CLIMATE VULNERABILITY ASSESSMENT

REPUBLIC OF MACEDONIA

This project is co-funded by the European Union

CCA Forum
South East European Forum on Climate Change Adaptation

МРЕЖА ЗА КЛИМАТСКИ ОДГОВОР
CLIMATE REACTION NETWORK

ЦРВЕН КРСТ НА РЕПУБЛИКА МАКЕДОНИЈА
KRYQI I KUQ I REPUBLIKËS SË MAQEDONISË
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„This climate vulnerability assessment report is a publication under the Instrument for Pre-Accession Assistance (IPA) project “South East European Forum on Climate Change Adaptation” (SEEFCCA). Within this regional project, four national civil society organisation (CSO) networks on climate change adaptation in Croatia, Macedonia, Montenegro and Serbia have been established to strengthen civil society and tackle climate change through awareness-raising and policy dialogue on national and regional levels.

The recommendations of this report should foster the definition of climate change related initiatives and guide the work of national CSO networks on Climate Change Adaptation (insert the name of your CSO network). The results of this document are also integrated in the regional synthesis climate vulnerability assessment report that brings together the findings of national climate vulnerability assessments in Croatia, Macedonia, Montenegro and Serbia.

The IPA project “South East European Forum on Climate Change Adaptation“ 2011-2012 is implemented by Croatia Red Cross, Macedonian Red Cross, Montenegro Red Cross, the NGOs Environmental Improvement Center and WWF in Serbia and coordinated by the Austrian Red Cross.

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The “Report on Climate Vulnerability Assessment on the territory of the Republic of Macedonia” was developed by PhD. Aleksandar Glavinov, Assistant Professor, representative from the Republic of Macedonia.

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As author of this report I strived to ensure that all information in the report is accurate at the time of finalizing the report, namely as of May 2012. As author I refrain from any liability in case of loss or damage that may arise as a result of reliance on this information in the forthcoming period since the data from this CVA report is constantly changing, particularly in terms of longer period of time.

Skopje, May 2012 PhD. Aleksandar Glavinov, Assistant Professor

PREFACE

The influence of climate change represents an important social, ecological and economic threat to European and global community. The frequent extreme weather conditions – rains and flood, heat waves and droughts – reduced snow falls, increased temperatures and rising sea level will increasingly have more and more influence on the livelihood, food production, energy, infrastructure, ecosystems and the society as a whole.

The first internationally binding document that raises the issue of responsibility in terms of climate change is the United Nations Framework Convention on Climate Change (UNFCCC) adopted in Rio (1992). The ultimate goal of the Convention is to achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic (human) disturbance of the climate system[2]".

The Republic of Macedonia ratified the Convention on climate change on 04.12.1997. As a Party to the Convention, the state has an obligation to prepare national reports on climate change, developed in compliance with the guidelines adopted on the Conference by all parties which are not included in Annex I of the Convention. On the third meeting of the Conference held in Japan, the participants adopted detailed plan of activities or additions to the Convention, known as Kyoto Protocol. The plan foresees that states that respect the Kyoto Protocol aim to reduce the concentrations of greenhouse gases (CO_2 and others) in the atmosphere, namely those gases that pollute the atmosphere through harmful emissions in the air at a level that will minimize dangerous anthropogenic influence in the climate system.

In the 2009, the Conference on Climate Change, better known as the Copenhagen Summit[3] was held in Bella Center in Copenhagen, Denmark, in the period of December 7-18 December, 2009. On the last day of the conference, international media announced that the conclusion of the conference was far from the expected ("weak political position") and action must be taken to keep the temperature rise below 2°C. Many countries and NGOs feel this outcome does not go far enough.

Several other conferences on climate change[4] were held after the Copenhagen Summit among which the most important ones are the Cancun Conference held in November 2010 and the Durban Conference held in November/December 2011.

The Cancun Conference resulted with the most comprehensive and far-reaching international response to climate change the world had ever seen to reduce carbon emissions and build a system which made all countries accountable to each other for those reductions.

At the Cancun Conference, the states' parties agreed as follows:

- to commit to a maximum temperature rise of 2 degrees Celsius above pre-Industrial levels, and to consider lowering that maximum to 1.5 degrees in the near future.
- to make fully operational by 2012 a technology mechanism to boost the innovation, development and spread of new climate-friendly technologies;
- to establish a "Green Climate Fund" to provide financing to projects, programmes, policies and other activities in developing countries via thematic funding windows; and
- Adaptation Framework, which included setting up an Adaptation Committee to promote the implementation of stronger, cohesive action on adaptation.

The conference left the future of the Kyoto Protocol unresolved, which also left open the question of the fate of the international carbon market.

At the Durban Climate Change Conference, held in November 2011, the Secretary General of the International Federation of Red Cross and Red Crescent Societies Mr. Bekele Galeta stated: - "Failure to reach a binding agreement to further reduce greenhouse gas emissions at this week's 17th Conference of the Parties (COP-17) represents

2 United Nations Framework Convention on Climate Change (UNFCCC) adopted in Rio (1992)

3 Copenhagen Climate Change Conference - December 2009

4 http://unfccc.int/meetings

our "collective failure" and puts the world's most vulnerable people at even greater risk. Failure to reach a binding agreement was not unexpected but is nonetheless extremely alarming. The devastating consequences of global warming on people and their communities are increasingly clear to see and it is frankly unacceptable we cannot all agree when so many lives are at stake".

SCOPE, METHODOLOGY AND DEVELOPMENT

This vulnerability assessment from climate change aims evaluates the socio-economic and ecological consequences and formulates real response strategies.

The main objective of the project is to enhance the participation of the civic organizations in the efforts for climate change adaptation through national and regional cooperation initiatives. In order to accomplish the expected results, one of the foreseen activities is also the development of this document (which also considers the EU *acquis communautaire*)[5] which is expected to contribute to the identification of the main challenges and the vulnerability to climate change on national level.

The Report "Climate Vulnerability Assessment on the territory of the Republic of Macedonia" was developed by PhD. Aleksandar Glavinov, Assistant Professor.

The following guidelines, manuals and approaches were used in order to assess the impact of climate change in the most vulnerable areas: health, energy sector, agriculture, water resources and to assess the impact of the climate change on the socio economic conditions:

- Assessment of long-term impact of the climate change in Macedonia
- UNEP Handbook on Methods for Climate Change Impact Assessment and Adaptation Strategies;
- UNFCC Handbook on Vulnerability and Adaptation Assessment;
- IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptations;
- National/regional methodologies and handbooks.

During the process of the development of the report, the author consulted the Climate Reaction Network which was established by Macedonian Red Cross within the project activities.

Several national workshops were conducted with the members of the national network of Macedonian Red Cross with participation of national civil organizations for adaptation to climate change for purpose of:

- Enhancement of the civil society (national civil organizations, nongovernmental organizations);
- Fight against climate change by raising public awareness;
- Dialogue for creation of policies on national level

The final workshop which was held in the period of April 10-11, 2012 resulted with defined final recommendations, discussions and conclusions of the national networks (Network on Climate Change Adaptation), namely, the national civic organizations and non-governmental organizations. The results from these discussions are incorporated in the national report of the Republic of Macedonia.

Besides the civic organizations – members of the Network, the author of this report consulted other relevant governmental representatives.

The need for this Report came as a result of the importance of this issue on global, regional and national level and the necessity to determine:

- the objectives and actions disaster preparedness and response to risks related to climate change;
- the need for interdisciplinary cooperation; and
- exchange of relevant information that may have impact on the wellbeing of the population in the Republic of Macedonia.

The Climate Vulnerability Assessment on the territory of the Republic of Macedonia foresees the objectives and activities which will be implemented by:

- the Government of the Republic of Macedonia in cooperation with other relevant sectors in the country.
- It will unite activities with other sectors in order to ensure a chain of activities targeted for reduction

5 New EU Member States must accept all the existing acquis - some elements of it during a transitional period - and put in place mechanisms to adopt future elements of the acquis.

of the impact of climate change in the Republic of Macedonia.

During the development of this report it was concluded that many sectors in the country lack documents and strategies targeted specifically for adaptation to climate change although some institutions, such as the Ministry of Health has developed action plans from prevention of harmful effects on the population from heat waves.

In the process of the development of the report it was also evident that there is a need for updating the existing data by conducting new researches and development of action plans for adaptation for the affected sectors by climate change.

The analysis of this report is expected to help define the actions in the following priority areas:

- identification, registration and monitoring the risks linked with climate change and their impact on the health of the people;
- promotion of vulnerability assessment, early warning and timely response for coping with risks from climate change;
- promotion of adaptation measures in the agricultural sector;
- promotion of energetic efficiency and renewable energy sources; and
- identification of the needs of the system for management of water resources.

LIST OF ACRONYMS

CEUDIP	Central European Disaster Prevention Forum
CMC	Crisis Management Center
CDM	Clean Development Mechanism
CSI	Indicator codes
CC	Climate change
CCA	Climate Change Adaptation
CVA	Climate Vulnerability Assessment
DPPI SEE	Disaster Preparedness and Prevention Initiative for South Eastern Europe
DPR	Protection and Rescue Directorate
ENNP	A European Network of National Platforms
EARM	Energy Agency of the Republic of Macedonia.
EE	Energy efficiency
EEA	European Environment Agency
EES	Electrical Energy Sector
EATD	Emission Allowance Trading Directive
GHG	Greenhouse Gases
GCM	Global Climate Model
IPCC	Intergovernmental Panel on Climate Change
IAC	Inter-Academy Council
IARU	International Alliance of Research Universities
IPARD	Instrument for Pre-Accession Assistance in Rural Development.
IDNDR	International Decade for Natural Disaster Reduction
ISDR	International Strategy for Disaster Reduction
ISDR-PPEW	International Strategy for Disaster Reduction Platform for the Promotion of Early Warning
MRC	Macedonian Red Cross
MDGs	Millennium Development Goals
MOEPP	Ministry of Environment and Physical Planning

NCCC	National Committee on Climate Change
PPEW	Platform for the Promotion of Early Warning
RSE	Renewable Sources Energy
RCC	Regional Cooperation Council
SREX	Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation
SEE/CCFAP	South East European Climate Change Framework Action Plan for Adaption
SEBI	Streamlining European Biodiversity Indicators
UN /	United Nations
UNISDR	United Nations International Strategy for Disaster Reduction
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNDP	United Nations Development Programme
UNDP/GEF	United Nations Development Programme Global environment facility
UNECE	United Nations Economic Commission for Europe
UNCBD	United Nations Convention on Biological Diversity
UNCCD	United Nations Convention to Combat Desertification
WMO	World Meteorological Organization
WCDR	World Conference on Disaster Reduction
WWF	World Wide Fund for Nature
CO_2	Carbon dioxide
$CO_{2\text{-eq}}$	Carbon dioxide equivalent
CH_4	Methane
N_2O	Nitrous oxide
NO_x	Nitrogen oxide

EXECUTIVE SUMMARY

In the last three decades global warming had a significant and obvious impact on the changes registered in many human and natural systems including the changes in the models of rainfall, rise of global average sea level, melting of glaciers and dropping the level of ice sheet in the Arctic Sea. Furthermore, in numerous cases we can notice the changing of the river flows, particularly the rivers which get water from snow or glaciers[6].

The risks from climate change that are expected in the Republic of Macedonia are as follows: increased risk from coastal and river floods, droughts, loss of biodiversity, threats to human health and damage in the economic sector, such as energy sector, forestry, agriculture and tourism[7].

The consequences from climate change are expected to vary significantly all over the Republic of Macedonia, with explicit implications in the southern part of the country, such as increased average temperatures and reduced access to water which would enhance the current vulnerability in terms of droughts, forest fires and heat waves.

Meanwhile, in northwestern parts of the Republic of Macedonia, the low coastal regions are faced with the risk of increased river levels.

Additional pressure on the environment may arise due to the easy access to oil and gas reserves, and the new transport routes due to the reduced level of ice cover[8].

The mountain regions are faced with significant challenges, including the reduced snow cover which has impact on the winter tourism and extinction of several species.

Moreover, the degradation of the eternally frozen soil in the mountain regions may cause infrastructural problems, since the roads and bridges may be endangered by this situation.

Climate change in the Republic of Macedonia is expected to result with increasing the global average temperature, and the number and intensity of the heat waves and the more and more frequent extreme weather conditions (floods, droughts, landslides, fires, illnesses, etc.)[9].

6 EEA-JRC-WHO, 2008. Impacts of Europe's changing climate - 2008 indicator-based assessment. Joint EEA-JRC-WHO report. Office for Official Publications of the European Communities, Luxembourg.

7 EEA-JRC-WHO, 2008. Impacts of Europe's changing climate —2008 indicator-based assessment. Joint EEA-JRC-WHO report. Office for Official Publications of the European Communities, Luxembourg.

8 EEA, 2007. The pan-European environment: glimpses into an uncertain future. EEA Report No. 4/2007. European Environment Agency, Copenhagen.

9 Action Plan for prevention of consequences from heat waves on the population of the Republic of Macedonia http://www.toplotnibranovi.mk/downloads/brosura.pdf

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1. Introduction: Climate change

1.1. SCIENTIFIC BACKGROUND

The risks of climate change and extreme weather

Extreme weather and climate events, interacting with exposed and vulnerable human and natural systems, can lead to disasters. This Special Report explores the challenge of understanding and managing the risks of climate extremes to advance climate change adaptation. Weather- and climate-related disasters have social as well as physical dimensions. As a result, changes in the frequency and severity of the physical events affect disaster risk, but so do the spatially diverse and temporally dynamic patterns of exposure and vulnerability.

Some types of extreme weather and climate events have increased in frequency or magnitude, but populations and assets at risk have also increased, with consequences for disaster risk. Opportunities for managing risks of weather- and climate-related disasters exist or can be developed at any scale, local to international. Some strategies for effectively managing risks and adapting to climate change involve adjustments to current activities. Others require transformation or fundamental change.

The Intergovernmental Panel on Climate Change (IPCC) is the leading international body for the assessment of climate change, including the physical science of climate; impacts, adaptation, and vulnerability; and mitigation of climate change. The IPCC was established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) to provide the world with a comprehensive assessment of the current state of knowledge of climate change and its potential environmental and socioeconomic impacts.

Source: From Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation: A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (IPCC, 2012, p i)

The global climate was extremely stable in the last 10.000 years and enabled preconditions for development of the human civilization but today there are evident signs that the climate is changing[10].

The Intergovernmental Panel on Climate Change (IPCC) suggests that increases in temperatures of the mid-20th century are very likely caused by increased concentrations of greenhouse gases arising from human activity like burning fossil fuels and deforestation.

The IPCC has also emphasizes that a global mean temperature increase of more than 2°C will have severe human and ecological consequences, making adaptation difficult and costly.

If global action to limit greenhouse gas emissions proves unsuccessful, the consequences will be significant. Current projections indicate that global average temperatures will rise between 1.0 and 5.5°C by the end of the century. Precipitation is likely to become more intense and predictable across the globe, while mean sea level rises of between 0.18 and 0.59m are likely by 2100.[11]

10 University of Copenhagen, 2009. International Scientific Congress Climate Change: Global Risks, Challenges & Decisions — Synthesis Report, IARU (International Alliance of Research Universities), Copenhagen, 10–12 March 2009.

11 IPCC, 2007. Climate change 2007: Synthesis Report (Fourth Assessment Report of the Intergovernmental Panel on Climate Change). Cambridge University Press, Cambridge.

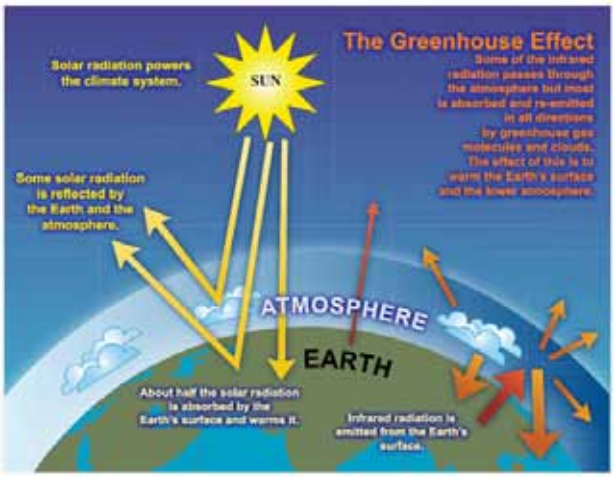

Figure 1: The Greenhouse Effect
Source:http://www.global-greenhouse-warming.com/effect-green-house.html

The latest perceptions provide grounds to believe that the increase rate of the greenhouse gas emissions and the numerous consequences from climate change is closer to the upper limits of the scope of the projections of IPCC that the lower ones[12].

Even the slightest changes in the temperature may have serious impact on the life of the people, animals and plants. The unexpected temperature rise contributes for appearance of extreme climate phenomena, such as hurricanes, floods, heat waves, droughts and storms, as well as the rise of sea levels and melting of the glaciers. This would lead to changing the commencing and the end of seasons which would result with serious consequences on the Earth.

12 The global greenhouse gas emissions abruptly increased in the period of 2000 to 2004 compared to the nineties in the XX century, but, they were significantly reduced after 2004. This comes partially as a result of the mitigation measures. The economic downfall caused reduction of global emissions of CO2 for 3% in 2009, compared to 2008. (PBL, 2009 scientific news on climate and border research, Netherlands Environmental Assessment Agency (PBL), No. Publication PBL 500114013, Bilthoven, the Netherlands).

1.2. CLIMATE CHANGE MITIGATION

The measuring of global atmospheric concentrations of greenhouse gases (GHG)[13] indicate evident increase of carbon dioxide (CO_2) levels compared to the pre-industrial level, far above the natural scope in the past 650.000 years. The concentration of the atmospheric CO_2 which was 280 ppm in the pre-industrial level rose to above 387 ppm in 2008[14].

The increase of the greenhouse gas emissions significantly comes as a result of the use of fossil fuels, although an important but significantly smaller input goes on deforestation, change of appropriation of land and agriculture. As a consequence to this, the average global temperature of the air in 2009 increased from 0.7°C to 0.8°C compared to the pre-industrial levels[15].

Other sources of greenhouse gases include deforestation, agriculture, waste disposal and fluorinated gases from industrial waste

Global efforts have been made to slow the rate of climate change by reducing emissions of the greenhouse gases that increase the warming effect. Although attempts to negotiate a global agreement have met with limited success, some regions, particularly the EU, have had some success in reducing their greenhouse gas emissions.

In general, in the EU, the energy consumption, the production and consumption of electricity and heat energy and in the industry, transport and housing, participate with 80% of GHG emissions[16].

The historic trends in the emission of greenhouse gases in EU in the past 20 years come as a result of two mutually contradictory factors[17].

On one hand, the greenhouse gas emissions in Europe have been driven upward by many factors, such as:

- increasing production of public electricity and heat by thermal plants, both in absolute terms and in comparison with other sources;

13 Carbon dioxide (CO_2) methane (CH_4), nitrous oxide (N_2O) and different chlorofluoro-carbon (CFC). You will notice that the biggest focus is on the role of carbon in general and particularly to carbon dioxide CO_2.

14 WMO, 2009. WMO Greenhouse Gas Bulletin, The State of Greenhouse Gases in the Atmosphere Using Global Observations through 2008, No 5, 23 November 2009, Geneva.

15 WMO, 2010. WMO statement on the status of the global climate in 2009, WMO-No 1 055, World Meteorological Organization, Geneva.

16 EEA, 2010. Annual European Union greenhouse gas inventory 1990–2008 and inventory report 2010. EEA Technical Report No 6/2010. European Environment Agency, Copenhagen http://climate-adapt.eea.europa.eu.

17 EEA, 2009. Greenhouse gas emission trends and projections in Europe 2009. EEA Report No 9/2009. European Environment Agency, Copenhagen, http://climate-adapt.eea.europa.eu.

- economic growth in manufacturing industries;
- increasing transport demand for passengers and freight;
- increasing share of road transport compared to other transport modes;
- increasing household size; and
- demographic growth in the last decades.

During the same period, significant emission reductions have been achieved, driven by, for example:

- energy efficiency improvements (in particular by industrial end users and energy industries);
- fuel efficiency improvements in vehicles;
- better waste management practices and improved utilization of the gas from the waste dumps (the waste management sector accomplished best relative reductions);
- reduction of emissions in the agriculture (for over 20% since 1990);
- a shift from coal to less polluting fuels (in particular gas and biomass) for the production of electricity and heat; and
- the economic downturn affecting eastern Member States in the 1990s.

Germany and the United Kingdom played a dominant role in the trends of greenhouse gas emissions in EU in the period of 1990 to 2008. They were both responsible for more than half of the reduction in EU. Significant reductions have been also achieved by other member states of EU 12 such as Bulgaria, Czech Republic, Poland and Romania. This overall reduction was partially compensated with the increase of emissions in Spain and to a less extent in Italy, Greece and Portugal.

In its package for climate and energy, the two key targets set by the European Council[18] are as follows:

- additional cutting of greenhouse gases for at least 20% by 2020 compared to the levels in 1990, and
- a reduction of 30% in greenhouse gases (GHG) by 2020 if there is an international agreement committing other developed countries to "comparable emission reductions and economically more advanced developing countries to contribute adequately according to their responsibilities and respective capabilities".

Switzerland and Lichtenstein (joint reduction from 20 to 30%), and Norway (from 30 to 40 %) accepted similar obligations.

Current trends indicate that EU-27 is making progress towards achieving its target for reduction of greenhouse gas emissions by 2020. The projections of the European Commission indicate that by 2020 greenhouse gas emissions will be reduced by 14% compared to the level in 1990, having in mind the implementation if the national legislation adopted until the beginning of 2009. If we presume that the package on climate and energy would be completely implemented, it is expected that EU would accomplish its target to reduce greenhouse gas emissions for 20%[19].

It must be noted that part of the additional reduction could be accomplished by utilization of flexible mechanisms in the trade and nontrade sectors[20].

The key relevant efforts involve expansion and enhancement of the EU Emission and Trading System[21], and defining legally binding quantitative targets for increasing the participation of the renewable energy by 20% out of the overall consumption of energy, including 10% in the transport sector, compared to the total share of less than 9% in 2005[22].

It is encouraging that the share of renewable sources in the production of energy is increasing, particularly biomass, wind and solar ennergy.

It is worth noting that UNFCCC and the Kyoto Protocol do not cover all greenhouse gases. Many of the substances controlled by the Montreal Protocol, such as chlorofluorocarbons (CFCs), are also powerful greenhouse gases. The gradual elimination of

18 EC, 2008. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: 20 20 by 2020, Europe's climate change opportunity. COM(2008) 30 final.

19 EC, 2010. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions — Analysis of options to move beyond 20 % greenhouse gas emission reductions and assessing the risk of carbon leakage (SEC(2010) 65).

20 „The Flexibility Mechanism" is a term which is used for collective representation of the instruments for fulfilling national targets for reduction of greenhouse gas emissions with market based approaches, which take in consideration the mitigation efforts supported in other countries.. Among these instruments is the Clean Development Mechanism (It allows emission reduction projects in developing countries), and Joint Implementation (which enables countries to earn certified emission reduction credits through investments in projects for reduction of greenhouse gases in other countries).

21 EC, 2004. Directive 2004/101/EC of the European Parliament and of the Council of 27 October 2004 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms. COM (2004) 101.

22 EC, 2008. Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources. COM (2008) 19 final.

substances which destroy the ozone layer and result in climate change indirectly contributes to the reduction of greenhouse gas emissions: in this way, the reduction in emissions of the GHG on a global level will be bigger than expected with the implementation of the provisions of the Kyoto Protocol by 2012[23].

23 Velders, G.J.M.; Andersen, S.O.; Daniel, J.S.; Fahey, D.W.; McFarland, M., 2007. The importance of the Montreal Protocol in protecting climate; Proceedings of the National Academy of Sciences 104: 4 814–4 819.

1.3. CLIMATE CHANGE CANNOT BE PREVENTED - THE NEED FOR ADAPTATION

Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. (UNFCCC, 2007: xx).

Even if European and global efforts for reduction and mitigation of greenhouse gas emissions in the forthcoming decades proved to be successful, still adaptation measures would be required for coping with the inevitable consequences from climate change.

Adaptation responses can be clustered into the following broad categories:

- technological solutions — (grey measures);
- ecosystem-based adaptation options — (green measures);
- behavioral, managerial and policy approaches — (soft measures).

Practical samples of adaptation measures include: systems for preparedness and early warning in the risk management from heat waves, droughts and lack of water, management of water demand, management of energy consumption, expansion of crop diversity, defending from costal and river flood, disaster risk management, expansion of economic diversity, insurance, adoption of management plans and techniques that strengthen changes in cropland or forestland use.

The above listed measures should take account of the vulnerability to climate change between regions and economic sectors, and between social groups particularly the older people and households with low income, which are more vulnerable than others. Furthermore, many adaptation measures should not be implemented as isolated actions, but should be incorporated in wider sectoral measures for risk reduction, including strategies for management of water resources and coastal defense.

The adaptation costs may be potentially high and they can reach up to 1 billion Euros annually, on midterm and long-term basis. But economic assessment of the costs and gain are subject to significant uncertainty.

Regardless of this, the adaptation options suggest that timely adaptation measures are rational from economic and social aspect and from the aspect of protection of the environment, since they can reduce potential damage and pay off manifold in comparison with not taking any action at all.

Most European countries are aware of the need to adapt to climate change: eleven European countries had adopted national adaptation strategies by spring 2010.[24]

In European framework, the EU White Paper for adapting to climate change[25] represents the first step towards strategy for adapting to climate change, in order to reduce vulnerability from consequences from climate change and it complements the activities on national, regional and even local level. The integration and adaptation in spheres for protection of the environment and sector policies, such as those linked with water, nature and biodiversity and efficient use of resources is a very important target.

However, this EU White Paper also emphasizes that limited knowledge surrounding this issue is a significant obstacle to effective adaptation. The development of a strong knowledge base is required in order to enable the exchange of information and adaptation best practices among affected groups.

24 The updated overview table for the achieved progress towards development of national adaptation strategies is available at www.eea.europa.eu/themes/climate/national-adaptation-strategies

25 EC, 2009. White paper, adapting to climate change: towards a European framework for action. COM(2009) 147 final.

2. Current and future climate risks in the Republic of Macedonia

2.1 INFORMATION ABOUT THE REPUBLIC OF MACEDONIA

2.1.1. Geographic features

TThe Republic of Macedonia is a landlocked country located in the central Balkan Peninsula in south east Europe. It has a total area of 25 713 km^2, the majority (79,1%) of which consists of hills and mountains, with smaller areas of plains (19,1%) and freshwater bodies (1,9%), the most significant of which are Lakes Ohrid, Prespa and Dojran. The highest peak is Mount Korab at 2 764m; however, the majority (44,01%) of the country lies at an elevation of between 500 and 1000 m. In terms of protected areas, there are three major national parks (Mavrovo, Pelister and Galichica), four natural reserves and 44 areas of natural significance. About 30 % of the country is forested, and 82% of the cultivable land (540000 Ha) is arable land or gardens. Despite the relatively small proportion of arable land, the agricultural sector is extremely important for Macedonia, accounting for 14% of the GDP in 2006 and providing the primarily livelihood of many people.

2.1.2. Demography / population

In the last several decades, the Republic of Macedonia has faced numerous problems linked with the population, as well as numerous challenges due to the existing economic and social situation, which have a direct impact on the demographic trends in the country. While the birth rate is decreasing, which results in a reduced percentage of the youth in the overall population structure, the number of older people is increasing. Also, the Republic of Macedonia is facing regional overbalance in terms of population growth, with significant difference between urban and rural areas.

According to the latest Census of population, households and dwellings in 2002, the Republic of Macedonia has 2,022,547 inhabitants, which is for 3,9% more compared to the previous census in (1994), and for 43,0% more than 1948. According to the data of the State Statistical Office, the total number of the population in 2006 was 2.040.228 citizens. Life expectancy for the period 2003-2005 was 71.44 years for men and 75.88 years for women. The average age of population for the country for the year 2005 was 35.9 years.

According to the United Nations World Population Prospects the number of population is expected to decrease to 2.037.000 people in 2015 and 2.001.000 people in 2025[26]. Measured with respect to the average growth rate of the population, negative growth is expected from 2010 onwards for 0,04 % which will continually last in the forthcoming period which would result with reduction of the number of people for 14.4% in the period 2007 - 2050.

The average population density is 79.3 inhabitants per km^2, which positions Macedonia in a relatively favorable situation. However, from aspect of regional division, the values are less favorable.

Skopje region is most densely populated with 326 inhabitants per km^2, followed by the Polog region with 128 citizens per km^2. On the contrary, Vardar region is most sparsely populated (with 39,3 inhabitants per km^2). This regional differentiation imposes the problem of sustainability of the regions, in terms of the population, the structure of the population and the economic and social conditions.

26 United Nations (2006) World Population Prospects The 2006 Revision.

Although, out of the total 1762 populated places only 34 are classified as cities, even 57,8% of the total population live there, and 20,5% of the total population lives in one of these cities (Skopje). On the other hand, 141 rural communities are totally depopulated, and similar situation is expected in other 455 populated communities. On the contrary, 240 rural communities have over 1'000 inhabitants[27].

2.1.3. Hydrography

The hydrographic territory of the Republic of Macedonia is a unique natural basin in the Balkan Peninsula and wider because more than 80% of the water resources are formed in the territory of the country. The river network is consisted of smaller and larger rivers. They spring high in the valleys of the mountains: Shar Planina, Baba, Karadzica, Belasica and many others enabling water supply of population and irrigation by gravitational way. Also, they represent high potential for energy production.

The hydrographic territory of the country belongs to four river basins: Vardar, Crn Drim, Strumica and Juzna (South) Morava river basin. The river basin areas of Vardar River and Strumica River gravitate towards the Aegean Sea. They are the major river basins in the country covering 86,9 % of the total territory. The river basin area of Crn Drim River gravitates towards the Adriatic Sea (12,9 % of the total area), and the river basin area of Juzna Morava which territory is insignificant gravitates towards the Black sea.

The River Vardar basin is the largest one, containing 80.4 % of the total territory of the Republic of Macedonia. Its total length is 388 km, of which 301 km run in Macedonia. It springs at thealtitude of 683 m.a.s.l. near the village Vrutok and runs off into the Aegean Sea. The average annual flow for the time series of 31 years (1960-1991) at the gauging station in Gevgelija profile is 144,9 m^3/sec. The River Vardar's major western tributaries are the River Crna and the River Treska, while the longest eastern tributaries are the River Bregalnica and the River Pchinja.

The Strumica catchment area covers an area of 1.649 km^2, or 6,4 % of the total territory of the Republic of Macedonia. Average annual volume of discharged water is approximately 132 x106 m^3/year. This area is poorest in water resources.

The Crn Drim catchment area covers the catchment areas of the Prespa and Ohrid Lake and the catchment area of the Crn Drim with its tributaries on the territory of the Republic of Macedonia to the Macedonian-Albanian state border. The Crn Drim catchment area covers an area of 3.359 km^2, or 13,1 % of the total territory of the country. Over the territory of the country, the river Crn Drim has a length of 44,5 km. The average annual volume of discharged water is approximately 1,64 x 109 m^3.

Since the catchment area of Juzna Morava is 44 km^2 it does not have a major impact on the available water resources in Macedonia. The river Morava springs in Macedonia and continues to flow in Serbia.

The Republic of Macedonia has many lakes. They are mutually different on basis of the creation of the lake basin according to the depth and economic value. The lakes are divided on natural and artificial on basis of the origin of the lake basins.

The natural lakes were created by the nature. They are divided on tectonic ad glacier lakes. The tectonic lakes are located in the valleys, and they were created due to the lowering of the land surface. In our country these are: Ohrid Lake, Prespa Lake and Dojran Lake.

The glacier lakes are most numerous and smallest. They are located on cirques, formed by the erosive activity of the glaciers. Therefore they are mostly located in the higher parts of the mountains where there were glaciers in the past. Glacier lakes are small, deep and usually round and they have clean and transparent water. The most famous glacier lakes are on the mountains Sar Planina, Pelister, Jakupica and Jablanica. Most famous of them are: Livadicko Lake, Bogovinsko and Karanikolicko on Sar Mountain and the Big and Small Lake on Pelister.

The artificial lakes are created by humans. They are built in the river valleys where there are favorable preconditions for blocking the river flow. The most famous Macedonian artificial lakes are: Matka and Kozjak on the river Treska, Mavrovo Lake, Debar Lake, Tikves Lake, on Crna Reka, Mladost Lake near Veles, Kalimanci Lake on Bregalnica River, etc. The biggest artificial lake is Mavrovo lake, and it covers a territory of 13,7 km^2 and the lake is built on the drainage-basin of Mavrovo river.

27 State Statistical Office

The artificial lakes are very important for the economy. They are used for irrigation of land, for production of electricity, and for water supply for the populated areas.

2.1.4. Politics

In the wake of the dissolution of the former Socialist Federal Republic of Yugoslavia, The Republic of Macedonia declared independence on 8th September 1991. Since then, the state has operated as a parliamentary democracy.

The president heads the executive branch of government and is elected by general ballot for a five-year term, with a maximum of two terms. The 120 members of parliament make up the legislative branch of government, and are elected for four-year terms. The majority party in parliament select the Prime Minister, who is not a member of parliament. The judicial branch consists of the Constitutional Court, Supreme Court, Administrative Court, appeals courts and an independent Public Prosecutor, with the Supreme Court judges and Public Prosecutor appointed by parliament.

The Republic of Macedonia has applied to join the EU, and was accepted as an official candidate country in December 2005. Since then, the government has begun the process of aligning national legislation with the EU *acquis communautaire.*

2.1.5. Economy

The national economy is modest, with a nominal GDP of approximately 4.5 billion dollars in 2005 and a rate of growth in the same year of 3.8%; however, inflation also remained low at 0.5% in 2005[28].

Historically, the agricultural and industrial sectors have dominated the national economy; however, recent years have registered a rise in the importance of the service sector, and a decline in the industrial sector in particular, which has lacked investment in recent years.[29]

In the fourth quarter of 2011 the active population in the Republic of Macedonia amounts to 937.326 out of who 639.340 persons are employed or 68.2%, and 297.986 persons or 31.8% are unemployed. The activity rate in this period is 56.5, the rate of employment is 38.5%, while the unemployment rate amounts to 31.8%. The average monthly paid gross salary per employee in February 2012 amounts to Denar 30.257. In February 2012, 2.7% of the employed people in the Republic of Macedonia did not receive their salaries[30].

The national economy is in a transitional stage from a state-managed to a more market-oriented economy. It is undergoing gradual reform, and inevitably has experienced problems during the transformation. In particular, a lack of job opportunities has resulted in many skilled workers seeking employment abroad.

However, after significant efforts for accomplishing economic and political stabilization, since 2004 the foreign direct investments show a growing trend. In 2006, there was an evident new wave of investments from the private sector in the energy sector, as well as certain “Greenfield” investments in the free economic zones. The future targets of the Government of the Republic of Macedonia are provision of support to the growth of the domestic consumption, industrial production and creation of favorable preconditions for domestic and foreign investments.

28 Ministry of Environment and Physical Planning, 2008

29 Ministry of Environment and Physical Planning, 2008

30 State Statistical Office.

2.2. ASSESSMENT OF THE CLIMATE IN THE REPUBLIC OF MACEDONIA

2.2.1. Current climate in the Republic of Macedonia

Although it is a small country, the Republic of Macedonia has a diverse climate. If tthe country and its the neighboring regions were flat, they would have significantly more Mediterranean climate, if we judge according the geographic latitude and the vicinity of the seas. The secondary factors (complicated contour structure and altitude) significantly modify the Mediterranean impact.

The following, more homogeneous climate regions and sub-regions, are differentiated as in Figure 2[31]:

31 Source: Institute for Agriculture.

- Region with a sub-Mediterranean climate (50 - 500 m);
- Region with a moderate-continental-sub-Mediterranean climate (to 600 m);
- Region with a hot continental climate (600 - 900 m);
- Region with a cold continental climate (900 – 1,100 m);
- Region with a sub-forest-continental-mountainous climate (1,100 -1,300 m);
- Region with a forest-continental mountainous climate (1,300 – 1,650 m);
- Region with a sub-alpine mountainous climate (1,650 – 2,250 m);
- Region with an alpine mountainous climate (hs >2,250 m).

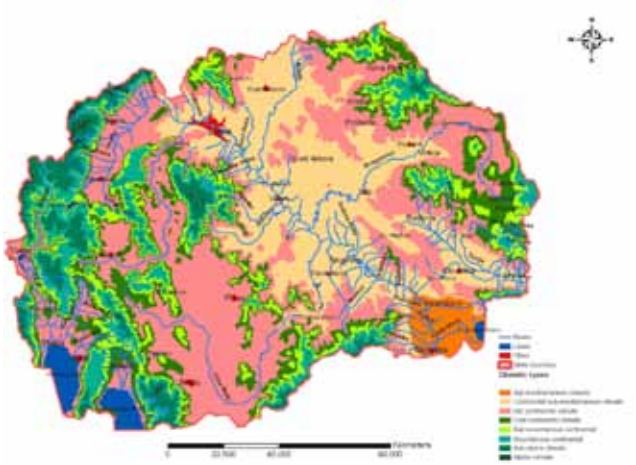

Figure 2: Climatic types in Macedonia
Source: http://www.eea.europa.eu/soer/countries/mk/soertopic_view?topic=country%20introduction

Due to the specific natural and geographic characteristics, there are three main types of climate in the Republic of Macedonia: **moderate-continental climate, mountainous climate and altered Mediterranean climate.**

The Mediterranean climate is warm and By contrast, the mountainous climate is much cooler, with short, cool summers and cold winters, with between five and six months of the year where the average monthly temperatures are below 0°C. The moderate-continental climate has shorter summers than the Mediterranean climate, with fewer very hot days. It has cool winters with spells where the temperature falls below zero, and most precipitation falls in storms in the warmer parts of the year.[32]

32 See http://www.mkdsumi.com.mk/zasumite_en.php?page=3&s=3

2.2.2. Trends and scenarios for climate change in the Republic of Macedonia

Data collected since 1961 indicates that average air temperatures have been warmer during the period 1971-2000 as compared to 1961-1990 in almost every part of the country, while winters and summers have been warmer in the most recent thirty year set, and springs and autumns colder. The warmest year on record is 1994, with other extremely warm years including ,1999, 2002, 2003. The highest temperatures ever recorded in the country occurred during the 2007 heat wave, with a high of 45.7°C recorded at Demir Kapija.

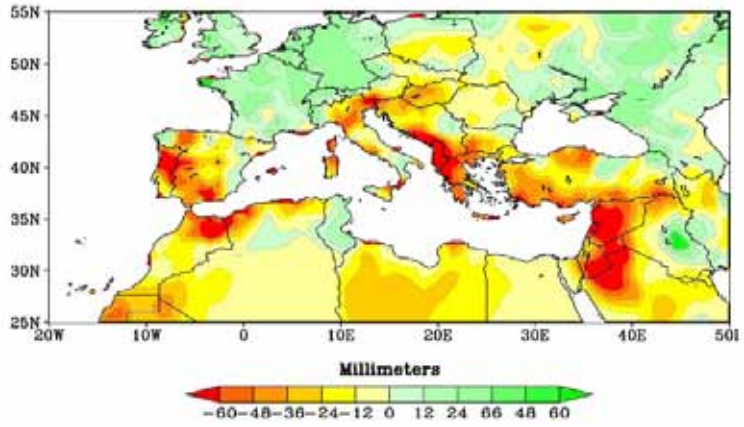

Figure 3: Overview of climate change (precipitation in mm) Source: http://www.sustainableguernsey.info/blog/2011/10/us-noaa-study-shows-that-human-caused-climate-change-causes-more-frequent-mediterranean-droughts/

Projections for the future climate of Macedonia have been developed for various sub-regions of the country, one scenario for the overall country based on the direct product of Global Climate Model (GCM). Key trends from these models include a high increase in air temperatures during summers by the end of the 21st century, and a considerable decrease in precipitation for all seasons except winter.

The projected changes in temperature and rainfall for Macedonia as a whole are shown in table 1 below[33].

However, it should be taken into consideration that the future climate projections are not precise but they are possible indications in which direction could climate change progress.

33 For more detailed information on climate projections for Macedonia, see Aneex 2 of this report.

Year	Average temperature change [°C]				Precipitation change [%]			
	annual				annual			
	2025	2050	2075	2100	2025	2050	2075	2100
Low	0,9	1,6	2,2	2,7	-1	-2	-4	-5
Mean	1,0	1,9	2,9	3,8	-3	-5	-8	-13
High	1,1	2,1	3,6	5,4	-6	-7	-12	-21

Table 1: Projected changes in average daily air temperature (°C) and precipitation (%) for the Republic of Macedonia, based on direct GCM output interpolated to geographic location 21.5 °E and 41.4 ° N (base period 1990). Source: Ministry of Environment and Physical Planning, 2008: 48

2.3 NATURAL HAZARDS AND OTHER CATASTROPHES

The impact of climate change directly or indirectly has impact and causes obligations for all institutions in the country. The Republic of Macedonia developed Risk Assessment[34], of several types of natural and other disasters.

In the forthcoming 50 years the climate change will cause significant effects on important economic sectors: agriculture, energy, transport, health and tourism. Climate change will cause loss of ecosystems and biodiversity, and will have impact on the households and the overall economy, as well as to specific groups in the society, particularly senior citizens, persons with special needs and households with low income.

The climate change has impact on:

- death rate and serious illnesses at older people;
- heat stress at cattle and at deer;
- crop yield;
- demand on cooling fluids;
- safety of the energy supply;
- scope and activities of vector transmitted diseases;
- demand for energy for heating;
- soil erosion;
- occurrence of floods;
- occurrence of forest fires;
- occurrence of heat waves;
- quality and quantity of water resources;
- risk from infections and epidemics;
- coastal erosions and damage to coastal infrastructure;
- other influences on the private property;
- possibilities for migration;
- risks from conflicts for drinking water.

34 Risk Assessment, Republic of Macedonia, Official Gazette of RM No117 dated 01 October 2007

2.3.1. Risk from heat waves

One of the consequences of a rise in global average temperatures will be an increase in the frequency and intensity of heat waves. In recent years, there has been a clear trend of higher summer temperatures in Macedonia, and particularly high temperatures were recorded in Macedonia in 1993, 1994, 2000, 2001, 2003, 2005 and 2007.[35]

During the 2007 heat wave it was estimated that there were 1000 more deaths during the summer as compared to the average number of deaths during the summers of 2004-2007[36]

The influence of the air temperature rise would be particularly evident in urban areas where the temperature is higher for several degrees compared to rural areas.

There is general conclusion that in the last fifteen years there is evident increase of days with:

- maximum air temperature, above or equal to 30°C (tropical days);
- maximum air temperature, above or equal to 35°C (hot days);
- minimum air temperature, above or equal to 20°C (tropical nights).

According to the projections listed in the Second National Report on Climate Change of the Republic of Macedonia dated 2008, climate change in the Republic of Macedonia would result with significant occurrence and intensity of heat waves, which would consequently result with more frequent extreme weather conditions (floods, droughts, landslides, fires, storms, etc).

35 Action Plan for prevention of consequences from heat waves on the population in the Republic of Macedonia http://www.toplotnibranovi.mk/downloads/brosura.pdf

36 Action Plan for prevention of consequences from heat waves on the population in the Republic of Macedonia http://www.toplotnibranovi.mk/downloads/brosura.pdf

The biggest air temperature increase in the Republic of Macedonia by the end of the century is projected for the summer period, which would be accompanied with most intensive reduction of rainfall. Practically, rainfall changes are not expected in the winter period, but rainfall is expected to be reduced in all other seasons.

2.3.2. Risk from floods

Floods are natural disasters which frequently affect the Republic of Macedonia. They appear as a result of specific features of the embossment, topography, orography, geomorphology and the climate change. Flooding results from the volume of water which overflows or breaks levee from rivers, hydroaccumulations and high dams.

Floods most frequently occur in the following regions: Polog region along Vardar River; Skopje region along Vardar River and the confluents; Kumanovo region around the confluents and rivers; Kochani region around the confluents and rivers; Strumica-Radovish region around the confluents and rivers; Gevgelija-Valandovo region along Vardar River and around the confluents and rivers etc. In the valleys along Vardar River and Crna River floods occur in winter and spring as a result of the fast melting of snow but they cause small damage compared to the short intensive floods in the summer period. Floods in summer period as a result of intensive precipitation are typical along the River Bregalnica and River Pcinja.

The improvement of the protection from floods requires application of numerous integrated, systemic and effective preventive structural and non-structural measures. Precondition for their application is active and coordinated participation of all interested parties – sectors for water and economy, services for protection and rescue, hydro-meteorology, health planners, local authorities, regional government, beneficiaries and managers of water accumulations, farmers, institutions for protection of the environment, scientists and researchers, media, universities, non-governmental organizations and citizens.

Flood safety cannot be accomplished without application of engineering measures which incorporate regular economic and technical maintenance of the water flows, water resources and water construction

Year	FIRES		BURNT AREA		BURNT TIMBER	
	No.	Index	Hectares	Index	m^3	Index
1	2	3	4	5	6	7
1998	151	100,0	2 859	100,0	26 104	100,0
1999	90	59,6	1465	51,2	5 687	21,8
2000	398	263,6	32 939	1 155,8	562 303	2 154,1
2001	255	168,9	7 312	255,8	84 451	323,5
2002	121	80,1	1 726	60,4	9 145	35,0
2003	193	127,8	2 282	79,9	15 328	58,7
2004	161	106,6	2 034	71,1	15 130	58,1
2005	260	172,2	3 361	117,6	7 313	28,0
2006	185	122,5	3 065	107,2	23 517	90,1
2007	620	410,6	39 162	1 369,8	392 914	1 505,2
Total:	2 434	-	96 204	-	1 141 892	-
Avg.	243,4	17,0	9 620,4	33,8	114 184,2	35,2

Table 7: Number of forest fires per year (Source: Public Company „Macedonian forests" controlled by the State Inspectorate for forestry and hunting) and our overview)..
Source: http://www.cuk.gov.mk

facilities and development of a system of measures for protection from floods. The preventive control of floods of international basins is planned to be accomplished through cooperation with responsible authorities from other countries, in compliance with the accepted multilateral and bilateral agreements for cooperation in the area of management of waters.

2.3.3. Risk from forest fires

There is a big possibility for occurrence and rapid spreading of forest fires in the Republic of Macedonia, in the public and private sector as well. Fires occur in urban and rural communities, industrial facilities, forests and agricultural land. The most frequent and biggest are forest fires.

The forest fires were analyzed for the period of ten years namely for 1998-2007, in terms of frequency and the scope of damage. The data refers to forest fires which occurred on the territory of 30 forest corporations, which are branches of the public company "Macedonian Forests".

In this period 2434 forest fires were reported or on annual average 243,4 fires. The total burnt surface area amounts to 96.204 hectares or on annual average 9.620,4 hectares. Also, the burnt (damaged) timber accounts for 1.141.892 m^3. In terms of frequency of the forest fires it can be concluded that the biggest number of forest fires were registered in 2007 amounting to 620 forest fires and in 2000 amounting to 398 forest fires.

The number of forest fires was higher than the annual average number of fires also in 2005 and 2001. The volume of the burnt forests was the biggest in 2007 amounting to 39.162 hectares and in 2000 amounting to 32.939 hectares.

In terms of burnt timber the biggest scope was in 2000 amounting to 562.303 m^3, which is almost over 50% of the overall ten year period and in 2007 this figure amounted to 392.914 m^3. Special analysis is required to determine the real reasons and factors that caused such extreme and disastrous situations.

During the analyzed period (1998-2007), 2.434 forest fires happened, and an area of 96 204 hectares was burnt and woods accounting for 1.141.892 m^3. The total damage from the forest fires amounts to Den 1.879.554.320. or Euro 30.812,366. According to the number of forest fires and the extent of damage it can be concluded that 2000 and 2007 were extreme years and represented national disaster for the Republic of Macedonia.

2.4. VULNERABILITY TO NATURAL DISASTERS

Climate change affects everyone, but not everyone is equally vulnerable because other factors such as geographical location, health system, age, social class and support systems determine the effect of climate change on people.

2.4.1. Vulnerability from heat waves

A large percentage of the population of Macedonia live in urbanized areas, which are particularly vulnerable to health problems due to climate change. This is because heat can be retained by the concrete and asphalt of urban areas even after nightfall, an effect which is known as the "heat island"[37].

Conditions caused by heat waves include heat stroke, fluid loss and cramps. Particularly vulnerable to these effects of heat waves are the very young and old, those engaged in hard physical work and those who are overweight. Heat waves can also exacerbate chronic health conditions, especially cardiovascular diseases.

Cold spells also cause a rise in health problems. During colder periods the most frequent causes of death are cardio-vascular, circulatory and respiratory illnesse. Those with cardiovascular diseases are particularly vulnerable during the winter, with the total mortality rate from these kinds of diseases rising to 13% above the summer average.[38]

There is evidence that it is possible to reduce morbidity and mortality through a variety of heat-wave preparedness and response activities:

37 Action Plan for prevention of consequences from heat waves on the population in the Republic of Macedonia http://www.toplotnibranovi.mk/downloads/brosura.pdf

38 Ministry of Environment and Physical Planning, 2008

- strengthening and conducting a heat-wave announcements and warnings system (heat-wave early warning system),
- strengthening preparedness and the health services response,
- timely informing the public about the possible effects of heat-waves and how to deal with them, as well as adequate civil engineering planning and housing;
- The Ministry of Health in cooperation with the World Health Organization developed the Action Plan for prevention of consequences from heat waves on the population in the Republic of Macedonia[39], including an early warning system for heat waves implemented in cooperation with the National Hydrometeorological Service of the Republic of Macedonia.

2.4.2. Vulnerability to floods

Floods are natural disasters which frequently affect the territory of the Republic of Macedonia and they appear as a result of specific features of the embossment, topography, orography, geomorphology and climate change as well as the irregular flow of rivers. The available data indicates that almost all rivers and water flows including Vardar River are prone to flash-flood feature which makes protection and rescue from floods more complicated and specific. Numerous floods have been registered on the territory of the Republic of Macedonia which caused significant consequences on the population and the material goods.

The precipitation is more intensive at higher parts of the drainage-basins, and since the area is very step the water gets acceleration when flowing into bigger water flows and it becomes flash-flood and overflows from the riverbed. With the construction of the dam Kozjak on Treska River, the water of Vardar River in Skopje region and partially in the region of Veles is well under control. With the construction of several water accumulations in Macedonia floods are significantly reduced in some areas and regions. These dams soften the impact of big waters, and in the same time they prevent big flooding and lower water quantity in the lower plains. Within the Hydrometeorological network 225 hydrological stations have been established, out of them 110 are on surface watercourses and 115 for groundwater observation.

Around 270 km of protective dams and river banks have been built in the Republic of Macedonia so far, and around 160 km of the river beds have been regulated. These facilities on the water flows and rivers provide complete or partial protection from floods for about 60.000 hectares of fertile soil. Also around 250 flash-floods (out of a total of 1590) have been regulated with different types of afforestation. The flash-floods affect around 15.000 hectares, and over 450.000 m^2 have been regulated with cascades, woody night shade and other objects around 4.000 km contour trenches and shoulders. On basis of the previously stated it can be concluded that the undertaken infrastructural measures and activities in terms of protection and rescue from floods are insufficient and do not ensure efficient protection from floods which affect Macedonia to a larger or smaller extent every year.

If we take in consideration that the affected regions have continuous growth of population with the expansion of the urban areas and new industrial facilities and roads are built, it can be concluded that the consequences from floods will be even bigger. Having in mind the overall situation with the high dams, and for purpose of avoiding the consequences from possible destruction or overflow of water over the dams, there is a need for undertaking the following measures:

- In the domain of regulations for safety of high dams, the responsible state authorities must consistently follow the regulation and measures for purpose of timely notification and alerting the population in case of sudden destruction of dams or overflow of water over high dams; and
- Conducting trainings for the population in the affected areas downriver from the high dams.

2.4.3. Vulnerability to forest fires

In one moment, forest fires can destroy vast natural and material resources, and the process of rebuilding the forest ecosystem is long, hard, complex and expensive. Therefore the protection against forest fires must have a dominant place and role in the strategy for protection against forest fires. Forest fires are the biggest cause of damage to the forest and natural ecosystems in general. Due to the large damage caused and the associated dangers, forest fire represents a national catastrophe and it is classified in the category of crisis situation.

For the Republic of Macedonia, the primary and most frequently, only cause for forest fires is human

39 Action Plan for prevention of consequences from heat waves on the population in the Republic of Macedonia http://www.toplotnibranovi.mk/downloads/brosura.pdf

activity. According to the information from responsible authorities and institutions, most of the forest fires are causes intentionally.

2000 and 2007 will be remembered as years when Macedonia experienced the biggest number of forest fire, with biggest intensity and scope and caused damage. In order to determine the scope of damage from forest fires, there is a need for passing appropriate legislation procedures on basis of scientific and expert analysis.

The Republic of Macedonia does not have a defined methodology and criteria for determining the damage from forest fires. Therefore, the biggest priority for the state institutions which are responsible for protection of forests is to adopt as follows:

- methodology for determining the damage from forest fires;
- regulations for defining the damage compensation amount; and
- Strategy with a plan of action for prevention and extinguishing forest fires.

The institutions and organizations responsible for monitoring the situation need significant financial resources, but these resources are relatively small compared to the total damage caused by forest fires.

The damage caused by forest fires which are not timely detected and prevented, depending on the terrain, may be extremely high, since besides the lost forest resources fires can affect the flora and fauna and other facilities and goods and even loss of human lives.

3. The sectoral impacts of climate change

In the Republic of Macedonia, some sectors are particularly vulnerable to climate change and likely to suffer the most severe long-term impacts, inclcuding agriculture, forestry, water resources, energy sector, biological diversity and health.

In compliance with the above listed long-term impacts on the Republic of Macedonia, the Climate Change Network of Macedonian Red Cross defined the following priorities:

- Health
- Disaster risk and response
- Agriculture and forestry
- Water
- Energy

The assessments are made in terms of the expected scenarios for climate change for the different regions in the country. In order to mitigate the negative impact of climate change on the above listed sectors, there is a need for coordinated response to the adaptation priorities in frames of the interagency national plan.

For developing countries such as Macedonia, which do not significantly in the global emission of greenhouse gases, *adaptation is a need and priority*. However, the country would need international assistance in order to improve the capacities for adaptation to climate change and to implement the required strategies for adaptation. The government should respond to these challenges, despite the fact that it operates under difficult financial constraints, but response is required also by the population, non-governmental organizations, the Red Cross, civic organizations and other actors which feel the impact of climate change.

3.1 THE IMPACT OF CLIMATE CHANGE ON THE HEALTH SECTOR

3.1.1 Impacts and vulnerabilities

Climate change impacts on the health sector may be categorized either as direct or indirect; direct impacts are conditions directly linked to changes in external temperature and air pollution (e.g. heatstroke or some kinds of respiratory illnesses) or the health impacts of natural disasters and extreme weather. Indirect impacts include vector-, food- and water-borne diseases, the spread of which may be affected by changing climatic conditions.

A warming climate is likely to cause a rise in the mortality rate from heat waves. Projections indicate that a rise in average monthly temperature of 1˚C above those of the period 1996-2000 will cause considerably higher mortality rates in the summer months, especially April, May and June.

There is also likely to be a rise in the number of cases of food and water-borne diseases. Already, peaks in the number of food poisoning cases often coincide with high summer temperatures, while studies indicate that the incidence of salmonella rises by between 5 and 10% for every increase in weekly average temperature of 1˚C above a base temperature of 5˚C[40]. Additionally, the effects of flooding, storms and drought on the drinking water supply may result in a rise in water-borne illnesses, to which children are particularly vulnerable.

3.1.2 Adaptation measures

The primary goal of adaptation is to decrease the burden of diseases, injuries, disabilities, suffering, and mortality. Important mechanisms for disease prevention originating from water and food are

40 Ministry of Environment and Physical Planning, 2008

traceability, microbiological risk assessment, risk communication, and risk management. The number of cases of salmonella could be diminished by control and monitoring of the entire food chain and enforcing food safety standards.

Other recommendations that can be given at the moment include regular monitoring of the events connected with climate change and the health of the people on global level, and being prepared to respond in case of cold and heat waves or spreading of infectious diseases.

The National Climate Change Health Adaptation Strategy and Action Plan

The Ministry of Health in cooperation with the World Health Organization developed the National Climate Change Health Adaptation Strategy and Action Plan of the Republic of Macedonia[1].

The Strategy aims to propose numerous measures and actions,

- for adaptation and response of the public health to risks related to climate change, with emphasis on risk groups;
- to provide guidelines for capacity building of the health system and health care providers;
- exploring the need for multi-sectoral cooperation, through inclusion of the institutions and
- monitoring and evaluation.

Accurate and prompt heat wave alert system. The heat-health warning system (ALERT system) is a tool for promptly informing all the participants in the system of upcoming heat-waves, so that they may implement the foreseen measures and activities immediately[2].

This system uses the weather forecast to predict situations which could lead to an increase in mortality and morbidity as a consequence of heat-waves.

As part of the Plan, a web site has been created (www.toplotnibranovi.mk) to monitor heat-wave announcements in the Republic of Macedonia. This web site has a service for heat wave announcements which can be automatically delivered via sms or e-mail to the people responsible for implementation of the plan.

Each of the responsible persons or institutions, upon receipt of the announcement, undertakes the appropriate measures for each phase, according to the defined procedure.

In order for the heat-wave announcement system to function, the territory of the Republic of Macedonia has been divided into five zones by the Hydrometeorological Institute and monthly threshold temperatures have been determined for each zone above which the heat-wave announcement alarm activates.

The Hydrometeorological Institute of the Republic of Macedonia uses the Gaius (normal) allocation for determining threshold air-temperature values.

These values are reference values for announcing emergency, dangerous and catastrophic weather within the net of major meteorological stations.

NGOs play an important role in the system, particularly in the part of access to information of the population with social risk factors. The obtained database will provide extrapolation to the future expected climate change.

The functioning of the heat-wave alert system in the Republic of Macedonia is presented in Figure 4(opposite page):

Source: from Ministry of Health (2011) *National Climate Change Health Adaptation Strategy and Action Plan of the Republic of Macedonia*

1 National Climate Change Health Adaptation Strategy and Action Plan of the Republic of Macedonia

2 The early warning and the alert system for heat waves is a tool which is aimed for prevention and early warning on negative impact of the thermal environment on the health of the people during heat waves, Government of the Republic of Macedonia, Ministry of Health of the Republic of Macedonia, 2011.

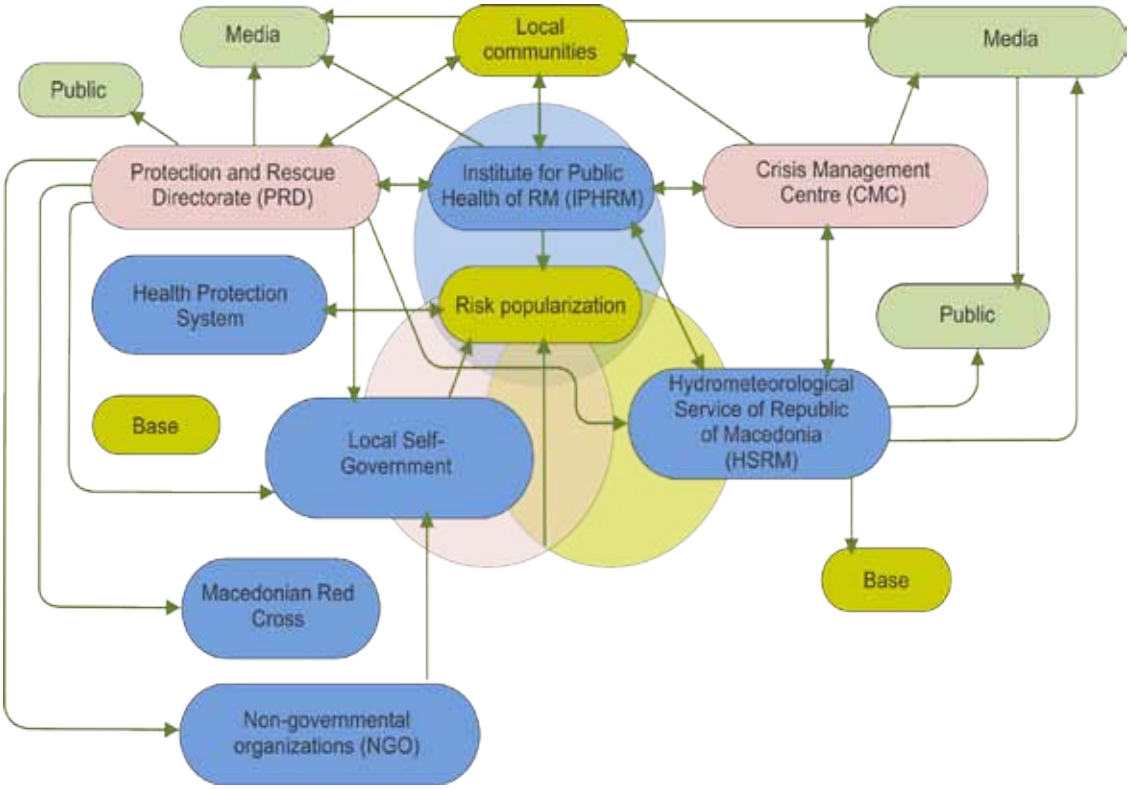

Figure 4: System for early warning and the alert system for heat waves is a tool which is aimed for prevention and early warning on negative impact of the thermal environment on the health of the people during heat waves. http://www.alert.mk/ Source: http://www.toplotnibranovi.mk/

In order to improve prevention and response, comprehensive action plans are necessary as part of preparation for disasters and extreme weather. In conjunction with the WHO, the Ministry of Health has already developed a national Action Plan to address heat waves, with the aim of reducing the higher mortality and hospitalisation rates associated with prolonged periods of high temperatures (see box opposite). The action plan involves the participation of NGOs, an approach which should be encouraged in order to ensure the inclusion of all stakeholders in developing strategies to adapt to climate change.

3.2 THE IMPACT OF CLIMATE CHANGE ON THE WATER RESOURCES SECTOR

3.2.1 Impacts and vulnerabilities

Water is the source of life and survival. Safe and sustainable access to good-quality drinking water – the safety of water in wider sense of the meaning – is a precondition for human development. However, climate change is likely to affect water availability in the Republic of Macedonia.

Changes in temperature and precipitation will affect the amount of water available in the future. Projections suggest that by 2050 mountainous regions will experience 15% less rainfall, the southwest of the country 20-23% less and the rest of the country as much as 40% less rainfall than currently. This could rise to respectively 30%, 45% and 70% reductions by 2100. Since the vast majority of water resources available are formed within Macedonian territory, the drop in precipitation is likely to result in severely limited water supplies in the future. [41]

Diminishing precipitation will lead to lower discharge rates in river basins across the countries. Already there has been a declining trend in the quantity of water

41 Ministry of Environment and Physical Planning, 2008

which flows out of Macedonia; this is partially due to increased temperatures, and partially due to increased water withdrawals. Water levels in two major lakes (Dojran and Prespa) showed a marked decline in water levels between 1986 and 2002, after which point levels have slowly risen again. There is evidence to suggest that this is due to human activities and climate change. Ultimately, water availability throughout the Vardar river basin (which comprises much of the country) is likely to decrease by between 13 and 23% by 2100[42]. However, due to the increasing irregularity of the rainfall, both flash floods and dry spells will become more frequent.

Increased droughts and flash floods can have severe socioeconomic impacts, especially in ruralr areas where the main income is from farming; flooding in 2004 caused significant economic losses (91.3% of which were agricultural[43]), while a drought in 1993 caused damages to agricultural yields equivalent to 7.6% of GNI. Generally poor financial, institutional, technical and legal capacities mean that Macedonia has significant problems dealing with severe droughts and floods.

The demand for water over the twenty first century depends on demographic and socio-economic trends, and so far there has not been significant rsearch in this area. However, it appears likely that the demand for drinking water in particular will rise (by as much as 30% in Skopje)[44].

3.2.2 Adaptation measures

Adaptation in the water sector should be regarded as a priority, since water availability affects so many other sectors. There is a need to respond to both the increasing demand on water resources and decreasing availability due to climatic factors.

The current water distribution infrastructure, including irrigation facilities, needs repair and updating due to the significant losses experienced under the current system. New dams, reservoirs and waste water treatment plants should also be built. To protect against the consequences of extreme weather, especially floods and droughts, the flood protection infrastructure and drainage system should also be upgraded, with increased awareness of which areas now and in the future are most likely to be affected by flooding. To accompany improved infrastructure, there must be better management of the water supply system, with plans in place as to how to cope with droughts and floods.

There should also be increased awareness surrounding water efficiency, recycling and limiting water usage. Changes in the current water pricing arrangements may encourage more efficient use of water.

Another significant gap is a lack of up-to-date and comprehensive data concerning water resources in Macedonia, in part due to the aging equipment and reduced monitoring network used by the national hydrometeorological service. There is no soil monitoring, and few available maps showing relevant data. In order to improve the knowledge base in this sector, the capacities of the various institutions involved in monitoring should be increased: more funding and access to modern equipment and techniques are required to produce the research required. Increasing the forecasting capacities of hydrometeorological institutions would also be useful for preparing for extreme weather. [45]

42 Ministry of Environment and Physical Planning, 2008

43 Report of the State Commission, 2004

44 Ministry of Environment and Physical Planning, 2008

45 Ministry of Environment and Physical Planning, 2008

3.3 THE IMPACT OF CLIMATE CHANGE ON THE ENERGY SECTOR

3.3.1 Impacts and vulnerabilities

Over the coming decades, climate change is likely to significantly effect the supply and demand of energy in Macedonia. Currently most of Macedonia's electricity production comes from oil and coal sources, with (in and other renewable resources generate only a small amount of energy. In 2009 the country still needed to import 42% of its energy needs[46].

As temperatures increase, there is likely to be less demand for energy for heating in winter; however,

46 Source: World Bank Statistics

this may be compensated for by a higher demand for cooling in the summer. An aging population is also likely to lead to a higher demand in energy for heating. It is also likely that as the economy grows, there will be a greater demand for energy from business and industry[47]. At the same time, steps must be taken to keep the emissions of greenhouse gases low, and usage of energy efficient.

Water shortages may indirectly affect thermal power production: there may be limited availability of water for the purposes of cooling in thermal plants. The diminished surface runoff caused by decreased precipitation (see section 3.2) will have an impact on hydropower generation facilities. In 2009 18.6% of Macedonia's energy came from hydropower sources[48]; these facilities are unlikely to be able to operate at full capacity over the coming century and any future investment in hydropower may prove poor value for money if it will not be able to operate at full capacity much of the time.

Since wind speeds are in general low across the country, there is limited capacity for wind power in Macedonia; it is likely to only be able to provide a maximum of less than 10% of electricity needs, although it may be an effective power source for certain locations (e.g Povardarie, Ovche Pole). However, there is potential for exploring biomass, solar and geothermal energy in Macedonia, which would diversify the energy supply without contributing to greenhouse gas emissions[49].

3.3.2 Adaptation measures

Greenhouse gas emissions in Macedonia to a large extent result from utilization of energy and production processes. As an EU applicant country, there is potential to adopt EU approaches on energy efficiency and greenhouse gas mitigation. The main aim of the EU energy policy is to ensure the functioning of the energy market, to ensure the energy needs so they would be competitive, sustainable and safe as well as complied with the policy for protection of the environment, which would ensure reducing emissions of CO_2 and other greenhouse gases.

The main elements for achieving these objectives are:

- Improvement of the efficiency of the markets for energy and gas;
- Diversification of energy sources;
- Use of renewable sources of energy;
- Responsible use of energy;
- Improvement of the energy efficiency.

The way in which we produce and use energy and the way we produce and consume products which in turn involves big consumption of energy would require a system change in the energy sector. Therefore, efforts need to be made for further improvements of the energy efficiency and efficient use of resources, as a key component of strategies for emission of greenhouse gases.

Renewable energy sources such as the energy potential of waste biomass of vegetative and animal origin, solar energy, and geothermal energy, should get a more important place in the country's energy balance as this will make the energy supply more reliable, and is a good way of preventing future energy security issues.

There is also a need for more intensive inclusion and of the governmental and non-governmental sectors in the promotion of energy efficiency and renewable sources of energy.

47 Ministry of Environment and Physical Planning, 2008

48 Source; World Bank Statistics

49 Ministry of Environment and Physical Planning, 2008

3.4 THE IMPACT OF CLIMATE CHANGE ON THE AGRICULTURAL SECTOR

3.4.1 Impacts and vulnerabilities

Agriculture is an extremely important sector in Macedonia: it supports much of the population, including 43% of those who live in rural areas, and accounted for 14% of GDP In 2006. As country with a below-average income and a high level of unemployment, the agricultural sector is prioritised by the national government as playing a major role in poverty reduction and social security[50]. It is also likely to be one of the sectors most effected to climate change, since it directly depends on climatic conditions and will be exposed to future climate variability and extreme

50 Ministry of Environment and Physical Planning, 2008

weather. Food security is an issue to consider if yields decline considerably. [51]

Agriculture in Macedonia is likely to be affected by the changing precipitation patterns, warmer temperatures and extreme weather and hazards such as storms, flooding and droughts. In particular, the reduced availability of water (see section 3.2 above) is likely to cause difficulties in the future. Since parts of the agricultural regions of the country are some of the driest in Europe, higher temperatures and decreased rainfall are likely to result in loss of topsoil and reduced overall soil quality, decreased biomass production, decreased crop yields and limited fodder availability for cattle farming[52].

The sector also contributes to the national greenhouse gas emissions, and there are some pilot schemes nationally which make attempts to manage this. A scheme for biogas collection and combustion at six pig farms that started operations in 2010 is one example. Other approaches for reducing greenhouse gas emissions agriculture mainly involve making land more productive, and managing the diet of the animals specifically to reduce greenhouse gas emissions. There is also potential for research into the use of crop residues as an energy resource, and some cultivation of biofuels[53].

3.4.2 Adaptation measures

In compliance with development policies on climate change and agriculture in the Republic of Macedonia, the Government of the Republic of Macedonia and the Ministry of Agriculture, Forestry and Water Economy defined the following priorities for the agricultural sector in in May 2010:

- Development of the institutional capacities on all levels (central, regional, local),
- Inter-ministerial cooperation / inclusion of all involved parties,
- Good data base,
- Future programme/policy planning for agriculture, forestry, water, etc.
- Raising public awareness,
- Adaptation in terms of overcoming negative effects from climate change and introduction of new technologies for production.

In terms of three particularly endangered sub-sectors – rain-fed agriculture, soils, and animal breeding – further adaptation measures proposed are as follows:

Adaptation measures proposed for rain-fed agriculture and soils:

- Genetic measures (the development of new, more drought-tolerant crops and varieties);
- Land reclamation measures (to increase soil water holding capacity);
- Irrigation: the construction of new irrigation schemes and rehabilitation of existing schemes;
- Agricultural practices (soil and water conservation soil cultivation – reduced tillage, water harvesting, mulching, etc.);
- Technical support (sharing of knowledge through education of farmers, raising public awareness for new adaptation techniques, trainings, etc.).

Adaptation measures proposed for animal breeding:

- Controlled micro-climate conditions in the facilities (thermo isolation, cooling equipment, etc.)
- Efficiency in the nutrition process;
- Genetic perspectives (introduction of stronger breeds)

51 FAO, 2009

52 Ministry of Environment and Physical Planning, 2008.

53 Ministry of Environment and Physical Planning, 2008

3.5 THE IMPACT OF CLIMATE CHANGE ON THE FORESTRY SECTOR

3.5.1 Impacts and vulnerabilities

Forested land covers an area of 11,596 km^2 (1,159,600 ha) in Macedonia, with forests making up a total wood mass of 74,343,000 m^3 and an annual average increment of 2.02m^3 per hectare.

The forestry sector is particularly vulnerable to climate change since, like agriculture, it is directly affected by weather and climatic conditions. The sector is vulnerable to illegal logging, and the effects of climate change are already being felt in the form of increased forest fires, such as those in 2007.

Forest fires are a frequent hazard in Macedonia, and can have a major impact on the biodiversity and microclimate of the forest, as well as causing huge economic damage and increasing the risk of erosion. They are likely to become more frequent as the conditions necessary for their emergence become more common: longer dry spells and higher temperatures are significant risks. One reason the extended forest fires of summer 2007 caused so much damage (more than 50,000 ha of forest was destroyed) was that the country had experienced record high temperatures and a long dry period, which resulted in the fires lasting longer and spreading more quickly than usual.

There is also recent evident to suggest that changes in temperature and precipitation have caused changes in the distribution of certain tree species. Some are growing at higher altitudes than they have previously, and some at higher latitudes. As a result of this, afforestation with climate-resistant species is possible. Three endemic species of oak have been identified as most resistant to climate change and thus suitable for afforestation: the Downy Oak (*Quercus pubescens*), the Macedonian Oak (*Quercus macedonica*) and the Kermes Oak (*Quercus coccifera*). Two local coniferous species (*Pinus nigra and Juniperus excelsa*) may also be suitable for afforestation[54].

3.5.2 Adaptation measures

The Government of the Republic of Macedonia and the Ministry of Agriculture, forestry and water adopted the National Strategy for Sustainable Development of Forestry in 2006. In compliance with this strategy, the following priorities were made:

- Special attention to be given to protection and conservation of forests as a central ecosystem. This is of importance to biodiversity in general, but will also secure social, economical and cultural benefits to citizens of Macedonia.
- The establishment of criterion for erosive-protected forests and erosive soil.
- Promotion of the importance of the forests for the society;
- The development and adoption of a standard procedure for involving interested nongovernmental organizations and the units of the local self-government in different consultative processes.

Other adaptation measures include ensuring that climate change is considered in all future forestry strategies and business plans. The risk of forest fires can be reduced through the establishment of national strategies and mechanisms aimed at improving forest management in general and disaster risk reduction in particular. An increased number of monitoring and evaluation stations[55] for evaluation of the impact of climate change on forestry and identification of impacts of forest biodiversity would make this a more straightforward process. Meanwhile, attempts to diversify the make-up of natural and artificial forests, including endemic species that are more climate-resistant, and introduce planning measures to prioritize this[56].

54 Ministry of Environment and Physical Planning, 2008

55 This process began in 2012

56 Vulnerability Assessment for the forestry sector, Nikola Nikolov

4. National strategies and platforms for risk reduction from climate change

4.1. STRATEGIES AND PLATFORMS FOR DISASTER RISK REDUCTION

In 2005 the United Nations General Assembly convened a World Conference on Disaster Reduction (WCDR), to be held in Kobe, Hyogo in Japan, from 18 to 22 January 2005.

The disastrous tsunami that happened in the Indian Ocean on 26th December 2004, only a few weeks before the beginning WCDR, resulted in great loss of human lives and socio-economic damage and mobilized states throughout the world as well as international governmental and nongovernmental organizations and distinguished individuals to give strong support to the process in Hyogo. The conference resulted with adoption of the Hyogo Framework for Action (HFA) 2005-2015: Building the Resilience of Nations and Communities to Disaster. Supported by 168 states, among which was the Republic of Macedonia, the strategic and systematic approach for disaster risk reduction gained additional legitimacy.

The fundamental idea of the Hyogo Framework for Action is by 2015, to make significant reductions of the loss caused by disasters, such as human lives, social and economic facilities and the environment of the communities and countries. For accomplishing these objectives there is a need for complete dedication and involvement of all actors, including governments, regional and international organizations, civic society with involvement of the volunteers, private business sector and academia. Four groups of actors are responsile for the implementation of the Hyogo Framework for Action (see box below): governments, regional organizations, international organizations (including specialized UN agencies and international financial institutions) and the International Strategy for Disaster Reduction (ISDR). For achieving the above mentioned the ISDR Secretariat developed internet tool (HFA Monitor), for regular self-assessment of the states.

About the International Strategy for Disaster Reduction

The Republic of Macedonia is involved in international efforts to reduce the damages caused by natural disasters. The International Strategy for Disaster Reduction (ISDR)[1] was adopted, as a follow-up of the International Decade on Natural Disaster Reduction (IDNDR) 1990-1999 by the Member States of the United Nations in 2000. This strategy aims to achieve substantive reduction of disaster losses and build resilient communities and nations, as an essential condition for sustainable development.

As a main forum in frames of the United Nations system responsible for development of strategies and policies for risk reduction from disasters, ISDR has the following fundamental tasks:

1 General Assembly Resolution 54/219, 22 December 1999, undemocracy.com, 24 January 2010 <http://www.undemocracy.com/A-RES-54-219.pdf>.

- to enable communities to become resilient to the effects of natural, technological and environmental hazards, thus reducing the compound risk posed to social and economic vulnerabilities within modern societies;
- to proceed from protection against hazards to the management of risk, by integrating risk prevention strategies into sustainable development activities.

The establishment of ISDR reflected a major conceptual shift from the traditional emphasis on disaster response towards holistic disaster reduction. It recognized that natural hazards in themselves do not inevitably lead to disasters, but that disasters result from the impact of natural hazards on vulnerable social systems. In other words, disasters can be prevented through conscious human action designed to reduce vulnerability.[2]

ISDR is a system of partnerships composed of a broad range of actors. ISDR – system cooperates with numerous actors that provide support to the states and communities in the area of risk reduction form disasters. It is comprised of governments, international organizations, regional organizations, non-governmental institutions, international financial institutions, scientific and technical bodies and specialized networks as well as civic society organizations and representatives from the business sector.

The sub regional European partners of the ISDR system tend to enhance the regional cooperation and coordination in the area of disaster preparedness and prevention. The sub regional European partners of the ISDR system are as follows:

- Disaster Preparedness and Prevention Initiative for South-Eastern Europe – (DPPI SEE)
- A European Network of National Platforms,[3,]
- Central European Forum for Disaster Prevention – (CEUDIP)[4]
- Regional Cooperation Council - RCC.[5]

The partnership functions within the framework of several ISDR -mechanisms, such as: the global platform, national, regional and thematic platforms for disaster risk reduction. Therefore, the role of ISDR is to generate and support the global movement for disaster risk reduction and to build a “culture of prevention” in the society as part of sustainable development.

Keeping in mind that the early warning system is a good investment for protection of human lives and livelihood, and that many countries still do not have developed early warning systems, a group of EU countries founded the Platform for the Promotion of Early Warning - PPEW[6] in Bonn Germany. The Platform for the Promotion of Early Warning, which started operations in 2004, will help the development of early warning and preparedness systems by advocating for better early warning systems, especially in development assistance policy and programs, collecting and disseminating information on best practices, and stimulating cooperation among early warning actors and the development of new ways to improve early warning systems.[7]

Sources: From Hyogo Framework for Action 2005-2015, p5 and http://www.preventionweb.net/english/hyogo/isdr/history/

2 „ISDR System: History,” PreventionWeb.net, 24 January 2010 <http://preventionweb.net/english/hyogo/isdr/history/>.

3 The European National Platform was established in 2007 by the French, German and Swiss National Platforms, and was later joined by the national platforms of Czech Republic and Poland. The main objective of the Platform is to facilitate and improve the exchange of information on good practices among member states and to support integration of disaster risk reduction in all aspects of European society on national, regional and international level.

4 CEUDIP was founded in 1997, after the disastrous floods that struck Central Europe. The forum facilitates exchanging of information, experiences and knowledge and coordination of activities of the national platforms of Austria, Germany, Poland, Slovakia, Hungary, Czech Republic. More information on: „CEUDIP Mission”, PreventionWeb.net, 01 February 2010

5 RCC was established in 2008 as a successor of the Stability Pact for Southeastern Europe and serves as a regional centre for cooperation and a forum for continuous engagement of the international community in the region.

6 The Bonn Second International Conference on Early which was held in Bonn, Germany, 16-18 October 2003, called for the creation of specialized platform for support of the development of the system. Subsequently, the Government of Germany has supported the ISDR Secretariat to develop the platform in Bonn. More information is available at: „PPEW aims and background”, unisdr.org, 04 February 2010 <http://www.unisdr.org/ppew/about-ppew/aims-background.htm>.

7 PPEW strongly supports the concept of systems for early warning, being comprised of four key elements: (1) risk knowledge, systematically collect data and undertake risk assessments; (2) monitoring and warning service, develop hazard monitoring and early warning services; (3)Dissemination and communication, communicate risk information and early warnings; (4) Response capability, build national and community response capabilities. More information is available at „What PPEW does”, unisdr.org, 04 February 2010 <http://www.unisdr.org/ppew/about-ppew/in-brief.htm>.

As part of its responsibilities under the HFA, the government of Macedonia has also instituted a National Platform on DRR which was inaugurated in 2009. This is a nationally-owned committee that works on reducing the risks from disasters, and includes multiple stakeholders including NGOs, academic institutions and research communities, members of the private sector and business community, and government ministries.[57]

57 For more information about the Macedonia National Platform for DRR, please see http://www.preventionweb.net/english/hyogo/national/list/v.php?id=171

4.2. GOVERNMENT STRATEGIES, INSTITUTIONAL FRAMEWORKS, DEVELOPMENT PROJECTS AND POLICIES IN TERMS OF CLIMATE CHANGE

In terms of climate change, the Republic of Macedonia ratified the United Nations Framework Convention on Climate Change (UNFCCC) on December 4, 1997, and the Kyoto Protocol in July 2004. The Ministry of Environment and Physical Planning coordinated all the activities linked with the ratification of the Convention and the Protocol including the activities for raising public awareness shown in Figure 8. The Ministry of Environment and Physical Planning was designated to be the National Contact Agency with UNFCCC and as Designated National Authority (DNA) for the Kyoto Protocol implementation. This is the key governmental body responsible for policy-making and coordination of implementation of the provisions of the UNFCCC and Kyoto Protocol. In January 2000, the Climate Change Project Office was set up within the ministry. Figure 5 shows the various sectors engaged in climate change issues and how they are related to the Climate Change Project Office.

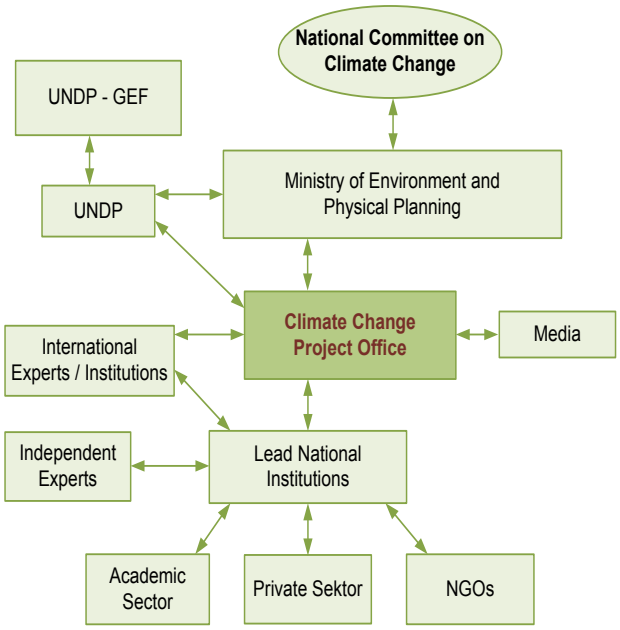

Figure 5: Flow-chart of the relevant sectors included in climate change issues
Source: Second National Communication of the Republic of Macedonia towards UN Framework Convention on Climate Change, Skopje, December 2008, page 27

The next step was the establishment of the National Committee on Climate Change (NCCC) as advisory body for policy-making related to climate change issues in Macedonia. The committee is comprised of thirteen representatives of key governmental agencies, non-governmental organizations, private entities and academia. The Committee is chaired by PhD. Natasha Markovska, representative of the Macedonian Academy of Sciences and Arts.

The function of the National Committee is to coordinate the implementation of the conventions on climate change, to develop strategic policies, to conduct research, etc. The National Committee has the following responsibilities:

- to develop the national policy on climate change and to implement the Framework Convention on Climate Change on national level;
- to monitor all projects, programmes and research activities related with climate change in the Republic of Macedonia;
- to ensure compliance of the national policies and programmes on climate change with the national development priorities and objectives;
- to provide current latest information to all interested parties in the state and to consult these parties in the process of development of policies on climate change;
- to develop negotiating human resources and strategies for the Government of the Republic of Macedonia for the meetings of Conferences of parties of UNFCCC;
- to revise and finalize different components of national reports before their submission for approval to the Government.

Who is responsible for implementing disaster risk reduction and the Hyogo Framework?

States are responsible for: (a) Developing national coordination mechanisms; (b) Conducting baseline assessments on the status of disaster risk reduction; (c) Publishing and updating summaries of national programmes; (d) Reviewing national progress towards achieving the objectives and priorities of the Hyogo Framework; (e) Working to implement relevant international legal instruments; and (f) Integrating disaster risk reduction with climate change strategies.

Regional bodies are responsible for: (a) Promotion of regional programmes on hazard and vulnerability monitoring and assessment, the sharing of information and effective mobilization of resources, in view of supporting national and regional efforts;, (b) Regional and sub-regional baseline assessments, (c) Reviews on progress in the region and on impediments and support needs, (d) Establishing or strengthening existing specialized regional collaborative centres for research, training, education and capacity building, (e) Support for regional mechanisms and capacities for early warning to disasters. Regional bodies also facilitate the convening of regional or sub-regional platforms for disaster risk reduction.

International organizations are responsible for: (a) Encouraging the integration of disaster risk reduction into humanitarian and sustainable development programmes and frameworks; (b) Strengthening the capacity of the United Nations system to assist disaster-prone developing countries with disaster risk reduction initiatives; (c) Supporting data collection and forecasting, information exchange, and early warning systems; (d) Supporting States' own efforts with coordinated international assistance; and, (e) Strengthening disaster management training and capacity building.

The ISDR system is responsible for: (a) development of a matrix for initiatives related to Hyogo Framework for Action, (b) coordination of support for stakeholders on international and regional level, (c) development of indicators for measuring progress, for purpose of provision of assistance to the states for easier monitoring of their progress towards implementation of Hyogo Framework for Action, (d) support for establishment and development of national coordination mechanisms, (e) stimulating exchange of positive practices and lessons learned, (f) making an overview of progress on implementation of the Hyogo provisions.

Source: *From An Introduction to the Hyogo Framework for Action*, UNISDR 2007, p5, available online at http://www.unisdr.org/files/1217_HFAbrochureEnglish.pdf

As a country which does not belong in the group of highly industrialized countries, the Republic of Macedonia only shares the joint obligations for responding to climate change:

- introduction of greenhouse gas inventories; and
- national reporting for undertaken activities in compliance with the Convention.

Part of these obligations include the development of national communications to the UNFCCC. The Initial National Communication was developed with the support of the UNDP and the GEF, and submitted to the UNFCCC in 2003. The Second National Communication was submitted in 2008, and the Third National Communication is in development and expected to be completed by the end of 2012.

An important activity that followed the Initial National Communication on Climate Change was the "Technology Needs Assessment in the Energy Sector" wherein the most prospective technologies were analyzed from economic and environmental aspects.

In addition to the institutional set-up, the Republic of Macedonia in addressing climate change is focusing its activities at several levels:

- strategic level,
- legislative level,
- regional level,
- bilateral level and
- multilateral level.

In 2010, the Government of the Republic of Macedonia adopted the Resolution on the impact of climate

change[58] which calls on the conclusion contained in the document adopted on the „United Nations Climate Change Conference".

The Law on Environment contains provisions related to climate change, especially climate change mitigation: this includes the development of the national greenhouse gas inventory, and the mitigation action plan which includes measures to minimize the negative impacts of climate change.

The Law on Environment stipulates that the National Plan on Climate Change must be adopted for purpose of stabilization of the concentration of greenhouse gases on a level that would prevent dangerous anthropogenic impact on climate system in a time frame enough to enable the ecosystem naturally to accept the changes and in compliance with the principles of international cooperation and the objectives of the national, social and economic development.[59]

From the aspect of EU integration, a more sophisticated inventory of greenhouse gases would mean a solid base for the national registry system, the establishment of which is one of the requirements for EU membership. Before the start of realization of this idea, there is a need to make several additions to the Law on environment and the Law on energy, for purpose of creating a base for introduction of a Law on trade with reduced emissions, for transposing the Directive for trading with reduced emissions (EATD) in the national legislation and for the introduction of Scheme for trade with permits for emission. In this direction, it is recommended that the "pilot phase" would be learning-by-doing in terms of trading with emissions for a period of two years, in order to enhance the capacities of the local authorities and companies, and to prepare them for the real implementation in trading.

Within the framework of the process "Environment for Europe" the United Nations Economic Commission for Europe (UNECE), and the Ministers and Head of Delegations from 51 countries in UNECE region and representatives of the European Commission met in Belgrade in October 2007, and adopted the Declaration named "Building bridges to the future"[60]. In this Declaration, the region addresses the urgent challenge of climate change through:

- Enhancing regional cooperation of interested South-Eastern European countries in the field of climate change;
- development of Climate Change Framework Action Plan (CCFAP) to support implementation of the United Nations Framework Convention on Climate Change (UNFCCC), particularly its Nairobi Work Programme;
- establishment of a sub regional virtual climate change-related centre in Belgrade which would provide a means to develop and implement programmes and projects under the sub regional CCFAPs designed for interested countries of South-Eastern Europe;
- strengthening international partnerships that foster exchanges of experience and expertise in the fields of climate research and observation, education, public awareness-raising and capacity-building.

These initiatives underlined the necessity of integrating climate change adaptation into environment, energy and development policies. They also emphasized the importance of energy efficiency, with the involvement of public-sector investors in a new energy efficiency investment fund (the Energy Efficiency 21 Project) a promising sign. The Republic of Macedonia has taken part in a number of regional projects reflecting these priorities.

In order to improve its national greenhouse gas inventories, the Republic of Macedonia took part in a regional project designed to build capacity in this area (the 2003-2006 UNDP-GEF "Capacity Building for Improving the Quality of Greenhouse Gas Inventories (Europe/CIS region)" project). This project helped improve the quality of the Second National Communication through training staff and developing the institutional capability to conduct quality greenhouse gas inventories.[61]

The Republic of Macedonia has also participated in the regional project of UNDP: "Regional project for capacity building to access carbon finance (East Europe and CIS region)". The project resulted with development of National Strategy on Clean Development Mechanism (CDM). At the moment, the country participates in REC sub regional project

58 Resolution on the impact from climate change (Official Gazette of RM, No 31/2010)

59 Ministry of Environment and Physical Planning, 2008

60 See http://www.coe.int/t/dg4/cultureheritage/nature/biodiversity/STRACO2008/STRA-CO_2008_6.pdf

61 Ministry of Environment and Physical Planning, 2008

"Improvement of the regional cooperation in Southeast Europe in the area of Climate Policy".

In compliance with the international obligations, in 2005 Macedonia finalized the project "Macedonia's National Capacity Needs Self Assessment for Global Environmental Management". The general objectives of the Assessment were to adapt the capacities so the country can fulfill the obligations towards global conventions on environment – for biodiversity (UNCBD), for climate change (UNFCCC) and for combating desertification (UNCCD). The assessment used the cross-cutting approach for defining efficient use of national resources and achieving synergy effects which would be in compliance with these three Rio Conventions.

4.3. EARLY WARNING SYSTEMS

An effective early warning system is crucial for minimizing human and economic losses from disasters. The term early warning means giving warning on possible risks and threats to the security of the society in wide range of existing and future sources of threats. Figure 6 below outlines the elements of comprehensive and effective early warning systems as identified by UNISDR.

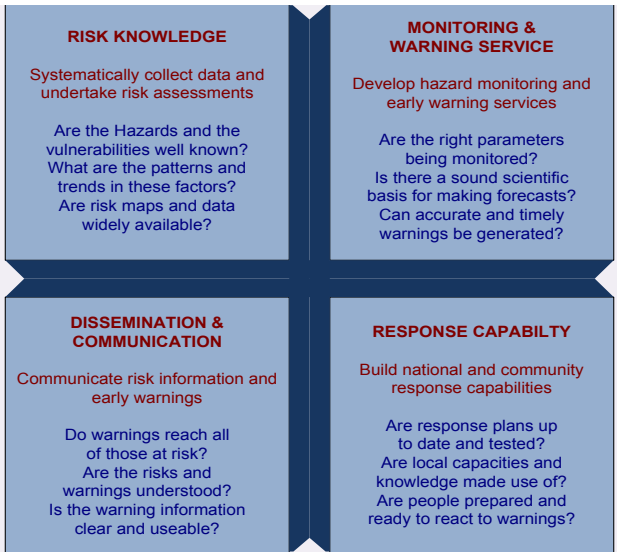

Figure 6: The Four Elements of Effective Early Warning Systems (UN/ISDR Platform for the Promotion of Early Warning)
Source: http://www.unisdr.org/2006/ppew/whats-ew/basics-ew.htm

Early warning is not a separate model developed by the states or international institutions. It represents a direct link with security policy, prevention of conflicts, risk assessment and crisis management. The correlation of all these elements is targeted towards achieving the ultimate goal, that is, successful coping with risks and preserving security.

However, we must take in consideration that early warning is the essential segment through which we can define measures and activities and use appropriate instruments and procedures in specific institutions or state agencies for purpose of prevention of risks and threats to the security and safety.

The general approach to handling accident and disaster risks, regardless of whether the events are natural or man-made, is to prepare a single doctrinaire position that will be used as a blueprint to mark out specific strategies, policies and legislation.

Early warning is central to the work of the National Platform for Disaster Risk Reduction (see section 4.1 above) which aims to integrate early warning into a comprehensive disaster risk reduction approach including multiple stakeholders. The development of such an integrated system is especially important for dealing with the increased risk of natural disasters as a result of climate change.[62]

The complexity of the impacts and consequences of modern risks and threats on the security and safety of the individuals (citizens) and the state directs us towards finding urgent and complex responses in crisis situations, and the experiences and needs for successful coping with risks and crisis, causes reappraisal of the practical engagement of numerous stakeholders[63].

62 The first session of the extended Steering Committee held on 19.11.2009.

63 L. GEORGIEVA "Conflicts Prevention: From the idea to the culture for prevention of conflicts", Crisis Management, Crisis Management Centre, year I, No.1 Skopje, 2006, pg. 23

4.4. MONITORING AND RESEARCH CAPACITIES

The conducted monitoring and research in terms of the air, and water include: monitoring of the air quality; monitoring of qualitative and quantitative characteristics of surface waters; periodic control of the communal and industrial waste water; monitoring of the chemical and toxic pollution of the water; and periodic conducting of radiologic and periodic bacterial analysis. Monitoring of underground waters does not exist even where the ecosystem is most sensitive to the quantity and quality (e.g. Prespa Lake).

The national hydrometeorology network has climatological, meteorological, phenological, aerological, and hydrological stations for surface and underground waters. The situation in terms of systematic monitoring of basic climatic and hydrological parameters is unsatisfactory, and there is almost no conducted research work in this area.

Besides the operational measures for monitoring, new research work is required, in order to obtain a better overall picture in regard to the reaction of biological and ecological systems on recent climate change events, including the possible biologic and ecologic reactions to extreme situations.

The capacity constraints are at systemic, institutional, and individual levels, and they are closely linked with the lack of financial resources and the low interest of the public sectors. New technologies are required for monitoring the parameters for detection and diagnostic of global changes, such as the surface temperature, rainfall and water resources, weather and other natural hazards, emission of gases and polluting matters and the consequences on the environment from the human activities and from natural phenomena.

In the Republic of Macedonia, the development of long-term data base with high quality which does not exist now, must be considered as high priority. The development of several parallel plans and programmes for rehabilitation, promotion and management of existing monitoring systems, in frames of the national strategy for research and systematic monitoring, for involvement of appropriate institutions, ensuring different types of national and international assistance and effective management of the existing resources, should reduce the identified limitations.

The highest appearance of the capacity constraints is at the institutional level for all five priority issues in the area of climate change. Understandably, the reduction of greenhouse gas emissions is an issue with a high number of constraints, such as lack of funds, low level of foreign investments, lack of communication mechanisms, insufficient capacities for transfer of technologies, insufficient capacities for monitoring, lack of consistent and qualitative data base and access to data, different interests of involved actors, etc.

A proper response in the most vulnerable sectors and adaptation measures require significant financial means. Cooperation among the institutions is insufficient and training programmes are frequently inappropriate and linked directly with individual interests. The utilization of individual experts' experience is not sufficient. The information data base in the Republic of Macedonia needs to be promoted and to be accessible for all relevant parties, which would significantly enhance the institutional cooperation.

The systemic level depends to a large extent on the existing political, economic and social situation in the country which is unfavorable. The main barriers are the legal framework, the general economic situation, lack of strategy for energy efficiency, insufficient capacities for transfer of technologies, incomplete legal framework and the favorable customs and tax measures, lack of funding, low level of foreign investments, lack of mechanisms for communication among relevant ministries and other institutions, including the administrative constraints, and the fact that climate change is not high priority for the country. Also, effective implementation of the strategic documents in practice is rather low.

Capacity constraints are least visible at an individual level, since a high level of education means that the knowledge and experience of many of those conducting the research is more than sufficient. The human capacity is not matched however by technical

capacity, and the lack of access to modern information technology is a problem. While environmental awareness is considered high among the scientific community, it is lower among the general public. The challenge of harnessing the available expertise and raising public awareness remains great.[64]

For all three levels going from personal to institutional and finally, to the systemic level most common constraints are:

- lack of financial assets;
- lack of cooperation among the institutions and ministries;
- lack of policies laws and standards;
- lack of public and individual awareness;
- lack of knowledge and experiences;
- different interest of interested parties;
- administrative limitations;
- lack of experience;
- insufficient number of trained resources in the area of ecology.

64 Ministry of Environment and Physical Planning, 2008

4.5. DEVELOPMENT OF THE CIVIC SOCIETY: REPORT ON THE CIVIC ORGANIZATIONS AND MACEDONIAN RED CROSS[65]

Besides the withdrawal of the state from the dominant role in the public life, the development of the civic society means development of civic activities and wide participation of the public in the civic sector so the civic organizations can establish the link between the public and the state.

A key element and objective of the development of the civic sector in post-communist societies such as Macedonia is rebuilding of associative life of the citizens. Also, the civic society which is constituted in this manner is a step forward towards the creation of authoritative forms dependent on public approval as a precondition for democratic reign. In this direction, the central role of the political elites in the democratic transition must be recognized, since they cannot model the democracies isolated from the people with whom they reign.

All conceptual frames disregard the perspective of the citizens as the most important factor in understanding democratic developments and all are concerned to explain why things are not working as they should. Meanwhile, however, they fail to explain why things are working in the way they do. “Therefore, there is a need for enhanced participatory approach of the civic society in promotion of democracy and civic society.

Despite the relatively high number of civic organizations in the Republic of Macedonia the level of civic activities is quite low. This may be due to different reasons. The analysis of a conducted survey indicates that the influence of the previous period and the disappointment with the process of transition are two possible reasons.

It cannot be concluded that the civic society in the Republic of Macedonia is the link between the public and the state. The key indicator in terms of the development of the civic society in the Republic of Macedonia since 1990 is the increased number of civic organizations. According to the available data there were 6.500 registered civic organizations in the Republic of Macedonia in 1998. At the moment there are about 6000 NGOs, out of which only 1500 are active, and over 50% of them are located in the capital Skopje.

Their participation in the passing of laws so far was incidental despite the fact that the representatives of the Government emphasize that the amended Rules of Procedures would enable each citizens to put up proposals and comments about any regulation on the web page of the Government. But this is not enough. There is a need for additional amendments to the Rules of Procedure which would enable incorporation of the opinions of the civic organizations, citizens, nongovernmental organizations, and the Red Cross in the earliest phase of the preparation of the laws and regulations.

The basic mode of organizing is networking among the civic organizations, citizens, nongovernmental

65 Master thesis „The role of the civic sector within the integral approach of the crisis management” from MA Sait Saiti, September 2011 FON University

organizations, and the Red Cross and the objectives of the network would be targeted towards:

- Promotion of mutual cooperation through exchange of resources;
- Initiation and implementation of joint projects;
- Increasing the influence of the civic organizations, citizens, nongovernmental organizations and the Red Cross in the local communities;
- Expansion of the Network.

Still the increase of the number of civic organizations does not result in the increased influence of civic society. The large number of civic organizations ideally should be substantive indicator that citizens are active in building the civic society. However, in the case of the Republic of Macedonia, the human resources of these organizations are limited. The results show that the biggest expectations of the citizens are from the state as a result of cultural statism.

4.6. THE ROLE OF THE CIVIC SECTOR AND THE RED CROSS IN THE AREA OF CLIMATE CHANGE AND RISK REDUCTION FROM DISASTERS[66]

There is a formal framework for civil organizing in the Republic of Macedonia but this does not guarantee effective inclusion of the civic society in all phases of the crisis management that is in the pre-crises management, crisis management and post crises management. Namely, the laws that regulate the crisis management in the Republic of Macedonia enable civil organizations to undertake voluntary activities and some of these provisions foresee compulsory participation of some civil organizations in specific phases of the crisis management.

The primary objective is good preparedness for efficient utilization of al available resources for ensuring appropriate support. The Republic of Macedonia is prone to natural and man-made disasters such as: earthquakes, floods, forest fires (open space fires), landslides, epidemics, heavy snowfalls and avalanches, technological hazards and traffic accidents.

The Red Cross and disasters:

Disaster and crisis management starts with raising public awareness, education for protection and self-protection on possible consequences from disasters for early action of the volunteers. It also maintains contingency stocks of essential supplies and it undertakes activities for appropriate preparedness of our logistics and communications. Reliable early warning systems are instrumental for decreasing the consequences from disasters.

In frames of the system for disaster management it leads coordination for emergency shelter provision for the affected population and it helps in the restoring of family links that have been disrupted. In its operation the Red Cross promotes contractual cooperation and building partnership relations with the responsible state authorities in order to establish coordination mechanisms and disaster management, to contribute in the creation of more efficient national system for disaster preparedness and response.

Following a disaster or in a crisis situation the national society targets its activities on reduction of further loss and enabling essential preconditions that would enable people to start rebuilding their lives and communities.

Depending on the specific requirements, the recovery assistance aims to prevent further damage and loss, repair essential services, protect health, provide psychosocial support, restore livelihoods, and enhance food security. The process of recovery is carried out in such a way so as to rebuild more inclusive societies and reduce vulnerability to future disasters. Thus, recovering communities are made safer than before.

The Macedonian Red Cross works on building local and national capacities in the area of disaster management for purpose of further enhancing the disaster management system in cooperation with partner organizations in the state and region. The

66 Master thesis „The role of the civic sector within the integral approach of the crisis management" from MA Sait Saiti, September 2011 FON University

comparative advantage of the Red Cross in the disaster management is based on the collective resources of the Movement.

The humanitarian and protective function in case of disasters of the Macedonian Red Cross is performed through different activities for purpose of provision of elementary assistance to vulnerable population.

The assistance of the Red Cross is comprised of provision of appropriate shelter, food items, nonfood items, hygiene material, clothes, blankets, bedding, mattresses, etc. the Red Cross has trained teams for reception, shelter and registration of persons that require assistance, as well as keeping evidence for distributed assistance to the final beneficiaries. The initial assistance is provided from the own reserves of a specific Red Cross/Red Crescent national society and if required, the second phase is launching international appeal by the national society for raising international assistance.

The Red Cross and climate change:

The Red Cross and Red Crescent has long been concerned with the humanitarian consequences of the rising number of weather-related natural disasters, and the changing risk of extreme weather that has been linked to climate change. Rather than focusing solely on disaster response, increasingly the Movement has been taking steps to manage the impacts of such disasters through a focus on disaster preparedness, early warning systems, and climate-aware development programmes, preferring to concentrate on integrating climate risk considerations into a broad spectrum of existing and future projects rather than designing "single-issue" climate change-centred actions. The goal of these activities is to decrease the vulnerability of those most severely affected by climate change through building human capacity and mobilising resources to adapt to climate change, and mainstreaming climate risk management approaches into development and policy planning.

Guided by the importance of the phenomena of climate change, the Macedonian Red Cross will engage on building capacities for protection of the environment and raising public awareness on climate change, so we can contribute for decreasing the risks from disasters caused by climate change.

Therefore, there is a need Macedonian Red Cross to continue to build its capacities for disaster response and reduction of risks and vulnerabilities. The efficient disaster response requires well-defined planning on all levels to determine the responsibilities of the key actors (government, national society, NGO) and all other relevant actors in the crisis management system. The national society gives its contribution in this area through enhanced advocacy in terms of planning disaster response activities and development of appropriate operational mechanisms. The Red Cross continuously works on enhancement of the operational system in order to be able to efficiently respond after the disaster strikes.

Red Cross activities during heat waves:

The Macedonian Red Cross in cooperation with the Ministry of Health and the World Health Organization – Office Skopje, in compliance with the plan of action for protection of the people against heat waves, continuously undertook activities for raising public awareness on possible consequences from heat waves as well as education on prevention for purpose of protection of the health of the people from heat waves.

In the course 2011, the Macedonian Red Cross printed 4 types of fliers in 120.000 copies with practical advices for protection of the health of the population, older people, workers and managers of the medical and social institutions and they were distributed throughout the country by the Macedonian Red Cross branches and the Centres for Public Health.

Also, the Macedonian Red Cross opened a free of charge SOS telephone line in for providing advices for protection from heat waves in the premises of the City Red Cross of Skopje. Our national society also provided different types of information through the printed and electronic media, free of charge distribution of bottled water, educational lectures for groups of population at risk, such as workers, older people, pregnant women, measuring blood pressure[67].

Within the disaster preparedness and response activities of the Macedonian Red Cross as part of the crisis management system, the national society

67 Macedonian Red Cross Annual Report 2011

undertakes initiatives for enhancing the local capacities and resilience of the local authorities in the past period. Besides the regular project activities comprised of education and raising awareness on risk reduction from disasters, the Macedonian Red Cross also provided educational lectures on the impact of climate change on local, national and global level. The national society also provided general guidelines for raising public awareness on risk reduction from climate change, with different information material such as brochures, posters and video clips.

Case study: Decreasing negative health consequences from climate change

The Ministry of Health of the Republic of Macedonia, supported by the World Health Organization, German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, started conducting activities on protecting health from climate change in 7 countries in the WHO European region.

As part of this cooperation, a climate change health adaptation strategy was developed for purpose of recommending a series of measures and activities in order for the health system to adapt and respond to climate change risks, with a particular focus on vulnerable groups and to provide guidance for upgrading the capacity of the health system and the health workers, considering the need of a multi-sectoral collaboration through institutional involvement, surveillance and evaluation.

Within the framework of Climate Change Health Adaptation, an Action Plan was delivered as well as a separate document called the Heat-Health Action Plan, to prevent the heat wave consequences on the health of the population in the Former Yugoslav Republic of Macedonia.

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5. Recommendations

5.1. POLITICAL DIALOGUE - PASSING DECISIONS AND ADOPTION OF SOLUTIONS

It is well-known that the policy of human development is the safest base for adaptation, but even the best practices of human development would need to take in consideration the prevailing and expected risks from climate change. Preliminary action for improvement of the seasonal climate projections, food safety, reaction in case of accidents and emergencies, systems for early warning and insurance, may minimize the damage from climate change.

During the Conference of the Parties of the United Nations Framework Convention on Climate Change (UNFCCC), held in Copenhagen in 2009 the European Union pledged 7.2 billion Euros for climate change adaptation for new technologies of the developing countries. **Their policy which should be adopted by the Republic of Macedonia** is known as policy of the **three twenties** (3 x 20) , referring to a goal to reduce greenhouse gas emissions by 20%, reduce primary energy usage by 20% and increase the share of renewable energy to 20%, all by 2020 (see Annex 3 for more information about these policies).

Further efforts need to be made for establishing national criteria for climate change adaptation and for prioritization between and within sectors. The most interesting projects would be those that would come from the sectors with highest priority and from two or more joint vulnerable sectors (synergy approach). Also we must have in consideration the connection with climate change mitigation, as well as the opportunities for implementation of adaptation projects on regional level.

The appropriate national measures for mitigation of the situation in the Republic of Macedonia are in compliance with the Copenhagen treaty which is signed by the Republic of Macedonia, (see Annex 3) but the following adaptation recommendations for policy-makers are also important:

- Abide by all international agreements signed, including the recommendations for greenhouse gas emissions reduction given in the Copenhagen treaty (see annex 3). Continue to align environmental legislation with the EU acquis, and adopt the “policy of the three twenties” (see above and Annex 3).
- Develop the cooperation between ministries responsible for climate change adaptation so that comprehensive cross-sectoral adaptation strategies can be developed that integrate climate change adaptation and disaster risk reduction into development policy.
- Build relationships and links between government ministries, academic institutions and civil society to enable multi-stakeholder consultation to ensure that all affected parties are represented when making decisions about climate change strategy and in developing forthcoming National Communications to the UNFCCC. Similarly, these relationships will provide good avenues for sharing knowledge.
- Invest further in research and data collection surrounding climate change so that hydrological and ecological systems can be closely monitored, and better forecasting capacity can be developed which will help with early warning and in devising more effective policies.
- Enforce current environmental and planning legislation. Although current legislation encompasses a certain level of environmental protection, it is not always strictly adhered to, and more robust enforcement would put fewer people at risk.
- Include climate change in educational curricula at all levels. Currently climate change and other environmental issues receive little attention at any level, although this is being rectified.

5.2. RAISING AWARENESS: EDUCATION, PROMOTION AND CAMPAIGNS

The education, training and public awareness in terms of climate change in the Republic of Macedonia is not on appropriate level yet, although the process of preparation of the first and second national communications on climate change made significant contribution to raising awareness among all relevant actors. Raising public awareness is one of the most important activities in terms of providing support to the implementation of the strategy and policy on climate change. This process requires coordinated activities and cooperation among the policy makers, industrial subjects, professional organizations and nongovernmental organizations.

Other recommendations include:

- The role that NGOs play in awareness-raising in conjunction with educational institutions.
- Develop more comprehensive awareness-raising strategies. NGOs and civil society organizations have a significant role to play in raising awareness surrounding climate change in the general public, government and business community. This may include more use of the media.
- Develop linkages between NGOs, government and civil society. This well allow for more effective awareness-raising and sharing of knowledge, and could involve NGO input into the development of national communications.
- Civil society to integrate climate change considerations into their current activities, while taking an active role in DRR and national early warning systems if appropriate.

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Annex 1: Procedure for declaring a state of emergency and the 2007 forest fires

Procedure for declaring a state of emergency

In the event of a crisis, the Crisis Management Centre calls an urgent meeting of the Assessment Group (from the Centre for Crisis Management) in order to consider the necessity for the authorities to take the necessary measures and action. The Assessment Group examines all the findings, information and reports on the specific conditions and provides recommendations to the steering committee (a government body for coordination and managing of the crisis management system which consists of the ministers of internal affairs, health, transport and communication, defense, foreign affairs and the manager of the assessment group.

If necessary, other functionaries can be included. On basis of all the findings in terms of the conditions in the Republic of Macedonia as well as on proposal of the assessment group, the steering committee informs the Government about the specific conditions, or recommends to the Government of the Republic of Macedonia to declare a crisis situation.

On the basis of the conclusions of the steering committee, the Government of the Republic of Macedonia meets urgently to make a decision to declare a crisis in the endangered area and to engage all available human and material resources to combat the consequences of the same. After the decision has been taken, the main headquarters of the Crisis Management Centre, which has to be in constant session, is activated.

Crisis situation in the Republic of Macedonia (open space fires in 2007)

In July 2007 the temperatures in the Republic of Macedonia reached 45°C and more, which resulted with numerous forest fires in the Republic of Macedonia. Due to the situation the Republic of Macedonia declared state of emergency.

In the middle of July around 3.000 hectares of forest were affected by fire at 32 different locations. All available state capacities were used in order to protect the environment and the infrastructure. On July 18 the state declared national emergency and requested international assistance. The peak of the

Year 2007																			
Date	18.07	19.07	20.07	21.07	22.07	23.07	24.07	25.07	26.07	27.07	28.07	29.07	30.07	31.07	01.08	02.08	03.08	04.08	05.08
No. of fires	23	19	11	13	25	37	48	67	54	44	48	29	19	15	20	11	15	13	1

Table 12: Daily overview of number of active fires on the territory of the Republic of Macedonia in the period of 18.07 – 05.08 2007 Source: http://www.cuk.gov.mk

crisis situation was on July when there were 67 active fires and around 3.500 different institutions were involved in the fire fighting.

Besides its own air wing and equipment, Macedonia was assisted by many countries such as: Croatia, Slovenia, Turkey, Norway and Germany. Other types of assistance such as technical advisers, firemen or direct financial assistance were provided to Macedonia by Austria, Sweden, Estonia, Poland, Denmark, Czech Republic and Lithuania. The Republic of Macedonia also received assistance from the United Nations.

Lately, open space fires represent the biggest threat (particularly the fires in 2007) which caused significant damage on the forests and the environment in the Republic of Macedonia, and the material resources required for efficient response proved to be insufficient and old.

The private companies, associations of citizens and volunteers may be engaged in the process of coping with open space fires only on voluntary and contractual basis. The material resources for responding to open space fires that are available to the state authorities are insufficient and old which represents a significant problem for efficient coping with open space fires.

Crisis situation in the Republic of Macedonia (electric energy crisis in 2012)

The Government of the Republic of Macedonia on its session held on 12.02.2012 adopted the Decision No. 41-994/1 dated 13.02.2012 for declaring electric energy crisis as of 13.02.2012, which obliged the state companies to maintain the energy stability in the state. The decision forbade the export of electricity. The Government could import at that moment electricity from Greece but at an extremely high price. With this decision the Government recommended, as 13 February, 2012, the state and private entities and the local self-government throughout Macedonia to turn of the electric sign boards and to reduce the street illumination. An order was issued to prepare inclusion of the thermo-electric power plant Negotino in the power supply system to compensate the loss. The Government did not pass a decision to impose electricity restrictions on the households, but sources of the government stated that if the crisis had deteriorated the government would have imposed this measure. The electric energy crisis lasted 17 days from the date of the enforcement of the original decision.

Annex 2: Projected climatic trends in the Republic of Macedonia

This annex consists of an extract from the 2008 Second National Communication on Climate Change and is included to provide more detailed information surrounding the projected climatic trends modelled for the Republic of Macedonia. Information from this annex is summarised in chapter 2 of the main report.

"Climate change projections were made for the main climatic elements (air and precipitation) for the 21 century, namely for the period 1996-2025 (marked with 2025), 2021-2050 (marked with 2050), 2050-2075 (marked with 2075) and 2071-2100 (marked with 2100), which are compared with the period 1961-1990.

The highest increase in air temperature by the end of the century at the country level is projected for the summer season, together with the most intensive decrease in precipitation presented in tables 2 and 3.

In the case of precipitation, practically no change is expected in winter, but a decrease in all other seasons is expected. The increase in average daily temperatures is expected in summer and small decrease in winter. However, scientists agree that beyond a threshold of 2°C the risks of large-scale human development setbacks and irreversible ecological catastrophes will increase sharply.

Year	Average temperature change [°C]				Precipitation change [%]			
	annual				annual			
	2025	2050	2075	2100	2025	2050	2075	2100
Low	0,9	1,6	2,2	2,7	-1	-2	-4	-5
Mean	1,0	1,9	2,9	3,8	-3	-5	-8	-13
High	1,1	2,1	3,6	5,4	-6	-7	-12	-21

Table 1: Projected changes in average daily air temperature (°C) and precipitation (%) for the Republic of Macedonia, based on direct GCM output interpolated to geographic location 21.5 °E and 41.4 ° N (base period 1990). Source: Ministry of Environment and Physical Planning, 2008: 48

Year	Average temperature change [°C]															
	Winter				Spring				Summer				Autumn			
	2025	2050	2075	2100	2025	2050	2075	2100	2025	2050	2075	2100	2025	2050	2075	2100
Low	0.7	1.4	1.8		0.7	1.3	1.8	2.2.	1.2	2.2	3.2	3.7	0.8	1.5	2.2	2.6
Mean	0.8	1.7	2.3	3.0	0.8	1.5	2.2	3.2	1.4	2.5	4.1	5.4	0.9	1.7	2.8	3.7
High	0.9	1.9	2.9	4.2	0.9	1.8	2.9	4.6	1.7	2.9	5.1	7.6	1.1	2.0	3.6	5.3

Table 2: Projected changes in average daily air temperature (°C) for Macedonia, based on direct GCM output Source: Second National Communication of the Republic of Macedonia towards UN Framework Convention on Climate Change, www.moepp.gov.mk page 48

Year	Precipitation change [%]															
	Winter				Spring				Summer				Autumn			
	2025	2050	2075	2100	2025	2050	2075	2100	2025	2050	2075	2100	2025	2050	2075	2100
Low	1	5	3	4	-3	-2	-7	-5	2	-16	-21	-21	2	-2	0	-5
Mean	0	1	2	-1	-5	-6	-10	-13	-7	-17	-27	-37	-1	-4	-9	-13
High	-2	-1	1	-3	-7	-10	-13	-22	-24	-18	-33	-53	-3	-7	-17	-23

Table 3: Projected changes in precipitation (%) for Macedonia, based on direct GCM output Source: Second National Communication of the Republic of Macedonia towards UN Framework Convention on Climate Change, www.moepp.gov.mk page 49

For the region of south-east Macedonia with a prevailing sub-Mediterranean climate impact (represented by the stations at Gevgelija and Nov Dojran), a slight decrease of precipitation is expected by the end of the 21st Century in winter. More intense decrease of precipitation is expected in all other seasons, reaching the value of -19% in summer. However, a dramatic increase of temperature by 6°C in summer is projected. The difference between winter and summer increase in air temperature is especially evident for this region. Projected changes of air temperature and precipitation for the south-eastern part of Macedonia are presented in table 5.

The region of central Macedonia, which is under a combination of continental and sub-Mediterranean climate impacts (represented by the stations at Veles, Skopje-Petrovec, Strumica, and Shtip as presented in table 4), shows a more intensive temperature change in winter and less intensive in summer and autumn compared to the region of south-east Macedonia. The highest increase of air temperature by 5.4°C for the year 2100 is expected in summer. Practically no change in precipitation is expected in the winter season and a decrease in precipitation in all other seasons, reaching the maximum value of -23% in summer. Projected changes of air temperature and precipitation for the central part of Macedonia are presented in table 4.

In the case of the southern region, represented by Bitola and Prilep, almost no change in precipitation is expected in winter while a decrease is expected in all other seasons, the greatest being in summer. A slightly stronger signal in temperature change is expected for this region in comparison with regions with sub-Mediterranean climate impacts. On the contrary, projections of temperature changes for the south-western region represented by Ohrid and Resen are much lower than those for the region represented by Bitola and Prilep.

Additionally, even a slight increase of precipitation is expected for winter, but an evident decrease in other seasons. The different response of these two regions in large scale climate variability could be related to the proximity of large bodies of water (lakes Prespa and Ohrid) in the case of the Resen and Ohrid stations.

For the eastern part of Macedonia with a prevailing continental climate impacts, represented by the stations at Berovo and Kriva Palanka, a slight increase in precipitation, by 6%, is expected in winter, but a decrease in all other seasons, most intensive (-20%) in summer. In summer as well as in autumn, an increase

Year	Average temperature change [°C]				Precipitation change [%]			
	Annual				Annual			
	2025	2050	2075	2100	2025	2050	2075	2100
Low	1.0	1.9	2.6	3.1	-1	-3	-5	-6
Mean	1.1	2.2	3.3	4.5	-3	-6	-9	-13
High	1.2	2.5	4.2	6.3	-6	-8	-13	-21

Table 4: Projected changes of average daily air temperature (°C) and precipitation (%) for the central part of Macedonia (sub-Mediterranean and continental climate impacts, represented by the Veles, Strumica, Skopje-Petrovec, and Shtip stations) Source: Second National Communication of the Republic of Macedonia towards UN Framework Convention on Climate Change, www.moepp.gov.mk page 49

Year	Average temperature change [°C]				Precipitation change [%]			
	Annual				Annual			
	2025	2050	2075	2100	2025	2050	2075	2100
Low	1.1	2.0	2.7	3.2	-1	-1	-4	-5
Mean	1.2	2.3	3.4	4.6	-3	-5	-9	-12
High	1.3	2.6	4.3	6.5	-5	-7	-12	-20

Table 5: Projected changes of average daily air temperature (°C) and precipitation (%) for the south-eastern part of Macedonia (sub-Mediterranean and Continental climate impacts represented by the Gevgelija and Nov Dojran stations) Source: Second National Communication of the Republic of Macedonia towards UN Framework Convention on Climate Change, www.moepp.gov.mk page 49

in daily air temperature is expected, reaching the maximum value of 5.2°C in summer 2100.

For all three climate subtypes found in the north-western part of Macedonia, under the prevailing alpine climate impacts represented by the stations at Lazaropole, Popova Shapka, and Solunska Glava, as shown in Figure 6, the projections of air-temperature change and precipitation are very similar. An increase of precipitation by 5% until the end of 21st Century is expected in winter and a more intense decrease in all other seasons. The most intensive decrease of precipitation by 18% is expected in summer. The expected air temperature change is the strongest in this region of the country. The highest increase in the air temperature, of 5.9°C, is expected in summer, but the difference between seasons is not large. Such dramatic temperature changes will have a strong ecological impact, which is further detailed in the most vulnerable sectors. Projected changes of air temperature and precipitation for the north-western part of Macedonia are presented in table 6.

Although empirical downscaling projections of climate change on a local level (developed for the first time) contain uncertainties related to the results, they present a step forward towards the needed knowledge about how the different sub-regions of Macedonia might respond to large-scale climate change."

Source: Ministry of Environment and Physical Planning (2008) Second National Communication on Climate Change, Skopje pp 48- 50

Year	Average temperature change [°C]				Precipitation change [%]			
	Annual				Annual			
	2025	2050	2075	2100	2025	2050	2075	2100
Low	1.2	2.3	3.0	3.7	0	-1	-2	-2
Mean	1.3	2.6	3.9	5.3	-2	-3	-5	-8
High	1.5	3.0	5.0	7.4	-4	-5	-8	-15

Table 6: Projected changes of average daily air temperature (°C) and precipitation (%) for the north-western part of Macedonia (prevailing alpine climate impacts, represented by the stations at Lazaropole, Popova Shapka, and Solunska Glava) Source: Second National Communication of the Republic of Macedonia towards UN Framework Convention on Climate Change, www.moepp.gov.mk page 50

Annex 3: Goals for mitigating greenhouse gas emissions

This annex contains tables summarizing proposed goals for the mitigation of greenhouse gas emissions. It includes comprehensive proposals from the national government developed as part of the National Communication to the UNFCCC (see table 11) and EU objectives for reducing greenhouse gas emissions, increasing energy efficiency and increasing the percentage of energy derived from renewable sources (see table 9).

Ecological question	EU-27 measurable/general objective	EU-27— on a good way?	EEA-38 — trend?
CLIMATE CHANGE			
Change of global average temperature	To limit the growth below 2°C on global level	(*) ☒	⇗
Emissions of greenhouse gases	To reduce emissions of greenhouse gases by 20% by 2020	(**) ☑	⇘
Energy efficiency	To reduce the use of primary energy by 20% by 2020 compared to the condition without measures	(**) ☐	⇗
Renewable sources of energy	To increase the renewable energy in the total energy consumption by 20% by 2020	(**) ☐	⇗
(*)The ambition is to limit global mean temperature increase to below 2 °C above pre-industrial levels. This depends critically also on greenhouse gas emissions originating outside Europe (**)The EU-27 in 2008 was more than halfway towards its unilateral target to reduce greenhouse gas emissions by 20 % in 2020 compared to 1990. The provisions of the EU Emission Trading Scheme and the effort-sharing decision ensures that the 2020 target will be met, although the built-in flexibility makes it difficult to foresee the exact mix of policies and measures that industry, individual countries and the EU will use to reduce emissions.			
☒ EU is not on a good way (some countries may accomplish the goal). ☑ EU is on a good way (some countries may not accomplish the goal). ☐ Mixed progress (but the general problem remains) ⇗ Trend of increase ⇘ Trend of reduction			

Table 9: Indicative collective chart of the achieved progress towards fulfillment of quantitative or general objectives on climate change and description of daily trends in the past 10 years Source: EEA, 2010. European Environment Agency — Condition and perspectives 2010: Synthesis European Environment Agency, Copenhagen (www.europa.eu). Page 18

Greenhouse gas emissions	EPR, CSI 10
Energy efficiency	ENER 22, ENER 23, ENER 24, ENER 25
Renewable energy sources	ENER 28
Global mean temperature change	EPR, CSI 12
Pressure on ecosystems	EPR, CSI 05
Conservation status	EPR, SEBI 03, SEBI 05, SEBI 08
Biodiversity	SEBI 01 (birds and butterflies) EPR (fisheries) SEBI 12, SEBI 21
Soil degradation	IRENA (soil erosion)
Decoupling	SD indicator (Eurostat)
Waste generation	EPR, SOER 2010 including CSI 16
Waste management	EPR, SOER 2010 including CSI 17
Water stress	EPR, CSI 18
Water quality	CSI 19
Water pollution	CSI 22
Transboundary air pollution	EPR
Air quality in urban	EPR

Table 10: Indicator sets of the European Environment Agency Source: http://www.eea.europa.eu/data-and-maps/indicators

	GOALS	ACTIONS
I. GHG emission reduction in electric power sector		
I.1	Harmonization and implementation of EU legislation in Energy and Climate	Energy and Climate Package Liberalization of energy markets (electricity and gas)
I.2	Ensuring stability in energy supply with investment activities for building new big hydro power plants	HPP Boskov Most HPP Galiste HPP Cebren
I.3	Ensuring stability in energy supply with investment activities for building new thermal power plants on gas	CHP Skopje 230 MW CC gas (200-300 MW)
I.4	Increasing the share of renewable in the energy sector	Small hydro power plants Wind power plants Biomass electricity and PV panels

	GOALS	ACTIONS
I.5	Improvement of the energy efficiency	Building plants for production of combined heat and electrical energy (CHP). Measures for reducing the losses in transmission and distribution of electricity. Measures by the electricity consumers by introducing more efficient lamps, more efficient electric appliances etc. Animation of the interested investors with favorable legal regulations and tax relieves.
II. GHG emissions reduction in the industrial energy transformations and heating sector		
II.1	Reduction of the use of carbon intensive fuels	Replacement of coal with liquid or gaseous fuels; replacement of liquid fuels with gaseous fuels
II.2	Improvement of the energy efficiency and energy saving	Improvement of the energy efficiency of the boiler plants with permanent maintenance; Replacement of old equipment in boiler rooms, with regular revitalization works; Installation of measurement-regulation equipment and automatic control systems; Better insulation, maintaining clean heat exchanging surfaces; Utilization of heat content in flue gases; Reduction of losses in systems for transportation of fluids; Heat insulation of pipelines for transport of water, steam, fuels etc.; Reduction of specific consumption of energy in the industry by introduction of up-to-date technologies and processes; Improvements of the performances of thermal cycle; Improvement of the standards for construction of buildings, better insulation, use of high quality materials
II.3	Increasing of the contribution of renewable energy sources in the country's energy balance	Utilization of waste biomass as an energy source and as a raw material for production of briquettes and pellets; Installation of tens of boiler units on waste biomass in the agro-industry complex, industry sector and in households; Rehabilitation, revitalization and expanding of the geothermal system Geoterma-Kochani; Revitalization of other systems on geothermal energy; Introduction of solar energy systems for heating and hot water supply (in hotels, hospitals, schools, public buildings, health resorts etc.)

	GOALS	ACTIONS
II.4	Awareness raising of the final consumers	Reduction of energy consumption in the households with measures of energy saving Reduction of electricity use for heating Introduction of measurement equipment and charging in accordance to the consumption
III. GHG emissions reduction in the transport		
III.1	Improvement of the overall efficiency in the transport sector and energy efficiency of the vehicles	Revitalization, extension and better maintenance of the road and railway infrastructure; Extension-spreading of the electrification of the railway network; Modernization of the vehicle fleet; Motivation for wider use of alternative fuels and other power systems (LPG, CNG, biodiesel, hybrid vehicles etc.)
III.2	Improvement of the public urban and inter-city transport	Improvement in the planning, organization and control of the traffic; Measures for regulation of the traffic in central urban areas; Modernization of the transport equipment for the public traffic; Synchronization of the road signalization in the towns; Introduction of electronic pay toll charging; Introduction of electrically driven types of transport, i.e. tramway; Railway transport - electrification of the railway network
III.3	Harmonization of the national legislative, regarding the transport sector, with the European Union directives	Energy and Climate Package (biofuels) Regulation on fuels quality in accordance with the European Union norms
IV. GHG emissions reduction in the waste sector		
IV.1	GHG emission reduction at the existing landfills	Technical improvement of the existing landfills Installation of methane recovery and flaring systems at selected landfills
IV.2	Improvement of the possibilities for efficient methane collection	Construction of regional solid waste disposal sites
IV.3	Reduction of the nitrous oxide (N20) emissions.	Implementation of legal measures for restriction of the economic activities that include uncontrolled burning of the waste Raising public awareness for restriction of the uncontrolled burning of the waste
IV.4	Reduction of the methane emissions from the wastewater	Expansion of the wastewater treatment plant network

	GOALS	ACTIONS
V. GHG emissions reduction in the agriculture and forestry		
V.1	Enabling favourable pre-conditions for GHG emission reduction (laws, bylaws, institutional measures, support measures)	Transposition and implementation of EU CAP legislation Completion of institutional and legal reforms in irrigation sector Increasing of the institutional and individual capacities for application of the available EU funds Development of system for application of Good Agricultural Practices Financial support for motivating the farmers to use mitigation technologies
V.2	Introduction/development of GHG mitigation technologies in agriculture	Installation of methane recovery and flaring systems at selected farms Research support program for development of new mitigation technologies and transfer of the existing ones Program for introduction of practices that use the agriculture potential for renewable energy and carbon sequestration Programmatic CDM projects
V.3	Strengthening the national and local capacities for carbon financing	Training for CDM potential in agriculture Training for preparation of CDM documentation
V.4	Education (of experts/farmers/decision makers) for application of mitigation measures/technologies in agriculture	Current curricula and syllabuses upgraded with CC mitigation issues Training of farmers for adopting new technologies Familiarization of public and institutions with the problem of CC mitigation
V.5	Implementation of the national strategic documents in the forestry	Forestation and re-forestation Prevention measures against fires Prevention of illegal cut

Table 11: The appropriate national measures for mitigation of the situation in the Republic of Macedonia Source:http://www.moepp.gov.mk/WBStorage/Files/Nationally%20appropriate%20mitigation%20measures%20-%20Climate%20change.pdf

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