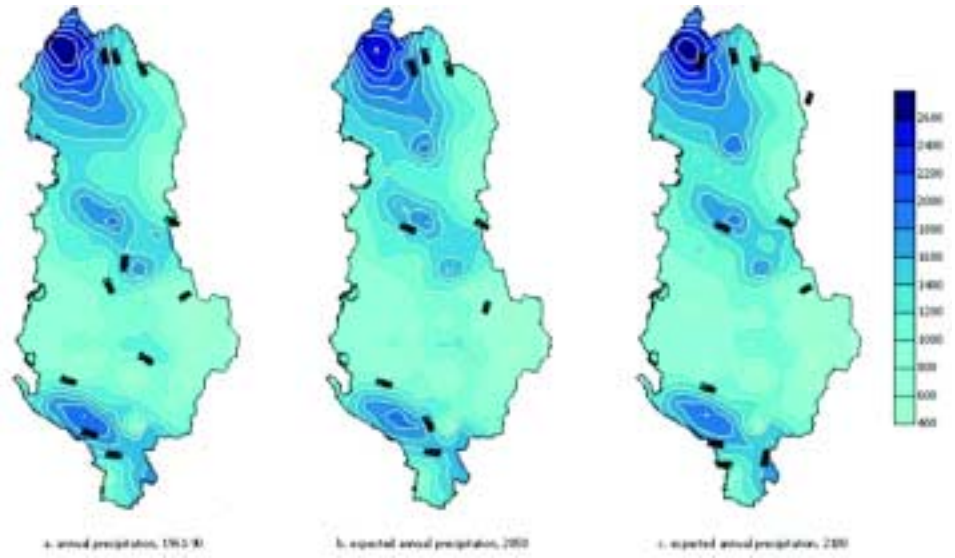


Fig.IV.4. Expected annuall change of precipitation

By analyzing the seasonal temperature and precipitation changes proposed by scenarios we may expect milder winter, warmer spring, drier autumn, drier and hotter summer. The expected severe summer with high temperatures, up to 4.1°C and low precipitation, up to -27% over all the territory, followed by the increase in drought duration, intensity and frequency may affect negatively many sectors.

It is important to emphasize that the outputs of the scenarios should be considered as indicators of changes that might occur. By using different relationship for the existing period and physical arguments, the expected changes in other relevant climatic elements or extreme events are predicted as follows:

- Cloudiness is expected to decrease from -2.6% up to - 4.6% by 2050 related to the year 1990 and 2100 respectively;
- Wind speed is expected to increase up to 1.3 to 2.3% by 2050 and 2100 respectively in relation to the period 1961-1990, especially during summer because of the increase in the land-sea temperature contrast;
- An increase in the global radiation and the sunshine hours might be expected, due to the cloudiness decrease;
- Evapotranspiration is expected to intensify due to the temperature and wind speed increases;
- A decrease in the rainy days is expected almost at the same range as the precipitation;
- The total number of hailstorm days is expected to decrease, although an increase in such days during summer might be expected, owing to the temperature rise.

3.3 Water resources

From the analysis of the seasonal and yearly runoff anomalies, it results that almost all the profiles show an decreasing trend, which might be explained by the same tendency that precipitation shows (Fig IV.4). Comparing the results of the changes in river runoff obtained for the CCSA, which expect an increase of the long term mean annual and seasonal air temperature and a decrease of mean annual and seasonal precipitation, it can be stated that a decrease in the long term mean annual and seasonal runoff has to be expected for the whole territory and for

all three time horizons (Fig.IV.5).The outputs of models used[2] forecast a small decrease in the long term mean annual runoff, respectively from -9.8% to -13.6% and from -6.3% to -9.1%, for 2025. The degree of decrease varies according to the time horizons considered, but both exhibit acceleration in the decrease towards 2100.

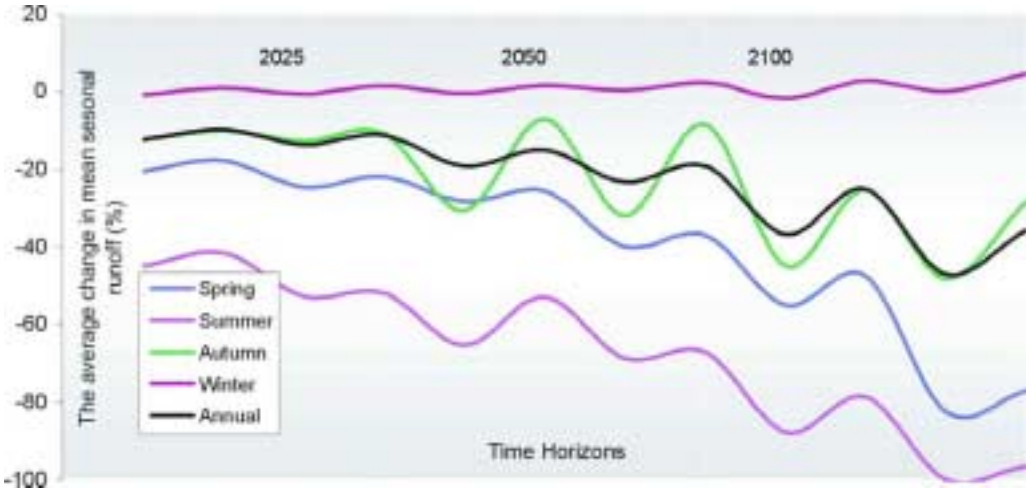


Fig.IV.5 The average change in mean runoff according to CCSA for three time horizons: 2025, 2050, 2100.

It would affect the surface water flow, by reducing its amount. Under the reduced surface water flow and increased evaporation, the storage of reservoirs will decrease, and that would effect the energy production by hydro power stations.

Because of the reduction of stream flows in the wetlands, the western part of Albania would experience both increasing demands for water and reduced supply of water, which would decrease wetland area.

The increase of the extreme events may lead an under designed reservoir or spillway with potential flood risk.

Other consequences of expected warming include not only changes in total water amount and levels, but also erosion of riverbeds, and modification of turbidity and sediment load.

The likely reduction of water resources would lead to less dilution flow in the stream. It might lead to degraded water quality or increased investments in waste water treatment, especially for the third horizon 2100, where the reduction of the river flow would be very high. Water quality is expected to degrade in Albania, not only due to the expected climate changes, but also due to new industrial and agricultural development. The main hot spots for this problem are the districts of Tirana, Fier, Korçë, Kavajë, Durres, Vlorë, Elbasan and Berat.

The ground water supply will be affected by decreased percolation of water, due to decrease in the amount of precipitation and stream flow and as well as losses of soil moisture from increased evapotranspiration. This can lead to the increase of pumping costs. The predicted sea level rise of 20-24 cm by 2050 is not expected to have significant impact on ground water, whereas the sea level rise of 48-61 cm expected by 2100 will cause the increase in the salinity of aquifers especially for the coastal area. This effect will be more significant in Fushe Kuqe and Durresi plain. Fushe Kuqe has very important aquifers, because it supplies drinking water to the

[2] For assessment of the impact of climate change on the mean annual runoff, two models that relate runoff forming factors (annual sum of precipitation and mean annual evapotranspiration) to the long term mean annual runoff are considered. These models are predictive ones and are based on statistical relationships.

northern coastal cities as well as Durresi and Kavaja. The other areas that will be influenced, though less than Fushe Kuqe and Durresi plain, are Velipoja (Zadrima plain in Shkodra city) and Vlora plain. Reduction in ground water supply in combination with the increase of salinity of the ground water supply will bring shortage of adequate quality of drinking water. Moreover, the demand for drinking water and water use for social and economic purposes may be expected to increase because of population growth. Table IV.2 shows the expected increase of water demands for some municipalities up to year 2025, estimated according to national standard (150 l/p/d) and European standartd (350 l /p / d). The problem of drinking water will be more acute especially by 2100.

Municipality	Year 2000	Year 2010		Year 2025	
	70 l/p/d	150 l/p/d	350 l/p/d	150 l/p/d	350 l/p/d
Shkoder	700 (l/s)	1,000 (l/s)	1,200 (l/s)		
Durres	381	583	972	675 (l/s)	1,125 (l/s)
Elbasan	150	424	707	490	817
Korce	300	327	578	795	982

Source: (Dhima, K., et al. 2000)

Tab. IV.2 The increase of water demand for some municipalities; [l / s]

The temperature of the surface layer of the sea will increase, therefore the greater evaporation will result probably in a salinity increase, especially in shallow areas.

A sea level rise of 48-61 cm for 2100 would result in direct flooding of coastal area. Due to the increasing of the sea level, flooding will be intensified both directly by the sea and indirectly by changes in water tables. In non-protected lagoons, accretion is expected to occur, following destruction of the low strands separating them from the sea.

Such situations are expected to occur in the north and south of the Mati delta, (Patok) in the north of Erzeni delta, in the old Semani delta, in the area between Seman and Vjosa and the south of Vjosa river. An increase in sea level may also be expected in Ceka lagoon, while the formation of new wetlands is expected in Mati delta.

An increase in the wetland surface in the area between Vjosa and Semani rivers is also expected. Infrastructure components such as sewers, water supply, electricity and other service could be flooded and corrosion of pipes and intrusion of seawater into pipes and sewage systems will occur.

3.4 Natural ecosystems

An increase in sea surface temperature is unlikely to have a direct, negative impact, since most sea grasses, including Posidonia and Cymodocea, are somewhat Thermophylic. However, Thermophylic algae and perhaps other sea grasses may actively compete with native species.

As mentioned, the sea level rise up to 24 cm by 2050 and up to 61 cm by 2100, as predicted by CCSA will result in the gradual inundation of low lying coastal areas. The natural communities associated with such areas are expected to move inland. However, certain communities including existing coastal dunes, saline marshlands and wetlands are likely to reduce their surfaces, although new dunes, marshlands and wetlands may gradually form elsewhere.

As mentioned above, the vulnerable areas include the north and south of Mati delta (Patok), the north of Erzeni delta, in the old Semani delta, the area between Semani and Vjosa rivers and the south of Vjosa delta. Karavasta and Narta lagoons are expected to have better communications

with the sea in the future. This will change the present ecosystems, gradually to a complete saline ecosystem. Changes in these wetland areas, besides favoring the halophylic vegetation, will also affect many bird species through loss of nesting, breeding, staging and wintering habitat

The sea level rise will impair estuarine water quality in other subtle ways, contributing to the degradation of in situ conditions for aquatic biota (e.g. increased temperature results in lower dissolved oxygen) and the increase of the health risks of the population, dependent on withdrawals of fresh water from the rivers.

3.5 Managed ecosystems

3.5.1 Agriculture

Agriculture will also be affected by expected climate changes. These changes will modify rainfall, evaporation and soil moisture storage, leading to the increase of the irrigation requirements and a more decrease of the capacity of reservoirs and irrigation distribution systems

The available water resources will be sufficient for irrigation by 2025. Thus, no considerable impact on the yields of crops like wheat, maize, potato, vegetables, forages (alfalfa etc.) fruit trees etc. may be expected by 2025.

But, if appropriate measures will not be taken for the rehabilitation, the maintenance and improvement of the conveyance and distribution systems, the insufficient irrigation would be again a more important restrictive factor to the yield crops, for the other time horizons (the period 2050, 2100).

Referring to the other time horizons, 2050 and 2100, the expected impacts on agriculture to be expected are: the reduction of the extent of arable land, due to soil erosion and alteration; the changes in the growth cycles, harvest time and the quality of the agricultural production, especially along the coastal area, owing to an increase in salinity because of the sea level rise and intrusion of salt water into the soil; the cultivation of early agricultural products in the open air or in greenhouses, owing to an increase in winter temperatures.

Using the time horizon 1990 as a reference by 2025, the impacts[3] to be expected are: the potential citrus growing area would be adapted to the conditions (temperature and precipitation) in higher elevations about 150 m; the potential olive growing area would be adapted to the conditions (temperature and precipitation) in higher elevations about 150 m ; the potential citrus area would enlarge from about 13,6285 ha (in 1990) to 36,2527 ha; the potential olive area, in which the year 1990 was about 474,993 ha, would be 598,090 ha.

3.5.2 Forests

As regards the forest sector, referring to the CCSA, a summary of the expected extensions of vegetation flats by, 2025, 2050, 2100 related to 1975, is provided in figure IV.6.

By 2100, the area of Eu-Mediterranean evergreen forests of Lauretum in generally, would be increased from 42,9 % to 62,6 %. Mainly, the area of Eu-Mediterranean evergreen forests of warm Lauretum would be increased from 9,0 % to 44,0 %. The area of Eu-Mediterranean evergreen forest mixed with deciduous tree of Lauretum flat (Lm- middle Lauretum) would be reduced from 22,5 % to 7,0 % by 2100. That of deciduous forest of Lauretum flat (Lc-cold Lauretum) would be reduced from 11,4 % to 7,8 % by 2050, followed by the increase to 11,6 % by 2100. The area of deciduous forests of Castanetum flat in general, would be increased from

[3] In both cases surface of the potential citrus and olive areas are calculated based only in temperature and precipitation indices; respective calculations and findings presented in Chapter 3.5.4 (Forestry) have been used.

16,6 % to 23,2 % by 2050 and later would be reduced to 21,5 %. The area of Cw-warm Castanetum will change from 10,8 % to 17,9 % and later 17,2 %, while, that of Cc-cold Castanetum would be reduced from 5,8% to 4,3%, by 2100.

The species that resist high temperatures and severe long dry seasons would be able to over live. 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 sealevel, whereas oak species, which produce big seeds, would occupy new areas but very slowly.

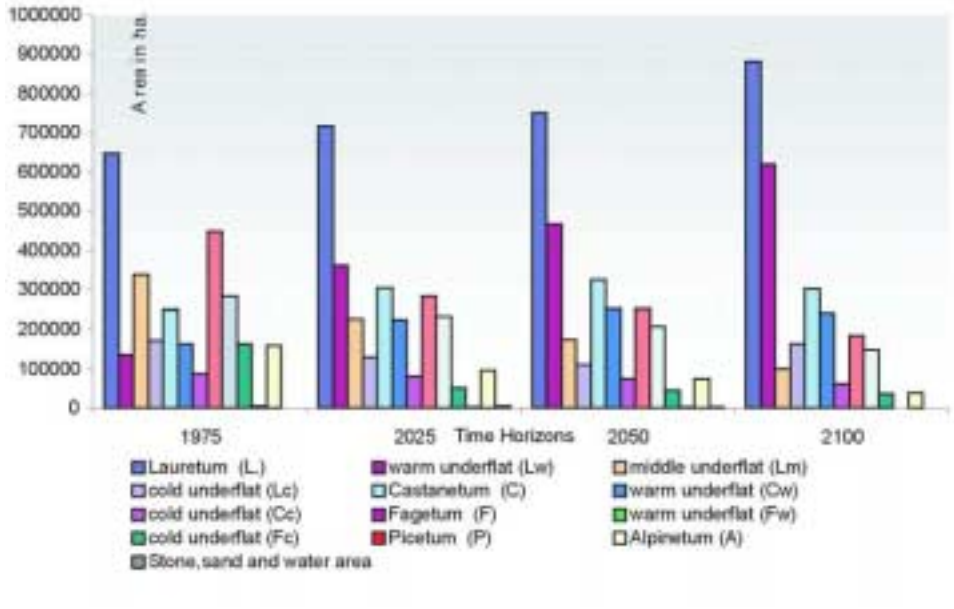


Fig.IV.6 Expected expansion area of vegetation flats [%]

Sea level rise, by directly influencing the increase of the ground water levels and composition, would limit the growing of some species that do not like moisture and salt along the Adriatic coast.

3.6 Energy

Climate change is expected to have significant impacts on the energy sector. Predicted raised temperatures, changes in the amount of precipitation, variation in humidity, wind patterns, and the number of sunny days per year, could affect both energy consumption and production.

3.6.1 Energy consumption

Climate change is likely to affect the major electric end-uses such as space heating, space cooling, water heating and refrigeration. The frequent increases of extreme events might result in some regional changes in the energy consumption, if such events will bring about population shifts. Referring to the CCSA, an expected decrease in heating degree days is foreseen. Three zones are selected for the estimation of the expected rate of decrease of heating degree days up to 2025, related to 1990.(Tab. IV. 3.)

Zones	Time horizon	2010	2025
Zone I	Durres	76	120
Zone II	Tirana	73.4	135
	Gjirokastra	66	120
Zone III	Korca	55.5	100

Tab.IV.3 The expected rate of decrease of heating degree days, related to 1990

By comparing the energy scenarios (demand side) up to the year 2025, developed by considering or not considering the expected climate change impacts in residential sector, it results that energy demand for three zones (I. II.and III) is expected to be respectively reduced from 318.99 kTOE, 301.04 kTOE and 156.26 kTOE to 266.93 kTOE, 253.96 kTOE and 138.15 kTOE.

In order to reflect more clearly how the climate changes (decrease in heating degree days) affect the energy demand for space heating in particular and energy demand in residential sector in general, we have estimated this difference and presented it in figures IV.7, IV.8, and IV.9 as follows:

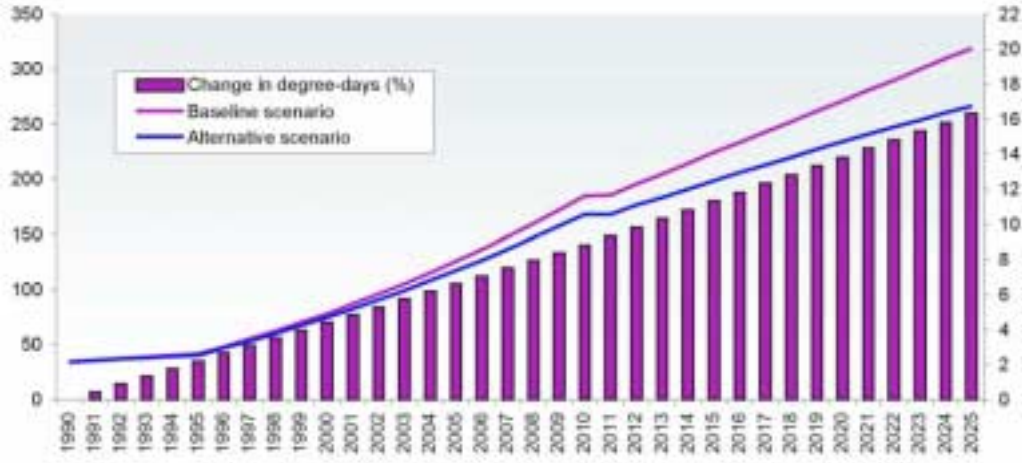


Fig. IV.7. Projected changes in energy demand for space heating for 1-rst zone reflected to the changes in heating degree days.

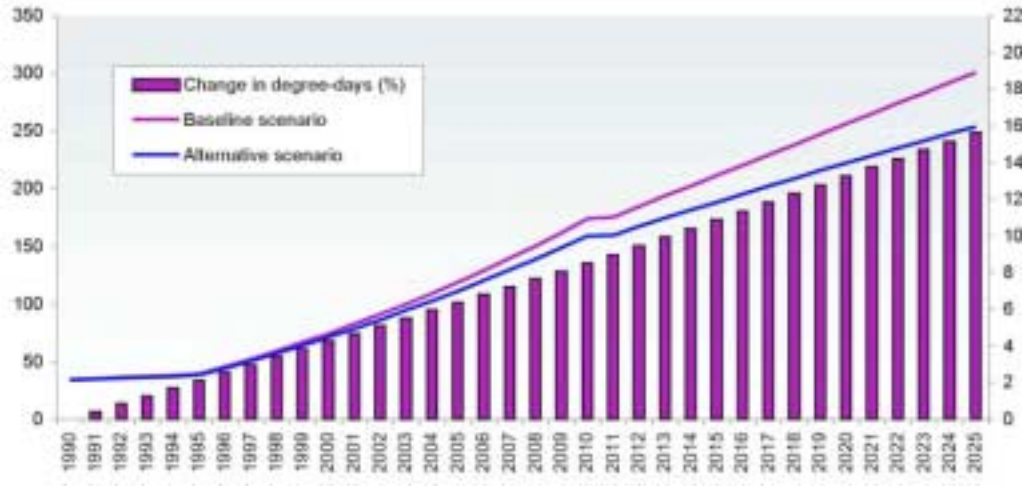


Fig.IV.8. Projected changes in energy demand for space heating for 2-nd zone reflected to the changes in heating degree days.

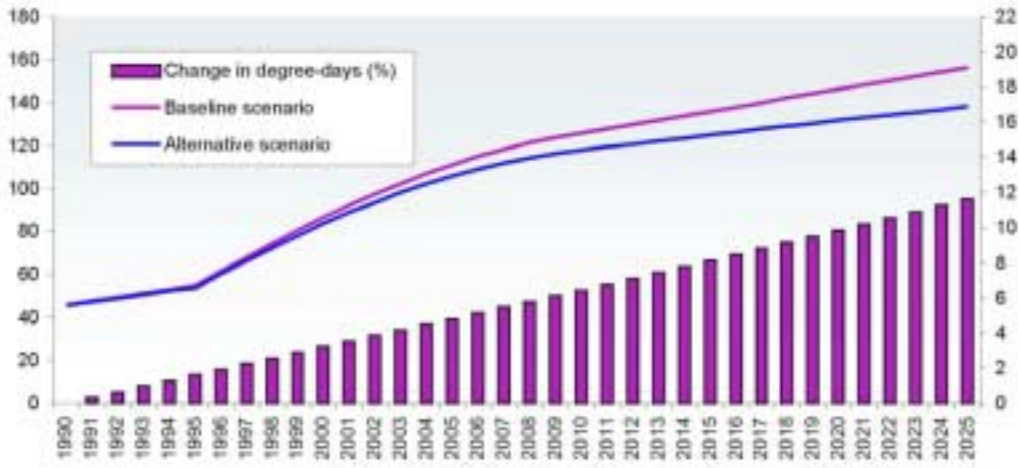


Fig. IV.9. Projected changes in energy demand for space heating for 3-rd zone reflected to the changes in heating degree days.

From figures IV.7, IV.8, and VI.9, it is evident that energy demand for space heating in the alternative scenario will decrease in each zone, compared to baseline scenario, due to the projected decrease in heating degree days.

It would be interesting to know the impacts of climate changes in energy demand for space cooling in residential sector, since this energy service will play an increasing role in the future.The same can be said for service sector, concerning the energy demand for air conditioning. Anyway, the lack of forecasted changes in cooling degree days was an important factor, for not providing their impact quantitatively. Based on the scenario of the temperature changes, we can say in a qualitative way, that the expected cooling degree days will mark an increase. The energy intensity for space cooling will be increased as well. This will be an issue to be tackled in the future.

3.6.2 Energy production

Changes in energy consumption as result of predicted climate changes, will also lead to changes in energy production. Climate changes impacts may be primarily analysed in power generation sector, including hydro power plants, thermo power plants, solar heaters systems and wind power plants.

A reduction of 20% in natural water runoff was projected to cause a reduction of 60% in hydro power generation, whereas a 20% increase was projected to cause an increase in generation of 40%. In areas where it becomes hotter and drier, the hydro power generation could be virtually reduced year round. A reduction in hydro power generation is expeced.

Albania is heavily reliant on hydro power electricity production. If a severe drought will happen, it will result in less electricity produced by the hydro power plants.The heavy reliance on hydro power sources may be appropriate for reducing greenhouse gas emissions and improving air quality in Albania, but can increase vulnerability to climate change. Taking into account the mean annual change in river's water flow, a new Energy Scenario, which considers climate change impacts 1990 - 2025 (supply side) is developed. Figure IV.10 and IV 11 represents the electricity generation up to the year 2025, and the share between hydro power plants and thermo power plants. According to the above figures, we can conclude that the electricity generation is expected to increase from 1,795 GWh in 1990 up to 23,816 GWh in 2025. The share between hydro power plants and thermo power plants is expected to go in favor of the latter. So in 1990, 94% of the electricity was generated from hydro power plants and only 6% from thermo power plants, while in 2025 hydro power plants is expected to contribute by 11,353 GWh or 47.68% and thermo power plants with 12,460 GWh or 52.32 % of the total.

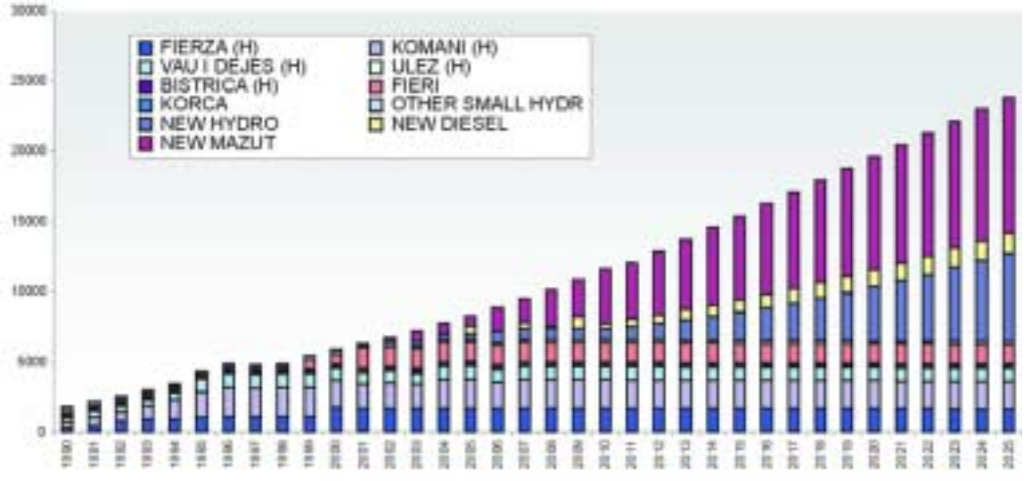


Fig. IV.10 Electricity generation according to the alternative scenario. [GWh]

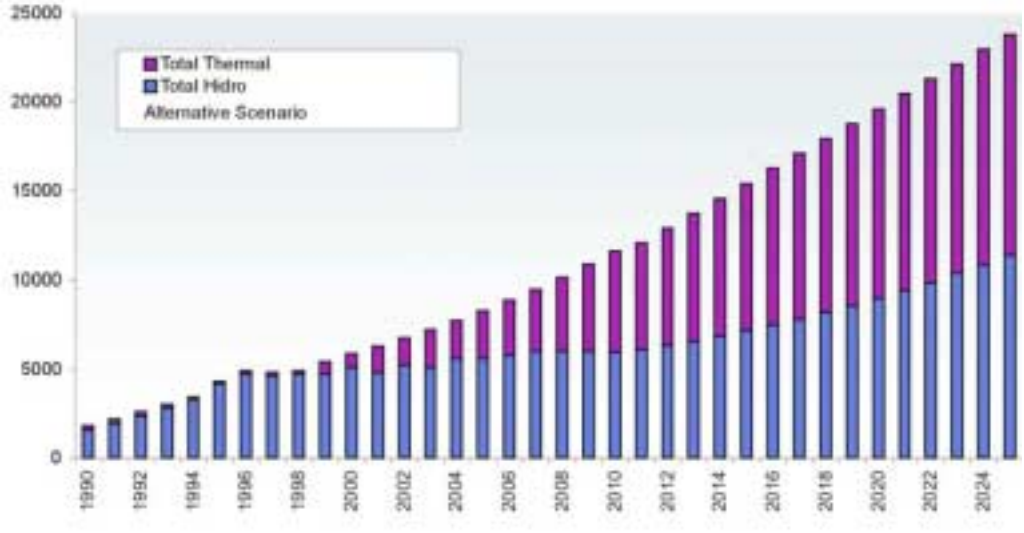


Fig.IV.11 Shares of electricity generation by HPPs and TPPs according to the alternative scenario; [GWh]

Thermo power plants are expected to cover the largest share of electricity generation in 2025, compensation even for the part of electricity not produced by hydro power plants, due to the expected climate change impacts. This is a very important conclusion to be considered by policy / decision makers, while preparing strategic plans for development of the energy sector in the future.

Climate change may also affect the supply of energy from solar and wind power. A likely increase in the global solar radiation and the hours of sunshine duration will lead to an increase in the use of solar energy for different energy services, especially for the preparation of domestic hot water.

Since, we are expecting an increase in the wind speed up to 1.3 to 2.3 %, by 2050 and 2100 respectively, compared to the period 1961-1990, it might be interesting to think about introducing wind power plants in the energy schemes in the future.

3.7 Public health

Referring to the likely changes of climate a series of impacts on public health are expected. Shortage of drinking water of adequate quality could be especially critical during summer time. Consequently, an increase of contagious diseases cases, digestive system diseases, etc., is expected.

The liquid and solid wastes, if discharged directly into the sea, are expected to destroy or strongly modify the sea flora and fauna. If these problems would not solved, the impact of climate change would lead to the deterioration in the health of the population, living especially in the coastal area.

The increase in temperature would affect the physiological and compensatory system of healthy people. Thus, age groups like: infants, children and elders where the decrease in compensatory system is common, will have changes in their health conditions, which would cause higher incidence of some diseases influenced by atmospheric changes. The infections in the respiratory system will be the most visible.

3.8 Population

The population living in coastal area, particularly in beach areas, is seriously threatened by the expected increase, in the sea level. The entire dwelling places, hotels, roads and agricultural areas etc., situated in the lower zones of the Adriatic coastal line (excluding the territories under the effect of raising movements) will be flooded.

The beaches in the areas affected by land subsidence (those of Shëngjin, Kune-Vain, Tale, Patok, Ishëm), and a substantial number of fields (drained in the late 50's and early 60's.) will be swept over by floods. Likewise, these floods will find their way into important segments of the local and national roads (including a part of the new road Fushë Krujë-Lezhë running through the former Lac swamp land), potable water supply sources (located in Lezha and Lac plains), as well as many lodging and tourism structures which have been, and continue to be built along these beaches.

Also, the floods will partially affect the beaches situated in the territories undergoing elevation (those of Durrës, Golem, Divjakë, Himarë, Borsh etc.), in addition to the tourism infrastructure. The same lot is expected to affect the agricultural land (in the former swamps of Durrës, Myzeqe, Narta, Vrug etc.) as well as dwelling centers and rural infrastructure, which reach up to 50 cm above the sea level. Figure IV.12 illustrates the expected shift of coastline by 2100 for the three areas (Patok, Durrës, Karavasta-Ndërnenas) along the Adriatic coast.

Patok Karavasta

Fig.IV.12. Some areas threatened by sea-level rise by 2100

3.9 Tourism

Coastal tourism is expected to suffer the vulnerabilities caused by sea level rise. The possibility of creation of new beaches (in a natural way) does exist, but building a new tourism infrastructure would require huge investments. On the other hand, considering the increase in temperature from 2.8 to 4.1°C during summer time a general inclination of tourism, towards the mountains or the lakes, instead of the beaches is expected. The coastal tourism would be more preferable by the end of spring and beginning of fall. However, like other Mediterranean countries, the services sector, especially tourism in Albania will occupy the first place, during the next half of this century, in the whole coastal area, involving employment, as well as income generation.

4. ADAPTATION OPTIONS AND RECOMMENDATIONS

A set of adaptation options for each sector has been identified. The adaptation options are identified, taking into consideration such principles like prevention of loss, tolerating loss, sharing loss, changing use or activity, changing locations, research and restoration.

4.1 Water resources

This paragraph identifies adoption measures for water resources and marine waters and includes:

♦ Modification of existing physical infrastructure.
Possible adaptations to address changed flows as a result of climate change include:
-Modification of existing reservoirs;
-Removal of sediments from reservoirs for more storage;
-Modification of existing irrigation systems;
-Modification of the coastal infrastructure.

♦ Construction of new infrastructure.
In river basins, where full development is not occurring yet, new projects could be developed to adopt the change runoff and water demand conditions like:
-Construction of new reservoirs;
-Construction of the new hydro power plants;
-Construction of new thermo power plants;
-Construction of waste water treatment plants;
-Construction of coastal infrastructure such as dams to protect wetland ecosystems;
-Construction and maintenance of tide gauges network.

♦ Water pollution control.
Reduced runoff from climate change will most likely increase concentrations of pollutants in the water column which must be monitored.

♦ Improvement of the monitoring and forecasting system for flood and drought.
Climate change is likely to affect the frequency of floods and droughts. Monitoring systems will help in coping with these changes.

♦ Drafting and approval of new legislation for water use.
Reduction of the demand can increase excess supply, creating a greater margin of safety for future droughts. Demand for water may be reduced through legal restrictions on water use.

♦ Setting a real water consumption fee.
In Albania, the water supply enterprises charge the consumer with a modest fee, which however

do not fully cover the cost. Thus, in the circumstances of reducing drinking water due to climate changes, the real price for water consumption is an adoption measure, which should be taken into consideration.

♦ Implementation of the Integrated Coastal Zone Management Plan.
Short-term and long-term measures could help the development of the coastal zone, taking into consideration climate changes.

4.2 Natural ecosystems

As a response to climate change, the species and ecosystems will adapt autonomously. In that sense, impact assessment is the task of identifying those species and / or ecosystems that are least likely to adjust to a changing climate. However, in the absence of significant evolutionary change, species are dependent on their inbuilt phenotypic plasticity and capabilities in order to respond to climate change. Thus, their ability to autonomously respond to climate change is inherently limited. If suitable habitat conditions disappear entirely, or shift in a position faster than a population can react, extinction will occur and the outcome will be the ecosystem simplification.

The primary goal of adaptation in the biodiversity sector is to ensure that natural ecosystems are able to respond to climate change to the limits of their capabilities. An effective strategy for achieving this, is to reduce or remove existing pressures.

It is possible to adopt policies and practices which assist species in adjusting to climate change, for example by designating and protecting migration corridors. In a changing climate, one must expect the unexpected and keep open as many response options as possible. Various adaptation measures are available to aid efforts of supporting the conservation of biodiversity in the face of climate change, including:

♦ The establishment and maintenance of protected areas (in-situ conservation).
It is important that the required steps are taken to enlarge the system of protected area in Albania, as proposed by the Albanian Biodiversity Strategy. The enlarged protected areas, if appropriately protected and managed will maintain the productivity, vitality and health of natural ecosystems they comprise, which in response may increase their carrying capacity, availability of food and shelter for emarginated living organisms.

♦ The active management of wild populations outside of protected areas (inter-situ manage ment).
It is obvious that most of the territories fall outside the protected areas system. Thus, the maintenance of vital populations of wild animal and plant species is very much dependent on the way how we manage territories outside protected areas. Special attention should be paid to plant and animal species, that are more vulnerable and sensitive to climate change, whose survival is not ensured unless if no active management measures are taken outside the protected areas.

♦ The maintenance of captive populations (ex-situ methods).
For a number of animals and plant species neither in-situ nor inter-situ conservation measures might be applicable or viable and their survival in the wild is not any longer ensured. Their extinction in the wild is not reverse. The only measures to be taken are those of ex- situ conservation. Hence, the support of the Botanical Garden in Tirana to realize ex-situ preservation of endemic and endangered species is an important action, which should be complemented with the future development of such practices for animal species in the long-term. At the same time, the strengthening of the genetic banks within the National Seed Institute, and a laboratory of deep freezing should include preservation of the genetic material of wildlife species

♦ Monitoring.
This is an important research priority, both for biodiversity conservation and because plant and animal populations serve as barometres of ecosystem integrity. As a first step, a map of the most sensitive biotopes should be prepared, beginning with those of protected areas (within first 5 years), and later for the rest of the country (5-20 years). Within this activity, the mapping of sea meadows with Posidonia oceanica and Cymadocea nodosa, and those environments with reed coral (Coralum rubrum) and (Lipthophaga lipthophaga), collected by fishermen and divers (within 1-3 years), has been proposed.

4.3 Managed ecosystems

4.3.1 Agriculture

To adapt the likely impacts of climate change on agriculture the following actions are recommended:

♦ Afforestation and the setting up of the barriers to protect the arable land threatened by soil erosion and alteration

♦ Planning of agricultural production toward xerophilic crops to allow adaptation to the higher winter and summer temperatures and to the scarcity of water in summer.
Agricultural development should be adjusted towards species that would adapt best to the expected soil and atmospheric conditions.

♦ A significant improvement in irrigation sector.
The improvement will be done through application of the following measures:
-Rehabilitation of irrigation schemes;
-Improvements of the conveyance systems;
-Construction of new public schemes;
-Completion of ongoing works;
-Modernization of on-farm distribution systems;
-Development of private pumping schemes;
-Private groundwater development;
-Participation of farmers through Water User Associations;
-Consolidation of extension organizations for irrigated crops;
-Introduction of new irrigation techniques.

♦ In plant protection from different pests and diseases.
This measure will be carried out through application of the following measures:
-Study and monitoring of more important pests and diseases;
-Control of the pests and their diseases on the basis of Good Plant Protection Practices and Integrated Pest Management approaches;
-Introduction and breeding of new species and hybrids which are resistant to particular pests or diseases;
-Limitation of chemical control in order to decrease the pesticide residues in plant and animal organisms;
-Consolidation of research and extension organizations which provide technical assistance to the farmers on plant protection issues.

4.3.2 Forestry

To adapt the forests against the predicted impact by climate change, the following measures are proposed:

♦ Preparation of the Strategy of Sustainable Development of Forest.
This strategy must consider the implications of climate change and carbon balance, to favor more adapted species against expected climate change and sea level rise, and also species that do not have the capability to occupy the same flats in new conditions.

♦ Preparation and implementation of the research programs.
These programs will aim at the management of forest unit on genetically resources, adapting of the forest species and provenance, production of hybrid, better adapted to climate change and sea level rise and, identification of better adapted cultivation systems.

♦ Evaluation of the actual situation for each forest type, in relation with climate change and sea level rise.

♦ Increasing of the protected forest area.

♦ Reduction of the illegal cuttings at the maximum extent and studying of the real need for fuelwood.
Reduction of the wood consumption for energy by replacing fuel wood with other non-pollutant fuels.

♦ Increasing of the investments to implement more actions in existing forests and environmen tal protection areas.
Increasing of the investments would reduce and unemployment and emigration, as well.

♦ Implementation of actions to increase the existing forest productivity (rehabilitation of the degraded forests, conversion of the coppice and shrub forests to high stem forests or planting the fast-growing species or more capable species to sink CO_2 emissions). It is important to have mix forests in an area over half of total forest area and, to manage better the prund forest area (mainly oak and beech forests) for fodder in conditions of small livestock husbandry increasing (mainly goats).

♦ Increasing of the forest area through the new reforestation.
This measure will be implemented by using species that could adapt the expected changes of climate and, more capable species to sink the CO_2 emissions especially on the eroded lands and refused agriculture lands (an area of about 120,000 ha).

♦ Study and monitoring of the forest health situation as well as effects of applied measures in forests.
Monitoring is important because the undistinguished factors could reduce the chlorophyll photosynthesis activity leading looses of bioms. Also monitoring of the fire situation in forests is important.

4.4 Energy

The list of adaptation options, dealing more with reduction of water flow on hydro power plants, must be effectively considered in a careful and detailed analysis. These options are as follows:

♦ Consider expected change of runoff / water flow rate in integrated resource planning.
The integrated resource plans for power providers must be adjusted by accounting the uncertainty in future water flow rates that is generated by uncertainty in future water flow rates which is caused by uncertainty in climate change. For some power providers, the consideration of potential impacts could lead to less investment today in hydro power, (as described in alternative scenario) relative to non hydro power plants, while other may conclude that reactive adaptation. is more efficient than anticipatory adaptation.

♦ Account for the expected change in runoff / water flow rate in the design of hydropower plants.
Hydro power facilities can be designed to accommodate lower and/or variable flow rates by:
-Building hydropower intakes at the lowest possible level;
-Making hydropower plants intakes adjustable; and
-Using variable blade turbines, which are adjustable to more variable conditions.

♦ Invest in energy conservation (Demand site Management) measures for space cooling.
Power providers could make investments today in assisting consumers with the installation of DSM measures for space cooling, e.g., building shell improvements, advanced, energy efficient and advanced space cooling technologies.

♦ Reduce energy subsidies.
In Albania, as in many other ex-socialist countries, energy prices, particularly electricity, are subsidized. Thus consumers pay less than the marginal costs of producing energy. Subsidies can result in a wasteful consumption of energy and can distort the market signals regarding changes in supply and demand ,caused by climate change (price will not increase sufficiently to reflect changes in supply and demand).

♦Account for the expected change in runoff/water flow rate in the design of thermal power facilities.
Thermal power plants, drought and/or more variable flow conditions adversely affect the supply of cooling water. This suggests that the anticipatory measures should be taken in constructing cooling water intakes for new power plants, low enough to accommodate changes in flow levels.

4.5 Public health

To adapt to the impact of the expected changes, it is very important to take the necessary measures to:

♦ Permanent control monitoring of the drinking water quality;

♦ Permanent control over water supply and sewerage systems affected by salt-water corrosion and intrusion in coastal areas;

♦ Permanent monitoring and drafting of a new law on air quality;

♦ Improvement of the solid wastes collection and treatment technology;

♦ Compilation of long term plans for the urban development;

♦ Elaboration of an reliable medical and statistical program that will help in finding the cause consequence (climate changes - health) correlations.

4. 6 Population, tourism

As expected by 2025, about 60 % of the population would be settled in the capital and the coastal area. The major economic sector will be that of services, which is expected to employ 40-50% of the active population in this region. To have a good functioning of the services sector, the following measures need to be taken:

♦ The provision of new potable water supply resources and the construction of new water supply, filtration and distribution systems.

This measure is feasible to be implemented due to availability of water resources and low costs involved.

♦ The provision of new power supply resources and the rearrangement of the appropriate distribution system.

The use of renewable energies can be one of the alternative sources.

♦ The construction of new sewage systems for both households and industry, as well as new processing units for all the urban waste.

Although it is a high cost measure, it is still indispensable for environmental rehabilitation in both residential and tourist areas.

♦ The rehabilitation of several road segments, and the construction of new roads, compatible with international quality standards, with high embankments so as to handle the rise of the sea level.

This is the primary condition to be met. It will facilitate the development in general and tourist activities in particular and will also have a positive impact on the minimization of personal losses, evacuation etc.

CHAPTER V

NATIONAL CLIMATE CHANGE ACTION PLAN (NCCAP)

Although Albania has no emission reduction targets under the UNFCCC as a non-Annex I Party, attempts to address the climate change issues are made. In Albania, no comprehensive national policy to address climate changes has been adopted to date. During the period of political and economic transformation of the society and the development of a new state, a range of acts, regulations and measures, indirectly related to greenhouse gasemission reduction are developed and even adopted.

Although climate change is not a priority for Albania, the effective implementation of the climate change measures may require the development of response measures that are primarily designed to achieve other development objectives. Fortunately, many mitigation and adaptation measures have multiple benefits and will contribute to the achievement of sustainable development goals.

Albania is addressing mitigation and adaptation measures through NCCAP (National Climate Change Action Plan), which consists of a set of priorities for action to integrate the climate change concerns into other economic development plans. This seems to be one of the most major challenges of this process, aiming the reduction of the growth rates of greenhouse gas emissions and adaptation to expected climate changes.

1. SCOPE AND METODOLOGY

The NCCAP is primarly focused on two directions and addresses:

- Measures to abate greenhouse gases emissions;
- Measures for adaptation to the expected climate changes;

Expected outcomes from this NCCAP are as following:

- Reduction of greenhouse emissions;
- Reduction of the vulnerability;
- Adaptation to expected climate changes;
- Promotion of sustainable development;
- Reduction of poverty;
- Protection of the environment;
- Institutional strengthening;
- Capacity building on climate change;
- Establishment of the legal framework to address climate change;
- Public awareness on climate change.

The NCCAP is designed in a sectoral approach where adaptation and abatement measures are addressed. A broad range of possible sectorial and cross-sectoral issues are addressed and then the most appropriate ones for our circumastances are selected.

The selection of abatement and adaptation options is made on the bases of:

- Cost-effectiveness (i.e. low or negative cost per ton of emission reduction);
- Emissions reduction potential (estimated total tons of emission reduction);
- Contribution to other national development goals ;
- Technological benefits (potential to gain an early lead in new technologies);
- Level of barriers;
- Potential for GEF or other Convention mechanisms support;
- Contribution to minimization of risk;
- Contribution to minimization of economic losses.

The findings of the greenhouse gaes inventory, abatement analysis and vulnerability assessment are the basic inputs used for the compilation of this plan.

During the development of the NCCAP the lessons learned from past climate change and environmental planning efforts, are considered. These include:

- Integration with other development plans and programs and measures that have multiple benefits
- Involvement of key governmental and non-governmental stakeholders.
- Practical orientation
- Flexibility of the plan in order to be regularly updated, to reflect changing circumstances.
- A high level of awareness among policymakers and stakeholders on climate change issues

2. RELATED STRATEGIES AND MEASURES

Strategies and developed measures indirectly related to greenhouse gases emission reduction are as follows:

- The revised National Environmental Action Plan.

This is a five year revised plan the and is recently adopted by Albanian Government and addresses explecitely, for the first time, the climate policy as one of the components of the environmental protection policy.

- Amended Law on "Environmental Protection" No.8364, date 02.07.1998.

This law addresses the full spectrum of environmental policy issues in Albania.

- Energy Strategy.

This is a draft strategy for energy sector up to the year 2010, which aims at the efficient use of energy, creation of a legal and institutional framework in compliance to the national and international legislation on environmental protection.

- Strategy on Forestry Development.

The basic strategic goal of the adopted Stategy of Forests is the conservation of forests in Albania.

- Urban Waste Management Plan.

The adoption of this plan has created the premises for the treatment of urban waste in six main cities of Albania, by applying a contemporary technologies.

- Strategy of Agriculture.

The adopted policy is focused on the development of a sustainable and ecological agriculture in Albania.

- National Action Plan for Health and Environment.

This plan was adopted by the Albanian Government in 1999. The basic goals of this plan are related to the ecological sustainable development and prevention and control of health and environmental risks.

- Growth and Poverty Reduction Strategy.

This is a mid-term economic development plan of the Albanian Government, which highlights the environmental poverty linkages, emphasizes the need to reverse environmental degradation, rehabilitate heavily polluted areas that jeopartize human health, and to ensure the sustainable use of natural resources.

- Biodiversity Strategy.

The aim of this strategy is the protection and improvement of the biological diversity and

landscape of the country, and providing a sustainable environment for future generations through the application of sustainable development policies,

♦ Water strategy.

This draft strategy aims at the protection and efficient use of water resources in Albania.

3. CLIMATE POLICY

The implementation of the recomended abatement and adaptation measures requires coordinated actions between the Ministry of Environment and other relevant ministries and governmental agencies, non governmental organizations and the public.

The main responsibility in the implementation process of the climate change action plan belongs to the Ministry of Environment as the governmental body responsible for environmental policy in the Republic of Albania.

The establishment of Interministerial Climate Change Committee is the main step towards the implementation process of the climate change action plan. The climate change action plan as a long term plan (up to 2020) and must be reviewed on regular basis, taking into account and monitoring the following indicators:

- new development plans for the relevant sectors;
- changes in legal framework;
- the state-of-art data on climate change;
- national environmental strategy;
- future developments of the UNFCCC and negotiating process;
- eligibility of funds from convention financial mechanisms and other international sources;
- amount of the funds allocated for the implementation of the action plan;
- level of public awareness on environmental policy.

3.1 Abatement policies and measures

The objectives of the abatement policy are primarly focused on the energy sector, as the main source category of emissions, which also has large abatement potentials. As concluded by the abatement analysis, the measures to be introduced in the energy sector consist in the increase of energy efficiency, increase and improvement of energy savings, use of economic, regulatory and legal instruments for energy efficiency and saving.

Development of sustainable transport is the focus of the measures to be introduced in the transport sector.

With regard to the forest sector, the main policy goal is the preservation of forests and development of new management options.

In agriculture sector, the main tasks consists in the increase of production efficiency by improvement of genetic parameters. The reduction of fertilizer amounts and development of ecologically-economically sustainable agriculture are other main goals.

The recomanded policies and measures aimed at reducing greenhouse gas emissions by sectors are summarized in the following box.

Box V.1 Abatement policies and measures

Sector/ subsecor	Policy goal	Recommrieded measures	Legal / regulatory framework	Public awareness raising / Information
ENERGY Households	Development of energy saving mechanisms in household sector for GHG abatement	Thermo insulation of households buildings stock for reduction of energy demand for space heating/cooling	Introduction of a law on Energy efficiency for the stock of buildings	Organization of energy saving campaigns for existing stock of buildings
		Thermo insulation of new household buildings	Introduction of new energy code for buildings	Organization of energy saving campaigns for new stock of buildings
		Introduction of central / district heating schemes	Introduction of a law for central / district heating systems in households	
		Introduction of efficient refrigerators in household consumers	Introduction of law for certification of electric appliances	Organizing energy saving campaigns through using of efficient electric appliances
		Introduction of efficient lights in household consumers	Reduction of energy subsides and introduction of a real price of electricity	
		Introduction of prepaid metres in household consumers		Public awareness on payment of the energy bill
		Introduction of solar water heaters systems versus electric boilers in household consumers	Introduction of a law on promotion of renewable energy sources	Organization of energy campains for promotion of utilization of renewables
Service	Development of energy saving mechanisms in service sector for GHG abatement	Introduction of district and central heating systems versus individual heaters in service buildings	Introduction of a law for central / district heating systems in service sector	Organization of energy saving campaigns in service sector
		Introduction of combined heat and power schemes in service buidings		
		Thermo insulation of service buildings stock for reduction of energy demand for space heating/cooling	Law on energy efficiency for existing stock of service buildings	
		Introduction of solar water systems versus electric boilers in service buildings (hotels, restaurants, hospitals) consumers.	Introduction of a law in promotion of renewable energy sources	
		Introduction of efficient refrigerators in service consumers	Introduction of law for certification of electric appliances	

Industry sector	Development of energy saving mechanisms in industry sector for GHG abatement	Introduction of efficient heavy fuel oil and fired boilers in industy sector Introduction of efficient coal fired boilers in industryl consumers Introduction of efficient electric motors in industry consumers Introduction of efficient lighting in industrial consumers Improvement of power factor for industrial consumers Introduction of district heating schemes in industry sector. Introduction of combined heat and power schemes in industrial buidings	Introduction of energy auditing in industrial enterprises. Establishemnt of an energy efficiency fund in order to subside the implementation of energy saving measures in industrial sector	Organization of energy saving campaigns in service sector
Energy transformation sector	Development of the cost effective and environmentally sound alternatives for power generation for GHG abatement purposes. Enabling the environment for the penetration of imported natural gas in economic sectors, especially in power sector	Construction of most cost effective hydro power plants versus heavy fuel oil plants in Albanian power sector Construction of the most - cost effective Mini hydro power plants versus diesel generator in Albanian power sector Construction of the most - cost effective wind turbines versus diesel generators in Albanian power sector Construction of the most cost effective hydro power plants versus natural gas plants in Albanian power sector Construction of the most cost-effective gas power plants versus heavy fuel oil plants	Development of an energy mapping for renewable energy sources.	Organizarion of campains in promotion of the utilization of the renewable energies

TRANSPORT	Development of a sustainable transport.	Increase of public transport share	Application of carbon tax system. Application of differenciated tax system in vehicle production year Setting of vehicle oil standards	Education of vehicle drivers
		Encouragement / promotion of non motorized tmodes of ransport Construction of tramway lines Tirana		Education of population on use of bicycles instead of cars
		Improvement of quality and construction of new public roads	Rigorous annual check-up of vehicles	
FORESTS	Increase of sinks though sustanable management of forests and pastures for GHG abatement.	Increase of foreset areas through reforestation Preservation of forests and pastures	Law on forest management	Organization of reforestation public campaigns
		Implementation of forest management operations	Application of a penalty system for illegal cutting of forest trees	
		Improvement of forest and pasture management Reduction of consuption of wood as fuel		
AGRICULTURE	Development of an ecologically-economically sustainable agriculture	Better management of pastures and the adjustment of the stocking rates. The improvement of digestibility by ruminants through food optimization Effective using and proper storing of fertilizers	Law on land management	Training of farmers

3.2 Adaptation policies and measures

The aim of the adaptation policy is to develop a climate change policy that is specifically geared towards more vulnerable sectors in the country and to establish a public policy, which encourages and supports adaptation at local or community level and in the private sector.

Another goal is the development of sustainable economic growth, which, in return, allows for a greater allocation of resources to the development of adaptive technologies and innovations.

The following box summarizes the adaptation policies and measures, regarded as the most important for adaptation to the expected climate changes in Albania

Box. VI.2 Adaptation policies and measures

Sector	Policy goal	Recommneded measures	Legal/regulatory framework	Public awareness raising / Information
WATER RESOURCES	Adaptation to expected shortage of water resources through aplication of water saving mechanisms	Rehabiltaion of irrigation shemes, completion of ongoing irrigation schemes and introduction of new irrigation technologies	New legislation for water use	Public campaigns for water saving ways
		Provision of new potable water supply resources and the construction of new water supply, filtration and distribution systems	Application of a real price for water use	Participation of farmers at Water User Associations
		Frequent monitoring of drinking water quality		
		Improvement monitoring and forecasting system for flood and drought		
		Provision of new potable water supply resources and construction of new water supply filtration and distribution systems		
AGRICULTURE	Proper adaptation of agriculure sector to expected climate changes	Cultivation of xerophilic crops		Consolidation of organizations for irrigated crops
		Cultivation of agricultural species and hybrids resistant to pests or deseases.		Assistance to the farmers on plant protection issues
		Protection of the soil from erosion and desertification risk		
NATURAL ECOSYSTEMS	Protection of natuaral ecosystems in conditions of expected climate changes	Preparation of a forest sustainable Monitoring of forest health and fire	Law for speial protected areas	Protection of forests from fire
		Reduction of use of wood for energy purposes	Application a penalty system for illegal cutting	Expanding and strengthening the network of protected areas
		Construction of coastal infrastructure such as dam to protect wetland and coastal ecosystems		
		Active management of wild populations outside of protected areas (inter situ management)		
ENERGY	Meeting demand and supply for energy in the conditions of the expected climate changes	Consider runoff/water flow rate expected change in integrated energy resource planning (design of hydropower, thermo power plants)	Reduction of energy subsides and introduction of a real price of electricity	Organizing energy saving campaigns
		Use alternative forms of energy such as solar and wind		
	Adaptation to a lower demand for energy for space heating and higher demend for space cooling.	Application of conservation / saving measures for space heating / cooling		
HEALTH	Application of a public health policy in the conditions of expected climate changes	Establishemnt of air-quality monitoring system	Law on air quality	Public awareness on measures for reduction of risks of deseases causes from hot weather

CHAPTER VI

VI

PUBLIC AWARENESS, EDUCATION AND TRAINING ON CLIMATE CHANGE

Capacity building in the area of climate change, including awareness, education and training, is a crucial pre-requisite for any serious effort in that regard. Building of national capacities through development and promotion of education, public awareness, training programs on climate changes and related issues, is a general obligation to UNFCCC and an important component of the implementation process of the UNFCCC.

1. PUBLIC AWARENESS ON CLIMATE CHANGES

Despite the increasing public awareness regarding environmental issues in general, the issue of climate change in Albania is still relatively dormant, even the policy makers do not have a very good understanding of the climate changes, of the implications of expected climate changes, of the potential benefits of the response measures for mitigation and adaptation to climate change, and the importance of meeting the commitments under the UNFCCC and achieving its ultimate objective.

The preparation of the Albanian's First National Communication, to the COP of UNFCCC is the first step in the fulfillment of the country's commitments under the UN Framework Convention on Climate Change. These comprehensive results of the conducted work, under the frame of this document, show that raising awareness and the level of education and training on that issue is very important, in order to expect effective implementation of the National Climate Change Action Plan and meeting obligations to the Convention.

Prior the start of the GEF funded project on National Communication no public awareness activities have been organized in Albania. Although raising of public awareness is not the immediate objective of this GEF funded project. The process for the preparation of the First National Communication has positively contributed to awareness raising, among all stakeholders.

The preparation process of the first National Communication has also contributed to the enhancement of general awareness and knowledge on climate change related issues in Albania; strengthening of the dialogue, information exchange and cooperation among all relevant stakeholders including governmental, non-governmental, academic and private sectors; and building national capacities.

The Project Steering Committee meetings and joint efforts of ensuring the support from the governmental institutions for the project, have served as a way of raising awareness among policy makers who represent different climate change institutions. These policy makers are expected to also provide support for the adoption and implementation of the National Climate Change Action Plan.

The workshops organized in the frame of the GEF funded project on National Communication have contributed to the same purpose of awareness raising, namely: the project initiation workshop held in March 1999 in Tirana, Albania and the workshop for finalization of the First National Communication, held in April 2002.The aim of the project initiation workshop was to launch the project on National Communication and to raise awareness on climate change. This workshop brought together participants from relevant project sectors. During this workshop, the project objectives and activities were presented. It also took stock of and clarified the links with other ongoing or already finalized activities relevant to the project, identified existing national capacities relevant to the project, reviewed the draft-working plan and clarified the institutional and other practical arrangements. Since it was the first workshop on awareness building for climate changes in Albania, the workshop participants were informed about the greenhouse effect, climate change and its impacts, and other related issues. The CC: TRAIN materials were used and the film titled " What is greenhouse effect", produced by Information Center of UNEP, was put on show during this workshop.

The finalization workshop of the First National Communication was organized as a joint event

with ECAT(Environmental Center for Administration of Technology) of Tirana, which recently has managed the regional project: Building capacities on climate change in Balkan region, funded by the Ministry of Environment and Physical Planning of Greece. During this workshop, the key findings of the First National Communication were presented. Also, the status of the implementation of the climate convention was presented along with the international, regional and sub-regional cooperation. Two posters addressing the climate change issue, in Albanian language were designed in the frame of this workshop. In addition to that many electronic media and press representatives addressed this workshop and specifically mentioned the key findings of the First National Communication of Albania.

The publication of the main results and findings of the Albania's First National Communication in the recent Status of Environment Report and inclusion of the Climate Change Action Plan into the revised National Environmental Action Plan are indicators of a higher level of awareness among the environmental policy makers. The establishment of the National Climate Change web page and the publication of the project newsletter have played an effective role in awareness raising about climate change.

2. EDUCATION ON CLIMATE CHANGE

A similar situation relates to education on climate changes. The level of education is low even for environmental education in general. The recent tendencies aim at including the environmental education into school curricula. Some progress has been achieved, but to a very low extent and nothing is explicitly referred to climate changes.

The first attempt to establish an environmental branch in the high level education in Albania succeeded in 1994, when the Environmental Engineering branch was opened within the Polytechnic University. This was enabled through EU assistance, PHARE program. Students who attend this branch are free to chose two majors: water or energy. The curricula of energy major includes topics on atmospheric pollution, where the climate change is somehow addresses. Moreover some lectures on emissions from energy sources are delivered in other subjects.

In addition to the above, some other attempts have been made by the Natural Sciences Faculty of Tirana University to introduce environmental physics into the curricula of the physics branch.

3. TRAINING AND CAPACITY BUILDING

The project on the preparation of the First National Communication has also contributed to building of national capacities through the compilation of the national greenhouse gas inventory, analysis of greenhouse gas abatement, assessment of vulnerability and adaptation, and compilation of the climate change action plan, as well as through the integration of these issues into other sectoral development plans.

The establishment of the Climate Change Program Unit from the National Environmental Agency (actually the Ministry of Environment) is a step forward in the process of building the institutional capacity for climate change issues. The mission of this Unit is to implement the climate change enabling activities and other climate change related activities and also to assist the Ministry of Environment in the smooth implementation process of the UNFCCC.

The national capacities for the compilation of National Communications are built not only through the learning by doing process, but even through workshops (technical, national, regional, inter-regional), training and hands-on training sessions, and technical and consultative meetings held during project phase-I cycle life as follows:

Training workshop on IPCC methodology, organized by project office and held on March 2000, in Tirana, Albania. This one week workshop provided a hands-on training for the national team

on greenhouse gas inventories. Samir Amous, PhD from Tunisia, assisted the Albanian team during the training. Other interested experts from different national institutions and ministries participated in this workshop. This training provided a very good basis for conducting the national greenhouse gases inventory.

Training workshop on vulnerability and adaptation organized by the project office was held on August 2000.This workshop provided training for a national team on vulnerability and adaptation methods and models for development of climate scenarios and scenarios of other vulnerable sectors.This training was provided by the national team leader who was experienced in leading studies on expected impacts of climate changes.

Hands-on training workshop on abatement analysis, organized by the project office and held in September 2000, in Tirana, Albania. Samir Amous, PhD from Tunisia assisted the Albanian team during the training. This one week workshop aimed at providing a hands-on training for the national team on abatement analysis. Relevant national institutions and ministries were invited to participate in this training workshop.

Regional thematic - training workshop on abatement analysis, organized by UNDP-GEF National Communications Support Program (NCSP), and held in Tbilisi, Georgia, on October 1999. This one week workshop provided an overview of abatement analysis of greenhouse gases for preparing the National Communication, helping identify priority sectors and issues at national and regional level, facilitating exchange of national experiences on the process of conducting abatement analysis, and identifying follow-up activities for technical support and capacity building.

Regional thematic training workshop on vulnerability and adaptation assessment, organized by the UNDP-GEF NCSP and held in Chisinau, Moldova on January 2000. The main objectives of the workshop were to discuss national priorities, to exchange experience on methodological and organizational - issues of vulnerability and adaptation, to provide training on preparation of climate change scenarios and to discuss funding possibilities for adaptation measures.

Regional exchange workshop on national communications for Europe and CIS organized by UNDP-GEF NCSP, held in Yerevan, Armenia on October 2000. This workshop provided an opportunity to discuss national and regional priorities for National Communications. The main objective of the workshop was to identify options for improving the technical studies for national communication through identification of project activities to incorporate into project proposal in inventory, abatement and vulnerability and adaptation; assessment of existing in country infrastructure and identification of priorities for technical assistance needs.

Inter-regional workshop of CGE (Consultative Group of Experts) on national communications from non Annex I Parties, organized by CGE on National Communications from non-Annex I Parties as mandated by decision 8/CP.5 of the Conference of the Parties, in close collaboration with the UNFCCC secretariat, held in Panama City, Panama on March 2001. The main objectives of the workshop were: to facilitate the exchange of experiences, problems encountered, and lessons learnt from the preparation of national communications, to make recommendations for enhancing the preparation of national communications from non-Annex I Parties (decision 8 / CP.5), and to make recommendations on the elements for consideration by the Subsidiary Body for Implementation in the revision of the UNFCCC guidelines for the national communication from non-Annex I Parties.

Regional workshop for development of the project on " Building capacities for improvement of the quality of Inventories for Europe and CIS" organized by UNDP-GEF NCSP, held in Bratislava on July 2001. This workshop provided an opportunity to review and discuss the draft proposal of the full project : "Building capacities for improvement the quality of greenhouse gas inventories for Europe and CIS".

Regional Workshop for finalizing the project document: "Building Capacities for improvement the quality of inventories for Europe and CIS", organized by UNDP-GEF NCSP, held in Zagreb, Croatia, on March 2002. The aim of this workshop was to finalize the project document before its submission for final comments to GEF.

Workshop of CGE (Consultative Group of Experts) on National Communications from non-Annex I Panties, organized by CGE on National Communications from non-Annex I Parties as mandated by decision 8 / CP.5 of the Conference of the Parties (COP), in close collaboration with the UNFCCC Secretariat, held in Bonn, on July 2002. The aim of this workshop was to facilitate the exchange of experiences, problems encountered, and lessons learnt from the preparation of national communications, giving particular attention to the identification and assessment of technical problems and constraints that have affected the preparation of initial national communications by non-Annex I Parties that have yet to complete them, and make recommendations for consideration by the subsidiary bodies, and provide input to the draft improved guidelines for the preparation of national communications of non-Annex I Parties referred to in paragraph 1(b) of decision 32/CP.7.

UNFCCC / UNDP Expert meeting on methodologies for technology needs assessments, organized jointly by the UNFCCC and UNDP-GEF NCSP, held in Seoul, Republic of Korea, on April 2002. The aim of the meeting was to facilitate detailed discussions among Parties and participants to identify and elaborate on methodologies needed to undertake technology needs assessments. In addition, attention was given to the identification of financial and technical assistance needed by Parties, particularly the developing country Parties in undertaking technology needs assessments.

Technical / Consultative meetings
Since 1998 when the project began, a series of fifteen technical and consultative meetings of expert vulnerability and adptation from the four national teams (inventory, abatement analysis and vulnerability and adptation and CCNAP) have been held. Joint meetings (expert and PSC meetings) have been organized to review the final reports prepared by the national teams.

Project Steering Committee meetings
Since March 1999, when the PSC was established, six PSC meetings have been held. These meetings focused on the problems / sconstraints, raised during the implementation of the project and the PSC was asked to intervene as mandated by the terms of reference of the PSC. The progress reports on the status of project implementation have been submitted to each of these meetings.

Other prior or ongoing related activities on climate changes have/will contribute to the enhancement of capacities on that issue, like:

- "Assessment of implications of expected impacts of climate changes for the Albanian coast" financed by UNEP/MAP, finalized on 1995;
- "Capacity building on climate change issues for Balkan region" financed by Ministry of Environment and Physical Planning of Greece, finalized recently;
- A series of demonstration small projects financed from GEF/Small Grants Program for com munity based organizations on reforestation and renewable energy sources.
- PHARE project for enabling Albania to prepare the draft Energy Strategy, finalized on 1997.

4. FOLLOW – UP ACTIVITIES

Additional funds are requested and already received from the Government of Albania under the Operational Guidelines for Expedited Financing of Climate Change Enabling Activities (EA) - Phase II, to maintain and enhance national capacities to prepare National Communications, to

ensure a continuity and improvement of this process. Raising public awareness regarding climate change issues is another objective of the phase II. Additional activities will be undertaken to meet the country's needs to build capacities for identification and assessment of technology needs.

Also, Albania is expected to participate in the GEF funded project "Capacity building for improving the quality of greenhouse gas inventories (Europe/CIS region)". The project will initiate a regional programmatic approach to build capacity for improving the quality of data inputs to national greenhouse gas inventories, using the good practice guidance of the IPCC for cost effectiveness.

The project will build upon the expertise gained during the preparation of the initial National Communications. By strengthening the institutional capacity to prepare inventories and establishing a trained, sustainable inventory team, the project will help the participating countries to reduce uncertainties and improve the quality of inventories for Second National Communications. This, on the other hand, will allow participating countries to improve their national strategies for reducing greenhouse gas emissions. The approach has been built on the concept of key sources of emissions.

CHAPTER VII

VII

PROBLEMS, CONSTRAINTS AND NEEDS

Albania as many non-Anex I Parties is faced with a number of problems and constraints during the process of preparation of the First National Communication. Despite the fact that Albania has developed the First National Communication, and national capacities are being built, it is still overwhelmed by a number of problems and constraints. These problems and constraints are of institutional, technical, methodological and financial nature and remain considerable concerns, threatening the sustainability of this exercise. The following is an analysis of the problems and constraints identified, according to each component of the National Communication.

1. NATIONAL GHG INVENTORY – PROBLEMS, CONSTRAINTS AND NEEDS

1.1 Institutional

The institutional problems and constraints identified during the preparation of the First National Communication are related to the lack of institutional and legal framework which might facilitate the process of preparation of National Communication as a whole. The following problems identified represent the institutional problems and constraints not only for Inventory preparation process, but also all components of the National Communication, which need to be overcome and to be improved. Specifically, the identified problems are as follows:

♦ Lack of institutionalization and reporting obligations to enforce relevant state and especially private sector for data provision.

Some branches of economy in Albania have been privatized since 1992. Multiplex forms of ownership of economy, the reduction of state intervention to inner life of enterprises, braking into small pieces of biggest enterprises to be ready for privatization process, made impossible the data collection by the old way (exhaustive). The transition period was accompanied with a decline of centralized statistical information received from public sector, as well as with the distortion of some centralized structures of the statistical system and the missing of data from private sector. As described above it, is very important to have a legislative framework in order to force private entities to regularly report data on their activities. Due to the lack of institutionalization of this process, a weak cooperation with national institutions for getting the necessary data is identified. Sometimes it was difficult to get the necessary data, free of charge from relevant institutions.

♦ Lack of an appropriate support from the Project Steering Committee.

The Project Steering Committee members represent different relevant Institutions, ministries and NGOs.The aim of this Steering Committee is to provide substantial support from the Governmental side to the project. However several times the support has not been sufficient.

♦ Lack of awareness on climate change issues among different stakeholders.

It is identified that there is a lack of awareness among all categories of stakeholders regarding climate change issues.

♦ Execution of the project according to NEX (National Execution) modalities.

According to the NEX modalities, despite of the responsibility that the National Project Manager has for the daily management of the project, he/she has no right of signature. This responsibility lies with the National Project Director, a high-level / political person, not paid from the project budget, who is presumed to ensure and provide the governmental support to the project. Since the National Project Director is a political person, he / she changes with the political changes, which were very frequent in the last years.

1.2 Technical

The technical problems and constraints identified relate to the availability, reliability and variability of activity data and emission factors. Specifically, they are as follows:

♦ Lack of disaggregated activity data or inconsistecy with IPCC format

In many cases, activity data reported for different sectors / sub sectors are very aggregated or inconsistent with the IPCC format, which makes the estimation of the emissions very difficult.The following cases are the most specific ones and they remain as problems for further improvement (for more information see the chapter II, section 6.1 - data gaps):

There is a lack of activity data for transport sector according to the modes of road transpor tation. Also a high variability of activity data among 90's is identified.

There is a lack of activity data for fuel consumption in Industrial sector for years other than the base year – 1994. This is relevant to the high variability of activity data during 90's, due to the fast changes of this sector in these years.

There is a lack of activity data in land use change and forestry sector. There are reliable activity data regarding to fuel wood consumption for energy purposes. This subcategory is identified as one of the key sources with a high degree of uncertainty 79,23% (the total uncertainty estimated is 17,03%).

Also, there is a lack of activity data in agriculture / livestock regarding the enteric fermentation subcategory. Activity data for this subcategory are very fragmentized or discrete. Referring to the key sources, this subcategory is identified as key source as well.

♦ Most of emission factors do not reflect Albanian situation

There is a growing consensus among Albanian experts that default emission factors used for emission estimation do not represent the Albanian actual situation. Except of two cases when country specific emission factors are used, in all other cases the default factors are utilized. There is a need to generate at least regional emission factors.

1.3 Methodological

♦ A discrepancy on local classification of forests to that of IPCC methodology.

A local classification of fruit trees is made by national experts.

♦ IPCC do not reflect the case of burning waste or open dump.

This case is typical for Albania. The urban wastes are only deposited in open dumps or burned. They are not landfilled.

♦ Lack of a methodology for solvents

The CORINAR classification is used for solvents.

1.4 Availability of resources

♦ Lack of previous experience on preparation of greenhouse gases inventories and lack of a trained national team.

This is another constraint identified during the process of preparation of First National Communication.

♦ Lack of appropriate financial resources for development of greenhouse gases inventory.

There was a need for financial resources for conducting surveys and studies in cases when data were not available or when they existed but were aggregate.

2. ABATEMENT ANALYSIS - PROBLEMS, CONSTRAINTS AND NEEDS

2.1 Institutional

As indicated for the inventory, the institutional problems, constraints and needs that have affected the process, remain the same for the abatement analysis.

2.2 Technical

♦ Lack of appropriate data to perform a quantitative analysis for the following measures (in residential and service sector):

-Introduction of central heating plants;
-Introduction of district heating plants;
-Introduction of small scale combined heat and power and district heating plants in new urban areas;
-Lack of adopted strategies for some relevant sectors;
-Lack of predictions (scenarios) for future development of different sectors;

2.3 Methodological

♦ Lack of explicit guidelines for abatement analysis;
♦ Lack of models / software for scenario development for sectors other than energy and trans port;
♦ Lack of training on available models;

2.4 Availability of resources

♦ Lack of previous experience on preparation of abatement analysis;
♦ Lack of a trained national team to perform an abatement analysis;
♦ Lack of appropriate financial resources for quantitative analysis of other abatement mea sures;

3. VULNERABILITY ASSESSMENT - PROBLEMS, CONSTRAINTS AND NEEDS

3.1 Institutional

As indicated about the inventory and abatement analysis, the institutional problems, constraints and needs remain the same for vulnerability assessment and adaptation.

3.2 Technical

♦ Lack of sufficient data becasue of lack of monitoring process;

♦ Impossibility to develop baseline scenarios for sectors like Agriculture, Tourism, Health etc, due to the fact that their development before 90's was dictated by political factors

3.3 Methodological

♦ Lack of explicit guidelines from UNFCC for vulnerability assessment and adaptation
♦ Lack of a finer resolution for MAGIC / SCENGEN software
♦ Lack of methods for simulation of extreme weather events
♦ Lack of models for cost / benefit analysis

3.4 Availability of resources

- Lack of experience for such a complex study.
- Lack of appropriate financial resources for the development of vulnerability assessment.

There was a need for financial resources for conducting surveys and studies, in cases when data were not available.

ABBREVIATIONS

CC	Climate Change
CCSA	Climate Change Scenario for Albania
CEEC	Central and Eastern European Countries
CEP	Committee for Environmental Protection
CHP	Combined Heat and Power
CHS	Central Heating Systems
ClA	Climate Impact Assessment
DHS	District Heating Systems
GACMO	Greenhouse Gas Costing Model
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GHG	Greenhouse Gases
GWP	Global Warming Potential
IAE	International Agency for Energy
IPCC	Intergovernmental Panel on Climate Change
LEAP	Long-range Energy Alterantive Planning
LPG	Liquified Petroleum Gas
LUCF	Land Use Change and Forestry
MAGGIC/SCENGEN	Model for Assessment of GHG Induced CC / Scenario Generator
MCF	Methane Conversion Factor
MMS	Manure Management System
MoE	Ministry of Environment
MSW	Municipal Solid Waste
NCCAP	National Climate Change Action Plan
NCSP	National Communication Support Program
NEA	National Environmental Agency
NEAP	NationalEnvironmental Action Plan
NEX	National Execution
NGO	Non Governmental Organization
PV	Photo Voltaic
PSC	Project Steering Committee
SoE	State of Environment
UN	United Nations
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations International Children's Fund
WHO	World Health Organization
WMO	World Meteorological Organization

Chemical Symbols

CO	Carbon monoxide
CO_2	Carbon dioxide
CO_2 eqv.	Carbon dioxide equivalent
CH_4	Methane
N_2O	Nitrous oxide
NOx	Nitrogen oxides
NMVOC	Non Methane Volatile Organic Compound

ABREVIATIONS

Units

g	gram
kg	kilogram
G	giga
Gg	gigagram
m	metre
mm	millimetre
cm	centimetre
m^2	square metre
m^3	cubic metre
km	kilometre
km^2	square kilometre
km^3	cubic kilometre
kTOE	kilo ton oil equivalent
MTOE	million tons oli equivalent
ha	hectare
kt	kiloton
M	mega
Mt	megaton
W	watt
h	hour
Wh	watt hour
MW	megawatt
kWh	kilowatt hour
GWh	gigawatt hour
TWh	terawatt hour
ppm	parts per million
USD	american dollar
^0C	degree celcius
yr	year

- Achenkirch altitude profils, PHYTON, Annales Rei Botanicae. Vol. 34 (Fasc.3), Special Edition; Horn (Austria) Apud Ferdinandum Berger & Fil., 1995 - Gil, D. & Guttenberger, H.
- Activity of states sanitary inspectorate; Ministry of Health, 2000;
- Agriculture and food statistics of Albania; Ministry of Agriculture and Food; Directorate of statistics & information,1998;
- Agricultural production in Albania, Ministry of Agriculture and Food, 1990-1994;
- Agricultural production in Albania, Ministry of Agriculture and Food, 1990-1999;
- Albanian human development report - UNDP, 1998;
- Albanian human development report - UNDP, 2000;
- Albania in figures; INSTAT, 1999;
- Albania in figures; INSTAT, 2000;
- Annual statistics book of Albania for 1990 - 1994; INSTAT;
- Annual statistical book of Albania for 1990-1999; INSTAT;
- Annual statistical book of Albania for 1964; INSTAT;
- Annual statistical book of Albania for 1961-1991;INSTAT;
- Annual statistics related to GDP sectors contribution; 1990-1994; Ministry of Finance
- Annual statistics related with GDP sectors contribution; 1990-1999; Ministry of Finance
- Archives of Hydrometeorological Institute; 1995;
- Archives of statistics sector; Ministry of Health and Environmental Protection - MHEP, 1990
- Aspekte te studimit te rregullimit te rrjedhjes ujore ne lumenjte Drini i Zi dhe Vjosa; Studime Hidrometeorologjike, Nr.10 - Selenica, A., 1984;
- Biodiversity strategy and action plan; National Report; Albania. November 1999;
- Biodiversity and carbon sequestration; Proceedings of the XI World Forestry Congress; 13-22 October 1997 Antalya; Volume 1; Shand, E.A; 1997;
- Botime periodike tremujore; INSTAT; 1991-1998, Tirane;
- Caring for the forest; Research in a changing world; Congress Report, Volume II.IUFRO XX World Congress, 6-12 August 1995 Tampere, Finland - Skelly, J.M. 1997;
- Climate change and forestry;Proceedings of the XI World Forestry Congress 13-22 October 1997 Antalya. Volume 1 - Reis,I;
- Climate change effects on forests;Caring for the forest; Research in a changing world; Congress Report, Volume II.IUFRO XX World Congress 6-12 August 1995, Tampere, Finland - Krauchi, N. Xu, D., 1995
- Climate change mitigation analysis; GUIDE; CC:TRAIN; Training Package;
- Climate change;The IPPC Response Strategies; Karimanzira, R;
- Climate change and the Mediterranean; Environmental and Social Impacts of climate change and sea-level rise in the Mediterranean. Eduard Arnold; A division of Hodder & Stoughton; London, New York, Melburne; Auckland - Emmer,I.M;
- Climate change and the Mediterranean; Environmental and social impacts of climate change and sea-level rise in the Mediterranean; Edward Arnold. A division of Hodder & Stoughton. London, New York, Melburne, Auckland - Sestini, G.;
- Climate change and the Mediterranean; Volume 2; Jeftic, L. et al., 1996;
- Climate change and the role of forest as carbon sinks in Indonesia. Proceedings of the XI World Forestry Congress 13-22 October 1997 Antalya; Volume 1. - Retnowati, E, 1997;
- Conservation and sustainable management of forests in Central and Eastern European contries; Multi-country and national reports. European Commission, Phare Programme 1999; ISBN: 92-828-84163-Catalog N^0:GU-23-99-435-EN-C. - Driessche,G.Van, etcc

REFERENCES

- Data on infection diseases; Dep. of Epi- Biostatistics; IPH 1998;
- Data on infection diseases (Sector of hygiene & epidemiology); Ministry of Health, 2000;
- Disa veçori te renies ne toke te pluhrave te atmospheres se Tiranes. Instituti i Hidrometeorologjise - Dautaj, H., Xhelili, L.1987;
- Draft national strategy of energy (up to 2010);National Agency of Energy; Albania;
- Druret dhe shkurret e shqiperise; Mitrushi,I; Tirane, 1953;
- Dynamics of deep jets in the Polymode region.; J. Phys. Oceanogr; 17(8): 1163-1188 - Pinardi, N; 1988;
- Eastside forest ecosystem health assessment; Volume I; Executive Summary; USA Department of agriculture; General technical report; PNW-GTR-317; Everett,R; Hessburg,P;Jensen, M; Bormann, B; February 1994;
- Eastside forest ecosystem health assessment; Volume II. Ecosystem management; Principles and applications; USA departament of agriculture; April; Jensen, M.E.; Bourgeron, P.S; 1993;
- Eastside forest ecosystem health assessment; Everett,R; Hessburg,P;
- Eastern europe and global change; European Commission; Kassandra, Halkidiki, Greece-1997; Ghazi, A; Mathy, P.; Zerefos, C;
- Executive Summary; USA Departament of Agriculture; General technical report. PNW-GTR-317. February. - Jensen, M.; Bormann, B. 1994. Volume I;
- Evaluation of desertification on Eu- mediterranean Countries; The pilot zone of Karaburun - Qeparo, Ionian Coast (third report); Karadumi, S.; Minga, Sh.; Samimi, G.; Papandile, A .;1996. Medimont PECO Project;Tirana;
- ”Evolucioni i peizazhit gjeografik gjate shekullit te XX ne zonen fushore midis rrjedhjeve te poshtme te Matit dhe Ishmit”; Konferenca kombetare: ”Gjeografia dhe ekonomia”; Qiriazi P.; Laçi S.; Nikolli P., Shkoder 1995;
- Flora of Albania; Vol.1,2,3; Paparisto, K.; et al.,1988-1996;
- Flore forestiere Francaise; Tome 3: Monsion.j. Montagnes Institute for climate change and forestry; Proceedings of the XI World Forestry Congress; 13-22 October 1997; Antalya; Volume 1; Rameau, I.; C. Reis, I.; 1997;
- Focus: Aspects of yield sustainability through suitable production systems. Plant research and development. Volume 41 / 42;Tubingen,1995 - Institute for scientific Co-operation;
- Focus: Forest management and sustainibility. Plant research and development; Volume 47/ 48.Tubingen,1998; Institute for scientific Co-operation;
- Forestry and other human activities climate change.The IPPC response strategies - Kupfer, D. Karimanzira; R. Agriculture;
- Forest and climate change; role of forestlands as carbon sinks. Proceedings of the XI World Forestry Congress 13-22 October - Brown, S, October 1997.Antalya.Volume I;
- Foresting of deserted and degraded land. Proceedings of the XI World Forestry Congress 13-22 October 1997 Antalya. Volume 1; Serafimovic, B. 1997;
- Forecast of energy and electricity demand and financial evaluation of power sector expantion in Albania - Islami, B.; PhD Thesis;
- Fuel production & consumption of the Republic of Albania (Statistical directory); State statistical department of the RA; 1992; INSTAT;
- Fuel production & consumption of the Republic of Albania (Statistical directory); State statistical department of the RA.- 1994; Ministry of Energy & Mineral Resources;
- Global climate change mitigation and sustainable forest management – The Challenge of Monitoring and Verification; Makundi,W, R;
- Greenhouse gas mitigation assessment; A guide book - U.S. Country Studies Program
- Good practice guidance and uncertainty management in national GHG inventories; 2000. (IPCC/NGGIP);
- Health statistics (Data of the sector; Health statistics); MoH 1999;
- Hidrologjia e Shqipërisë; Instituti i Hidrometeorologjise,1984, Tiranë;

REFERENCES

- IPCC guidelines for national GHG inventories; Revised 1996; (IPCC/UNEP/OECD/IEA);
- Implication of climate change for the Albanian coast; MAP technical reports; No. 98, UNEP Athens; 1996;
- Implications of climate change on land degradation in the Mediterranean; Climate change and the Mediterranean; Environmental and Social; Imeson, A.C;
- Industrial production in Albania; 1990-1994; Ministry of Energy and Mineral Resources;
- Industrial production in Albania; 1990-1999; Ministry of Public Economy and Privatization;
- Inventory of natural & semi-natural forests in Central & Eastern Europe; Albania; Tirana, July 1998; Karadumi, S.;
- IPCC guidelines on greenhouse gas Inventory; 1995;1996 (revised); Volume 1, 2, 3;
- IPCC special report on LU LUCF; IPCC Methodology, 24 June 1999;
- IUFRO Task Force; Climate change and air pollution; final report of the period 1991-1995 IUFRO Occasional Paper Nr.4; Krauchi, N;
- Klima e Shqipërisë; Instituti i Hidrometeorologjise; 1975 Tiranë;
- Late quaternary vegetation history of northwestern Greece; Groningen, 1974; Botema, S.
- L'Albanie, une agriculture en transition; Option méditerranéennes; Nr.15, CIHEAM, Montpellier;1997;
- Livestock in Albania; 1990;1991; 1992; 1993; 1994; Scientific Research Institute of Veterinary;
- Livestock in Albania; 1990 - 1999; Scientific Research; Institute of Veterinary Research;
- Livestock census versus outbreaks of diseases in various species. Draft report 2000; Institute of Veterinary Research Tirana, Albania;
- Livestock and pastures in Albania. Current situation and prospective development; Int. Heifer Project; December 1999;
- Long-term implications of climate change and air pollution on forests ecosystems. Progress Report of the IUFRO; Forest, climate change and air pollution. IUFRO World Series Vol.4. Vienna - Schlaepfer, R. 1993;
- Manual of states sanitary inspectorate; MoH 1999;
- Mbi percaktimin e zonave fito-klimatike te Rep. se Shqiperise; BuletinShkencor; Bujqesor Nr.2,1969. Botim i Institutit te Larte Shteteror te Bujqesise, Tirane 1969; Nako,I.;
- Mbi percaktimin e shtreses mesatare te rreshjeve ne Shqiperi. Instituti Hidrometeorologjise; Sanxhaku, M. and Themelko, B.; 1982;
- Medimont PECO Project evaluation of desertification on Eu-Mediterranean countries. The pilot zone of Karaburun, Qeparo, Ionian Coast; (the third report); Karadumi, S.; Minga, Sh.; Samimi, G.; Papandile, A., Tirana, May 1996.;
- Mountainous areas in Albani; Source of Rural Exode, International Conference; EUROMONTANA, Selanik ; Civici A.; Laçi S; 1996;
- National waste management plan for albania; CEP, 1993;
- National Water Strategy for Albania, BCEOM, 1997
- National Environmental Health Action Plan in Albania, Ministry of Health, 1998;
- Oil by products consumed on transport sector, 1994 - 1999; Ministry of Transport;
- Pasojat potenciale nga ndryshimet klimatike te parashikuara ne pyjet, kullotat dhe lagunat e Bregdetit Shqiptare; Referat mbajtur ne takimin nderkombetar mbi lagunen e Kune-Vainit, Lezhe; Karadumi, S.; Tirane, Mars 1999;
- Perhapja e bimesise pyjore sipas lartesise nga niveli i detit per rrethin e Beratit. Tirane, Pa publikuar; Karadumi, S.;1998 ;
- Përvoja, strategjia dhe politika urbane; Buletini: Studimet e Popullsisë; Nr. 5; Stringa O. ; Dumani B.;1996;
- Position paper on policy and strategies for the Albanian health sector, MoH
- Pyjet, shpendet dhe kafshet e egra te bregdetit shqiptar dhe vlerat peisazhiere e turistike, Karadumi, S.;Tirane, 1997;

REFERENCES

- Report on forest cadastra; Forest and Pasture Research Institute;The situation of the standing wood stock of Albania, for the year 1994,1995,1996; FPRI.
- Report on situation and development of established reforestation with black pine, seaside pine, aleppo pine, stone pine and poplars hybrids; Karadumi, S.; Tirana, December 1985;
- Reports prepared for systemic and prospective analyses, development / environment scenarios for Albania (in the framework of CAMP); Blue Plan, 1995 ;
- Resurset hidrogjeologjike ne Shqiperi, administrimi i tyre dhe gjendja aktuale, Dhami, K.; Kalaja, F.;Saraci, M., 2000;
- Solvents imported into Albania,1994; INSTAT and Customer Offices of Albania.
- Situata social-ekonomike e zonave malore dhe shkaqet e eksodit të popullsisë; Studime Albanologjike ll, Tiranë ; Laçi, S.;1996;
- Silvikultura. Instituti i Larte Shteteror i Bujqesise;Tirane; Treska, Ll.;1963;
- Shkaqet dhe pasojat e levizjes hapesinore te popullsise ne rrethet Shkoder dhe Malesi e Madhe, gjate periudhes 1990-1994; Konferenca Kombetare “Shkodra ne shekuj”, Shkoder Laçi, S.; Shem, S.; 1995;
- State of the environment report; Ministry of Environment 1995 - 1996; 1997 - 1998;
- Studim per gjendjen e ekonomise pyjore te vendit tone dhe masat qe duhen marre per ritjen e prodhimtarise se saje;Tirane, Shtator 1985; Grup autoresh
- Sul clima e sul distribuzione altimetrica della vegetazione forestale in Calabria.Annali del’Istituto Sperimentale per la Silvicoltura Arezzo.Estratto dal Vol.II.; Ciancio, O.;
- Studies of ecosystems in the lime-stone alps-Gil,D. & Guttenberger, H. “Achenkirch Altitude Profils”;PHYTON, Annales Rei Botanicae; Vol.36 (Fasc.4); Special Edition; Horn (Austria) Apud Ferdinandum Berger & Fil - Smidt, S.; Herman, F. 1996;
- TBFRA - 2000; The UN-ECE/FAO; Temperate and boreal forest resources assessment; 2000; Volume I. Main Report. ECE/TIM/NONE/99/4.GE.99-21010; United Nations
- Technical guidelines for assessing climate change impacts and adaptations; IPCC,1994 CGER-I015-1994;
- The green strategy; Booklet issued by the Ministry of Agriculture and Food; Tirana Albania 1999; Ministry of Agriculture and Food.
- The Harvard open ocean model; App. Numer. Math., 3 (1-2): 89-131 - Robinson, A., 1987
- The region of Durresi–Vlora, coastal profile; Document CAMP/1993/AL/CAM-CP - UNEP, 1994
- The UN-ECE/FAO; Temperate and boreal forest resources assessment; 2000; Volume I. Main report. ECE/TIM/NONE/99/4.GE.99-21010 - UN TBFRA-2000
- Threatened and rare plant species of Albania; Vangjeli, J.; et al., 1995-Red Book;
- Urban waste in Albania, 1990-1994; Institute of Technological Chemistry Research;
- Urban Waste in Albania, 1990-1999 - Institute of Technological Chemistry Research;
- Vegetation and land use in the Mediterranean basin by the year 2050; Le Houerou, H.N;
- Vecoritë klimatike edhe hidrologjike të ultësirës perëndimore. Instituti i Hidrometrologjise 1985 Tiranë;
- Vecorite kryesore te rrjedhjes ujore dhe te rrjedhjes se ngurte te pellgut ujembledhes te rrjetit hidrografik te Shqiperise; Studime Hidrometeorologjike; No. 10 - Pano, N., 1984;
- What is changing in the global environment? Caring for the forests; Research in a changing world; Congress report; Volume II; IUFRO XX World Congress; Tampere, Finland. 6-12 August 1995, Kauppi, P.; 1995.