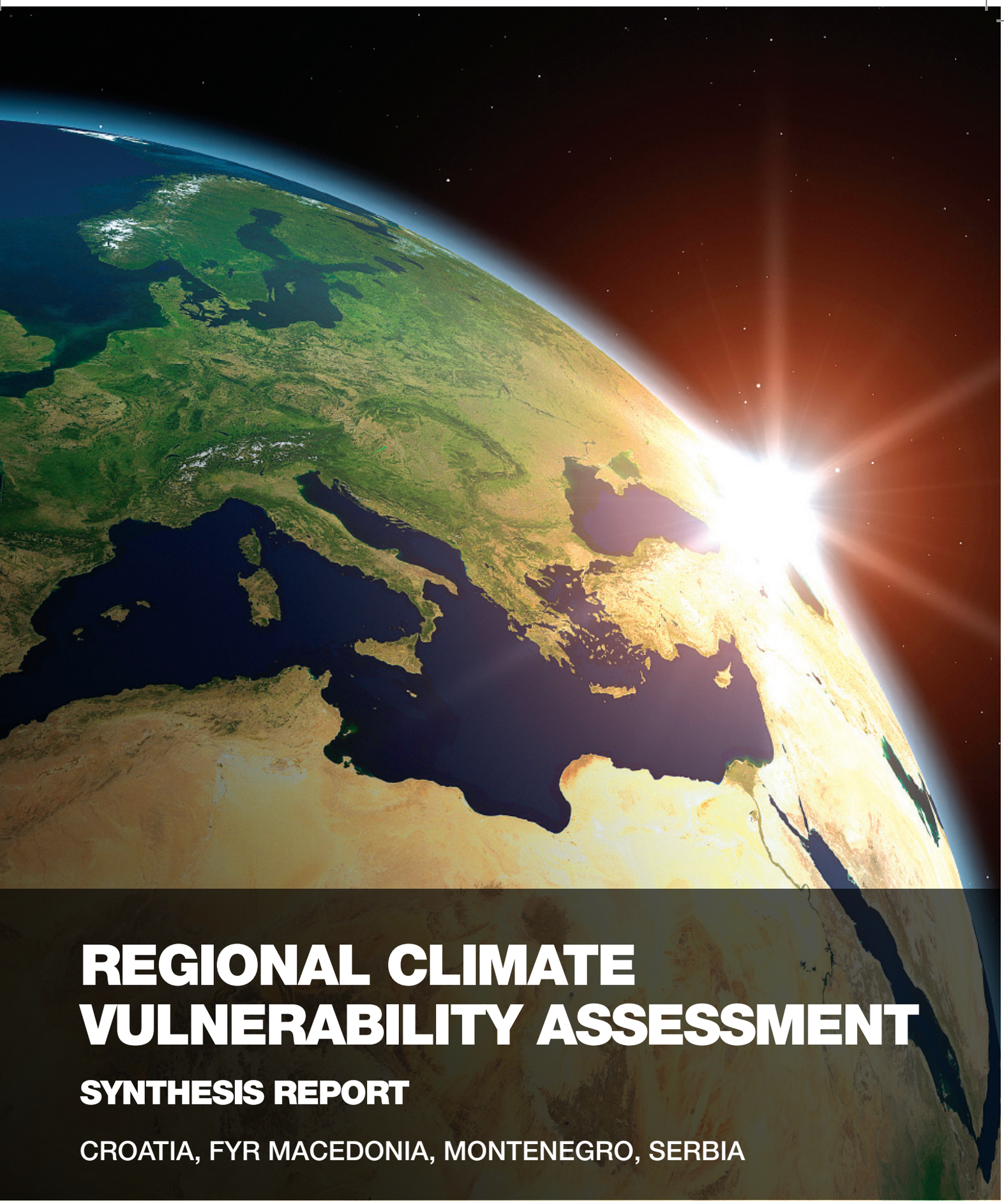

REGIONAL CLIMATE VULNERABILITY ASSESSMENT

SYNTHESIS REPORT

CROATIA, FYR MACEDONIA, MONTENEGRO, SERBIA

This project is co-funded by the European Union

CCA Forum
South East European Forum on Climate Change Adaptation

AUSTRIAN RED CROSS

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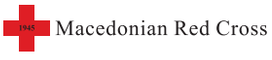

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Belgrade, May 2012.

PREFACE

Increasingly, climate change is becoming a cause for serious concern among policy-makers, civil society and the general public who recognise the potential it has to damage human health, economies and societies. South East Europe has been identified by the IPCC as one of the areas of Europe most vulnerable to the effects of climate change, and decisions need to be taken now that will determine how the countries of that region will respond to the challenges that lie ahead.

This regional 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 project, four national civil society organisation (CSO) networks on climate change adaptation in Croatia, FYR Macedonia, Montenegro and Serbia have been established to strengthen civil society and tackle climate change through awareness-raising and policy dialogue. In all four countries, national climate vulnerability assessments based on existing literature and data have been conducted by experts who were supported by members of CSO networks. The results of these studies are summarised and further elaborated in this regional synthesis report to highlight common challenges related to climate change.

The recommendations chapter should serve as a starting point for the definition of regional initiatives in climate change adaptation and foster structured and targeted cooperation between civil society, governmental institutions, universities, private sector, Red Cross Societies and national hydrometeorological institutes, recognizing the specific and complementary roles and expertise of each actor for concerted action.

The IPA project "South East European Forum on Climate Change Adaptation" 2011-2012 is implemented by the Croatia Red Cross, Macedonia Red Cross, Montenegro Red Cross, the The NGOs Environmental Improvement Center and WWF in Serbia and led by the Austrian Red Cross. Other partners in this project are the Institute for Economic Promotion of the Austrian Federal Economic Chamber, the Red Cross/Red Crescent Climate Centre in The Hague (Netherlands), the World Wide Fund for Nature (WWF) Danube-Carpathian Programme and the WWF Romania.

METHODOLOGY AND DEVELOPMENT

This report was compiled through a desk study of the available literature, including the recently-developed national CVA reports under the same project. Further information was obtained via discussions with the national CVA report authors and contributions from CSO members of the national climate change networks. In cases where insufficient data existed on a local and regional level, data from other international studies was used. The recommendations were compiled from those in the national CVA reports, with additional regional recommendations developed from the literature by the author.

This study is not a scientific report, but rather should be intended as providing an accessible overview of the situation for policy-makers, opinion-leaders, civil society and other non-specialists, to be used to stimulate a dialogue about the best ways to tackle the challenges of climate change in the region. Wherever possible, links have been provided to documents or institutes where further information may be found. Since the primary focus of the report is on climate change adaptation, there will be limited discussion of climate change mitigation measures such as curbing greenhouse gas emissions.

LIST OF ACRONYMS

CCA	Climate Change Adaptation
CSO	Civil Society Organisation
CVA	Climate Vulnerability Assessment
DRR	Disaster Risk Reduction
EC	European Commission
EU	European Union
EWS	Early Warning System
FYR Macedonia	Former Yugoslav Republic of Macedonia
IPA	Instrument for Pre-accession Assistance
IPCC	Intergovernmental Panel on Climate Change
NGO	Non-Governmental Organisation
RCCC	Red Cross/Red Crescent Climate Centre
RC/RC	Red Cross/Red Crescent
SEE/CCFAP-A	South East European Climate Change Framework Action Plan for Adaptation
SEEFCCA	South East European Forum on Climate Change Adaptation
SEEVCCC	South East European Virtual Climate Change Centre
UN	United Nations
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNISDR	United Nations International Strategy on Disaster Reduction
WHO	World Health Organization
WWF	World Wide Fund for Nature

EXECUTIVE SUMMARY

Climate change and natural disasters pose a considerable threat to the economies and population of South East Europe, including Croatia, FYR Macedonia, Serbia and Montenegro. Predicted climatic changes over the coming century include higher temperatures, less precipitation, and a greater risk of floods, droughts, heat waves and forest fires. Policy-makers and civil society in these countries must act now to take steps to adapt to the challenges posed by climate change.

Sectors particularly vulnerable to climate change include agriculture, biodiversity, energy, human health, tourism and water resources. Reducing the vulnerabilities in each sector is possible via targeted policy interventions, developing and enforcing robust environmental protection legislation, and encouraging the involvement of civil society and the general public in working to mitigate the effects of climate change.

Some policy measures are already in place to deal with climate change and disaster risk reduction; however, most of these are inadequate to the scale of the future threat. Climate change policies need to move forward from solely addressing greenhouse gas mitigation, and focus on adaptation; a key strategy will involve integrating climate change adaptation and disaster risk reduction policies into planning and development strategies, and the development of comprehensive national climate change adaptation plans. Civil society organisations have a role to play in raising awareness about climate change and conservation issues among the general public, business and industry. They should also be encouraged to collaborate with state actors by taking an active role in policy dialogue in this area, including providing input into the preparation of the next national communications to the UNFCCC.

Keeping in mind that climate change does not stop at national borders, regional and cross-border cooperation in climate change adaptation must be enhanced. This collaboration should include knowledge sharing between governments, civil society, national hydrometeorological institutes, private sector and universities, and knowledge transfer from EU countries. Moreover, highlighting the links between climate change adaptation and disaster risk reduction on a regional and national level will foster the exchange of expertise between the environmental, economic, social and humanitarian sectors that will ultimately result in an integrated approach to minimise economic costs of climate change and the loss of human and animal life.

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1.1 THE CLIMATE IS CHANGING

The climate of the Earth is changing; data show that over the past 150 years the planet has been warming at an unprecedented rate. The impacts of these changes are being felt in many parts of the world today, and as the climate warms, more of the world will experience more variable and extreme weather. In order to understand how best to adapt to the coming changes, it is necessary to understand how the climate has changed so far, and how it is predicted to change in the future.

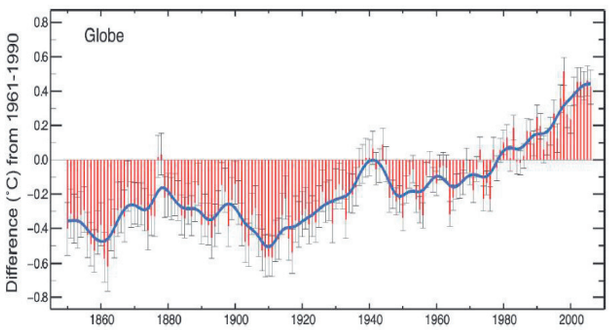
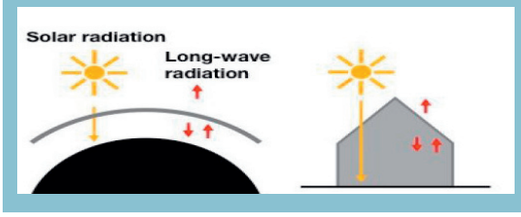


Figure 1 shows how the global temperature has risen over the past 150 years. The vast majority of scientists attribute this warming trend to the greenhouse effect, caused by increased emissions of greenhouse gases since industrialisation[1], a process known as the greenhouse effect (see Box 1).

1 IPCC, 2007a

Box 1: The Greenhouse Effect

The figure to the left illustrates the greenhouse effect. The temperature rise caused by greenhouse gases in the atmosphere is similar to the warming inside a greenhouse. Radiation from the sun travels through the atmosphere and warms the earth's surface. Part of this incoming energy from the sun leaves our planet in the form of heat (long-wave radiation, or infrared). On its way back out through the atmosphere some of this heat is absorbed by greenhouse gases that act as a blanket over the earth, keeping it warmer. Without these greenhouse gases, the planet would be too cold and life on earth wouldn't be possible. Carbon dioxide and methane are two important greenhouse gases. Adding more of these gases to the atmosphere however enhances the greenhouse effect and thus increases the average temperature at the earth's surface: global warming. A warmer world in turn causes our climate to change.



Since the end of the industrial revolution, concentrations of carbon dioxide, which is produced by burning fossil fuels (coal, oil, natural gas), have risen by over 30 per cent, while methane has approximately doubled. Carbon dioxide molecules can live around 100 years in the atmosphere, and they now stand at a concentration of about 385 parts per million (ppm), as compared to a pre-industrial concentration of about 280 ppm. The current concentration of carbon dioxide is at least a quarter higher than at any other time during the past 650,000 years. If we carry on burning fossil fuel in a "business as usual" way, carbon dioxide concentrations will rise to 600 or 700 ppm by the year 2100. Even if the whole world worked very hard to limit emissions, carbon dioxide concentrations are unlikely to stabilize below 450 ppm".

Source: The Red Cross/Red Crescent Climate Centre (2007) *The Red Cross/Red Crescent Climate Guide*, p 14

1.1.1 Climate change in the past

The global climate has always changed, but over the past 150 years, there has been a steep rise of global average temperatures. Global average temperatures have risen by 0.7°C since 1850, and have been rising more quickly more recently; nine out of the ten warmest years on record have happened since the year 2000.

1.1.2 Climate change in the future

Key global trends as a result of climate change include[1]:

- **Changing precipitation patterns:** Rainfall patterns are predicted to change across the globe, with the result that in most areas the rainfall will become more erratic and intense. Overall, global precipitation levels will drop.

- **Rising sea-levels:** Sea levels are predicted to rise by a global average of between 0.09 and 0.88 m by the end of the century, as a result of thermal expansion of warming sea waters, and, to a lesser extent, of melting of polar ice caps. Even very small rises in sea level can translate into high levels of coastal recession.[2]

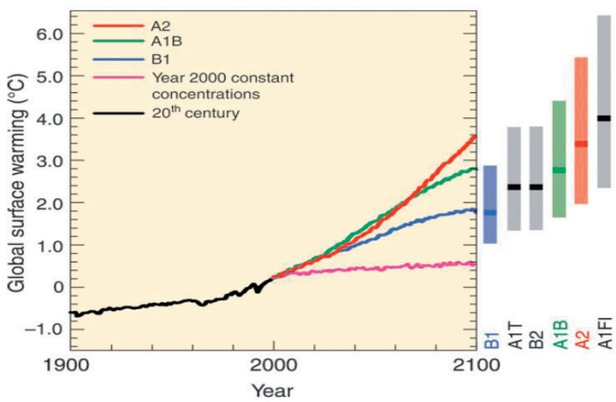


Figure 2: Projected changes in global climate in the 21st century under various emissions scenarios. Source: IPCC, 2007a

- **Rising temperatures:** Global average temperatures are predicted to rise by between 1.1 – 6.4°C by the end of the century (an increase of between 1.8 and 4.0 °C is considered more likely).The warming may manifest itself very differently at local levels ,with the highest rates of warming experienced at the poles, and winters generally warming more than summers.

Figure 2 shows how the average global temperatures are predicted to change up to 2100, under a variety of climate change scenarios. The scenarios, developed by the IPCC, take into account variables such as population and economic growth, rate of greenhouse gas emissions and adoption of green technology. The bars on the right of the diagram show the outside bounds of the predictions in temperature changes; they range from a minimum change of around 1.0°C under the B1 scenario, to a maximum of more than 6.0°C under the A1FI scenario[3]. These scenarios were developed in 2001, and current emissions are already exceeding those imagined under the most pessimistic scenario[4].

1.1.3 Climate change, natural hazards and disasters

Climate change will also affect the number and frequency of natural disasters. While it is impossible to link one individual disaster directly to climate change, there is a well-documented link between climate change and an overall increase in the frequency and intensity of hydrometeorological natural hazards[5]. The number of disasters occurring throughout the world has risen steeply during the twentieth century, affecting millions of people and causing huge economic losses. In particular, the incidence of hydrometeorological hazards

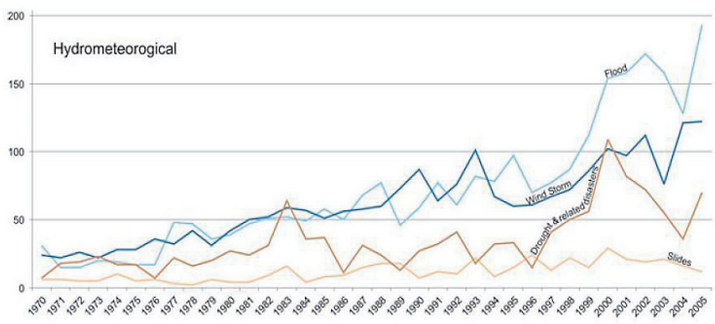


Figure 3: Graph showing the rising number of hydrometeorological hazards since 1970. Source: UNISDR

(weather-related hazards such as flooding, storms etc.) have risen at a much faster rate than geophysical hazards such as volcanoes and earthquakes (see figure 3), causing a much larger number of disasters. The result of this is that the number of people affected by disasters has risen to 250 million a year[6].

1 IPCC, 2007b

2 *Ibid*.

3 For further discussion about emission scenarios, please see IPCC, 2007a.

4 RCCC, 2007

5 IPCC,2012

6 RCCC, 2007

1.2 ADDRESSING CLIMATE CHANGE

Climate change will have significant impacts on human health, societies and economies, affecting all sectors from agriculture to water resources, while a rising number of disasters can severely affect economic growth. Attempts to address the issue take two forms: mitigation and adaption. So far, many countries have focussed on mitigation efforts, with little attention paid to adaptation; however, given the lack of success of mitigation efforts so far and the increasing awareness that the effects of climate change are already being felt, adaptation must now be a key area of focus for policy-makers.

1.2.1 Mitigation

Since the primary cause of the warming trend is generally agreed to be the presence of increasing amounts of greenhouse gases in the atmosphere, attempts have been made to reach a global agreement to limit the emission of greenhouse gases. The Kyoto Protocol, signed in 1997 by parties to the UNFCCC, committed developed nations to cutting emissions significantly; however, this treaty was undercut by the decision of the USA, a major greenhouse gas emitter, not to ratify the treaty. Attempts to agree on a successor treaty to include major developing countries have so far been unsuccessful. However, while international mitigation efforts are stalling, there is a rise in grassroots, community efforts in this area, and many countries are pursuing considerable emissions cuts regardless.

1.2.2 Adaptation

Even if all greenhouse gas emissions ended today, the earth would still undergo some degree of warming, as greenhouse gases stay in the atmosphere and affect the climate for decades after they have been emitted. However, since global attempts to dramatically limit greenhouse gas emissions have been unsuccessful, the world must be prepared for the challenges posed by climate change. Mitigation is not enough: every country will need to adapt to the effects of climate change.

Adaptation measures can take many forms, from building barriers to protect infrastructure from a predicted increase in flooding, to increasing investment into scientific research into the impacts of climate change. Selecting which adaptation measures to pursue when there remains considerable uncertainty in exactly how future changes will affect society remains challenging. One way for societies to address this dilemma is through options which can be described as “no-regrets” or “win-win”. “No-regrets” strategies benefits regardless of how climate changes, while “win-win” strategies provide additional benefits beyond climate change adaptation. “No-regrets” strategies are also less likely to result in so-called “maladaptation”, which happens when climate change adaptation policies inadvertently increase vulnerability[7]. Examples of no-regrets strategies include increased investment into research capacities, or incorporating climate change and disaster risk reduction considerations into all aspects of policy planning and development.

However, limiting adaptation measures solely to win-win or no-regrets options can restrict the potential benefits of adaptation, so it is important to encourage flexibility in adaptation approaches, and that governments are prepared to invest in significant adaptation-specific options where justified. This approach allows countries to build societies that are able to cope with and recover from disasters and extreme weather caused by climate change, and continue to develop and prosper.

7 Cimato and Mullan, 2010

2. Climate change in South East Europe

2.1 CLIMATE CHANGE AND NATURAL DISASTERS

2.1.1 Current climate

Croatia, FYR Macedonia, Montenegro and Serbia cover a geographically highly varied territory, ranging from the alpine Dinaric mountains, peaking at Mount Korab on the Macedonian border at 2,764 m, down to the Adriatic coastline of Croatia and Montenegro, via the lowland plains of Vojvodina in the northeast of Serbia. Consequently, the climatic systems are also varied, but there are two major climate systems predominate. Along the Adriatic coast, a Mediterranean climate prevails, characterised by hot, dry summers, and mild, wet winters; further inland a humid continental climate of warm summers, cold winters and year-round precipitation is more common, with winters becoming milder further south. In the mountainous areas very cold winters are common, with average annual temperatures as low as 1.5˚ C in areas above 1500m. In the inland, lower altitude areas, average temperatures are closer to 12˚C.

2.1.2 Natural hazards and disasters

South East Europe is a region that is particularly prone to natural hazards, and it is frequently affected by floods, earthquakes, extreme temperatures, landslides and wildfires. These hazards regularly cause disasters, resulting in considerable human and economic losses. Figure 1.1 shows the breakdown of natural disasters in Croatia, FYR Macedonia, Montenegro and Serbia since the dissolution of Yugoslavia in 1991. Over the past twenty years, the most frequently occurring disasters have been floods, extreme temperatures and wildfires.

Although historically disasters in the region have not caused high numbers of deaths, they have affected thousands of people and caused significant economic losses. Table 1 shows the top five hydrometeorological

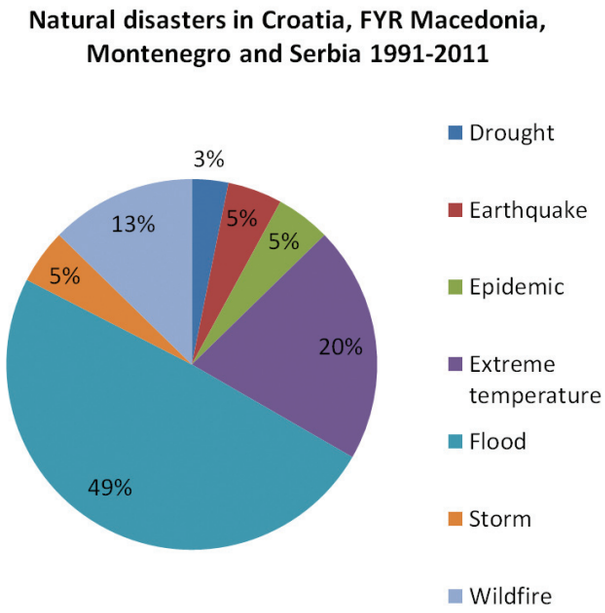


Figure 4: Chart showing natural disasters affecting Croatia, FYR Macedonia, Montenegro and Serbia from 1991 until 2011. Source: EM-DAT

disasters[8] since 1991, categorised by number killed, number affected and amount of economic damage caused[9]; while floods are the most frequent hazard and have affected more people, the most deadly hazard in the region is extreme temperature (heat waves in particular) while droughts and floods have been extremely costly.

8 All four countries are exposed to considerable seismic risk. However, since earthquakes are not hydrometeorological hazards and therefore not affected by climate change, this report will not examine the risk in-depth. For further information about the seismic hazard in the region, see UNISDR (2008), Pollner *et al.* (2009) etc.

9 EM-DAT defines a disaster as an event which fulfils one or more of the following criteria:
- Ten (10) or more people reported killed.
- Hundred (100) or more people reported affected.
- Declaration of a state of emergency.
- Call for international assistance.

Hazard, country and year	Total number killed	Hazard, country and year	Total number affected	Hazard, country and year	Amount of damage in $US
Heat wave, Croatia, 2003	788	Wildfire, FYR Macedonia, 2007	1,000,000	Drought, Croatia, 2003	330 million
Heat wave, Croatia, 2000	40	Flood, FYR Macedonia, 2004	100,000	Flood, FYR Macedonia, 1995	245 million
Cold wave, FYR Macedonia, 2004	15	Flood, Serbia & Montenegro, 1999	70, 678	Heat wave, Croatia, 2000	240 million
Heat wave, FYR Macedonia, 2004	15	Cold wave, Serbia, 2012	70, 000	Flood, Croatia, 2010	80 million
Wild fire, Croatia, 2007	12	Flood, Serbia, 2007	12,370	Wildfire, Croatia, 2003	20 million

Table 1: Top 5 hydrometeorological disasters since independence, by total number killed, total number affected and damage in $US. *No data is available for Serbia & Montenegro (before 2006) or Montenegro (after 2006) in this category. Source: EM-DAT

The number of reported natural hazards has risen during the twentieth century. Figure 2 shows the number of reported natural disasters in Yugoslavia from 1963-1991 (a territory which in addition to the four countries in this report included the current states of Bosnia & Herzegovina and Slovenia) and of Croatia, FYR Macedonia, Serbia and Montenegro since independence in 1991 (Serbia and Montenegro became separate states in 2006). The number of reported disasters has risen significantly in recent decades, following the global trend of a rise in natural disasters towards the end of the century (see section 1.1). However, it is important to note that the political upheavals of the 1990s resulted in a general paucity of data for the region, and the rise in reported disasters in partiular since 2000 may simply reflect better reporting of events. Nonetheless, evidence suggests that the number of floods in particular has risen dramatically over the past two decades[10], with record high flood levels recorded in several locations in the past ten years[11].

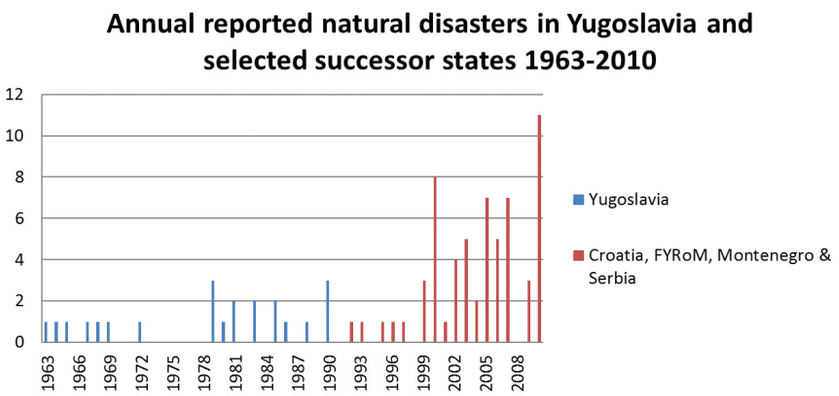


Figure 5: Annual reported disasters in Yugoslavia (1963-1991) and Croatia, FYR Macedonia, Montenegro and Serbia (1991-2010). Source: EM-DAT

Flooding is the most frequently-occurring hazard in the region: almost half of all natural disasters since 1991 have been caused by flooding. Serbia experiences a major flooding event on average once every two years, while nearly 15 % of Croatia's territory is vulnerable to flooding[12], and much of Montenegro's limited agricultural land is also flooded on a regular basis[13]. Major riverine floods are usually a result of melting snow or intense precipitation, while Croatia and Montenegro are also vulnerable to coastal flooding caused by storm surges.

Extreme temperatures have been responsible for the most deaths in the region since 1990, most of which were caused by heat waves. Over 700 extra deaths were attributed to the heat wave in Croatia in 2003[14], and heat waves have been more common than cold waves in recent times. However, extreme low temperatures are also serious: in early 2012, a major cold wave hit all four countries,

10 Pollner *et al.*, 2009
11 UNISDR, 2008
12 *Ibid.*
13 *Ibid.*
14 Emergency Events Data Base (EM-DAT): www.emdat.be

affecting 70,000 people in Serbia alone[15]and causing an as yet unknown number of deaths.

Droughts are a significant hazard, especially in countries such as Serbia and Croatia where the agricultural sector still involves a significant percentage of the labour force. A drought in Croatia in 2003 caused losses of $330 million[16]. Droughts and heat waves also result in conditions which raise the risk of the associated hazard of wild fires, which have affected all four countries since independence; most significantly, in the summer of 2007 the FYR Macedonia experienced wild fires which affected a million people and destroyed more than 40,000 hectares of forest[17].

2.1.3 Climate trends and future climate change

Historically, data show only a small temperature rise for the region during the 20th century, and small decline in precipitation, although neither of these is significant enough to identify a clear trend separate from normal climate variability[18]. However, major changes are predicted for the region during the next century. Climate models agree that South East Europe will experience significant rises in temperature, diminishing precipitation, and potentially damaging sea-level rise.

- **Temperature:** The average temperature will rise across all four countries, within outside bounds of 1.0 to 5.5˚C by the end of the century[19]. Climate models based on the A1B scenarios (assuming moderate increases in greenhouse gas emissions) predict that an increase in temperature of between 1.8 and 2.3˚C is likely by mid-century[20]. The temperature increase is likely to manifest itself in hotter summers, although winter minimum temperatures are also likely to increase, with fewer frost days. Temperature increase will be greater along the coasts of Croatia and Montenegro, and in the southern parts of Serbia and in FYR Macedonia[21].

- **Precipitation** is more difficult to forecast, but most models agree that it will decrease throughout the eastern Mediterranean, and by the end of the century the region will be considerably drier, with winter precipitation diminishing more than summer precipitation. While precipitation will decrease overall, most models agree that it will fall in fewer, more intense events, with longer dry periods between events[22]. Surface runoff (a measure of water availability) will decline by up to 36 % by the end of the century, and peak flows of rivers during the summer will also decrease[23].

- **Sea-level rise:** Global sea levels are predicted to rise between 0.09 and 0.88 m by 2100[24], and sea-level rise in the Mediterranean is potentially a significant risk for Croatia and Montenegro. However, it is difficult to predict the exact effects of sea level rise along the Adriatic coast due to the fact that the area is tectonically highly active, and local uplift or subsidence could have a greater influence on coastal dynamics than sea level rise. Nevertheless, any sea-level rise is likely to increase the risk of coastal erosion and coastal flooding from storm surges.

2.1.4 Impacts of climate change on natural hazards and disasters

The link between climate change and extreme hazards is clear: a changing climate results in more frequent and more intense hydrometeorological hazards[25], and this will also be true in South East Europe. Rising temperatures and changing rainfall patterns will affect all of the hydrometeorological hazards which already occur in the region. Table 2 summarises how the behaviour of natural hazards is likely to be affected by projected changes in climate.

Although precipitation will decrease overall, the risk of flash-flooding is likely to increase in the short term at least, as the rise in rainfall intensity makes this hazard more frequent[26], also raising the risk of associated hazards such as soil erosion and landslides. Towards the end of the century, flooding is likely to decrease in overall frequency, with extreme floods becoming less common, while warmer winter temperatures mean that snowmelt floods are likely to occur earlier in the

15 Emergency Events Data Base (EM-DAT): www.emdat.be
16 *Ibid.*
17 Government of the former Yugoslav Republic of Macedonia, 2008
18 Westphal, 2008.
19 IPCC, 2007b
20 Westphal, 2008
21 UNDP, 2008.
22 UNDP, 2008
23 IPCC, 2007b.
24 *Ibid.*
25 IPCC, 2012
26 IPCC, 2007b

Hazard	Projected changes in behaviour of natural hazards as a result of climate change		
	2030s	2050s	2070s
Flooding	Risk of flash floods to increase; snowmelt flooding likely to arrive earlier in the year.		100-year floods to become less frequent
Droughts	Warmer temperatures and increasing numbers of consecutive dry days Decrease in surface runoff by up to 23%.	Surface runoff to decrease by 20 to 30 %	Surface runoff to decrease by up to 36%; 100-year droughts return every 50 years or less
Extreme temperature (high)	Extreme high temperatures to rise, longer-lasting heat waves	Higher average summer temperatures, heat waves are more frequent, begin earlier in the year and last longer	
Extreme temperature (low)	Winter extreme low temperatures increasing;	Up to seventeen fewer frost days per year by mid-century	Risk of cold waves significantly decreased.
Storms and high winds	Wind speeds to increase slightly.	Higher wind speeds along the Adriatic coast bring more coastal storms and coastal flooding from storm surges.	
Wild fires	Risk increases as longer droughts and higher extreme temperatures become more common.		

Table 2 The projected changes in frequency and intensity of natural hazards in South East Europe over the 21st century
Source: IPCC (2007b) and Westphal (2008)

year[27]. Meanwhile, rising sea temperatures in the Adriatic are likely to lead to higher wind speeds along the coast, and stronger storms in general, raising the risk of coastal flooding from storm surges, and increasing the likelihood of inundation of vulnerable and ecologically delicate habitats such as wetlands and river deltas in Croatia and Montenegro. More violent storms and even water spouts may threaten coastal areas of Croatia and Montenegro, and cause flash-flooding further inland[28].

The diminished surface runoff is expected to contribute to the higher incidence of drought. Droughts will begin earlier in the year and last for longer, as a significant rise in the number of consecutive dry days is predicted[29]. The fall in winter precipitation means that reservoirs and groundwater resources are less likely to be replenished during that season, and water shortages are a risk. Simultaneously, extreme summer temperatures are likely to rise, along with the risk of heat waves, which will become more frequent and longer-lasting[30]. The combination of high temperatures and drought will also provide conditions amenable to the spread of wild fires, which will be an increasing risk over the century. Extreme winter temperatures will also increase, and the number of frost days decrease, so the risk of sustained cold waves is likely to diminish[31].

27 IPCC, 2007b
28 UNDP, 2008
29 IPCC, 2007b
30 *Ibid.*
31 Westphal, 2008.

2.2 CLIMATE CHANGE AND VULNERABILITY

Climate change will not affect everyone equally. For example, extreme cold weather causes more problems for those living in poor-quality housing with limited heating than it does to those living in well-insulated accommodation who can afford adequate fuel. The vulnerability of an individual or a community to a risk depends on a number of considerations, including physical, social, economic and environmental factors.

2.2.1 Vulnerability in South East Europe

There has not as yet been a comprehensive study of climate change vulnerability in this region. However, there are certain key trends which are likely to play a role in how climate change affects various sectors of society both now and in the future.

Populations are aging across Europe, but this is particularly the case in South East Europe where in general the populations are not renewed by high levels of migration.[32] In Croatia and Serbia, the population has already begun to decline, while FYR Macedonia and Montenegro have very low rates of population growth that have decreased considerably since 1990. The percentage of the population above the age of 65 is currently rising. Aging populations put increasing numbers at risk from hazards such as heat waves, and also (though this is likely to be less common) cold waves, as the elderly suffer disproportionately at both temperature extremes (see section 3.4).

There is a long term trend of urbanisation in all four countries. Urbanisation continues to rise in Croatia and FYR Macedonia; however, it has dropped slightly in 2010 in Serbia and Montenegro, possibly as a result of the financial crisis. However, the overall trend is of rural depopulation, in part due to the decline in importance of the agricultural sector in the economy more generally (see section 3.1). In the long term this will lead to changes in land use which may have an effect on the hydrological cycle (e.g. an increase in built-up areas, increasing the risk of flooding; decreased hill slope management in rural areas, potentially increasing the risk of erosion), while rising numbers arriving in urban areas without climate-proof plans for expansion run the risk of increasing the number of people living in poor-quality, highly-exposed housing in disaster-prone areas.

One of the major signifiers of vulnerability is poverty: people with few economic resources are often far less able to cope when disaster strikes, and less able to adapt to changing circumstances. They also tend to be more dependent on incomes which are highly climate-sensitive, such as agriculture. These jobs are often part of the so-called “grey market” , the unofficial economy of unrecorded transactions that provide income for a large proportion of the least well-off. Seasonal and unofficial workers are less likely to have access to social safety nets; they are also likely to have low levels of education and few qualifications, thus preventing them from easily changing employment if their livelihood is damaged by climate change. This is true especially in Croatia and Montenegro, where the economy (especially the rural economy) is dependent to a large extent on agriculture (especially Croatia) and tourism[33].

Trend	Croatia	FYR Macedonia	Montenegro	Serbia
Population	4,418,000	2,060,000	632,000	7,291,000
Rate of population growth %	-0.3	0.2	0.2	-0.4
Urban population %	58	68	60	52
Annual urban population growth %	0.2	0.9	-0.4	-0.1

Table 3: Population indicators (2010) in Croatia, FYR Macedonia, Montenegro and Serbia. Source: World Bank

2.2.2 Key vulnerable groups

The following groups are likely to be particularly vulnerable to the negative impacts of climate change.

- **Those living below the poverty line:** The number living below the poverty line in each country has increased since the financial crisis of 2008.

32 IPCC, 2007b

33 UNDP, 2008

For these people, increases in food or energy prices caused by climate change. Poverty levels are notably higher among rural communities[34].

- **The Roma:** Officially, Roma comprise of 0.21% of the population of Croatia, 2.66% in FYR Macedonia, 0.42% in Montenegro and 1.44% in Serbia ; however, unofficial estimates put the true number at three or four times this. Although a broad and diverse group, this ethnic minority is on average far more likely to be living below the poverty line and to suffer from social exclusion including low education levels. They are considerably more likely to be living in low-quality housing (including urban slums), thus making them more vulnerable to extreme weather and disasters.[35]

- **The elderly:** Not only are the elderly more likely to be living in poverty, but they are more vulnerable to disease and health risks from extreme weather such as heat waves. Demographic trends point to aging populations in all four countries, so increasing numbers are likely to be affected by heat waves and extreme high temperatures in this way[36].

- **The chronically ill and disabled:** Like the elderly, these people are more likely to be poorer, and are similarly disproportionately affected by extreme high temperatures and heat waves. They are also less able to evacuate quickly in case of disasters such as floods or wild fires.

Further research is necessary to identify the most vulnerable groups and examine to what extent their livelihoods will be damaged by the impacts of climate change and how climate change will affect their health and livelihoods. Changing demographics and society will also cause the profile of vulnerability in each country to change. However, the identification of vulnerable groups is of crucial importance for successfully adapting to climate change at every level of society.

34 UNDP, 2008
35 UNDP, 2006
36 IPCC, 2007b

3. Sectoral impacts of climate change

This chapter will examine the potential impacts of climate change and extreme weather on various sectors in the four countries. Rather than attempt a comprehensive discussion of the impacts of climate change on every aspect of the economy, each national CSO network on climate change adaptation identified areas which were of particular concern within their country. The selected priority areas were agriculture and forestry (all countries), biodiversity (Serbia only), disaster risk reduction and civil protection (all countries), energy (all countries), tourism (Croatia) and water resources (all countries). Each subsection provides an overview of the situation across all four countries, identifies potential vulnerabilities and proposes adaptation solutions which could be taken to bridge the identified adaptation gaps.

The sector-specific recommendations have largely been drawn from the national CVA reports developed in each country, which were in turn developed by the expert authors with input from the CSO network members of each country's climate change network under SEEFCCA. There are obvious linkages between several of the sectors: water resources are clearly relevant to almost all the other sectors, especially health, energy (given the importance of hydropower in the region) and agriculture. Meanwhile, agriculture and forestry are closely linked to biodiversity, as is tourism. Recommendations for one sector may end also up benefiting another in a clear example of "win-win" adaptation (see section 1.2).

3.1 AGRICULTURE AND FORESTRY

3.1.1 Overview of agriculture and forestry in the region

Although declining in economic importance, agriculture remains an important sector in all four countries, accounting for a considerably proportion of the labour market, especially in Serbia and FYR Macedonia (see Table 4).

	Croatia	FYR Macedonia	Montenegro	Serbia
% GDP (2011 est.)	5.5	9.5	0.8	12.3
% labour force (2010) *(2008) ɣ(2011)	5*	19.9	6.3ɣ	21.9

Table 4: Percentage of national GDP obtained from agriculture (source: World Bank) and percentage of labour force employed in agriculture (source: CIA Word Factbook)

Agriculture is most important in Serbia. Serbia is a net exporter of vegetables, and also exports considerable amounts of cereals to the EU. All other countries import most of their food, and food security is a rising concern.[37] Important crops in all four countries are fruit and vegetables, especially grapes, while livestock rearing is most important in Montenegro, where it accounts for 60% of its agricultural output[38]. Limited amounts of land are irrigated, but the inefficiency of irrigation can be considerable: 40% of FYR Macedonia's annual freshwater withdrawals are used to irrigate 25 % of its arable land.[39]. There is as yet limited penetration of drip-irrigation and other water-conserving techniques.

All four countries still have large rural populations, and

37 Lampietti *et al.*, 2009

38 Government of Montenegro, 2010

39 Government of the former Yugoslav Republic of Macedonia, 2008

the majority of farms are small and family-owned (with an increasing number of larger commercial operations in Croatia[40]). This means that the actual number of people involved in agricultural work may be much higher than recorded in Table 4, since as it is so low-paid, and often unofficial (e.g., for family members), the work is not always recorded. The small size and non-commercial nature of most farms means that they are often inefficient, with limited technical and financial capacity to take new approaches. In Croatia, farming is increasingly unattractive to the younger generation, so that the age of the farming population is gradually increasing, while rural areas continue to decline economically. The lack of employment opportunities in areas other than agriculture in rural areas is hastening their economic decline and fuelling rapid urbanisation[41].

A high percentage of all four countries is forested (as much as 54 % in the case of Montenegro)[42], most of which is state-owned. Areas of concern in the forestry sector surround illegal logging and subsequent slope degradation, leading to potential flooding (Montenegro and FYR Macedonia), and forest fires, which have been a frequent occurrence in all countries since independence (see section 2 above)[43]. The especially damaging forest fires in FYR Macedonia in 2007 were associated with a major heat wave, potentially foreshadowing likely condition over the coming century. The state of forestry management varied between the countries: Montenegro has no up-to-date survey of its forestry resources, while Serbia's 2006 National Forests Development Strategy lays out a detailed strategy for developing the forest sector, including efforts to manage the effects of climate change[44].

3.1.2 Climate change impacts and vulnerabilities

While crop yields are expected to increase overall across Europe due to the effects of climate change, with the exception of the northwest part of Serbia, the opposite effect is predicted in South East Europe[45]. Warmer temperatures, more frequent and longer droughts and heat waves causing heat stress are all predicted to have a largely adverse effect on crop yields: projections suggest that crop yields will decrease by up to 30% by 2100 under the worst case scenario[46]. Poor farming practices combined with higher rates of evaporation from the topsoil and more intense rainfall produce conditions where soil erosion and degradation are major threats, ultimately having a negative impact on crop yields[47]

Similarly, the warmer temperatures will decrease the reproductive cycle of some common pests affecting crops and livestock[48],while vector-borne pests not currently indigenous to the region (e.g. West Nile fever, Rift Valley fever etc.) will become more common, increasing pressure on crops and livestock.

Certain crops which are currently non-irrigated (e.g., many vegetables) will be forced to become more dependent on extra water; however, the predicted water shortages (see section 3.7 below) in the second half of the century mean that there will be much less water available for irrigation, requiring either the adoption of more efficient irrigation technology or for farmers to switch to more drought-resistant species.[49]

Food security is an increasing concern, as lower yields (particularly of winter wheat) will require greater food imports, which could seriously affect food prices, with negative consequences for the economy more generally. Rising food prices are likely to hit the poorest (many of whom live in rural areas) the hardest.

Another major concern is the low adaptive capacity among the majority of the region's farmers: small farms are usually less able to cope with climatic uncertainty and absorb losses than commercial operations. Low levels of technical agricultural knowledge among farmers prevail, many of whom have low levels of education, which means that the capacity to develop new approaches is limited[50]. Without opportunities for livelihood diversification, the economic decline of rural areas will continue, and rural depopulation is likely to accelerate, pushed by increased losses attributable to climate change.[51]

40 UNDP, 2008
41 Government of Croatia, 2009
42 Government of Montenegro, 2010
43 *Ibid.*
44 Government of Serbia, 2010.
45 IPCC, 2007b
46 EC, 2007
47 Lampietti *et al.,* 2009
48 *Ibid.*
49 *Ibid.*
50 UNDP, 2008.
51 *Ibid.*

The major concern for the forestry sector in all countries is the increasing risk of forest fires. In the past decade, forest fires have destroyed thousands of hectares in each country, and the conditions present under the new climate regime will make the incidence of this kind of hazard even more likely[52]. Climate change is also likely to change the species make-up of forests, and cause forests to expand to higher altitudes[53] (see section 3.2).

3.1.3 Recommendations

- **Conduct national vulnerability assessments of agricultural sector:** An in-detail effort to map the risks to the agricultural sector caused by climate changing, including an exact assessment of the impacts of crop yields and an vulnerability analysis of low-income rural households is the first step in developing a comprehensive adaptation and food security strategy for the agricultural sector. For agriculture in particular, the earlier such a strategy is adopted, the more likely it is to be successful.[54]

- **Strengthen linkages between the hydrometeorological and agricultural sectors:** Farmers have specialised climate information requirements, and may not be aware of the services offered by national hydrometeorological services. Increase research into new ways of obtaining useful information e.g. using remote sensing data to monitor soil fertility and water levels (see section 4.5).

- **Support farmers to improve sustainability and adapt to climate change:** This is particularly important for small farmers who may have difficulties accessing information about new farming techniques or crop diversification. It includes making capital and new technologies more available to farmers, promoting organic and sustainable farming techniques (including those that minimise soil degradation), especially for family farms, strengthening legislation surrounding food safety and animal health, encouraging the diversification of agricultural production and investigating the potential use of cereal for energy production, and exploring options for biofuel production.

- **Encourage sustainable rural development:** Improve rural infrastructure, provide support for livelihood diversification beyond farming and encourage sustainable rural tourism.

- **Improve irrigation efficiency:** Although only limited areas of most countries are irrigated at the moment (see section 3.6) this is likely to increase in the future. More efficient irrigation techniques such as drip irrigation will reduce this water usage significantly, while switching to crops which are less water-intensive to produce is another way to decrease water usage.

- **Integrate climate change concerns into forest management:** This would include selecting species for drought resistance, and developing early warning systems for forest fires, as well as conducting comprehensive inventory surveys of the forestry sector.

52 IPCC, 2007b.

53 Government of the former Yugoslav Republic of Macedonia, 2008

54 Lampietti et al., 2009

3.2 BIODIVERSITY

3.2.1 Overview

The Balkan peninsular has been recognised by the EU as one of the most diverse areas of Europe in terms of plants and animal species[55]. It encompasses a wide variety of ecosystems and habitats, including alpine, grasslands, wetlands, forests and freshwater and marine environments.

All four countries have protected certain areas as national parks as shown in Table 5. In addition to terrestrial protected areas, Croatia has also protected 3.4 % of its territorial waters, and Montenegro 0.8 %. These are relatively low levels of protection by European standards. Even so, enforcement of such protection is often limited, and issues such as illegal logging are still very much a concern, in Montenegro and FYR Macedonia in particular.

55 Sekulić, forthcoming

	Croatia	FYR Macedonia	Montenegro	Serbia
% land area protected (2010)	13.0	4.9	13.3	6.0

Table 5: Percentage of total protected land area. Source: World Bank

All four countries are signatories to the International Convention on Biodiversity, and have national strategies and action plans devoted to preserving biodiversity in the region.

3.2.2 Climate change impacts and vulnerabilities

There is still limited knowledge as to how many ecosystems react to climate change. Given that ecosystems in the region are already under considerable anthropogenic pressure, climate change is likely to exacerbate this. Current understanding suggests that most ecosystems are resilient to a certain level of climate change, but once that level is exceeded, collapse can occur relatively easily[56].

Hotter and drier conditions are likely to result in many species of plants and animals shifting their range northwards, especially reptiles and amphibians. Vegetation zones are likely to shift northwards and to higher altitudes, while the range of various animal species will also change, including the range of damaging invasive species, some of which may be damaging to human or animal health. Already the Asian Tiger Mosquito (*Aedes albopictus*), vector for diseases including yellow fever and dengue fever, has been reported in the region (see section 3.4)[57]. FYR Macedonia in particular has a relatively high number of invasive species (non-native species which often displace similar native species or cause damage to ecosystems).

Ecosystems especially vulnerable to climate change include wetlands and coastal zones. Any rise in sea level would have a considerable negative impact on coastal ecosystems in Croatia and FYR Macedonia; coastal erosion, soil and groundwater salinization, inundation of fragile wetlands and delta ecosystems are a serious risk .Increasing concentration of water pollutants as a result of decreasing surface runoff and peak flow (see section 3.6) will negatively impact freshwater ecosystems. Alpine zones are also extremely vulnerable, since temperature rises expected to be more dramatic at higher altitudes, and the flora and fauna will have fewer refuges than lower-altitude species.

3.2.3 Recommendations

- **Develop indicators for monitoring biodiversity health:** A set of indicators should be developed to monitor climate change impact on biodiversity in the region, including identification and monitoring of invasive species and bell-weather species which may be able to give an indication of reaching dangerous climate change. This will also involve working closely with water and agriculture/forestry authorities to monitor water quality, biodiversity in aquatic ecosystems, and a healthy balance of species that are amenable to climate change in the forests.

- **Research biodiversity climate change impacts:** Currently there is limited information and data available surrounding the impacts of climate change on biodiversity in the region, and research urgently needs to be conducted to fill these knowledge gaps.

- **Increase protected areas:** Given the strength of the biodiversity in this region, the percentage or protected areas should be raised, especially in biodiversity hotspots. The connectivity of protected areas should also be improved so that the migration routes of native species are preserved.

- **Awareness-raising on the issue of biodiversity and climate change:** This should take place at all levels among the public, business, government and industry.

- **Encourage sustainable ecotourism in protected areas:** Especially in Montenegro and Croatia, increasing numbers of tourist are likely to be visiting inland national parks (see section 3.5). Sensitively-developed, sustainable ecosystems provide a way to raise public awareness of national parks and biodiversity, while providing income for their upkeep.

56 IPCC, 2007b

57 Laušević *et al.*, 2008

Figure 6: Amphibian larvae in dried-out pond.
Photo credit: Environmental Improvement Centre

Relocation of amphibians in Serbia

During 2011, activists from the Environmental Improvement Centre in Belgrade organised the monitoring of local amphibian populations in the area of Bojcin Forest, not far from the city. In the period from April to September, the following species of amphibians were monitored: Smooth Newt (*Lissotriton vulgaris*), Danube Crested Newt (*Triturus dobrogicus*), Common Toad (*Bufo bufo*), European Green Toad (*Pseudepidalea viridis*), Common Spadefoot Toad (*Pelobates fuscus*), European Tree Frog (*Hyla arborea*), Agile frog (*Rana dalmatina*), Marsh Frog (*Pelophylax ridibundus*). During the driest part of the summer, many of the smallest ponds began to dry up completely, threatening the wellbeing of amphibian larvae. As a result of their close observation of the habitat, volunteers from the Center Environmental improvement were able to move the larvae to larger ponds which were less likely to dry out. As a result of this action, around 500 amphibian larvae were moved into safer environment. This action underlines the importance of volunteers for monitoring how biodiversity is changing in each country. Accurate data concerning the occurrence of native species is crucial for monitoring a healthy level of biodiversity, and since newt species are protected in Europe and are threatened by habitat loss, monitoring the levels of these amphibians was particularly significant.

Source: Environmental Improvement Centre and Sekulić, forthcoming

3.3 ENERGY

3.3.1 Overview of energy in the region

Domestic energy production is all four countries is still primarily coal-based, with hydropower also significant in most countries, and a very small percentage of other renewable sources in Serbia and Croatia. There is some natural gas production in Croatia and Serbia, but none in FYR Macedonia and Montenegro. The majority of oil and natural gas used by each country is imported; however, considerable oil shale resources have recently been uncovered in the Aleksinac region of Serbia, and investigations into exploiting this potential are ongoing[58]. No energy is generated from nuclear power in the region.

Energy security is a matter of considerable concern. All four countries import considerable amount of their energy (see Table 6); Serbia, Montenegro and FYR Macedonia are all primarily supplied with gas via the volatile Ukraine-Russia pipeline, and several times in recent years gas supplies have been cut when there has been tension between those two countries (as happened in 2009).

The percentage that domestic power production is drawn from hydropower ranges from 7 % in FYR Macedonia to 9% in Serbia and 14 % in Croatia[59], plus limited quantities of small hydropower (no disaggregated data is available yet for Montenegro from the IEA in this area). Only limited amounts of energy are produced from non-hydropower renewable sources. While all four countries have considerable potential in terms of wind, solar, biomass and even geothermal energy, so far this has only been explored to a very limited extent by Croatia (wind) and Serbia (biomass). In terms of private energy use for cooking and heating, many rural households use wood-burning stoves, and there tends to be a much higher use of this kind of fuel when electricity prices are high. In very cold weather, the cost of fuel wood can become even more expensive per unit than electricity, prompting a

	Croatia	FYR Macedonia	Montenegro	Serbia
Energy imports as % of energy use (2009) *2005	53	42	40*	35

Table 6: Energy imports as a percentage of total energy use.
Source: World Bank

58 See "The Dark Side of Serbia's Oil Shale Fairy Tale" (http://ipsnews.net/news.asp?idnews=106490)

59 Source: IEA www.iea.org/stats

sharp spike in demand at the very coldest times of year for electricity for heating.[60]

Awareness among the general public and the business community of the importance of energy conservation is generally low across the region. Labelling of energy-efficient appliances is poor, and there is little in the way of external pressure to encourage businesses and industry to engage in energy conservation. Awareness-raising in this area will be crucial to decrease overall energy consumption.

3.3.2 Climate change impacts and vulnerabilities

Extreme weather has historically caused problems for energy infrastructure. Droughts have already hit the hydropower production very hard, causing blackouts when there was not enough water in reservoirs for the power stations to function. Meanwhile, the cold wave which hit South East Europe in early 2012 underlined the vulnerability of the power network in all countries to extreme weather. Thousands of people suffered power blackouts as electricity lines were severely affected by the above-average snowfalls in much of the countries.

The dramatic reduction in surface runoff predicted over the next decades (up to 25% by 2050, and up to 36% by the end of the century)[61] should be a major cause for concern, particularly in Montenegro, where a high percentage of energy is derived from hydropower. Current investment in new hydropower projects may prove poor value for money if they end up running at a small fraction of their total capacity, and blackouts are possible if this occurs. Hydropower projects also have significant detrimental effects on the environment of river basins, and should be carefully considered for this reason. In addition to decreasing hydropower production, water shortages may also have a negative effect on thermal power production, due to the increasing scarcity of water for cooling purposes[62].

Warmer winter temperatures are likely to reduce the energy demand for heating at this time of the year; however, this is likely to be offset by the rise in demand for cooling during the summer. Aging populations are also likely to raise the demand for energy for both heating and cooling[63]. Projected energy demands are due to rise overall by 2030 due primarily to increasing demands from business and industry[64]. The declining hydropower output combined with the increasing demands for energy means that more energy will have to be imported, potentially resulting in more volatile prices, and adverse consequences for the poorest members of society.

3.3.3 Recommendations

- **Conduct thorough vulnerability assessment of the energy sector:** In order to establish investment priorities, a thorough investigation of vulnerability of existing energy infrastructure and distribution network to climate change and extreme weather, including natural disasters, needs to be undertaken by national governments.

- **Invest in the electricity distribution network**: The highly centralised nature and aging infrastructure of the power distribution network in all four countries leaves it vulnerable to extreme weather, while encouraging micro-energy generation projects. Further decentralization of the energy sector would improve its resilience to extreme weather events.

- **Increase investment in non-hydropower renewable energy:** Croatia has some facilities for wind power, and Serbia and Montenegro for solar and geothermal power; however, so far they have attracted limited investment and provide only small fractions of the total energy used so far. Given that the goal of the EU is ensure that members obtain 20 % of all of their power from renewable resources by 2020, this should be a key area for investment, and the development of renewable energy should be incentivised.

- **Reduce in hydropower dependency**: The current trend of blackouts caused by water shortages mean that the hydropower capacities of all four countries will only decrease in the future. Planned new hydropower developments should be carefully examined to establish if they really will provide long-term benefits, while existing hydropower

60 IEA, 2008
61 IPCC, 2007b.
62 *Ibid.*
63 IPCC, 2007b
64 USAID,2008

plants should be modified to be more energy-efficient with less flow.

- **Focus on energy conservation and efficiency:** This should become a national priority in each country in the region. Awareness-raising on the part of business and the public of the importance of these approaches, and for energy efficiency to be part of new planning and development. The importance of energy efficiency in all sectors should be incorporated in educational curricula, and better availability and marketing of energy-saving appliances, national awareness-raising campaigns surrounding energy efficiency in homes and businesses to reduce overall energy consumption.

- **Promote the use of public transport:** Encourage the use of public transport through investment in and extension of the network, including the development of a system of bike paths; encourage the the usage of fuel-efficient or electric vehicles; establish financial incentives for the use of more fuel-efficient vehicles, including hybrid and electric cars, to help minimise the emissions of greenhouse gases.

Figure 7: Solar powered bicycles in Podgorica. Photo credit: Government of Montenegro

Solar-powered electric bicycles in Montenegro

Energy is a key issue Montenegro: the country still relies heavily on coal and oil, much of which is imported, and on hydropower, which, while a renewable resource, is likely to become less reliable as the climate changes. It also has considerable potential to develop other forms of sustainable energy, including solar power. However, public awareness surrounding this issue is low.

In 2010 the Montenegro Office for Sustainable Development in cooperation with the German Agency for Technical Assistance (GTZ) opened a station for solar-powered electric bicycles in Podgorica. The bicycles were charged by solar panels installed on the roof of the station, and were made available to the public to rent. The aim of opening this station was to promote solar powered bicycles as a means of sustainable transportation, and of solar power as an effective energy source. In addition, the solar station was envisaged as an educational space where citizens could learn about practical uses of solar energy. It was also possible to charge electrical appliances at this station via solar power.

As well as promoting the use of sustainable development and encouraging the use of public transport, the solar station provided an important role in raising awareness of the potential for solar energy in Montenegro, as well as the importance of developing renewable energy sources more generally. Sustainably powered local energy solutions will be key to Montenegro's development as an environmentally conscious nation.

Source: Pavićević, forthcoming

3.4 HUMAN HEALTH AND CIVIL PROTECTION

3.4.1 Overview of health and civil protection in the region

The health system in the region suffered from a major lack of investment in the 1990s; investment has since increased, but healthcare systems still suffer from a lack of funds, and hospital infrastructure is aging and, in many cases, decaying. Aging hospitals require considerable investment to bring them up-to-date; however healthcare expenditure in real terms is limited. Healthcare human resources are good, with high-level medical training in all four countries. Climate change and environmental health appears on the curricula of medical schools as an option in both Serbia and Croatia.

Trend	Croatia	FYR Macedonia	Montenegro	Serbia
Healthcare expenditure % GDP	7.8	7.1	9.1	10.4
Life expectancy at birth	76	75	74	74
Total population aged 65 or above %	17	12	12	14

Table 7: Key health indicators (2010) for Croatia, FYR Macedonia, Montenegro and Serbia. Source: World Bank

The population profile of all four countries is changing: the rate of population increase has dramatically slowed since 1990 for Montenegro[65] and FYR Macedonia[66], while the population is declining in Croatia and Serbia. As birth rates decline, life expectancy is rising in all four countries, and the percentage of population over 65 is currently increasing (see section 2.2), and is likely to continue to do so, with a likely associated rise in demand on the healthcare system.

As a result of the SEEDRMAP project (see section 4.1), civil protection and emergency response has become more centralised in all four countries. However, there remains a persistent attitude among officials in many countries that disaster risk management should focus primarily on disaster preparedness and response, rather than taking the next step towards integrating disaster risk reduction concerns into the planning and development process. While early warning systems exist, they sometimes operate in a piecemeal manner and do not always disseminate warnings efficiently. There are no specific emergency plans in place for particular hazards that include the health sector (although efforts are currently being made to design a heat wave emergency plan), and the ministries responsible for health in each country are not heavily involved in preparations for climate change.[67]

3.4.2 Climate change impacts and vulnerabilities

The rise in the number of warm days and the rising risk of heat waves are of major concern. An increase in the number of deaths occurs even at relatively modest temperatures; however, heat waves can cause significant numbers of deaths, even after the population acclimatises[68], and morbidity in South East Europe during heat waves has been dramatic on several occasions during the past twenty years(see section 2.3). Heat waves are particularly dangerous for the elderly, chronically ill and disabled[69]. Higher temperatures are also likely to lead to an increase in the number of water and food-borne diseases (e.g. salmonellosis and gastro-intestinal infections), to which children are especially vulnerable, while water quality may also suffer from algal contamination and concentration of pollutants (see section 3.6). Warm and dry conditions causing an increased abundance of pollen is likely to lead to a rise in allergic reactions[70].Air pollution causing respiratory problems may increase in summer, but decrease in the warmer winters. A rise in the incidence of skin cancer is likely with more sunny days.[71]

Cold weather deaths are usually a result of higher rates of respiratory infection and poor housing and heating[72]; deaths due to these causes are likely to decline as winters become warmer and extreme low temperatures occur less frequently. However, the shorter, warmer winters increase the likelihood of pest survival over winter, leading to a rise in vector-borne diseases, both currently endemic (such as tick-borne encephalitis) and as yet

65 Government of Montenegro, 2010
66 Government of the former Yugoslav Republic of Macedonia, 2008
67 SEEDRMAP, 2011d
68 IPCC, 2007b
69 *Ibid.*
70 *Ibid.*
71 *Ibid.*
72 *Ibid.*

unknown. Although the WHO advises that the spread of malaria in Europe is unlikely, isolated cases may occur[73].

The rise in frequency and intensity of natural hazards as a result of climate change is discussed in detail above (see section 2.2). However, with aging populations projected and elderly people are more likely to be affected more severely, the number of hospital admissions as a result of natural disasters appears likely to increase.

3.4.3 Recommendations

- **Fully incorporate disaster risk reduction concerns into future planning and development:** The key to successful disaster risk management and climate change adaptation is to bring them in at the planning stage, and include them in development strategies in order to "climate-proof" development. This could include comprehensive hazard risk mapping for each country.

- **Develop emergency plans for effective early warning systems for health risks of climate change:** The development of effective national EWS for heat waves, cold waves, floods and forest fires should be a priority, as well as mechanisms for detecting outbreaks of new diseases that may become prevalent as a result of climate change. A key area to focus on dissemination of the message, possibly an area where the state and CSOs could work together.

- **Awareness-raising of the health risks from extreme weather and climate change:** This is an important corollary to the previous recommendation: without a high level of public awareness of the health risks from extreme weather, they are unlikely to heed emergency warnings. This is crucial for both health professionals and the general public, and should include cooperation with media outlets for dissemination of this important message.

- **Enforce legislation concerning air pollution:** As development continues, air quality levels are likely to decrease. Developing and enforcing robust legislation concerning air quality and emissions from industry is important to prevent detrimental impacts to respiratory health. An early warning system based on air quality indicators would also be useful.

73 IPCC, 2007b

Case study: Preparing for heat waves in FYR Macedonia

Heat waves will be an increasing risk across the region as temperatures rise over the coming decades. Already, when they occur, they result in a considerable increase in the number of deaths and hospital admissions. In 2011, the Macedonian Red Cross (MRC) began to cooperate closely with the national government and the national WHO office to help prepare the population for the threat of heat waves. The intervention was particularly targeted towards vulnerable groups; in particular, the elderly, who are more vulnerable to heat waves than the general population.

In the course 2011, the MRC became active in raising awareness of the importance of suitable preparation for extreme high temperatures and heat waves in a number of ways. Information was distributed via electronic and print media: 120, 000 fliers were printed and distributed, containing preparedness information, with a focus on elderly people, healthcare practitioners and the managers of social institutions.

The MRC also held public lectures on the consequences of heat waves targeted at high-risk groups, including the elderly, manual workers and pregnant women, and maintained a free SOS telephone line for information about heat waves. On a more practical level, the national society distributed free bottled water during the hottest days.

Figure8 : Macedonian Red Cross volunteers handing out water during hot weather. Photo credit: Macedonian Red Cross

This initiative illustrates the way that civil society can complement the work of the government in awareness-raising, dissemination of information during a crisis and practical support of the general population during extreme weather and disasters. Closer cooperation between the state and civil society is likely to result in more efficient programmes and provide a platform for developing future initiatives.

Source: Macedonian Red Cross, 2012

3.5 TOURISM

3.5.1 Overview of tourism in the region

Croatia is by some distance the most visited country in the region, attracting more than twenty times more visitors in 2010 than FYR Macedonia (see Table 8).

Trend	Croatia	FYR Macedonia	Montenegro	Serbia
Number of tourist arrivals(2010)[1]	9,111,000	262,000	1,088,000	683,000
% GDP direct contribution (2011)	11.0	1.3	7.5	1.7
% GDP total (including services etc.) (2011)	26.5	4.8	15.4	6.0
% Employment direct (2011)	12.3	1.2	6.5	1.5
% Employment total (including services etc.) (2011)	28.3	4.3	13.7	5.5

Table 8: Tourist arrivals (2010) and contribution of tourism to the economy (2011) in Croatia, FYR Macedonia, Montenegro and Serbia. Data from World Bank (tourist arrivals) and World Travel and Tourism Council economic impact reports.

Croatia and Montenegro have highly developed tourism sectors centred on the Adriatic coastline, where there is advanced infrastructure catering to mass tourism. Serbia and FYR Macedonia have much less developed industries, although this is a sector that both countries are attempting to grow. Other centres for tourism apart from the Adriatic beaches are national capitals, ski resorts, cultural attractions, vineyards and national parks.

In Croatia in particular, tourism is a huge income-generating activity, while, Montenegro in 2011 was predicted to have the most rapidly-expanding tourism sector in the world over the next ten years[74]. More recently, there have been efforts made by these countries developing inland destinations in addition to the coast, but at the moment, the vast majority of visitors come to visit the beaches (in Montenegro in 2009, tourists staying in the mountainous areas in the north of the country accounted for just 2% of the total[75]). The high percentage of the economy and labour force that depend on tourism in Croatia and Montenegro mean that both countries were hit hard by diminishing tourist receipts in the wake of the 2008 economic crisis. Many people working in areas benefitted by tourism do so as part of the unofficial economy, in low-paid jobs with limited or no job protection[76].

74 WTTC,2011

75 Government of Montenegro, 2010

76 UNDP, 2008

3.5.2 Climate impacts and vulnerabilities

As the coast accounts for such a disproportionately large amount of the tourism industry in Croatia and Montenegro, these two countries will be hit most severely by rising temperatures. Rising temperatures in the whole Mediterranean are likely to lead to a gradual decrease in summer tourism, as tourists head further north. However, tourism earlier and later in the season may increase, resulting in a more even spread of tourists throughout the year. Tourist infrastructure along the Adriatic coast may be vulnerable to sea-level rise and coastal erosion, while warmer winter temperatures and decreased winter precipitation threatens the activities of ski resorts, especially early and later in the current in the season[77].

Many areas of tourist interest such as cultural centres and national parks are at greater risk of increased natural hazards. Not only are reports of natural hazards likely to discourage tourists from visiting, but natural hazards and extreme weather could potentially damage centres of tourism, decreasing their long-term potential. The vulnerability of cultural icons and centres of tourism in all four countries need to be protected, including from natural hazards, and an efforts to assess these risks need to be prioritised[78].

3.5.3 Recommendations

- **Encourage sustainable development in the tourism sector:** New tourist developments and infrastructure should be planned with minimal environmental footprints, with consideration given especially to ecologically sound waste-management and the use of renewable energy (including installation of solar panels on new buildings). At

77 IPCC, 2007b

78 Government of the former Yugoslav Republic of Macedonia, 2008

the same time, projected rises in temperature mean that greater efforts should be made to design buildings with efficient cooling systems. Sustainable ecotourism should be a key area targeted for growth; rather than focusing on large-scale coastal developments, planners have the opportunity to develop lower-impact, more sustainable ecotourism in national parks.

- **Conduct a thorough risk assessment of tourist assets:** Major cultural, environmental and other touristic sites should be the subject of a thorough climate and natural hazard risk assessment, and arrangements made to safeguard these assets from any potential risks.

- **Provide state support to private sector adaptation measures:** Provide resources and make information available to the private sector about how to best adapt to climate change in this sector, targeting smaller private entrepreneurs in particular who may have less support than large commercial enterprises.

- **Explore diversification options:** To compensate for income lost from tourists staying away during hotter summers or from failure of climate-dependent activities such as skiing, operators might diversify through changing or expanding the tourist season or (e.g. skiing resorts could explore diversification into outdoor activities (hiking, horse-riding, rafting etc.) or spa tourism). Croatia and Montenegro in particular should begin to encourage and develop tourism in their interiors.

3.6 WATER RESOURCES

3.6.1 Overview of water resources in the region

Freshwater resources in the region are unequally split between the four countries. Major river basins include the Sava (in Serbia and Croatia), the Drava (Croatia) and the Danube (Serbia and Croatia); Montenegro and FYR Macedonia also have many smaller watercourses. The largest freshwater lakes are Ohrid and Prespa in FYR Macedonia (also shared with Albania and Greece respectively),and Skadar in Montenegro (also shared with Albania). Croatia and Montenegro both have long coastlines. Since most of the main rivers and lakes in the region cross international boundaries, serious international cooperation for transboundary water management is necessary. Many watercourses are used for the generation of hydropower (see section 3.3).

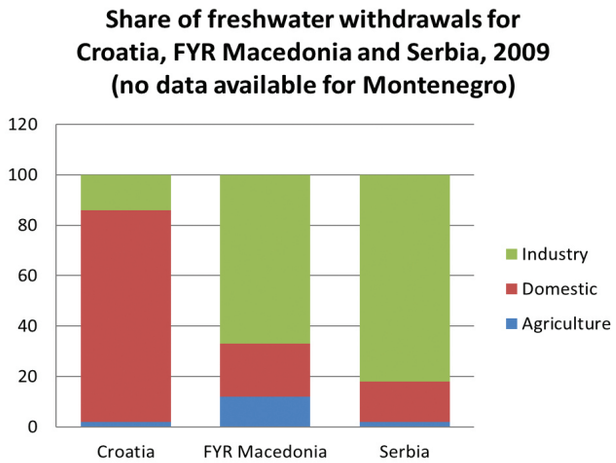


Figure 9: Share of freshwater withdrawals for various sectors in Croatia, FYR Macedonia and Serbia (no data available for Montenegro). Source: World Bank

While Croatia and much of Montenegro are adequately supplied with water, the northern part of Serbia has significantly fewer water resources than the south (and is also where the demand for irrigation is greatest[79]), while FYR Macedonia has per capita available freshwater resources significantly below the European average[80]. Currently, freshwater withdrawals for agriculture are limited, with the highest being in FYR Macedonia. Industry makes up the greatest percentage of withdrawals in both FYR Macedonia and Serbia, while Croatia withdraws far more for domestic usage.

Although all four countries have very high levels of access to clean drinking water, the water distribution networks are aging and considerable amounts are

79 Government of Serbia, 2010.

80 Government of the former Yugoslav Republic of Macedonia, 2008

lost through leakage. Freshwater quality is declining in many places throughout the region due to poor quality waste water management, and water pollution of agricultural drainage and industry is a problem in all countries. In Serbia, only 12% of municipal waste water is treated[81], and similarly low levels are treated in Montenegro and FYR Macedonia[82].

3.6.2 Climate change impacts and vulnerabilities

Climate change will have a severe effect on water availability in South East Europe. By the end of the century, surface runoff is due to decrease by up to 36%, with reduced peak summer flows by up to 80%. A decline in precipitation during the winter is likely to disrupt groundwater discharge, resulting in even less fresh water availability[83]. Although precipitation is projected to decrease by the end of the next century, the risk of flash-flooding will rise in the short term due to more intense bursts precipitation, potentially causing considerable losses to the agricultural sector (see section 3.1). Water shortages are likely to be exacerbated by the poor quality of the current water distribution network.

While freshwater availability declines, there will be greater demands for water for irrigation purposes (see section 3.1). Freshwater withdrawals for farming are likely to increase significantly. At the same time, water quality is likely to decline for two reasons: firstly, the low rates of flow in water courses will raise the concentration of pollutants which are already present. Secondly, rising temperatures increase the risk of algal growth in water supplies, contaminating them for drinking purposes. Climate change is likely to bring with it a rise in the incidence of water-borne diseases (see section 3.4). Many water treatment plants are aging and inadequate for the current purpose, and there is often limited capacity to adequately monitor the water quality[84]. Meanwhile, the demand for drinking water is also likely to rise, putting further pressure on water distribution networks.

81 Government of Serbia, 2010

82 Government of Montenegro, 2010

83 IPCC, 2007b

84 World Bank, 2004

3.6.3 Recommendations

- **Repair and extend water distribution network:** Currently a high volume of water in the region is lost through leakages within the water distribution network. Aging infrastructure needs to be repaired in order to minimise this loss in the future. At the same time, the network should be extended to fully cover rural areas, so that all citizens have access to safe, piped drinking water.

- **Develop better water quality standards and monitoring:** The water quality across the region could be improved by closely monitoring the water supply and developing improved standards for water quality. Careful monitoring of water levels and availability is also key for developing effective risk mapping for droughts and floods.

- **Improve waste water management and treatment**: Currently there are limited water processing plants, particularly in smaller settlements. The construction of more waste water treatment plants would also help improve the water quality.

- **Increase the water efficiency of business, industry and private homes:** The efficient use of water in all sectors can be promoted via legislation and awareness-raising campaigns about the benefits of water conservation, recycling grey water etc. Awareness-raising on this issue should be conducted at all levels via the state and civil society.

- **Encourage sustainable eco-tourism around water bodies:** This will provide an economic incentive to keeping water bodies well-maintained and free from pollution (see also section 3.5).

- **Cross-border cooperation and basin management:** In order to manage water quality, ecosystem health and flooding risk on a regional level, the promotion of integrated basin management approaches to major rivers should be encouraged (e.g. basin management of the Danube).

4. Addressing climate change in South East Europe

4.1 AWARENESS OF CLIMATE CHANGE

Developing effective policies to address climate change is difficult without a high level of public awareness and support of the issue, and reasonable levels of understanding among policy-makers and supporting CSOs. Awareness is often limited among policy-makers and opinion-leaders. While technical specialists have a deep understanding of climate change, for the majority of state actors, climate change is an issue that has only recently begun to be a part of the political landscape. Although general awareness of the issue of climate change appears to be rising, specific knowledge at a more detailed level (e.g. the link between climate change and natural disasters, details of the impacts of climate change in various sectors) is limited. This means that institutional capacity to deal with climate change issues is often low, as has been noted in Montenegro[85] and Serbia[86] in their most recent national communications on climate change.

Awareness among civil society is increasing, with more and more CSOs in each country taking an interest in environmental issues (see section 4.4). However, levels of awareness among business and industry remain low, and these are unlikely to change until external pressure (from government and society) becomes significant enough to encourage business to actively engage with environmental issues.

More detailed surveys in Croatia and Serbia[87] indicated that while among the public more generally there is a relatively high level of interest in environmental issues and problems caused by climate change, detailed knowledge pertaining to these issues was in fact limited. In Croatia, the public also appeared generally supportive of government actions to reduce emissions of greenhouse gases[88]. The fact that all countries are taking steps to include environmental issues, including climate change on national educational curricula is encouraging, as this is an important way in which the public understanding of climate change improves.

Figure 10: Earth Hour celebrations in Belgrade in 2012. Photo credit: WWF Serbia.

Case study: Earth Hour

Confronted in 2007 with serious scientific data concerning the effects of climate change, WWF Australia began to look at new ways to take climate change mainstream. A campaign was envisioned that would be based on hope not fear, and the idea that everyone can take personal responsibility for the future of the planet we live on – Earth Hour was born.

Since its inception in 2007 in only one city - Sidney, Australia – Earth Hour has grown into the largest

85 Government of Montenegro, 2010

86 Government of Serbia, 2010

87 Government of Serbia, 2010

88 UNDP, 2008.

voluntary action for the environment in history. By the following year, 371 cities and towns in more than 35 countries around the world had joined the event. The campaign has experienced the largest growth since 2009, and in 2012 more than 6,950 cities and towns in 152 countries and territories switched off their lights for Earth Hour, sending a powerful message for action to save the planet. The year 2012 marked the continuation of the movement's commitment to going Beyond the Hour, with more than 200,000 individuals accepting the "I Will If You Will" challenge to turn their symbolic action for the planet into an ongoing commitment to a sustainable future.

Countries from South East Europe also participate in Earth Hour. The WWF has organized local events in conjunction with local CSOs in Serbia, Croatia and Montenegro. Since 2009 when the first Earth Hour was celebrated in South East Europe, the number of cities, CSOs, businesses and individuals that are taking action has grown every year. In 2012, Earth Hour was celebrated in 47 cities and towns in Serbia, 38 in Croatia and 10 in Montenegro.

The increasing participation in activities linked to Earth Hour is indicative of the rising public consciousness concerning climate change and other environmental issues in the region. By raising awareness among all sectors and showcasing ways in which everyone can get involved in adapting to climate change, Earth Hour provides a good example of the kind of initiatives necessary to produce an environment in which there is significant public will to address climate change issues.

Source: WWF, 2012

4.2 GOVERNMENT STRATEGIES ADDRESSING CLIMATE CHANGE AND DISASTER RISK REDUCTION

4.2.1 Climate change policies

All four countries have ratified the UNFCCC (Croatia as an Annex 1 party, while FYR Macedonia, Montenegro and Serbia as non-Annex 1 parties). and have submitted their initial national communications to the UNFCCC; Croatia has most recently submitted its fifth (2010) and Serbia its second (2010), while Montenegro (2010) and FYR Macedonia (2008) have both submitted their initial communication only. Currently, climate change legislation is mainly restricted to that concerned with the limitation greenhouse gas emissions, with few comprehensive strategies for climate change adaptation (with the exception of the voluntary SEECCFAP-A, see section 4.2)[89]. While the most recent national communications of all four countries have contained some proposed adaptation measures, they do not go far enough. The development of comprehensive national adaptation action plans and the integration of adaptation concerns into planning must be a priority for every country.

4.2.2 Disaster risk reduction polices

All four countries have adopted the Hyogo Framework for Action. The IPA-funded South Eastern Europe Disaster Risk Management and Adaptation Programme (SEEDRMAP, see section 4.3) has been in operation in all four countries, with the goal of reducing vulnerability to natural disasters by strengthening national DRR and adaptation strategies[90].Consequently, the development and improvement of national disaster risk platforms has been rapidly taking place over the past few years. While the broad understanding of disaster risk reduction and disaster risk management is generally good, there remains a tendency to see disaster risk management primarily in terms of preparation and response, with more weight given to the latter, than prevention[91]. More headway needs to be made in integrating disaster risk reduction considerations into future planning and development processes.

4.2.3 National environmental legislation and the EU aquis communautaire

As official candidates for EU accession (and, for Croatia, as an acceding country), all four countries must abide by EU environmental legislation, including

89 EC, 2011d

90 SEEDRMAP, 2011a.

91 SEEDRMAP, 2011b

legislation surrounding the emission of greenhouse gases and climate change adaptation. Legislation surrounding air quality, waste management, water quality, pollution and nature protection all need to be enacted and enforced before EU accession can take place. All are making progress to harmonise environmental and civil protection laws with EU standards, but the record in this regard is mixed among countries; Croatia has been assessed as making reasonable progress in most fields[92] with the exception of pollution and natural protection, which still require more work, as has Montenegro, while Serbia[93] and FYR Macedonia[94] have a considerable way to go, both in devising and enforcing environmental legislation; more funds are required in this area to enforce this legislation.

4.2.4 Government structures

The ministries and committees taking the lead on climate change and disaster risk reduction are different bodies in each country. In Croatia, the Ministry of Environmental Protection, Physical Planning and Construction, with the National Protection and Rescue Directorate is responsible for coordinating disaster response; In FYR Macedonia, the Ministry of the Environment and Physical Planning coordinates environmental policy and is the UNFCCC focal point for the country; in Montenegro the Ministry for Sustainable Development and Tourism leads on climate change, while the Sector for Emergency Management comes under the purview of the Ministry for the Interior; and in Serbia, the Ministry of the Environment, Mining and Spatial Planning, is in charge, with the Sector for Emergency Management coordinating disaster risk management. Other important ministries include those responsible for agriculture, development, rural affairs and (for Croatia and Montenegro) fisheries, and national environment agencies and environmental protection agencies.

In general, the co-operation between ministries is limited. In all four countries, administrative capacity in environment and climate change were singled out in EC reports[95] as areas where further effort was needed, while many excellent proposals languish due to poor communication between government departments and restricted cross-ministerial communication[96]. The design of more straightforward and effective governing structures is key to engaging in more efficient and productive planning for climate change and disaster risk reduction and ultimately developing truly climate-smart policies.

4.2.5 Climate and hazard monitoring, research and early warning

Data on climate and natural hazards is collected in each country by the national hydrometeorological societies, which are coordinated by the relevant ministries. Data collection comes from stations around the country; however, technical capacity is often low, with a low density of measuring stations, aging equipment and sometimes limited numbers of trained staff able to engage in high-quality data collection[97],although this is an area in which the SEEDRMAP initiative aims to build capacity (see section 4.3) . Some national hydrometeorological societies provide seasonal and long-term forecasts, but in most cases they do not reach out to end users; interested stakeholders such as farmers might be able to access useful information from these agencies, but they would have to take the initiative themselves.

The sub-regional the South East Europe Virtual Climate Change Centre (SEEVCCC), hosted in the Republic Hydrometeorological Service of Serbia in Belgrade is a good example of cross-border cooperation in this area. Established as part of the same initiative that saw the creation of SEECCFAP-A (see section 4.3) this centre coordinates research in the area of regional climate modelling and projections. The centre models future temperature and precipitation changes, along with hydrological modelling and dust forecasts from the Sahara, although modelling capacity is limited due to lack of computing facilities. Its mission includes linking science with policy in the area of adaptation planning; in this area, the VCCC is exploring various options including public-private partnerships to gain satellite remote-sensing data for hazard risk mapping and monitoring indicators such as soil moisture[98]. One potential area for regional cooperation would be in sharing supercomputing facilities in order to improve the quality of regional climate modelling.

92 European Commission, 2011a
93 European Commission, 2011d
94 European Commission, 2011b
95 See European Commission Country Progress Reports for each country.
96 European Commission, 2011d
97 SEEDRMAP, 2011d
98 See www.seevccc.rs

Closely linked with the national hydrometeorological centres is the concept of early warning. Timely early warnings of approaching hazards disseminated quickly and effectively to end users who have an emergency plan in place are crucial in minimising losses from disasters. However, while early warning systems for natural disasters are in place across all four countries, they are not always effective. While information is usually received and passed on by the national hydrometeorological society in a timely manner, an unclear information chain and, again, limited ministerial coordination, can result in slow information dispersal[99] and a lack of public awareness may result in any warning not being acted on, even by community leaders (see CRC case study, section 4.4). A more streamlined system combined with an active public awareness campaign, including close cooperation with the media, would improve this aspect of disaster risk reduction.

99 SEEDRMAP 2011a

4.2.6 Towards integration?

Although historically climate change adaptation and disaster risk reduction have been treated as separate fields, there is an increasing move to integrate the two approaches into one robust risk-management strategy that can cope with a great deal of uncertainty[100]. A more effective long-term solution to developing effective government strategies to deal with climate change and disaster risk reduction might be to combine the separate structures that currently manage disaster risk management, climate change and early warning into one body tasked with integrating climate change concerns into all aspects of future policy.

100 Mitchell and van Aalst, 2008

4.3 REGIONAL CLIMATE CHANGE AND DISASTER RISK REDUCTION INITIATIVES

- The **South East European Climate Change Framework Action Plan for Adaptation (SEE/CCFAP-A)[101]** was developed by five countries in the region in 2008 (Albania, Bosnia and Herzegovina, FYR Macedonia, Montenegro and Serbia) and signed by the ministers responsible for the environment in each country. It provides an effective action plan which covers adaptation and mitigation strategies across multiple sectors, and provides recommendations and identified priorities for action. Unfortunately, so far limited progress has been made into putting this plan into action, since as a voluntary agreement it is not binding. However, given the comprehensive nature of the document, it would be a unfortunate if it was not used as a resource to assist national governments to develop future climate change policy.

- The World Bank and UNISDR developed the IPA-unded **South Eastern Europe Disaster Risk Management and Adaptation Programme (SEEDRMAP)** in Albania, Bosnia and Herzegovina, Croatia, FYR Macedonia, Montenegro, Serbia, Kosovo (under UNSCR 1244) and Turkey to improve coordination in disaster risk management, build technical capacity in collecting and using hydrometeorological data, and develop appropriate procedures to finance disaster losses and recovery.[102]

- The **South East European Forum on Climate Change Adaptation (SEEFCCA)[103]** is an IPA-funded project aimed at developing the capacity of civil society to engage in policy dialogue and awareness-raising concerning climate change issues in Croatia, FYR Macedonia, Montenegro and Serbia. This capacity-building has been developed since 2011 through the establishment of four national CSO networks, bringing together organisations with a wide variety of expertise who share a desire to take positive steps to address

101 Available in full online at http://www.ccsd-conference.me/documents/experience-montenegro/climate-changes/South_East_European_Climate_Change_Framework.pdf

102 SEEDRMAP, 2011b

103 See www.seeclimateforum.org

climate change. Each country has developed a national climate vulnerability assessment, written by experts with the support of civil society within their country, and developed recommendations to policy makers and civil society in their countries as to how to take steps to address climate change. Four national CSO networks will develop regional and national awareness raising initiatives and advocacy strategies taking into account the results of climate vulnerability assessments.

- The **Regional Environmental Network for Accession (RENA)**[104] is an EC-managed network designed to help prepare official EU-candidate countries for accession through sharing knowledge and experience in the environmental field. Currently active in Albania, Bosnia & Herzegovina, Croatia, FYR Macedonia, Kosovo (under UNSCR 1244), Montenegro, Serbia, and Turkey, the network operates in environmental compliance, cross-border cooperation, strategic investments and planning, and, crucially, climate change.

104 See www.renanetwork.org

4.4 CIVIL SOCIETY AND THE ROLE OF THE RED CROSS

4.4.1 Civil society, climate change and disasters in South East Europe

The involvement of civil society (including NGOs and private organisations) as an active participant in and scrutiniser of the policy-making process is still in its infancy in most of South East Europe. Despite a relatively active civil society presence in each country (although in most cases centred on the capital[105]), there is limited historical precedent for such an association between the state and civil society, and in each case the relationship is still evolving.

The extent to which the state and civil society currently cooperate in this area varies considerably between the four countries. In Montenegro, state-civil society cooperation is good at high levels and improving at local levels, with increasing involvement of NGOs in the policy-making process[106]. Some rise in involvement has also been noted in FYR Macedonia[107], while state-civil society cooperation is considerably less formalised in Serbia, where public participation in environmental decision-making is particularly weak[108], and there is limited CSO involvement in state decision-making processes in Croatia, where CSOs still have difficulty obtaining ostensibly public information and are often excluded from the decision-making process entirely[109].

105 European Commission, 2011d
106 European Commission, 2011c
107 European Commission, 2011b
108 European Commission, 2011d
109 European Commission, 2011a

Partially of a consequence of the limited influence they have had in this area historically, CSOs in the region tend to focus their energy more on concrete, measurable activities such as awareness-raising, seeing themselves also as service-delivery organisations. Since local funds for local civil society are limited, many NGOs gain much of their funding from abroad. This leads to high dependencies on foreign donors and their interests.

Many CSOs, particularly the smaller ones, have limited capacity in terms of human resources , funding, and communication and advocacy training. More specifically, in the environmental arena, technical expertise in the fields of climate change adaptation and disaster risk reduction can be low. In-depth knowledge of climate change issues is not common except among a very few highly specialist organisations, while businesses similarly often have limited awareness of environmental issues. Cross-border cooperation should be more systematically developed.

Despite this, many local CSOs are actively engaging with environmental issues, including climate change and disaster risk and response. CSOs in Montenegro are being encouraged to participate in the preparation of the second national communication to the UNFCCC, which is a highly positive development which should be emulated by other countries in the region when developing their next national communications. However, in order to change the vision that national

CSOs have of their roles, considerable capacity building is needed in the fields discussed above. There is a particular need for assisting CSOs in integrating climate change and disaster risk reduction concerns into activities that do not have an explicit climate change or DRR focus, and building partnerships to facilitate knowledge transfer, including across national boundaries.

4.4.2 The role of the Red Cross

The Red Cross and Red Crescent has long been concerned with the rising number of weather-related natural disasters. Rather than focusing solely on disaster response, increasingly the organisation 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. As a result, the Red Cross and Red Crescent is now taking steps to integrate an awareness of climate change into all of its activities (see Box 2), preferring to focus on climate-proofing existing projects than designing "single-issue" climate change centred projects, and where possible cooperating with organisations which already have considerable expertise in this field.

In South East Europe, the work of the National Red Cross Societies encompasses a wide variety of activities, including home visits for the elderly, blood donation, and training in first aid. In all four countries, national and local societies are active in emergency preparedness and response, with local branches organising and training volunteers and maintaining preparations for emergency situations. This level of preparation often gives local branches a highly detailed knowledge of vulnerable groups and individuals in a particular area, and this is the kind of knowledge that would be useful for state vulnerability assessments. The recent cold wave highlighted the importance of such preparation and training for effective emergency response (see case study below). Although in such situations the national societies coordinate with state disaster response teams, there is in general limited cooperation in the area of disaster preparedness and early warning so far. One exception was the successful scheme in FYR Macedonia where the national society cooperated with the state to disseminate early warning and protection advice for heat waves (see section 3.4) in a successful partnership that could be used as a model for future state-civil society cooperation.

Although all four national societies have considerable experience and high levels of capacity in the arena of disaster risk reduction and emergency response, there is limited progress so far in integrating climate change concerns into existing projects that do not have an explicit climate change focus. Similarly, policy dialogue must be elaborated, and capacities increased in this area. Since all four National Societies are active (and, with the exception of the Red Cross of Serbia, coordinating) members of the climate change networks in their respective countries as part of the IPA SEEFCCA,

Box 2: Commitments by the Red Cross and Red Crescent Movement at the 2007 International Conference

The urgency of addressing the humanitarian consequences of climate change is evident and actions to address these risks need to be ambitious. As reflected in the declaration "together for humanity" the Movement has committed to

1. ***raise awareness on climate change;***
2. ***provide humanitarian assistance;***
3. ***improve capacity to respond, including through better disaster preparedness;***
4. ***decrease vulnerability of communities most strongly affected;***
5. ***integrate climate risk management into policies and plans;***
6. ***mobilise human and financial resources, giving priority to actions for the most vulnerable people.***

Source: The Red Cross/Red Crescent Climate Centre (http://www.climatecentre.org/site/about-us)

it is anticipated that these capacities can be strengthened through network activities.

Case study: Responding to emergencies

In the first half of February 2012, a major cold wave was forecast across Croatia, following extreme low temperatures across the region. The forecasts proved accurate, and there were major snow falls and very cold temperatures across Croatia. These caused particular problems in the coastal regions, which are historically very rarely affected by snowfalls; based on this experience, many individuals and communities failed to take warnings seriously. The poor levels of preparedness led to large numbers of injured people, and considerable economic damage.

The Croatia Red Cross (CRC) acted immediately, with volunteers distributing more than 15,000 kg of food, and delivering and distributing medication, hygiene products and fuel to remote villages, including those completely cut off by the snow. In many towns across Croatia, the CRC organised temporary shelters for the homeless and those who had suffered cuts in electricity and gas supplies at home. More than 300 homeless people across Croatia were put in temporary shelters of CRC, where food and medical attention were provided.

The cold wave emphasises the importance of disaster preparedness at all levels, from individuals and families, to communities and more. The successful response by the CRC was a result of high levels of training and preparedness on the part of local branches. It also underlines the importance of early warning systems, and how even effective early warning systems can fail if people do not take the warning seriously. This is an area in which awareness-raising is crucial, since taking swift action on early warnings can avoid considerable amounts of human and economic casualties.

Source: Croatia Red Cross, 2012

4.5 THE IMPORTANCE OF KNOWLEDGE-SHARING: SCIENCE, THE STATE AND CIVIL SOCIETY

Key to integrating climate change concerns fully into national strategies is the development of good working relationships between the government, technical specialists and civil society actors and other end-users. As policy-makers, state actors must make sure that they are receiving inputs not only from scientists and economists who are able to give expert advice about the ways in which climate change and disasters will affect society and the economy, but also from CSOs who are in the position to represent the needs of the most vulnerable in society, who might otherwise have no entry point into decision-making. CSOs are in a strong position to assist in identifying vulnerable groups, articulating their needs, and scrutinising proposed policies and legislation to make sure that government policies address the most serious vulnerabilities. The development of knowledge-sharing platforms should be priority, including the activation of dormant platforms where they exist (e.g. the national forum on climate change adaptation in Montenegro).

Increasing the level of knowledge among stakeholders is a challenge, but an area where both the state and civil society can play an active role – awareness-raising of issues surrounding climate change and disaster risk reduction is key. Meanwhile, knowledge producers (e.g. national hydrometeorological institutes, universities etc.) should be making efforts to reach out to stakeholders and find out what their needs are in terms of information and data. Some positive steps are being taken in this direction, including provision of seasonal forecasts for farmers by the Virtual Climate Centre in Belgrade, who are also exploring opportunities to partner with private companies to gain remote sensing data which can be used for hazard mapping. Part of the role of the national societies in each environmental network should include raising the capacity of each organisation to integrate climate change concerns into their day-to-day activities.

5. Conclusions and recommendations

This study has shown that Croatia, FYR Macedonia, Montenegro and Serbia remain vulnerable to the effects of climate change and natural hazards. While policy-makers and civil society are beginning to take note of the issue, a more concerted and coordinated effort to adapt to climate change is necessary if the region is to develop and prosper over the coming decades.

Below are a set of key recommendations for policy-makers, opinion-leaders and civil society organisations to start working in this area. Sector-specific adaptation measures are detailed in chapter 3, but most of these recommendations apply equally well to all sectors discussed in this report, as well as many which are not.

5.1 KEY RECOMMENDATIONS FOR POLICY-MAKERS AND OPINION-LEADERS

- **A strong focus on "no-regrets" adaptation measures:** Since there is so much uncertainty surrounding the effects of climate change and natural hazards in the future, adaptation measures should be based on "no-regrets" options that provide benefits regardless of how the climate changes.

- **Develop national climate change action plans:** This must be a priority for all national governments. There should be attempts made to actively involve CSOs in the development of the next national communications to the UNFCCC.

- **Improve cooperation between sectors and government ministries:** In many cases, there are numerous ministries with responsibilities for various aspects of climate change with limited coordination between them. It is necessary to develop a coordinated national climate change action plan with a clear leadership structure in place and a clear procedure for cooperation between ministries and sectors in order to successfully tackle climate change.

- **Improve data availability and accessibility:** Data related to climate change and climate change impacts, including government data is not always freely available to researchers. The development of a publically accessible database where this information can be easily found would make planning for future climate-smart development much easier. It is also vitally important that information on climate change be made available in language that is understandable by all levels. Scientists in particular must think about how they present their information so that it is easily comprehensibly to those without a technical background.

- **Develop an expert advisory body for climate change:** This body should include NGOs and other climate change experts and advise the government about the development of policies and legislation for climate change adaptation and DRR at all levels, and should operate at national levels and at a regional level for information-sharing.

- **Improve legislation and enforce current legislation more effectively in environmental and planning sectors:** Many countries in the region already have environmental and planning legislation in place that would help mitigate the impact of climate change; however, this is often inadequately enforced. A commitment to enforce current building and planning regulations, especially

in hazard-prone areas as well as developing more thorough legislation will put fewer people at risk in the future.

- **Link science with policy-makers and public**: Developing a network and lines of communication between scientists and decision makers will help the latter to develop sensible policies to effectively deal with climate change, while the former are better able to discern the needs of policy makers and the public in terms of data products.

- **Ensure the participation of vulnerable groups in decision-making:** Often, the impacts of climate-change disproportionately affect the most vulnerable members of society. In order to fully incorporate the needs of vulnerable groups in climate change response policies there must be a concerted effort to identify these groups and make sure their needs are felt, including from CSOs representing the needs of such groups.

- **Bring climate change into educational system at all levels:** Not only do the countries in this region suffer from a lack of expertise in certain areas (especially science), there is also a lack of public awareness. One way to tackle this is to include climate change topics in the educational system, from primary level through to university, so climate change becomes a topic of common knowledge among the general public as well as scientists and government officials.

- **Cross-border cooperation for better information-sharing:** There are many areas where effective cross-border cooperation could improve the quality of information available and prevent duplication of effort. The SEEVCCC is a step in the right direction, but future areas of cooperation should include proactive data sharing, and potential development of a plan for shared supercomputing facilities to improve the climate modelling capacities of the region.

- **Develop functional, efficient early warning systems and emergency plans for all hazards**: Effective early warning systems can save huge losses, and the system in all four countries could be streamlined and improved, and take advantage of cross-border information sharing and warning dissemination. Include close cooperation with the media and public awareness-raising of the rising risks of natural disasters.

5.2 KEY RECOMMENDATIONS FOR CIVIL SOCIETY

- **Strengthen linkages with other relevant organisations:** There is high potential for better cooperation between CSO networks and national hydrometeorological organisations, military, etc. including cooperation with public health ministries for the monitoring of the incidence and mortality from weather-dependent diseases, and response to and preparation for natural disasters.

- **Mainstream climate change into all activities where possible:** CSOs should assess how all of their activities will be affected by climate change, not solely disaster preparedness programmes, and develop strategies to respond to this and design future programmes with climate impacts in mind.

- **Build capacities in the area of advocacy**: Currently there is limited capacity among the CSO community to engage in policy dialogue in the area of climate change adaptation, so training is required in this area.

- **Actively engage with development and monitoring of legislation**: CSOs have a role to play in scrutinising policy and legislation proposals related to climate change and. To this end, they should aim to build good relationships with decision-makers and develop lobbying materials related to climate change adaptation, including the monitoring of the implementation of policies.

- **Civil society to engage with development of national communications to the UNFCCC:** CSOs in Montenegro have already given input into the development of the initial communication of Montenegro to the UNFCCC, which is a step that should be emulated in a systematic manner by all countries during the preparation of the next national communications.

- **Identify needs of vulnerable groups:** CSOs are well-positioned to identify particular groups that are most vulnerable to the effects of climate change and disasters, and should work closely with policy-makers to ensure that the needs of these groups are met.

- **Disaster preparedness and early warning:** All national RC societies and many CSOs have the potential to be involved in government early warning systems for disasters, including preparedness and response, and to that end should build the capacity of local branches for responding to extreme weather and disasters, especially hydrometeorological disasters, and work with state EWS to disseminate warnings and respond to emergencies.

- **Awareness-raising and media coverage:** CSOs have a major role to play in raising public awareness surrounding climate change. In order to do this effectively, there should be coordination with government awareness-raising campaigns, and media training available to effectively disseminate their messages.

- **Strengthen regional and international cooperation:** Many of the countries in the region and further afield face similar challenges as a result of climate change. Documentation of experiences and best practice, building knowledge-sharing channels and cooperating in order to identify the best ways to respond to these challenges will all be crucial for state and non-state actors.

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Annex 1: Glossary of terms

Climate
The statistics of weather over a period of time ranging from months to thousands or millions of years. The classical averaging period is 30 years, as defined by the World Meteorological Organization (WMO). Climates can be described as tropical, arid, polar etc. Characteristics of a climate are often described by seasons such as winter and summer, or the wet and dry times of year. In contrast, weather is the day-to-day experience of the climate, for example, a dry day during the rainy season.

Climate Change
A statistically significant change in measures of climate (such as temperature, precipitation, or wind) that persists for an extended period (decades or longer). The term climate change can be used to refer to climate change that results from both natural and man-made factors. However, the UNFCCC and this document uses the term to refer to the current human-induced climate change that is occurring, caused by human activities that are changing the composition of the atmosphere (e.g. through burning fossil fuels) and the land use change.

Climate-Related
Usually the term climate-related is used in reference to natural hazards to differentiate them from geophysical hazards. For example, floods, storms and drought are all climate-related. The term climate-related can be used without specifying whether such a hazard is attributed to climate change, climate variability, or simply the climate. “Hydrometeorological” is also used to mean the same thing.

Climate Change Related
Climate change related refers to phenomenon related or attributable to climate change.

Climate Variability
Variations in the state of the climate that can last from months to decades. Climate variability can result from natural and man-made process. However, this document uses the term to refer to natural processes. An example of such processes includes El Niño and La Niña.

Climate Change Adaptation
Adjustments in response to actual or expected climate change, to reduce negative impacts or take advantage of opportunities.

Climate Change Mitigation
Initiatives and measures to reduce the sources, or enhance the sinks, of greenhouse gases.

Disaster Risk Reduction
The conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development.

Seasonal Forecast
Provides a general indication of the likely character of the season over the next 3 months – specifically what the chances are that temperature or precipitation is likely to be normal, above normal and below-normal for the given place and time of year, based on conditions in the climate system. Seasonal forecasts indicate the likelihood of the general conditions for a particular season ahead and do not provide any information regarding day-to-day weather or extreme events.

Vulnerability

The conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards. For positive factors, which increase the ability of people to cope with hazards. (ISDR).

Weather

Atmospheric condition at any given time or place. It is measured in terms of such things as wind, temperature, humidity, atmospheric pressure, cloudiness, and precipitation. In most places, weather can change from hour-to-hour, day-to-day, and season-to-season.

Source: All definitions are taken from the Glossary of Terms in the Red Cross/Red Crescent Climate Guide (RCCC, 2007, available online at [http://www.climatecentre.org/downloads/File/reports/RCRC_climateguide.pdf])

Annex 2: Key demographic information

Indicator	Croatia	FYR Macedonia	Montenegro	Serbia
Total land area km²	55,960	25,220	13,450	87,460
Total agricultural area % (2009)	23.2	40.2	38.2	57.8
Total forested area %	32.7	39.6	40.4	31.0
Population	4,418,000	2,060,000	632,000	7,291,000
Population density/km²	79	82	47	83
Rate of population growth %	-0.3	0.2	0.2	-0.4
Urban population %	58	68	60	52
Annual urban population growth %	0.2	0.9	-0.4	-0.1
Total population aged 65 or above %	17	12	12	14
Life expectancy at birth	76	75	74	74
Population with access to improved water supply %	99	100	98	99
GDP total USD	60,851,860,677	9,189,454,663	4,111,066,225	38,423,239,717
GDP per capita USD	13,774	4,461	6,505	5,270

All date is from 2010 except where otherwise stated. All data is taken from the World Bank data portal, located at http://data.worldbank.org/

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CCA Forum
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AUSTRIAN RED CROSS

RED CROSS/RED CRESCENT CLIMATE CENTRE
International Federation of Red Cross and Red Crescent Societies
The Netherlands Red Cross

CROATIAN RED CROSS

Macedonian Red Cross

Montenegro Red Cross

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WWF