

## 1. INTRODUCTION

Climate change increases land and sea temperatures and alters precipitation quantity and patterns, resulting in the increase of global average sea level, risks of coastal erosion and an expected increase in the severity of weather-related natural disasters. Changing water levels, temperatures and flow will in turn affect food supply, health, industry, and transport and ecosystem integrity. Climate change will lead to significant economic and social impacts with some regions and sectors likely to bear greater adverse affects. Certain sections of society (the elderly, disabled, low-income households) are also expected to suffer more.

Addressing climate change requires two types of response. Firstly, and importantly, we must reduce our greenhouse gas emissions (GHG) (i.e. take mitigation action) and secondly we must take adaptation action to deal with the unavoidable impacts. The EU's recently agreed climate change legislation puts in place the concrete measures to reach the EU's commitment to reduce emissions to 20% below 1990 levels by 2020 and is capable of being amended to deliver a 30% reduction if agreed as part of an international agreement in which other developed countries agree to comparable reductions and appropriate contributions by economically more advanced developing countries based on their responsibilities and capabilities. However, even if the world succeeds in limiting and then reducing GHG emissions, our planet will take time to recover from the greenhouse gases already in the atmosphere. Thus we will be faced with the impact of climate change for at least the next 50 years. We need therefore to take measures to adapt.

Adaptation is already taking place but in a piecemeal manner. A more strategic approach is needed to ensure that timely and effective adaptation measures are taken, ensuring coherency across different sectors and levels of governance.

This White Paper sets out a framework to reduce the EU's vulnerability to the impact of climate change. It builds on the wide-ranging consultation launched in 2007 by the Green Paper on Adapting to Climate Change in Europe<sup>1</sup> and further research efforts that identified action to be taken in the short-term. The framework is designed to evolve as further evidence becomes available. It will complement action by Member States and support wider international efforts to adapt to climate change, particularly in developing countries. The EU is working with other partner countries in the UNFCCC<sup>2</sup> towards a post-2012 climate agreement which will address adaptation as well as mitigation. The Commission's proposals in this context are set out in the Communication entitled "Towards a comprehensive climate change agreement in Copenhagen"<sup>3</sup>.

Enhancing the EU's resilience to the impacts of climate change also means the chance to invest in a low-carbon economy, for instance, by promoting energy efficiency and the uptake of green products. This is one of the key objectives of the European Economic Recovery Plan, which outlines the EU's response to the economic crisis, leading us to a creative, knowledge-based economy. At the same time, we can facilitate structural changes through the modernisation of European infrastructure and enhance the competitiveness of our economy.

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<sup>1</sup> COM(2007) 354.

<sup>2</sup> United Nations Framework Convention on Climate Change.

<sup>3</sup> COM(2009) 39, 28.1.2009.

Developing this framework has been a cross-cutting exercise and this white paper is accompanied by three sectoral papers on agriculture<sup>4</sup>, health<sup>5</sup> and water, coasts and marine issues<sup>6</sup>. Further sectoral papers may be presented in the future.

## 2. WHY DO WE NEED AN ADAPTATION STRATEGY? WHY AT EU LEVEL?

### 2.1 The impact of a changing climate

The severity of the impacts of climate change varies by region. The most vulnerable regions in Europe are Southern Europe, the Mediterranean Basin, Outermost regions and the Arctic. Furthermore, mountain areas in particular the Alps, islands, coastal and urban areas and densely populated floodplains are facing particular problems. Outside Europe, developing countries (including small island states) will remain particularly vulnerable.

Climate change will impact a number of sectors. In **agriculture** projected climatic changes will affect crop yields, livestock management and the location of production. The increasing likelihood and severity of extreme weather events will considerably increase the risk of crop failure. Climate change will also affect soil by depleting organic matter – a major contributor to soil fertility. The effects of climate change on **forests** are likely to include changes in forest health and productivity and changes to the geographic range of certain tree species. Climate change will be an added stress for the **fisheries and aquaculture sectors**. **Effects will also be severe on coasts and marine ecosystems**. Coastal erosion rates will increase and existing defences may provide insufficient protection. In this context, islands and outermost regions deserve special consideration.

In the **energy** sector, climate change will have a direct effect on both the supply and demand of energy. The projected impact of climate change on precipitation and glacier melt indicate that hydropower production could increase by 5% or more in northern Europe and decrease by 25% or more in southern Europe<sup>7</sup>. Decreased precipitation and heat waves are also expected to influence negatively the cooling process of thermal power plants. On the demand side, increasing summer peaks for cooling and impacts from extreme weather events will affect in particular electricity distribution.

Extreme climate events cause huge economic and social impacts. **Infrastructure** (buildings, transport, energy and water supply) is affected, posing a specific threat to densely populated areas. The situation could be exacerbated by the rise in sea level. A more strategic and long-term approach to spatial planning will be necessary, both on land and on marine areas, including in transport, regional development, industry, tourism and energy policies.

**Tourism** is likely to suffer from decreasing snow cover in Alpine areas and from increasing temperatures in Mediterranean regions. Unsustainable forms of tourism can exacerbate the negative effects of climate change.

Changing weather conditions will also have profound effects on **human health** and on **animal and plant health**. As extreme events become more frequent, weather-related deaths

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<sup>4</sup> SEC(2009)417.

<sup>5</sup> SEC(2009)416

<sup>6</sup> SEC(2009)386

<sup>7</sup> EEA-JRC-WHO — Impacts of Europe's Changing Climate — 2008 Indicator-based assessment Report 4/2008.

and diseases could rise. Climate change could also increase the spread of serious infectious vector-borne transmissible diseases including zoonoses<sup>8</sup>. Climate change will threaten animal wellbeing and could also impact plant health, favouring new or migrant harmful organisms, which could adversely affect trade in animals, plants and their products.

Climate change will cause significant changes in the quality and availability of **water resources**, affecting many sectors including food production, where water plays a crucial role. More than 80% of agricultural land is rain-fed. Food production also depends on available water resources for irrigation. Limited water availability already poses a problem in many parts of Europe and the situation is likely to deteriorate further due to climate change, with Europe's high water stress areas expected to increase from 19% today to 35% by the 2070s. This could also increase migration pressures.

Climate change will increasingly drive **ecosystem including marine ecosystems** and **biodiversity** loss, affecting individual species and significantly impacting ecosystems and their related services, on which society depends. Ecosystems play a direct role in climate regulation with peat lands, wetlands and the deep sea providing significant storage for carbon. In addition, salt marsh ecosystems and dunes provide protection against storms. Other ecosystem services will also be affected such as the provision of drinking water, food production and building materials and oceans can deteriorate through acidification. Some land use practices and planning decisions (e.g. construction on flood plains), as well as unsustainable use of the sea (e.g. overfishing) have rendered ecosystems and socioeconomic systems more vulnerable to climate change and thus less capable of adapting.

The **challenge for policy-makers** is to understand these climate change impacts and to develop and implement policies to ensure an optimal level of adaptation. Strategies focused on managing and conserving water, land and biological resources to maintain and restore healthy, effectively functioning and climate change-resilient ecosystems are one way to deal with the impact and can also contribute to the prevention of disaster as addressed in a recent Commission Communication<sup>9</sup>. Evidence<sup>10</sup> suggests that working with nature's capacity to absorb or control impact in urban and rural areas can be a more efficient way of adapting than simply focusing on physical infrastructure. Green Infrastructure<sup>11</sup> can play a crucial role in adaptation in providing essential resources for social and economic purposes under extreme climatic conditions. Examples include improving the soil's carbon and water storage capacity, and conserving water in natural systems to alleviate the effect of droughts and to prevent floods, soil erosion and desertification.

***Action (EU and Member States)***

- To promote strategies which increase the resilience to climate change of health, property and the productive functions of land, inter alia by improving the management of water resources and ecosystems.

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<sup>8</sup> Zoonoses are diseases that can be transmitted from animals to humans.

<sup>9</sup> COM(2009) 82 : A Community approach on the prevention of natural and man-made disasters.

<sup>10</sup> See Impact Assessment, the Green Infrastructure Approach, chapter 4.1, page 29.

<sup>11</sup> Green Infrastructure is the interconnected network of natural areas including some agricultural land, such as greenways, wetlands, parks, forest preserves and native plant communities, and marine areas that naturally regulate storm flows, temperatures, flooding risk, and water, air and ecosystem quality.