



Adaptation to Climate Change: The International and European policy

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Abbreviations

AWG-KP	Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol
AWG-LCA	Ad Hoc Working Group on Long-term Cooperative Action under the Convention
CBD	Convention on Biological Diversity
COP	Conference of the Parties
EIA	Environmental Impact Assessment
EU	European Union
ECCP	European Climate Change Programme
GEF	Global Environmental Facility
ICZM	Integrated Coastal Zone Management
IMP	Integrated Maritime Policy
IPCC	Intergovernmental Panel on Climate Change
MSP	Marine Spatial Planning
NAMA	Nationally Appropriate -Mitigation Action
NAPA	National Adaptation Plans of Action
OECD	Organisation of Economic Cooperation and Development
SBI	Subsidiary Body for Implementation
SBSTA	Subsidiary Body for Scientific and Technological Advice
SAC	Special Area of Conservation
SCI	Site of Community importance
SEA	Strategic Environmental Assessment
SPA	Special Protection Area
UNCED	United Nations Conference on Environment and Development
UNFCCC	United Nations Framework Convention on Climate Change



Glossary of Terms

Adaptation	An adjustment in natural or human systems in response to actual or expected climatic stimuli of their effects, which moderates harm or exploits beneficial opportunities (IPCC, 2007c; Feenstra <i>et al.</i> , 1998)
Adaptive capacity	The degree to which a system is susceptible to, and unable to cope with, the adverse effects of climate change, including climate variability and extremes (IPCC, 2007c)
Ecosystem approach	A strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. (United Nations Convention on Biological Diversity, 2000)
Ecosystem-based adaptation	The sustainable management, conservation and restoration of ecosystems in order to ensure the continued provision of vital services that help people adapt to the adverse effects of climate change. Ecosystem-based adaptation integrates the use of biodiversity and ecosystem services into an overall adaptation strategy, can be cost-effective and generate social, economic and cultural co-benefits and contribute to the conservation of biodiversity (Secretariat of the Convention Biological Diversity, 2009)
Maladaptation	Business-as-usual development which, by overlooking climate change impacts, inadvertently increases exposure and/or vulnerability to climate change. It can also include actions undertaken to adapt to climate impacts that do not succeed in reducing vulnerability but increase it instead (OECD, 2009)
Vulnerability	The degree to which a system is susceptible to, and unable to cope with, the adverse effects of climate change, including climate variability and extremes (IPCC, 2007c)



Introduction

There is no doubt: climate is changing. The question is how we will adapt to this changing climate. The effects of climate change are already perceptible and predictable. Despite uncertainties about the timing and magnitude of the changes associated with global warming, the problem of global climate change has become one of the most important environmental issues facing the world today. Scientific research has revealed that even when the emission of greenhouse gases decreases the impacts of climate change will be inevitable (IPCC, 2007b). Therefore it is necessary to adapt to the impacts of a changing climate to reduce vulnerability to climate change.

So far, the international and European climate effort has generally focused on mitigation – reducing greenhouse gas emissions to prevent dangerous climate change – rather than adaptation. The growing evidence of adverse effects of climate change and impacts that cannot be avoided ensures that the international community now also deals with adaptation. In what follows will be discussed how this international and European effort on adaptation has been established and which adaptation measures and approaches the international community proposes to adapt to the impacts of climate change, with focus on marine activities and coastal flooding. This will provide the international and European framework on adaptation and is part of action 4.4 climate change proofing of legal and policy aspects of adaptive strategies. Given that planning initiatives take place in a broader European and International context. Furthermore the international and European context can be taken into account at a subsequent development of coastal adaptation strategies under W.P. 4.3 as in this case for the Belgian coastal zone.

First a brief overview on what adaptation means.



2 Adaptation to climate change

According to the Intergovernmental Panel on Climate Change (IPCC) a broad definition of adaptation is any adjustment in natural or human systems in response to actual or expected climatic changes or their effects, which moderates harm or exploits beneficial opportunities (IPCC, 2001). Or else: *“Adaptation is a process through which societies make themselves better able to cope with climate change. It entails taking the right measures to reduce the negative effects or exploiting potential benefits at a cost-effective manner by making the appropriate adjustments and changes.”* (IPCC, 2007c).

The objective of adaptation is to reduce vulnerability to climate change and variability, thereby reducing their negative impacts. Vulnerability to climate change is the degree to which geophysical, biological and socio-economic systems are susceptible to, and unable to cope with, adverse impacts of climate change (IPCC, 2007c; Feenstra *et al.*, 1998). The identification of potential vulnerabilities is intended to provide guidance to decision-makers for identifying levels and rates of climate change that may be associated with ‘dangerous anthropogenic interference’ (DAI) with the climate system, in terminology of the UNFCCC Article 2¹. This can give decision-makers an idea on what the priorities should be in the development of an adaptation strategy (IPCC, 2007c).

The Stern Report on the *Economics of Climate Change* highlights that without early and strong mitigation, the cost of adaptation will rise, and countries, and individuals’ ability to adapt effectively will be constrained (Stern, 2007). Hence adaptation, together with mitigation is an important response strategy. However mitigation measures are those that can help to reduce atmospheric accumulation of greenhouse gases and thereby delay and reduce the predicted impact of greenhouse gases on global climate. Such measures may either reduce greenhouse gases emissions (abatement) or increase terrestrial storage of carbon (sequestration). On the other hand adaptation measures are those that can be taken to moderate the impacts of climate change.

¹ Art. 2 UNFCCC: “The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.” Framework Convention on Climate Change, United Nations, FCCC/INFORMAL/84, 9 May 1992, B.S. 2 April 1997.



Adaptation measures can be divided into several ways depending on whom the action is based upon and what moment in time they are adopted.

One can distinguish autonomous and planned adaptation. Planned adaptation is established by active intervention of policy and is a result of a deliberate policy decision. In contrast autonomously adaptation takes place without the deliberate intervention of a public agency but originates from individuals who respond to changes in the physical, market or other circumstances which they find themselves. Autonomously adaptation is adaptation that is likely or even reasonable to assume to happen. Plants, animals, and humans will not simply continue on as they have without climate change but are quite likely to modify their behaviour. Plants, animals, and ecosystems may mitigate to new locations. Humans may change their behaviour to cope with a different climate (e.g. more heating/cooling, switch crops) or if necessary may mitigate (Feenstra *et al.*, 1998). Autonomously adaptation will in most cases provide local benefits and therefore many actions will be taken 'naturally' by private actors such as individuals, households and businesses in response to actual or expected climate change. Where autonomously adaption is undertaken mainly by the private sector (and in unmanaged natural ecosystems), planned adaptation is associated with public agencies, either they set policies to encourage and inform adaptation or they take direct action themselves, such as public investment. For greater foresights and planning, e.g. major infrastructure decisions, planned adaptation is more suitable. To promote autonomously adaptation the governments can provide information and clear policy frameworks to encourage individuals and firms to respond to market signals (Stern, 2007; IPCC, 2001).

In turn, adaptation measures may be divided into two broad categories, depending on the point in time when they are implemented: reactive and anticipatory. Reactive responses are those which are implemented as a response to already observed climate impacts whereas anticipatory responses are those that aim to reduce exposure to future risk posed by climate change (UNFCCC, 2007). In a study by the Centre for European Policy Studies it is emphasised that early anticipatory adaptation may be more cost-effective than reactive adaptation (Aaheim *et al.*, 2008).

Another important concept related to adaptation is the adaptive capacity. Adaptive capacity is the potential or ability of a system, a region or community to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences (IPCC,



2007c). Adaptive capacity influences the vulnerability of communities and regions to climate change effects and hazards. The capacity to adapt is dynamic and influenced by economic and natural resources, social networks, entitlements, institutions and governance, human resources, education and technology. The most vulnerable regions and communities are those that are highly exposed to hazardous climate change effects and have limited adaptive capacity. Countries with limited economic resources, low levels of technology, poor information and skills, poor infrastructure, weak institutions, and inequitable empowerment and access to resources have little capacity to adapt and are highly vulnerable (UNFCCC, 2001). It can be inferred that adaptive capacity is largely dependent upon development status. Consequently the adaptive capacity of developed countries will be higher than these of developing countries. High adaptive capacity does not necessarily translate into actions that reduce vulnerability. For example, despite a high capacity to adapt to heat stress through relatively inexpensive adaptations, residents in urban areas in some parts of the world, including in European cities, continue to experience high levels of mortality. One example is the 2003 European heatwave-related deaths (IPCC, 2007c). At the same time, adaptive capacity does not guarantee adaptation actions. Adaptation occurs when in addition to adaptive capacity there is also a political will and formal mechanisms that enable adaptation (Levina, 2007).

Adaptation to climate change must occur through the prevention and removal of maladaptive practices. The notion of maladaptation – a term coined by the IPCC- refers to those development or investment decisions which tend to increase vulnerability to climate change, where these actions neglect the actual or potential impacts of climate or climate change. For example, increased vulnerability to future climate change is being created where properties are built in hazard zones such as flood plains or coastal areas that are now subjects to floods and storms. Hence the first step in adapting to climate change can be to stop or alter existing maladaptive processes or practices (Feenstra *et al.*, 2007; UNFCCC, 2007). Maladaptation is commonly caused by a lack of information on the potential external effects of policies and practices on other sectors, or a lack of consideration given to these effects (Stern, 2007).



3 Why would adaptation be needed for the Belgium part of the North Sea?

3.1 Global Climate Change

Adaptation to climate change is necessary, as this will be a key response to reduce the vulnerability to climate change. As mentioned above: climate change is even today already perceptible. The Earth has already warmed by 0.6 °C since around 1900 (IPCC, 2007b). The currently observed impacts of climate change represent the reaction of the climate system to the greenhouse gas emissions of the past two centuries. Because of the inertia of the climate system, the impacts of the now significantly higher greenhouse gas emissions will not become noticeable until the coming decades and consequently the climate of the Earth will presumably continue to heat up for many centuries to come. Therefore, in addition to reducing emissions, which will continue to be essential, it will also be increasingly important to develop and implement strategies for adapting to this inevitable climate change (Stern, 2007).

According to the IPCC assessment reports not only the global surface temperature is rising, but also the average sea level and the global mean sea surface temperature. Global average sea level rose at an average rate of 1.8 mm per year over 1961 to 2003 and at an average rate of about 3.1 mm per year from 1993 to 2003. It is still not clear whether this faster rate for 1993 to 2003 reflects decadal variation or an increase in the longer-term trend (IPCC, 2007b). Global mean sea surface temperatures have risen about 0.6°C since 1950 (IPCC, 2007b).

To make an assumption about the future trends on climate change the IPCC developed the SRES, four families of socio-economic scenarios (A1, A2, B1 and B2). These scenarios represent different world socio-economic futures. They are neither predictions nor forecasts. Rather, each scenario is one alternative image of how the future might unfold. For example in the A1/B1 futures the population subsequently declines, while in A2/B2 it continues to grow throughout the 21st century.



Table 1. Selected global non-climate environmental and socio-economic trends relevant to coastal areas for the SRES storylines. Regional and local deviations are expected (IPCC 2007c).

Environmental and socio-economic factors	Non-climatic changes and trends for coastal and low-lying areas (by SRES Future)			
	'A1 World'	'A2 World'	'B1 World'	'B2 World'
Population (2080s) (billions) ^a	1.8 to 2.4	3.2 to 5.2	1.8 to 2.4	2.3 to 3.4
Coastward migration	Most likely	Less likely	More likely	Least likely
Human-induced subsidence ^b	More likely		Less likely	
Terrestrial freshwater/sediment supply (due to catchment management)	Greatest reduction	Large reduction	Smallest reduction	Smaller reduction
Aquaculture growth	Large increase		Smaller increase	
Infrastructure growth	Largest	Large	Smaller	Smallest
Extractive industries	Larger		Smaller	
Adaptation response	More reactive		More proactive	
Hazard risk management	Lower priority		Higher priority	
Habitat conservation	Low priority		High priority	
Tourism growth	Highest	High	High	Lowest

^a Population living both below 100 m elevation above sea level and within 100 km distance of the coast – uncertainty depends on assumptions about coastward migration (Nicholls, 2004).

^b Subsidence due to sub-surface fluid withdrawal and drainage of organic soils in susceptible coastal lowlands.

In terms of climate change, the SRES scenarios are translated into six emission scenarios: one for each of the A2, B1 and B2 worlds, and three scenarios for the A1 world (A1T, A1B and A1FI). This means that the researchers use alternative scenarios for greenhouse gas emissions as the basis for their climate scenarios. B1 produces the lowest emissions and A1FI produces the highest emissions. According to the B1 emission scenario the sea-level would rise up to 0.18m by 2100. The A1FI scenario provides a rise in sea-level up to 0.59m by 2100 (IPCC, 2007; IPCC, 2007b).

Table 2. Projected global mean climate parameters relevant to coastal areas at the end of the 21st century for the six SRES marker scenarios (IPCC, 2007b).

Climate driver	B1	B2	A1B	A1T	A2	A1FI
Surface ocean pH (baseline today: 8.1)	8.0	7.9	7.9	7.9	7.8	7.7
SST rise (°C) (relative to 1980-1999)	1.5	-	2.2	-	2.6	-
Sea-level rise Best estimate (m)	0.28	0.32	0.35	0.33	0.37	0.43
(relative to 1980-1999) Range (m) 5%	0.19	0.21	0.23	0.22	0.25	0.28
95%	0.37	0.42	0.47	0.44	0.50	0.58

These results only take into account two major processes, namely thermal expansion and exchange of water between oceans and other reservoirs and do not include additional climate initiatives as the implementation of the UNFCCC and the Kyoto Protocol (IPCC, 2000). It is not at all clear what the exact consequences of climate



change are. There are still many uncertainties mostly due to uncertainty about how much water will be lost from ice sheets. The UNEP report “*on Global outlook for ice and snow*” revealed that Greenland is showing rising loss of mass in recent years, this can lead to an even greater sea level rise than is already expected, namely up to 4 or 5 meters (UNEP 2007).

Other climate-related changes, as stated in the IPCC assessment reports, include: an intensification of tropical and extra-tropical cyclones, larger extreme waves and storm surges, altered precipitation/run-off; altered wind patterns and ocean acidification. The most important impacts of sea level rise are inundation of low-lying areas, increased flooding and storm damage, erosion of beaches and bluffs, salt intrusion into aquifers and surface waters, and higher water tables (IPCC, 2007b). These phenomena will vary considerably at regional and local scale. It is interesting to take a better look at the impacts of climate change specifically for the Belgian part of the North Sea.

3.2 The effects of Climate Change for the Belgian part of the North Sea

A Study carried out within the CLIMAR-project² by the MUMM (Management Unit of the North Sea Mathematical Models) to assess the impacts of climate change for the Belgian part of the North Sea shows that it is likely to experience a greater incidence of storm damage and flooding in vulnerable coastal areas. Though the exact impacts of climate change are difficult to predict, the study has also used scenarios to make assumptions on the future. The study draws five scenarios for 2040 and 2100: two moderate (M, M+) scenarios, two warm scenarios (W, W+) and a worst case scenario (Worst). In the M and W scenarios, there is no significant change in air circulation patterns, and the precipitation increases both in summer and in winter with about 3% per °C of air temperature increase. In the M+ and W+ scenarios, there are significant changes in air circulation patterns and the precipitation increases more in winter (about 7% per °C of air temperature increase) and decreases in summer (about 10% per °C of air temperature). The study shows that the significant changes in air circulation patterns have no influence on the increase of sea level. The expectations are that in 2040 the sea level will rise up to 30 cm in the moderate scenario, in the warm scenario

² The CLIMAR-project is a project about the evaluation of climate change impacts and adaptation responses for marine activities especially for the Belgian part of the North Sea and is launched in December 2006.



up to 40 cm and in the worst case scenario up to 50 cm. The expectations for 2100 are a sea level rise of 60 cm in the moderate scenario, 90cm in the warm scenario and 2m in the worst case scenario (CLIMAR, 2008a).

Table 3. five scenarios presented for 2100 within the CLIMAR project (CLIMAR 2008a).

	M	M+	W	W+	Worst
Air temperature	+ 2° C	+ 2° C	+ 4° C	+ 4° C	+ 4° C
Change air circulation	No	Yes	No	Yes	Yes
Winter precipitation	+ 8 %	+ 14 %	+ 16 %	+ 28 %	+ 28 %
Wind velocity	0 %	+ 4 %	- 2 %	+ 8 %	+ 8 %
Summer precipitation	+ 6 %	- 20 %	+ 12 %	- 40 %	- 40 %
Sea water temperature	+ 2.5 °C	+ 2.5 °C	+ 3.5 °C	+ 3.5 °C	+ 3.5 °C
Mean sea level	+60 cm	+ 60 cm	+93 cm	+93 cm	+200 cm

The CLIMAR-project also conducted studies to determine the ecological effects of climate change. This research is important because of the major ecological and economical importance of marine ecosystems. These studies show that coastal marine and estuarine ecosystems will be affected by changes in tidal height and tidal range caused by sea level rise. The consequences include changes in water depth, available light, current velocities, temperature, salinity distributions and a shift in the freshwater-saltwater distribution. This can lead to physiological burdens for some animal and plant species that could then require a habitat change. How regime shifts are triggered and what effects they have in the food web of an ecosystem are not yet thoroughly understood, even though climate change is predicted to have direct and indirect effects on marine plants and animals and consequently on marine food webs (CLIMAR, 2008b).

The effects of climate change will not only have an impact on sea level rise, changes in hydrodynamic climate (increase in storminess), changes in wave patterns (increase wave height) and changes in circulation patterns as know as the primary effects. There will be secondary impacts of climate change, which means impacts on natural and human systems, such as ecological effects (changes in water quality, in ecosystem productivity and biodiversity), economical effects (changes in production and additional cost) and social effects (such as attractiveness of the coast, employment, human settlement, health, accessibility, cultural value and welfare) (CLIMAR, 2007).



4 International actions on adaptation

4.1 Introduction

It is well known that international collective action is required to tackle the problem of climate change. Climate change is a global public good, countries can free-ride on each others' efforts, if there is no international engagement to tackle the problem of climate change, this will lead to a business as usual. Further it is known that cooperative action will greatly reduce the costs of both mitigation and adaptation (Stern, 2007). However adaptation is different from mitigation. Where mitigation actions will reduce greenhouse gases that will decrease the impacts of climate change globally, adaptation actions will reduce the vulnerability to climate change but only for that region where the adaptation measures are beneficial. The impacts of climate change will locally and regionally be different. The majority of adaptation actions need to be decided and to be undertaken at the local, regional and national level. Accordingly the benefits of adaptation will be predominantly situated at the local level. However it has to be recognised that when certain ecosystems are concerned (e.g. watershed, wetlands, forests) adaptation actions may have ecosystem-wide impacts. In addition, lack of adaptation in one place can create situations of mass migration that would affect other places/countries. Thus, adaptation to climate change is not only a local concern but is also of international importance (Levina, 2007). Therefore it is necessary that international organisations and scientists like the UNFCCC, IPCC and the EU insist on the development of adaptation policies within national policies and urge countries to cooperate and to transfer information. Further international and European action is necessary to enhance the adaptive capacity of some countries. It is well known that the impacts of climate change will be most severe in the developing countries and this while these countries have the least adaptive capacity. International action is necessary to support these countries in the development of adaptation strategies.

In what follows the several actions undertaken at international and European level for developing adaptation policies and proposed adaptation approaches and measures will be discussed.



4.2 Within the United Nations

4.2.1 Adaptation and the United Nations Framework Convention on Climate Change (UNFCCC)³

At the international centre of efforts to address climate change is the 1992 United Nations Framework Convention on Climate Change (UNFCCC): *“The UNFCCC provides the basis for concerted international action to mitigate climate change and to adapt to its impacts. Its provisions are far-sighted, innovative and firmly embedded in the concept of sustainable development”* (UNFCCC, 2006). The UNFCCC entered into force on 21st March 1994 and there are now 191 Parties to the Convention, including all major developed and developing countries. The UNFCCC sets the overarching objective for multilateral action: to stabilise greenhouse gas concentrations in the atmosphere at a level that avoids dangerous anthropogenic climate change. It also establishes key principles to guide the international response, in particular that countries should act consistently with their responsibility for climate change as well as their capacity to do so, and that developed countries should take the lead, given their historical contribution to greenhouse gas emissions (Stern, 2007). The ultimate objective of the Convention is to *“achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.”* (Article 2).

Several articles of the Convention deal explicitly with adaptation.

According to the UNFCCC, all Parties – in addition to the development of national greenhouse gases inventories and climate change mitigation measures- shall:

- “take precautionary measures to anticipate, prevent or minimise the causes of climate change and mitigate its adverse effects . . . To achieve this, such policies and measures should take into account

³ Framework Convention on Climate Change, United Nations, FCCC/INFORMAL/84, 9 May 1992, B.S. 2 April 1997.



different socio-economic contexts, to be comprehensive, cover all relevant sources, sinks, and reservoirs of greenhouse gases, and adaptation (Article 3, Section 3).

- formulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures to mitigate climate change . . . and measures to facilitate adequate adaptation to climate change (Article 4, Section 1 (b)).
- cooperate in preparing for adaptation to the impacts of climate change; develop and elaborate appropriate and integrated plans for coastal zone management, water resources and agriculture, and for the protection and rehabilitation of areas, particularly in Africa, affected by drought and desertification, as well as floods (Article 4, Section 1 (e)).
- take climate change considerations into account, to the extent feasible, their relevant social, economic and environmental policies and actions, and employ appropriate methods, for example impact assessment, formulated and determined nationally, with a view to minimising adverse effects on the economy on public health, and on quality of the environment, of projects or measures undertaken by them to mitigate or adapt to climate change (Article 4, Section 1(f)).”

In addition to the appropriate adaptation measures that the parties should take for their own country, the parties are also obliged to support developing countries in the development of adaptation measures:

“All Parties are required to take the actions necessary related to funding, insurance and the transfer of technology, to meet the specific needs and concerns of developing countries arising from the adverse effects of climate change (Article 4, Section 8) and to take full account of the specific needs and special situations of the least developed countries in their actions with regard to funding and transfer of technology (Article 4, Section 9). In addition, developed countries are required to assist developing countries in meeting costs of adaptation to the adverse effects of climate change (Article 4, Section 4).”



Furthermore Article 12 of the Kyoto Protocol to the UNFCCC⁴ refers in clause 8 to adaptation:

“The Conference of the Parties serving as the meeting of the Parties to this Protocol shall ensure that a share of the proceeds from certified projects activities is used to . . . assist developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation.”

Thus the financing of adaptation in some countries has been specifically linked to the measures for reducing emissions (Feenstra *et al.*, 1998).

These references to adaptation constitute only a small part of the Framework Convention, which is primarily devoted to “*stabilisation of greenhouse gas concentration in the atmosphere*” (Article 2). The Third and Fourth Assessment Report of the IPCC have initiated a discussion on adaptation. To this the Conference of the Parties to the UNFCCC has made several decisions in regards to adaptation to climate change.

At the first Conference of the Parties (COP 1) to the Convention, in 1995, the parties established a three-stage framework for addressing adaptation. Stage 1, should be carried out in the “short term”, focused on planning, which includes studies of possible impacts of climate change, identifying particularly vulnerable countries or regions and policy options for adaptation and appropriate capacity-building. Stage 2 involves measures, including capacity building, to prepare for adaptation. Stage 3 entails implementing measures to facilitate adaptation, including insurance, and other adaptation measures. The latter two stages were to be implemented over the “medium and long term”.⁵

Broadly speaking, the efforts to date have centred primarily on Stage 1- and Stage 2-type activities, more often simultaneously than sequentially (Burton *et al.*, 2006). The Convention’s Subsidiary Body for Implementation (SBI) addresses agenda items on vulnerability and adaptation in the context of climate change negotiations. Particular attention has so far been given to issues relating to Articles 4.8 and 4.9 (funding, insurance and transfer of technology to meet the specific needs of the least developed

⁴ Kyoto Protocol to the United Nations Framework Convention on Climate Change, 11 December 1997, B.S.16 September 2002.

⁵ UNFCCC, Decision 11/CP.1 in FCCC/CP/1995/7/Add.1, 6 June 1995.



countries and the developing countries). At COP 7, in 2001, parties established three Global Environmental Facility managed funds (GEF) dedicated fully or partly to supporting adaptation.⁶ SBI decisions have been made related to support and funding by Parties to assist developing countries with impact, vulnerability and adaptation assessment; capacity-building, training, education and public awareness; implementing concrete adaptation activities; promoting technology transfer; and exchanging experience through regional workshops. Attention has also been given to the scientific and technical aspects of adaptation and technology transfer, by the Convention's Subsidiary Body for Scientific and Technological Advice (SBSTA). This includes the Nairobi work programme on impacts, vulnerability and adaptation to climate change (Nairobi work programme). The Programme was adopted by the Conference of the Parties to the UNFCCC in 2005⁷ and renamed in 2006. Its objective is twofold: to assist countries, in particular developing countries and small island developing States, to improve their understanding and assessment of impacts, vulnerability and adaptation; and to assist countries to make informed decisions on practical adaptation actions and measures to respond to climate change on a sound, scientific, technical and socio-economic basis, taking into account current and future climate change and variability (UNFCCC, 2007).

At COP 13, held in December 2007, the UNFCCC developed a roadmap for a post-2012 climate regime the "Bali Road Map", which included "tracks" under the convention and the Protocol, comprising the Bali Action Plan negotiations under the Convention and the negotiations under the Kyoto Protocol (conducted by the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP)). Adaptation is one of the four building blocks in the Bali Action Plan along with mitigation, finance and technology, making adaptation equal important under the Convention.⁸ The Bali Action Plan has acknowledged the need for quick and strong action to limit the emissions of greenhouse gases and any delay in reaching a global long-term agreement will increase the risk of the consequences of climate change. Therefore it adopted the ambitious plan to reach a global long-term agreement at the

⁶ The three funds are the Least Developed Fund (LDCF), the Special Climate Change Fund (SCCF), and the Adaptation Fund. The first two are supported by voluntary contributions from donor countries, the third by a share of the proceeds from credits generated through the Kyoto Protocol's Clean Development Mechanism. The LDCF is designed to support projects addressing the urgent and immediate adaptation needs of the least developed countries as identified by their National Adaptation Plans of Action (NAPAs). UNFCCC, Decision 6/CP.7 and Decision 7/CP.7. in FCCC/CP/2001/13/Add.1, 21 January 2002.

⁷ UNFCCC, Decision 2/CP.11 in FCCC/CP/2005/5/Add.1, 30 March 2006.

⁸ UNFCCC, Decision 1/CP.1 in FCCC/CP/2007/6/Add.1, 3-15 December 2007.



COP 15 conference in Copenhagen in December 2009. To reach this goal it launched a comprehensive process to enable the full, effective and sustained implementation of the Convention through long-term cooperative action. The COP also decided that the process would be conducted under a new subsidiary body – the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA) – that complete its work in 2009. Related to Adaptation the AWG-LCA established the Copenhagen Adaptation Framework or Programme at COP 15, which provided several options to change the Convention and to strengthen enhanced action on adaptation. It also invited all parties to plan, prioritize and implement adaptation actions; to assess the impact, vulnerability and adaption to climate change, to strengthen institutional capacities, to develop means to incentivize the implantation of adaptation actions; to build resilience of socio-economic and ecological systems; to enhance disaster risk reduction; to take measures to enhance understanding and cooperation related to climate change displacement, migration and planned relocation.⁹

At COP 15 the work of the AWGs was open for further discussion, but at the end no legally binding agreement has been agreed. A group of Heads of States representing the major emitting countries and main negotiating groups drafted the Copenhagen Accord. The Copenhagen Accord was not formally adopted at the closing planetary by the COP, but the parties to the UNFCCC have “taken note of” the Copenhagen Accord. Furthermore this Accord is not based on the texts developed by either of the AWGs. Conversely this is a no legally binding political declaration. Up till now, more than 100 countries had officially communicated their support to, or association with, the Copenhagen Accord through written submissions.¹⁰ (IISD, 2009 and Averchenkova, 2010) Although this is only a political declaration the Accord also has some positive elements. Countries have committed themselves to keep global temperature rise below 2°C, in recognition of the principle of common but differentiated responsibilities.¹¹ To achieve this goal developed and developing countries both engaged to submit national actions and reduction targets by 31 January 2010. As of March 2010, many developed and developing countries including all major emitting countries had submitted national actions and targets. According to the Netherlands Environmental Assessment Agency, the World Resource Institute and Nicholas Stern the submitted intentions are already a

⁹ Ad Hoc Working Group on Long-term Cooperative action under the Convention, eighth session, Copenhagen, 7-15 December 2009 in FCCC/AWGLCA/2009/L.7/Add.1, 15 December 2009.

¹⁰ See the UNFCCC website at: <http://unfccc.int/home/items/5262.php>.

¹¹ UNFCCC, Draft Decision -/CP.15 in FCCC/CP/2009/L.6, 18 December 2009.



good step in the direction of keeping the global temperature rise below 2°C, but it would make it significantly more difficult and costly (den Helzen *et al.*, 2010; Levin, 2010 and Stern, 2010). Additionally the Accord announces numbers for fast-start financing (2010-2012) and long-term financing (2012-2020), and the establishment of new funds and mechanisms.¹² Regarding to adaptation the Accord stated that enhanced action and international cooperation on adaptation is urgently required. Developed countries shall provide adequate, predictable and sustainable financial resources, technology and capacity-building to support the implementation of adaptation action in developing countries.¹³ However, the vagueness and uncertainties surrounding the concrete modalities for distributing and allocation resources and implanting new funds limit how positively one may view these commitments (Chetaille *et al.*, 2010).

Since a long term agreement is not been reached the COP decided to extend the mandate of the AWGs to enable it to continue its work with a view to presenting the outcome to COP 16 for adoption.¹⁴ Prior to COP 16 four negotiating sessions of the AWGs were held in 2010. These took place in Bonn, Germany in April, May-June and August and in Tianjin, China, in October. Unfortunately and in line with the expectations the COP of Cancun in Mexico did issued neither a new long term binding climate change agreement nor an expansion of the Kyoto protocol. Nevertheless some progress is made towards a future long term binding agreement included in the Cancun Agreements. The Cancun Agreements import the essential elements of the Copenhagen Accord in the UNFCCC. These agreements include decisions under both the Convention and Protocol negotiating tracks, and contain provisions on adaptation, REDD+, technology, mitigation and finance. (IISD, 2010 and PEW Center, 2010)

Related to the Kyoto Protocol the parties agreed that the AWG-KP shall aim to complete its work in order to avoid a gap between the first and second commitment

¹² § 8 of the UNFCCC, Draft Decision -/CP.15 in FCCC/CP/2009/L.6, 18 December 2009. The collective commitment by developed countries is to provide new and additional resources, including forestry and investments through international institutions, approaching USD 30 billion for the period 2010. 2012 with balanced allocation between adaptation and mitigation. Funding for adaptation will be prioritized for the most vulnerable developing countries, such as the least developed countries, small island developing States and Africa. In the context of meaningful mitigation actions and transparency on implementation, developed countries commit to a goal of mobilizing jointly USD 100 billion dollars a year by 2020 to address the needs of developing countries.

¹³ UNFCCC, Report of the conference of the Parties on its fifteenth session, held in Copenhagen from 7 to 19 December 2009 in FCCC/CP/2009/11/Add.1, 30 March 2010.

¹⁴ UNFCCC, Report of the conference of the Parties on its fifteenth session, held in Copenhagen from 7 to 19 December 2009 in FCCC/CP/2009/11/Add.1, 30 March 2010.



period. Furthermore the COP also urges Annex I Parties to raise the level of ambition on the emission reductions. Finally the parties already reached consensus on some elements of the second commitment period e.g. the base year shall stay 1990, emission trading and project-base mechanisms shall continue to be available to Annex I Parties, the global warming potentials used to calculate the carbon dioxide equivalence of anthropogenic emissions by sources and removals by sinks of greenhouse gases shall be those provided by the IPCC and agreed upon by the COP.¹⁵

Related to the Convention and especially to adaptation a Cancun Adaptation Framework has been established, with the objective of enhancing action on adaptation in accordance with a country-driven, gender-sensitive, participatory and fully transparent approach and taken into account their common but differentiated responsibilities. Actions to be undertaken are the following:

- (a) Planning, prioritizing and implanting adaptation actions;
- (b) Impact, vulnerability and adaptation assessments;
- (c) Strengthening institutional capacities and enabling environments for adaptation;
- (d) Building resilience of socio-economic and ecological systems;
- (e) Enhancing climate change related disaster risk reduction strategies, taking into consideration the Hyogo Framework for Action where appropriate; early warning systems; risk assessment and management; and sharing and transfer mechanisms such as insurance, at local, national, subregional and regional levels, as appropriate;
- (f) Measures to enhance understanding, coordination and cooperation with regard to climate change induced displacement, migration and planned relocation;

¹⁵ UNFCCC, Outcome of the work of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol at its fifteenth session, Cancun.



- (g) Research, development, demonstration, diffusion, deployment and transfer of technologies, practices and processes; and capacity-building for adaptation;
- (h) Strengthening data, information and knowledge systems, education and public awareness
- (i) Improving climate-related research and systematic observation for climate data collection, archiving, analysis and modelling;

In addition the SBI was requested to elaborate modalities and guidelines to support the least developed country parties to formulate and implement national adaptation plans. Furthermore an Adaptation Committee has been established to provide technical support and guidelines to parties, facilitate sharing of information, knowledge and good practices and to promote synergies. Parties are invited to submit to the secretariat by 21 February 2011 view on the composition of and modalities and procedures for the Adaptation Committee. Finally a work programme to consider, including through workshops and expert meetings, approaches to address loss and damage associated with climate change impacts in developing countries that are particularly vulnerable to the adverse effects of climate change. Also in this context parties and relevant organizations are invited to submit by 21 February 2011 views and information on what elements should be included in the work programme e.g. on possible development of a climate risk insurance facility, options for risk management and reduction, approaches to addressing rehabilitation measures and engagement of stakeholders with relevant specialized expertise.

Regarding to mitigation developed countries will quantify economy-wide emission reduction targets and were urged to increase the ambition of these targets, with a view to reducing their aggregate anthropogenic emissions of carbon dioxide and other greenhouse gases to keep the temperature increase below 2°C. In addition developing countries are also planning to take nationally appropriate mitigation actions (NAMAs) aimed at achieving a deviation in emissions relative to 'business as usual' emissions in 2020. This outcome demonstrates a balanced solution of the existing tensions between the developed and developing countries. The latter asked for a differentiation in responsibilities since the largest share of historical global emissions of greenhouse



gases originated in developed countries and thus must take the lead in combating climate change. The developed countries and especially the United States demanded the need for symmetry in the nature of both groups' pledges. (PEW Center, 2010)

Related to forestry financial support will be made available by developed countries in order to support developing countries to reduce emissions from deforestation and degradation and to conserve forest since these are carbon stocks. The Cancun Agreements calls on developing countries planning to undertake such a reduction to develop a national strategy or action plan, a national forest or forest emission reference level and a transparent national system for monitoring and reporting of conservation and emission-reduction efforts. Countries also are to follow safeguards ensuring for instance, the full participation of indigenous people, local communities and other stakeholders. (PEW Center, 2010) Furthermore the Cancun Agreements incorporate the finance goals set in the Copenhagen Accord – a collective commitment by developed countries to provide new and additional resources approaching \$30 billion for the period 2010-2012 and \$100 billion per year by 2020. Finally parties also agreed to establish Green Climate Fund.¹⁶ However the question remains: “When will we ever reach a globally binding climate change agreement?”. The next COP, in Durban, South-Africa will hopefully bring an answer to this question.

Consequently the main focus of the UNFCCC regarding adaptation is to support developing countries in building up adaptive capacity, mainly by assisting them to assess the current vulnerabilities and giving them financial support to adapt. Developed countries have the obligation under Article 4 of the UNFCCC to launch an adaptive strategy as an adequate response to climate change. The same commitment is reflected in Article 10 of the Kyoto Protocol¹⁷ to the Framework Convention: “. . . *Formulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures to mitigate climate change and measures to facilitate adequate adaptation to climate change . . .*”. Nowhere are binding deadlines imposed to develop such adaptation strategies. Several countries have already taken steps in the development and implementation of national adaptation strategies (e.g. France, The Netherlands, the UK, Finland, Denmark, Spain) (ECCP, 2006; Prutsch *et*

¹⁶ UNFCCC, Outcome of the work of the Ad Hoc Working Group on long-term Cooperative Action under the Convention at its fifteenth session, Cancun.

¹⁷ Kyoto Protocol to the United Nations Framework Convention on Climate Change, United Nations, 11 December 1997, B.S. 26 September 2002.



al., 2010). With respect to Belgium a National Climate Plan was developed in 2002, but only concerning emission reduction commitments under the Kyoto Protocol without mentioning of adaptation efforts (National Climate Plan, 2002). Under the regional structure of the Belgian Government, the Flemish Government also developed two Flemish Climate Policy Plans. One for the period 2002-2005, which only related to emission reduction (Vlaams Klimaatbeleidplan, 2002-2005), and one for the period 2006-2012. The latter also deals with adaptation. It provides the future assessment of the effects of climate change for several sectors including agriculture, fisheries, forestry and tourism, and stated that a cost-effective. At the end of 2010 the federal government published the National Climate Change Adaptation Strategy.¹⁸ This strategy is mainly a framework strategy and contains guiding principles which can be taken into account in the development of Regional and National Adaptation Plans. A Flemish Adaptation Plan will be developed by 2012 that will seek to strike a balance between minimizing the possible risks of climate and its impact on the socio-economic development (Vlaams Klimaatbeleidplan, 2006-2012).

Under Article 12 of the Convention Parties are required to submit national reports on implementation of the UNFCCC to the COP, through the secretariat. Both Annex I and non-Annex I Parties need to provide a general description of steps taken or envisaged to implement the Convention as well as information on finance and transfer of technologies. This includes both mitigation and adaptation measures. Annex I Parties are required to submit information on their national inventories annually, and to submit national communications periodically, according to dates set by the COP. The first national communications were submitted in 1994-1995, the second in 1997–1998, the third after 30 November 2001 and the fourth national communications in 2006-2008. The fifth national communication was submitted by 1 January 2010. Following Massey (2010) *Assessing adaptation in the EU: An update*, which provide an assessment framework in which adaptation efforts in European Countries are compared using the national communication of the European countries there can be concluded that the efforts related to adaptation within the European countries have been augmented.

There can be concluded that in principle, adaptation was established as a priority at the very start of the international climate effort. In the UNFCC, all parties committed

¹⁸ National Climate Commission, Belgian National Climate Change Adaptation Strategy, December 2010.



generally to undertake national adaptation measures and to cooperate in preparing for the impacts of climate change. Nearly 16 years after the Convention's adoption, the international adaptation effort is more an irregularly funded patchwork of multilateral and bilateral initiatives than a fully conceived and functioning regime. Most attention is been given to the improvement of the adaptation capacity for developing countries and to provide funds for adaptation efforts in least developed countries (Burton, 2006).

4.2.2 Convention on Biological Diversity (CBD)¹⁹

The Convention on Biological Diversity (CBD) was opened for signature at the UN Conference on Environment and Development in Rio de Janeiro in 1992 and entered into force on 29 December 1993. The main objectives of the Convention are the conservation of biological diversity, the sustainable use of its components and the equitable sharing of the benefits from the use of biodiversity resources. With respect to adaptation to climate change it is recognised that the conservation and sustainable use of biodiversity can provide opportunities for adaptation and is an adaptation option itself, since maintenance and restoration of ecosystems generally provide cost-effective ways to address climate change.²⁰ The protection or restoration of sand dune systems, for example, can offer increased protection of coastal areas to sea level rise and extreme weather events. Likewise, rehabilitation of coastal wetlands can help regulate the flow in watersheds, thereby moderating floods from heavy rain and ameliorating water quality. Conversely, adaptation options may also threaten biodiversity and/or protected habitats, for example, construction of coastal defence works. Particularly when they aim to constrain regular ecosystem services if creation of dams, sea walls, and flood canals leads to habitat loss. (Secretariat of the Convention on Biological Diversity, 2003; The World Bank, 2009) In recognition of these factors, climate change activities have been integrated within all programmes of work of the CBD with the exception of the programme of work on technology transfer and the importance of an ecosystem based approach has been put forward. Ecosystem-based approach is “a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way” (United Nations Convention on Biological Diversity, 2000). An ecosystem-based approach provides a

¹⁹ Convention on Biological Diversity of 5 June 1992, Rio de Janeiro, B.S. 02/04/1997.

²⁰ Conference of the Parties to the Convention on Biological Diversity, 2010. Report of the Ad Hoc open-ended Working Group on review of implementation of the Convention on the Work of its third meeting. UNEP/CBD/COP/10/4, 6 June 2010.



flexible framework to address climate change mitigation and adaptation in a broader perspective (Secretariat of the Convention on Biological Diversity, 2003).

At several COP decisions and in several working papers, parties have been urged to exploit synergies between mitigation and adaptation activities (policies and projects) and activities to conserve and sustainably manage ecosystems as well as between national economic development objectives and environmentally focused projects and policies. Key elements that need to be taken into account to exploit such synergies in establishing such activities are:

- Clear coordination between first of all the work elaborated under the UNFCCC and under the CBD and second among sectoral agencies (Secretariat of the Convention on Biological Diversity, 2003)
- Transparent and participatory decision-making processes involving all relevant stakeholders, integrated into the project or policy design from the beginning, since this can enhance the probability of long-term success. (Secretariat of the Convention on Biological Diversity, 2003)
- Combination of problem identification and analysis, policy-option identification, policy choice and implementation and monitoring and evaluation in an iterative fashion. (Secretariat of the Convention on Biological Diversity, 2003)
- The use of tools such as Environmental Impact Assessment and Strategic Environmental Assessment to evaluate the economic, social and environmental impacts. (Secretariat of the Convention on Biological Diversity, 2003)
- Integrate climate change adaptation measures in protected area planning, management strategies, and in the design of protected area systems.²¹

²¹ CBD, Decision 28/CP. 7, 20 February 2004.



- Take measures to manage ecosystems so as to maintain their resilience to extreme climate events and to help mitigate and adapt to climate change.²²
- The use of the precautionary and ecosystem approaches.²³ The precautionary principle states that “*where there are threats of serious or irreversible damage to public or to the environment, lack of full scientific certainty shall not be used as a reason for postponing cost effective measures to prevent these threats*”. (Shelton *et al.*, 2005)

In 2009, a special Ad Hoc Technical Expert Group on Biological Diversity and Climate Change under the Convention on Biological Diversity developed a report *Connection biodiversity and climate change mitigation and adaptation* in which the need for ecosystem-based adaptation has been stressed. “*Ecosystem-based adaptation, which integrates the use of biodiversity and ecosystem services into an overall adaptation strategy, can be cost-effective and generate social, economic and cultural co-benefits and contribute to the conservation of biodiversity*” (Secretariat of the Convention Biological Diversity, 2009). Ecosystem-based adaptation uses biodiversity and ecosystem services in an overall adaptation strategy. It includes the sustainable management, conservation and restoration of ecosystems to provide services that help people adapt to the adverse effects of climate change. Ecosystem-based adaptation includes for instance coastal defence through the maintenance and/or restoration of coastal wetlands to reduce coastal flooding and coastal erosion. Measures to increase the adaptive capacity of species and ecosystems in the face of accelerating climate change include for instance strengthening of protected area networks. (Secretariat of the Convention Biological Diversity, 2009) Also within the policy of the European Union the need for ecosystem-based adaptation is emphasised.²⁴ Concluding that adaptation planners need to take into account first of all an ecosystem-based approach in setting-up coastal adaptation plans as well as the above mentioned key elements in order to exploit the opportunities of adaptation actions that need to be undertaken in order to

²² CBD, Decision 15/CP. 7, 20 February 2004.

²³ CBD, Decision 16/CP. 9, 30 May 2008.

²⁴ COM (2009) 147 final, White Paper: Adapting to climate change: Towards a European framework for action, and Dir. 2008/56 (2008) OJ L164/19, The European Parliament and the Council establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive).



protect the biodiversity. This has been reaffirmed at the 10th COP in Nagoya.²⁵ At the same COP the updated 10 year Strategic Plan 2010-2020 has been adopted. The first Strategic Plan was adopted at COP 6 in 2002 and aimed to achieve by 2010 significant reduction of the current rate of biodiversity loss²⁶, since biodiversity is still at risk and the protection on biodiversity is a continuous process 20 new targets have been adopted in order to achieve resilient ecosystems by 2020. Related to adaptation and the coastal zones two targets need to be mentioned namely target 11 which states that 10% of coastal and marine areas and 17% of terrestrial and inland water need to be protected by 2020 and target 15 which states that by 2020 15% of degraded lands need to be restored and conserve this to contribute to the conservation of biodiversity and thereby contributing to climate change mitigation and adaptation.²⁷ In order to make sure that those targets become more than empty promises, adequate legal and policy actions need to be undertaken by national authorities such as the implementation of marine protected areas with clear restrictions for fishing and dredging activities and a legal embedment of the UN Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UN-REDD).

4.2.3 Intergovernmental Panel on Climate Change (IPCC)

In 1988 the United Nations Environmental Programme and the World Metrological Organisation jointly established the Intergovernmental Panel on Climate Change (IPCC) with a mandate to assess the best scientific efforts on climate change, its potential impacts, and possible response strategies. Since then, the IPCC has produced four comprehensive assessments. These comprehensive assessments contain scientific, technical and socio-economic information relevant for mitigation and adaptation. Assessment Reports have been completed in 1990, 1995, 2001 and 2007. These assessment reports are prepared by three different working groups. Working Group I assess the available scientific information on climate change. Working Group II assess the vulnerability of socio- economic and natural systems to climate change and options for adapting to it. Working Group III assesses options for mitigating climate change.

²⁵ CBD, Report of the tenth meeting of the conference of the parties to the convention on biological diversity, held in Nagoya, Japan, 18-29 October 2010 in UNEP/CBD/COP/10/27, 19 December 2010.

²⁶ CBD, Decision 26/CP. 6, 19 April 2002.

²⁷ CBD, Decision 2/CP 10, 29 October 2010.



The fourth assessment report is composed of 4 volumes and various contributions. The fourth and last volume –Synthesis report- was launched in November 2007. Relevant for this research is the report published by the IPCC Working Group II *Climate Change 2007: Impacts, Adaptation and Vulnerability*. In this report the IPCC Working Group II assessed the observed changes and responses in natural and managed systems (e.g. coastal zones, marine and freshwater biological systems, agriculture, ...), and summarised new assessment methods and characterise future conditions. The report examined the vulnerability, the future trends, key future impacts and vulnerabilities, cost and socio-economic aspects, adaptation options for all the natural and managed systems and for the different regions of world (e.g. Africa, Europe, the polar regions, small islands). There is a chapter dedicated to the assessment of adaptation practises, options, constraints and capacity. Finally the IPCC assessed the interrelationships between adaptation and mitigation, examined the key vulnerabilities and the risks from climate change and gave perspectives on climate change and sustainable development (IPCC, 2007c).

Regarding to this research it is interesting to know what the IPCC assessed as the current vulnerabilities of coastal systems and low-lying areas and which adaptation options to mitigate the impacts of climate change are proposed.

First of all the IPCC pointed out that coasts will be exposed to increasing risks, including coastal erosion, over coming decades due to climate change and sea-level rise. Adaptation costs for vulnerable coast are much less than the costs of inaction. As post-event impacts on coastal businesses, people, housing, public and private social institutions, natural resources, and the environment generally go unrecognised in disaster cost accounting, the full benefits of adaptation are even larger (IPCC, 2007c).

One of the first vulnerabilities assessed by the IPCC Working Group II is the fact that coasts are dynamic systems and so they have a natural variability. This makes it difficult to identify the impacts of climate change. For example, most beaches worldwide show evidence of recent erosion but sea-level rise is not necessarily the primary driver. Erosion can result from other factors, such as altered wind patterns, offshore bathymetric changes, or reduced fluvial sediment input. A major challenge is determining whether observed changes have resulted from alteration in external factors (such as climate change) or short-term disturbance within natural climate variability (such as storm). Human activity is another assessed vulnerability. The IPCC report



pointed out that the direct impacts of human activities on the coastal zone have been more significant over the past century than impacts that can be directly attributed to observed climate change. The major direct impacts of human activities include drainage of coastal wetlands, deforestation and reclamation, and discharge of sewage, fertilisers and contaminants into coastal waters. Extractive activities can cause introductions of invasive species and construction of seawalls and other structures. Engineering structures, such as damming, channelization and diversions of coastal waterways and seawalls can alter natural systems directly or indirectly, even by soft engineering solutions, such as beach nourishment and foredune construction. Ecosystem services on the coast are often disrupted by human activities. For example, wetlands are reduced by large-scale ecosystem conversion for agriculture, industrial and urban development and aquaculture. The rise in sea level will ensure, in the absence of appropriate adaptation measures, that there will be even more wetlands which will disappear by coastal squeeze. Other vulnerabilities assessed in the report are the increasing human utilisation of the coastal zone and the marine influences (IPCC, 2007c).

Concerning adaptation, the IPCC stated that responses to sea-level rise and climate change need to be implemented in the broader context and the wider objectives of coastal planning and management such as integrated coastal zone management (ICZM). This will be more effective than reactive and standalone efforts. ICZM focuses on integrating and balancing multiple objectives in the planning process. Enhancing adaptive capacity is an important part of ICZM. The extent to which climate change and sea-level rise are considered in coastal management plans is one useful measure of commitment to integration and sustainability (IPCC, 2007c).

Furthermore the IPCC proposed different adaptation options. In this paper only the adaptation options for coastal systems and low-lying areas will be discussed. In general the IPCC stated that the decision as to which adaptation option is chosen is likely to be largely influenced by local socio-economic considerations. Subsequently the report stresses that the particular adaptation strategy that will be adopted depends on many factors, including the value of the land or infrastructure under threat, the available financial and economic resources, political and cultural values, the local application of coastal management policies, and the ability to understand and implement adaptation options. Concerning coastal systems and low-lying areas, the



report proposes different adaptation options depending on the adaptation objective (protect, accommodate or retreat). Examples of adaptation options are building dykes or beach nourishment if the objective is to protect and hold the line. If the objective is to protect and advance the line, solutions are land claim, empoldering and estuary closure. If the objective is to accommodate and increase flexibility, the proposed adaptation measures are ‘flood proof’ building and floating agricultural systems. If the objective is to retreat, adaptation responses could be managed realignment or wetland restoration. There is also need for improving awareness and preparedness which can be achieved by flood hazard mapping and flood warnings. It is important to consider adaptation measures that reduce the direct threats to the survival of coastal systems. These can include marine protected areas and ‘no take’ reserves (IPCC, 2007c). In figure 1 adaptation options as identified under the IPCC for Coastal areas can be identified.

Sector/System dependent on wetlands	Adaptation Options
Food, Fiber, Coastal Areas, Marine Fisheries	<ul style="list-style-type: none"> • Change timing of planting, harvesting, and other management activities. • Prevent or phase-out development in coastal areas vulnerable to erosion, inundation, and storm-surge flooding. • Use ‘hard’ (dikes, levees, seawalls) or ‘soft’ (beach nourishment, dune and wetland restoration, a forestation) structures to protect coasts. • Implement storm warning systems and evacuation plans. • Protect and restore wetlands, estuaries, and floodplains to preserve essential habitat for fisheries. • Modify and strengthen fisheries management institutions and policies to promote conservation of



	<p>fisheries.</p> <ul style="list-style-type: none"> • Conduct research and monitoring to better support integrated management of fisheries.
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Figure 1 – Examples of adaptation options for selected sectors (modified from IPCC 2001, Tables 3-6) (Ramsar, 2002).

4.3 Within the EU

4.3.1 Green and White Paper on Adaptation

The first step in addressing climate change adaptation issues was the development of the Green Paper on adaptation by the European Commission. This Green Paper *Adaptation to climate change in Europe - options for EU action*²⁸ has been adopted on 29 June 2007 and builds upon the work and findings of the European Climate Change Programme (ECCP).²⁹ The purpose of this Green Paper is to launch a debate on the EU's contribution to an efficient and coordinate adaptation strategy for Europe. It underlines the importance of the external dimensions and the need to cooperate actively with our foreign partners, in particular developing countries.

The Green Paper draws attention to the impacts of climate change for different physical and biological systems (e.g. water, ecosystems and biodiversity, food, coasts and health), and describes the most vulnerable areas in Europe, for instance coastal zones which are vulnerable due to sea level rise combined with increased risks for storms. These findings emphasise the need for adaptation within the European Union. The Green Paper stresses that adaptation could reduce costs and policies are put in place to overcome obstacles for private action.

Market forces alone are unlikely to lead to efficient adaptation because of a certain degree of uncertainty of climate projections and lack of financial resources. Cost-effective adaptation is therefore the most appropriate solution.

²⁸ COM (2007) 354 final, Green Paper from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions: Adapting to climate change in Europe – options for EU action.

²⁹ The first EPPC is established in 2001 but did not tackle the problem of adaptation to climate change. The First EPPC was only directed to identify and develop all the necessary elements of an EU strategy to implement the Kyoto Protocol. The second ECCP was launched in 2005 and one of the working groups (Working Group II Impacts and adaptation) is directly aimed at adaptation. The main objective of this Working Group is to explore options to improve Europe's resilience to climate change impacts, to encourage the integration of climate change adaptation into other policy areas at the European, national and regional level and to define the role of EU-wide policies complementing action by Member States.



Concerning adaptation responses, the Green Paper states that there are many actors who will be confronted with the consequences of climate change (e.g. private sector, businesses, industry and services' sectors, as well as individual citizens) and all these actors need to play an important role in adaptation measures. The Green Paper makes a distinction between soft, relatively inexpensive measures (e.g. water conservation, changes in crop rotations, sowing dates and use of drought tolerant crops, public planning, and awareness raising) and costly defence and relocation measures (e.g. increasing the height of dykes, relocation of ports, industry, entire cities and villages from low-lying coastal areas and flood plains, and building new power plants because of failing hydropower stations). Besides the private sector also the public sector will need to take actions to cope with the impacts of climate change (e.g. adapting spatial planning and land use planning to risks of flash floods, adapting existing buildings codes ensuring that long-term infrastructure will be proof to future climate risks, updating for disaster management strategies, early flood and forest fire warning systems).

The Green Paper also points out the positive effects of climate change such as the new economic opportunities that will arise, including new jobs and markets for innovative products and services. The Green Paper calls on member states to take action to cope with the changing climate. Namely early action will bring economic benefits by anticipating potential damages and minimizing threats to ecosystems, human health, economic development, property and infrastructure. At National level member states need to improve disaster or crisis management and develop adaptation measures. The Green Paper notices that experience and expertise in designing effective adaptation strategies and implementing policies is still limited and states that information sharing on adaptive response measures could greatly reduce learning costs. The European Commission sees in spatial planning a suitable tool to define cost-effective adaptation because it's a cross-sectoral issue and spatial planning could play a key role to raise awareness among the public, decision makers and professionals and to trigger a more proactive approach at all levels. Finally the Green Paper outlines the future policy of the European Union on adaptation, set out in a four-action approach at Community level:

- The first involves integrating adaptation when implementing and modifying existing legislation. This can be done in a variety of policy



areas from agriculture to trade that are backed by EU policies. In addition, adaptation should be integrated into Community funding programmes and the EU should develop new policy responses.

- The second recommends integration of adaptation into existing EU external actions, in particular its promotion in developing countries. Furthermore, adaptation policies could be shared between partners, with trade agreements used to promote green technologies and investment.
- The third calls for intensified climate research, in particular on the impacts of global warming, and technological innovation.
- The fourth is about involving all segments of society, business and the public in the further development of adaptation strategies. Since adaptation could cause significant changes in many different sectors.³⁰

The second step in addressing climate change adaptation issues was to initiate a public debate. The public debate involved soliciting input from European stakeholders using three media: web-based submissions, more formalized written submissions and stakeholder workshops and was launched on 3 July 2007. All interested parties (e.g. organisations and individuals) were invited to contribute to the debate, expressing concerns and suggesting changes and improvements (European Commission, 2008). The result of the public consultation was the drafting and adopting of a White Paper³¹, which was presented by the European Commission the first of April. In contrast to the Green Paper which was a discussion paper, the White Paper is a policy document and sets out a framework for adaptation measures and policies to reduce the EU's vulnerability to the impacts of climate change.

The objective of the White Paper is to improve the EU's resilience to deal with the impact of climate change and sets out a framework within which the European Union and its Member States can do so. A first phase of the strategy will run until 2012 and

³⁰ COM (2007) 354 final, Green Paper from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions: Adapting to climate change in Europe – options for EU action.

³¹COM (2009) 147 final, White Paper: Adapting to climate change: Towards a European framework for action.



will lay the groundwork for preparing a comprehensive EU adaptation strategy from 2013 and beyond. It will focus on increasing our understanding of climate change and possible adaptation measures and how adaptation can be embedded in key EU policies. Decisions on how best to adapt must be based on solid scientific and economic analysis, yet information content and availability differs widely across regions. The paper outlines four pillars in which several actions are determined to be carried out during the first phase.

- 1) Strengthen the Knowledge base/Evidence Base
- 2) Mainstreaming climate adaptation into key policy areas
- 3) Employ a combination of policy instruments to ensure effective delivery of adaptation
- 4) Advance work internationally on adaptation

One of the actions under the pillar 1 is the establishment of a Clearing House Mechanism by 2011 where information on climate change risks, impacts and best practices would be exchanged between governments, agencies, organisations working on adaptation policies and on-going global, EU and national research projects and studies. Related to pillar 2 mainstreaming climate change adaptation into EU key policies an important action is the development of guidelines to incorporate climate change impacts in several EU Directives. The first guidance document is issued on 30 November 2009 by the Water Directors of EU Member States on adaptation to climate change in water management.³² This document together with the state of affairs of important EU Directives related to the coastal zone and their inclusion of climate change adaptation is discussed below into more detail. Under the third pillar an Impact and Adaptation Steering Group (IASG) is established to put in place a process to better coordinate adaptation policies and assess next steps, review instruments and launch a debate on future funding. Furthermore the White Paper encourages the EU Member States to further develop National and Regional Adaptation Strategies with a view to considering mandatory adaptation strategies from 2012. Up till now 11 EU Member states have adopted a national adaptation strategy. (Prutsch *et al.* 2010)

³² European Commission (2009), Guidance document No. 24 River Basin Management in a Changing Climate. 134pp.



Regarding to ecosystem-based adaptation the Commission stresses the need for increasing the resilience of biodiversity, ecosystems and water. Ecosystem services such as flood protection and protection against soil erosion are directly linked to climate change and healthy ecosystems are an essential defence against some its most extreme impacts. A comprehensive and integrated approach towards the maintenance and enhancement of ecosystems and the goods and services they provide is needed.

Impacts of climate change will vary by region, with coastal and mountain areas and flood plains particularly vulnerable. It is for this reason that most adaptation measures will need to be carried out nationally or regionally. The role of the European Union will be to support these efforts through an integrated and coordinated approach, particularly in cross-border issues and policies which are highly integrated at EU level.

The Commission has also prepared three discussion papers on water, coasts and marine, agricultural and health issues based on the framework set out in the White Paper. Regarding to this research the working document on climate change and water, coast and marine issues³³ is of interest. The working document defines several key impacts on water and coastal and marine areas (e.g. changes in the natural environment, rising pressure on marine ecosystems and biodiversity, sea-level rise and ocean acidification will affect fisheries, aquaculture, wetlands and estuaries, increasing risk of infrastructure damage, coastal tourism will be affected by coastal erosion and changes in the marine environment and marine water quality). The working document highlights that all these impacts are enough reasons to develop a clear adaptation strategy, although further research is still needed in order to ensure that proper decisions on adaptation can be taken. The approach that the EU is pursuing is an integrated approach to both water management and to the management of marine and coastal zones, including measures to mainstream adaptation into sectoral policies. Adaptation efforts need to be integrated into the implementation of existing EU water legislation and marine and coastal zone legislation and policies, such as the Water Framework Directive³⁴, the Flood Directive³⁵, the Marine Strategy Framework

³³ SEC (2009) 386/2, Commission Staff Working Document accompanying the White Paper Adapting to climate change: Towards a European framework for action, Climate change and Water, Coasts and Marine Issues.

³⁴ Dir. 2000/60 (2000) OJ L327/1, The European Parliament and the Council establishing a framework for Community action in the field of water policy (Water Framework Directive).

³⁵ Dir. 2007/60 (2007) OJ L288/27. The European Parliament and the Council, on the assessment and management of flood risk (Flood directive).



Directive³⁶ and in the Integrated Coastal Zone Management. In order to ensure a coordinated and integrated approach to adaptation in coastal and marine areas and to take into account trans-boundary issues, the Commission will develop guidelines on best adaptation practices in coastal and marine areas by 2012. These guidelines will take account of and build on existing studies, research and relevant policy initiatives, in particular the Community strategy on disaster prevention the Floods directive (preliminary risk assessments 2011), the EUroison and CONSTANCE research projects, the OURCOAST initiative, etc.. (Delsalle, 2010)

Ribeiro *et al.* (2008) also published a study on *guidelines for the elaboration of Regional Climate Change Adaptation Strategies* commissioned by the European Commission. The primary aim of this document is:

- provide a step-by-step process that will lead to a strategy for reducing regions' to vulnerability to climate variability and change
- identifying and prioritising adaptation responses
- where possible, integrating climate adaptation within a wider range of policies, plans and programmes

First a literature study has been carried out on existing adaptation guidelines and key features of these adaption guidelines have been determined as:

- Gaining political backing and managerial commitment.
- Embedding/Mainstreaming climate change adaptation within existing plans, policies and programmes.
- Developing an evidence base.
- Identification of key vulnerabilities.
- Selection and assessment of adaptation options.
- Stakeholder engagement and communication.

³⁶ Dir. 2008/56 (2008) OJ L164/19, The European Parliament and the Council establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive).



- Monitoring, evaluation and review.

Based on this study Ribeiro *et al.* (2008) identified a scheme to develop regional climate change adaptation strategy, see figure 2 on the next page.



Figure 2 – Regional adaptation strategies schematic diagram (Ribeiro *et al.*, 2008).

Furthermore the role of the EU in promoting the development of regional adaptation strategies is highlighted. Actions that can be undertaken by the EU are (Ribeiro *et al.*, 2008):

- Provide funding for adaptation under existing EU funds such as the European Regional Development Fund, Cohesion Fund, European Social Fund, etc.
- Develop methodologies for assessing the impact and assessing cost-effective adaptation policies to support and redirect existing policies, to facilitate cross-border cooperation and to facilitate negotiations with neighbouring non-EU countries.

Related to funding there must be noted that the EU budget currently does not reflect EU policy priorities in the field of adaptation to climate change. According to the European Union the next multiannual financial framework should accord a high ranking to climate change and in particular to adaptation measures.³⁷

In addition, the Policy Research Corporation published a report on *the economics of climate change adaptation in EU coastal areas* on behalf of the European Commission (Policy Research Corporation, 2009). This report highlight the impacts of climate

³⁷ European Parliament resolution of 6 May 2010 on the Commission White Paper: "Adapting to climate change: Towards a European framework for action".



change and note that each European coastal Member State is exposed differently to climate change, but trends can be observed per marine basin. This is followed by an overview of approaches and measures to climate change adaptation in coastal zones. According to the report measures to reduce coastal vulnerability to sea level rise, flooding and erosion are mainly categorized as ‘protect’, ‘accommodate’ and ‘retreat’ options:

	<i>Protect</i> = effort to continue use of vulnerable areas	<i>Accommodate</i> = effort to continue living in vulnerable areas by adjusting living and working habits	<i>Retreat</i> = effort to abandon vulnerable areas
<i>Hard</i>	Dikes, seawalls, groins, breakwaters, salt water intrusion barriers	Building on pilings, adapting drainage, emergency flood shelters	Relocating threatened buildings
<i>Soft</i>	Sand nourishments, dune building, wetland restoration or creation	New building codes, growing flood or salt tolerant crops, early warning and evacuation systems, risk-based hazard insurance	Land use restriction, set-back zones

Figure 3 – Adaptation measures to sea level rise, flooding and erosion (Policy Research Corporation, 2009)

Finally the report deals with the economic aspects of adaptation by providing a theoretical approach and determines how adaptation is dealt with in practice within the EU Member States. (Policy Research Corporation, 2009)

In conclusion since the adoption of the *White Paper on Adaptation* EU action on adaptation is getting more and more shape (guiding documents are being established, the Clearing House Mechanism is being worked out, a Steering Committee has been established etc.). Still lot of actions need to be undertaken in order to achieve a comprehensive EU adaptation Strategy by 2013, for instance gathering knowledge on cost and benefits of adaptation, optimise EU funding by developing vulnerability indicators to prioritise the funds and action to the most vulnerable EU regions and develop clear guidance to mainstream climate change adaptation in existing policies.

4.3.2 EU Directives and policies and their inclusion of climate change adaptation considerations

The White Paper on adaptation stressed the need to mainstream climate change adaptation in key policy areas rather than establish a new Directive or other legal instrument on adaptation. Climate change adaptation mainstreaming is the integration of climate concerns and adaptation responses into relevant policies, plans,



programmes, and projects at the national, sub-national, and local scales. (USAID, 2009) This section explores some directives and policies relevant for the development of coastal adaptation strategies and explores their linkages with climate change adaptation.

4.3.2.1 Environment Impact Assessment Directive (EIA-Directive)

The Environmental Impact Assessment Directive (EIA-Directive) requires an Environmental Impact Assessment (EIA) of any project likely to have significant effects on the environment before consent for the development can be granted. The public is consulted already at the beginning of the EIA process as well as in the different stages of the EIA process. The public can give its opinion and is informed of the decision afterwards.

The EIA Directive outlines which project categories that are subject to an EIA, what procedure to be followed and the content of the assessment. Article 4 of the Directive states that an EIA is mandatory for projects of the classes listed in Annex I but is only mandatory for projects listed in Annex II after a case-by-case examination or when it falls under certain thresholds or criteria set by Member States. Dams and other installations designed for the holding back or permanent storage of water when this exceeds 10 million cubic metres is an example of a project that fall into the Annex I category. Other Dams and installations to hold water or store it on a long-term basis, coastal work to combat erosion and maritime works such as dykes, jetties and other sea defence works, marinas and caravan sites are included in Annex II as projects which may require an EIA. Following the European Court of Justice in the case C-72/95 *Kraaijeveld*³⁸ the EIA-Directive has a wide scope and broad purpose. A Member State exceed the limits of its discretion if they establish the criteria and thresholds in such a way that, in practice, projects are exempted in advance from the requirement of an impact assessment, without taking into account the significant effects on the environment. Dykes in order to prevent flood relief works should be seen as flood relief works and therefore fall under Annex II of the EIA-Directive. Furthermore modification to dykes (relocation, reinforcement or widening and replacement) is also subjected to an EIA under the EIA-Directive. In the follow up of this decision the EIA-Directive is

³⁸ ECJ 24 October 1996, nr. C-72/95, *European Court Reports* 1996, I, 5403.



amended in such a way that from 1997 on dykes are explicitly mentioned in the EIA-Directive Annex II (k).

Related to the inclusion of climate change consideration in the EIA-Directive there has to be noted that the inclusion of assessing the emissions of green house gases of certain projects is already a commonly used practice in several Member States due to the fact that climatic factors is mentioned as on the aspects of the environment likely to be significantly affected and emission of pollutants is mentioned as one of the likely significant effects (Annex IV). Annex III of the Directive lists the factors that should be taken into account when assessing the environmental impact of a proposed development. This includes factors like characteristics of the project, location and characteristics of the potential impacts. With clear guidance climate change adaptation could also be considered in the EIA process. Such guidance is already given by the Organisation of Economic Cooperation and Development (OECD). The OECD is a multi-disciplinary inter-governmental cooperation organisation established in 1961. Today, it comprises 33 member country and the European Commission. In 2010 the report *Incorporating Climate Change Impacts and Adaptation in Environmental Impact Assessment Opportunities and Challenges* has been published (Agrawala *et al.*, 2010). The report shows that there is ample scope for employing EIA procedures as a vehicle for enhancing the resilience of projects to the impacts of climate change. A number of entry points within the EIA process have been identified to incorporate climate change impact and adaptation consideration. (Agrawala *et al.*, 2010)

Within the EU, the Green Paper on Adaptation states that climate change proofing must be integrated into the EIA-Directive and Strategic Environmental Assessment Directive (SEA-Directive) and policy impact assessments must address impacts on ecosystems³⁹. The White Paper on Adaptation states that the Commission will work out guidelines together with Member States and stakeholders to ensure that climate change impacts are taken into account when implementing EIA and SEA by 2011. In the follow up of this statement the European Commission launched a wide public consultation in relation to review EIA legislation in June 2010. In August of the same year the Committee of the Regions gave its opinion on improving the EIA and SEA Directives which states that both directives should contain a well-established

³⁹ COM (2007) 354 final, Green Paper from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions: Adapting to climate change in Europe – options for EU action.



methodology to determine the impacts of climate change.⁴⁰ All these findings will feed into a review in 2011. This review should culminate in a new text that will also encompass new policy developments such as sectors of climate change, energy and biodiversity. Concluding guidance on the integration of adaptation in the EIA Directive is underway.

4.3.2.2 Strategic Environmental Assessment Directive (SEA-Directive)

The Strategic Environmental Assessment Directive (SEA-Directive) involves the systematic identification and evaluation of the impacts of a plan or programme on the environment. In association with the EIA-Directive, the SEA-Directive requires certain plans and programmes that are likely to have significant effects on the environment to undergo an environmental assessment. The Directive's overall aim is *“to contribute to the integration of environmental considerations, into the preparation and adoption of plans and programmes with a view to promoting sustainable development.”* (Article 2)

SEA differentiates from EIA since the environmental assessment takes place at a higher level and in an earlier stage. In addition plans and programmes are established of a wider range of options than the eventual project they can also deal with a higher level of uncertainty such as climate change impacts since the level of detail is not that high as in a project-EIA.

As stated above the SEA-Directive requires a SEA of certain plans and programmes that are likely to have significant environmental impacts there can be concluded that SEA identifies the impacts of a proposed plan or programme on the environment rather than the impact of environmental change such as climate change on the plan or programme. This means that the inclusion of adaptation considerations, which anticipates the effects of climate change, is not strictly included into the SEA-Directive. However this does not mean that the plan-maker does not need to take into account the effects climate change will have on the plan or programme since this can lead to maladaptation practices and is not in line with the initial purpose of the SEA-Directive to enhance sustainable development. Though experience and empirical evidence on the inclusion of climate change adaptation considerations in programmes and plans through the SEA is not yet well known.

⁴⁰ Opinion of the Committee of the Regions on Improving the EIA and SEA Directives (2010/C 232/07) OJ. L. 232/41.



Up till now the European Commission did not publish guidelines on how to deal with the inclusion of climate change adaptation into a SEA. However, as stated above in the section on EIA, the European Commission, in the follow-up of the White Paper on Adaptation, is working on guidelines on how to integrate climate change impacts into the SEA-Directive.

However there must be noted that the OECD is taken a lead in integrating climate change adaptation concerns into SEA, as it also was the case for EIA. Already in 2008 the OECD published an advisory not on SEA and adaptation to climate change (OECD/DAC, 2008). The afore-mentioned advisory note aims to demonstrate how SEA facilitates the integration of climate change adaptation considerations into planning and decision-making.

The advisory note states that not all SEAs should include climate change considerations, only those plans, policies and programmes that are likely to be influenced by, and hence need to adapt to climate change or influence adaptive capacities in some way to integrate climate change considerations into the SEA process. In order to do so a climate lens can be adopted. A climate adaptation lens is an analytical process/step/tool to examine a plan, policy or programme. The main part of the advisory note sets key questions which should be asked in the process of integrating climate change considerations into SEA, especially in the first phase or the scoping phase and the second phase or the implementation phase. This advisory note is very useful for states to adapt their existing legally embedded SEA process to adaptation to climate change. Given that the OECD already elaborated a report on how to incorporate climate change impacts and adaptation in environmental impact assessments (Argawala *et al.*, 2010) it is likely that the OECD will elaborate a specific report on incorporating climate change considerations in strategic environmental assessments as well. Concluding guidance on the integration of adaptation in the SEA-Directive is underway.

4.3.2.3 Birds-Directive and Habitats-Directives

Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Habitats-Directive)⁴¹, adopted in 1992, and the Council Directive 79/409/EEC

⁴¹ Dir. 1992/43/EEC (1992) OJ L 206/7 on the conservation of natural habitats and of wild fauna and flora.



of 2 April 1979 on the conservation of wild birds (Birds-Directive)⁴² are the means by which the European Union meets its obligations under the Bern Convention⁴³ and the CBD⁴⁴, while at the same time creating a more detailed framework for site conservation and protection than these conventions themselves do. The main aim of the Habitats Directive is to promote the maintenance of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species at a favourable conservation status, introducing robust protection for those habitats and species of European importance. In applying these measures Member States are required to take account of economic, social and cultural requirements, as well as regional and local characteristics. The Birds-Directive on the other hand provides a framework for the conservation and management of, and human interactions with, wild birds in Europe. It sets broad objectives for a wide range of activities, although the precise legal mechanisms for their achievement are at the discretion of each Member States. In order to achieve these objectives the Habitat-Directive and the Bird-Directive require the establishment of respectively Sites of Community Importance (SCIs) and special areas of conservation (SACs) and special protection areas (SPAs). These areas should form a coherent ecological network, Natura 2000 (Article 3(a) Habitats-Directive).

Climate change is not directly addressed in the Birds-Directive and Habitats-Directives. Still it is acknowledged that on the one hand biological diversity is expected to come under increasing stress on account of climate change and on the other hand an ecosystem based adaptation approach to climate change can enhance the resilience of existing habitats and can lead to the creation of more natural habitats. (IPCC, 2007c; Secretariat of the Convention Biological Diversity, 2003) In the light of this it is noteworthy that Member States are under a continuous duty to designate or nominate sites which (newly) qualify for inclusion in Natura 2000, which may happen more often in the future as climate change advances. (Trouwborst, 2009) However climate change can also form a major threat for natural habitats, for instance due to coastal squeeze and if hard coastal defence structures are chosen instead of soft coastal defence structures, natural habitats can also be at risk of disappearing. Therefore it is necessary that Member States are given clear guidance and legally binding provisions

⁴² Dir. 1979/409/EEC (1979) OJ L 103/1 on the conservation of wild birds. As amended by the Dir. 2009/147/EC OJ. L. 20/07 of 30 November 2009.

⁴³ Convention on the Conservation of European Wildlife and Natural Habitats of 19 September 1979, Bern, B.S. 29/12/1990.

⁴⁴ Convention on Biological Diversity of 5 June 1992, Rio de Janeiro, B.S. 02/04/1997.



to avoid the loss of natural habitats due to climate change and to enhance the resilience of natural habitats.

According to Article 6(2) of the Habitats-Directive Member States need to take appropriate steps to avoid, in the SPAs, SCIs and SACs, the deterioration of natural habitats and the habitats of species as well as disturbance of the species for which the areas have been designated. In case *C-6/04 Commission of the European Communities v UK and Northern Ireland*⁴⁵ of the European Court of Justice the Advocate General observed in point 19 of her Opinion that it is clear that, in implementing Article 6(2) of the Habitats Directive, *“it may be necessary to adopt both measures intended to avoid external man-caused impairment and disturbance and measures to prevent natural developments that may cause the conservation status of species and habitats in SACs to deteriorate.”*⁴⁶ Climate change can be seen as one of those natural developments which Member States need to take in to account when setting up measures to avoid deterioration of natural habitats.

The formation of ecological networks under Article 3 of the Habitats-Directive is also a useful tool to enhance the resilience of natural habitats. However up till now when it comes to connectivity the relevant provisions of the Habitats-Directive are put rather weakly ‘shall endeavour’, ‘where they consider it necessary’, ‘to encourage’ and leave this crucial matter largely to the discretion of each Member State (See Article 3 and 10 Habitats-Directive): *“Where they consider it necessary, Member States shall endeavour to improve the ecological coherence of Natura 2000 by maintaining, and where appropriate developing, features of the landscape which are of major importance for wild fauna and flora.”* Recent EU policy including the EU Biodiversity Action Plan⁴⁷ demonstrates awareness of the shortcomings outlined here. (Trouwborst, 2009) According to this afore-mentioned Plan and the communication of the Commission hereon, climate change together with ill-considered land use and development are seen as the two major threats on biodiversity. The first actions mentioned in the Plan are related to the effective establishment and need for a sufficient connectivity of Natura 2000. Objective 9 of the Plan is specifically dedicated to support biodiversity adaptation to climate change. Related to climate change and enhancing resilience of

⁴⁵ ECJ 20 October 2005, nr. C-6/04.

⁴⁶ ECJ 20 October 2005, Case C-6/04, *Commission v United Kingdom of Great Britain and Northern Ireland*.

⁴⁷ COM (2006) 216 final, Halting Biodiversity Loss by 2010 – and Beyond: Sustaining ecosystem services for human well-being.



natural habitats the Plan set a target for 2010 to “*substantially strengthen coherence, connectivity and resilience of the protected areas network in order to maintain favourable conservation status of species and habitats in the face of climate change by applying as appropriate, tools which may include flyways, buffer zones, corridors and stepping stones (including as appropriate to neighbouring and third countries),’ as well as actions in support of biodiversity in the wider environment*”.⁴⁸ A mid-term assessment of the Biodiversity Action Plan documents the progress made since June 2006 and outlines the most important activities which have been undertaken by the European Commission and its Member States to implement the Plan.⁴⁹ It finds that the EU is “highly unlikely” to meet its 2010 target of halting biodiversity decline. In relation to progress made to support biodiversity adaptation to climate change the report mentions the White Paper on Adaptation to Climate Change, which addresses the relationship between biodiversity and climate change.

The White Paper on adaptation stipulates: “*Regarding habitats, the impact of climate change must also be factored into the management of Natura 2000 to ensure the diversity of and connectivity between natural areas and to allow for species migration and survival when climate conditions change. In future it may be necessary to consider establishing a permeable landscape in order to enhance the interconnectivity of natural areas.*”⁵⁰ Furthermore the mid-term assessment states that there is a need for “*better recognition of the critical role of healthy ecosystems in strengthening resilience to environmental stresses, which will, in turn, reduce exposure to the threat posed by climate change*” and “*synergies between climate change mitigation and adaptation measures, and the conservation and sustainable use of biodiversity need to be maximised*”. According to the afore mentioned White Paper draft guidelines should be developed by 2010 by the European Commission dealing with the impacts of climate change on the management of Natura 2000 sites. Up till now no such guidelines have been published.

⁴⁸ Action 9.4.4 SEC (2006) 621, Commission Staff Working Document Annexes to the Communication from the commission Halting Biodiversity Loss by 2010 – and Beyond: Sustaining ecosystem services for human well-being.

⁴⁹ COM (2008) 864 final, Communication from the Commission to the Council, the European Parliament, The European Economic and Social Committee and the Committee of the Regions – A Mid-Term Assessment of implementing the EC Biodiversity Action Plan.

⁵⁰ COM (2009) 147 final, White Paper: Adapting to climate change: Towards a European framework for action.



In January 2010, the European Commission adopted a Communication on Options for an EU vision and target for biodiversity beyond 2010,⁵¹ since it is clear that the target of halting biodiversity decline by 2010 has not been met. This provides an assessment of achievements and shortcomings of the current policy. One of the shortcomings that prevented the EU from achieving its 2010 target is the fact that there are still implementation gaps (delays and problems with implementation, including insufficient resources allocated to this effort) in establishment of the Natura 2000 network, which is not set to be complete on land until 2010 and at sea until 2012. Moreover, the Communication calls for the restoration of ecosystems to strengthen their resilience and sustain key services they provide, while also achieving conservation objectives and enabling Member States to adapt to climate change.⁵² In October 2010 the 2010 assessment of implementing the EU Biodiversity Action Plan has been adopted.⁵³ Building on the progress reflected in this report, the Commission is currently developing a post-2010 Biodiversity Strategy. Regarding to biodiversity and climate change the report stated that *“the EU has continued to highlight the important inter-linkages between biodiversity and climate change. When it comes to helping countries adapt to climate change, biodiversity provides many of the same services as man-made technological solutions, often at significantly lower cost. Protecting and restoring biodiversity therefore provide some cost-effective opportunities for climate change mitigation or adaptation.”*

Concluding in order to achieve resilient ecosystems especially in the light of climate change it is highly recommended that the EU adopts clear guidance for Member States on how they need to integrate climate change considerations into the SCIs, SPAs and SACs. Some small amendments to both Directives are even more recommended, since establishing binding provisions for Member States to establish ecological networks would be even better to enhance the resilience of ecosystems.

⁵¹ COM (2010) 4 final, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Options for an EU vision and target for biodiversity beyond 2010.

⁵² COM (2010) 4 final, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Options for an EU vision and target for biodiversity beyond 2010.

⁵³ COM (2010) 548 final, Report from the Commission to the Council and the European Parliament - The 2010 Assessment of implementing the EU Biodiversity Action Plan.



4.3.2.4 Water Framework Directive (WFD) and Flood Directive

The EU Water Framework Directive 2000/60/EC⁵⁴ (WFD) and Flood Directive 2007/60/EC⁵⁵ are part of the European Water Policy and establish a legal framework to protect and restore the water environment across Europe and mitigate the effects of flooding. The WFD obliges Member States to achieve a 'good water status' by 2015 and ensures the long-term sustainable use of water. River basin management plans (RBMPs) should be established containing concrete measures to achieve such a status, public participation and regular review (every six year) are essential elements thereto. The Flood Directive obliges Member States to undertake a preliminary flood risk assessment by 2011. Flood hazard maps and flood risk maps need to be completed by 2013 and in conjunction with the RBMPs of the WFD flood risk management plans (FRMP) need to be established by 2015. FRMPs shall address all aspects of flood risk management focusing on prevention, protection en preparedness. As indicated in the policy paper on marine and coastal areas and in Article 9 of the Flood Directive: *"the WFD and the Flood Directive shall follow a coordinated approach since this will ensure an overall effective approach and help avoid maladaptation measures"*.⁵⁶ The absence of a coherent approach could lead to increasing conflicts between countries or regions in the context of climate change. For example, developing activities that minimise the retention capacities upstream, might lead to unnecessary floods downstream. These effects will have to be addressed at river basin scale. (Delsalle, 2010)

The text on the WFD acknowledges the need to consider longer-term influences on water bodies however it does not explicitly mention risks posed by climate change. In contrary the Flood Directive explicitly stated that *"climate change can contribute to an increase in the likelihood and adverse impacts of flood events"* (preamble §2) and that *"FRMP should take into the likely impacts of climate change on the occurrence of floods"* (preamble §14)

⁵⁴ Dir. 2000/60/EC OJ. L. 327/01 of the European Parliament and the Council of 23 October 2000 establishing a framework for Community action in the field of water police.

⁵⁵ Dir.2007/60/EC OJ. L. 288/27 of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks.

⁵⁶ SEC (2009) 386/2, Commission Staff Working Document accompanying the White Paper Adapting to climate change: Towards a European framework for action, Climate change and Water, Coasts and Marine Issues.



This is repeated in the Guidance Document of the European Commission on River Basin Management in a Changing Climate: *“given that climate change will put additional pressure on the European water resources and flooding will occur more frequently, the several existing EU initiatives under the European Water Policy should contribute to efforts of adaptation to climate change with regard to water issues.”* (European Commission, 2009)

Potential impacts of climate change on the status of water resources and concerns hereon to implement the WFD are identified as:

- Any alternation in the climate system will induce changes in the hydrological cycle. The distribution in time and space of freshwater resources, as well as any socio-economic activity deepening thereon, is affected by climate variability and climate change. Consequently quality elements included in the definition of the WFD qualitative and quantitative status of water may be sensitive to climate change.
- Climate change will increase the frequency of extreme flooding events.
- Climate change will increase the frequency of drought conditions and water scarcity.

Since the key procedural requirement of the WFD and Flood Directive is the preparation of RBMPs and FRMPs, climate change should be comprehensively considered in the different steps of the WFD and Flood Directive, planning process and implementation process. According to the European Commission the second RBMPs due in 2015 and the FRMPs need to take account of medium and long-term implications of climate change and thus be designed to be robust to the impacts of climate change and climate variability. (European Commission, 2009) The above mentioned Guidance Document explains how to integrate climate change and climate change adaption management into the RBMPs and FRMPs as well as how to handle available scientific knowledge and uncertainties about climate change and how to develop strategies that build adaptive capacity for managing climate risk. Guiding principles to develop RBMP are (European Commission, 2009; Delsalle, 2010):



- Assess, over a range of timescales, direct pressures of climate change and indirect pressures created due to human activities in adapting to climate change.
- Avoid using climate change as a general justification for relaxing objectives, but follow the steps and conditions set out in the WFD.
- Use economic analysis to identify the most cost-effective combinations of measures under a plausible range of climate change and water supply-demand scenarios.
- Consider climate change when taking account of long term forecasts of supply and demand and favour options that are robust to the uncertainty in climate projections.
- Take account of likely or possible future changes in climate when planning measures today, especially when these measures have a long lifetime and are cost-intensive, and assess whether these measures are still effective under the likely or possible future climate changes.
- Proactive measures may be required if climate change threatens to jeopardise the achievement of WFD objectives.
- Choose sustainable adaptation measures, especially those with cross-sectoral benefits, and which have the least environmental impact, including GHG emissions.
- Avoid measures that are counterproductive for the water environment or that decrease the resilience of water ecosystems, or take all practicable steps to mitigate these adverse effects.

Concluding climate change adaptation considerations are included in the WFD and Flood Directive. Although climate change it is not specifically mentioned in the WFD the Guidance Document of 2009 gives concrete direction on how to integrate climate change and its adaptation concerns into the development of RBMP and FRMP.



4.3.2.5 Marine Strategy Framework Directive

The Marine Strategy Framework Directive⁵⁷ is adopted in June 2008 and is part of the sixth Community Environmental Action Programme⁵⁸ which lays down a thematic strategy for the protection and conservation of the marine environment with the overall aim of promoting sustainable use of the seas and conserving marine ecosystems.⁵⁹ The programme also stresses the need for the society to adapt to and prepare for the effects of climate change. The Community policy should prepare for measures aimed at adaptation to the consequences of climate change by reviewing Community policies and encouraging regional climate modelling and assessments both to prepare regional adaptation measures such as water resource management, conservation of biodiversity, desertification and flooding prevention and to support awareness raising among citizens and business.

The aim of the Marine Strategy Framework Directive is to achieve 'good environmental status' of the EU's marine waters by 2020. The Directive aims to deliver the environmental pillar of the Integrated Maritime Policy of the EU. This Directive establishes European Marine Regions on the basis of geographical and environmental criteria, in a similar way to the River Basin Districts established by the Water Framework Directive. Each Member State within a marine region is required to develop a strategy for its marine waters. The term 'marine waters' is defined in Article 3(1) as:

- (a) waters, the seabed and subsoil on the seaward side of the baseline from which the extent of territorial waters is measured extending to the outmost reach of the area where a Member State has and/or exercises jurisdictional rights, in accordance with the UNCLOS, ... and
- (b) coastal waters as defined by the WFD, their seabed and their subsoil, in so far as particular aspects of the environmental status of the marine environment are not already addressed through that Directive or other Community legislation;

⁵⁷ Dir. 2008/56 (2008) OJ L164/19, The European Parliament and the Council establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive).

⁵⁸ Decision No 1600/2002/EC (2002) OJ L 242/1 The European Parliament and of the Council of 22 July 2002 laying down the Sixth Community Environment Action Programme.

⁵⁹ COM (2005) 505 final, Proposal for a Directive of the European Parliament and of the Council establishing a Framework for Community Action in the field of Marine Environmental policy (Marine Strategy Directive).



Member States who share a marine region or subregion shall cooperate to ensure that the preparation of the marine strategy and measures herein to achieve a good environmental status are coherent and coordinated. (Article 5)

The preparation of the marine strategy shall comprise an analysis of the essential features and characteristics, and current environmental status of the marine waters as well as a current environmental analysis of the predominant pressures and impacts, including human activity on the environmental status. These impacts should cover the main cumulative and synergetic effects. Climate change is seen as one of the most significant and complex cumulative effects: it is due to the accumulation of many actions, each of which has only a limited impact but all of which together cause serious effects. (Environment Agency, 2004) Concluding climate change should be integrated into the preparation of the marine strategy. This initial assessment must be completed by 15 July 2012.

The actual marine strategy, which need to be ready by 2015 at the latest, will contain a detailed evaluation of the state of the environment, a definition of 'good environmental status' at regional level as well as programmes of measures to achieve this and the establishment of clear environmental targets and monitoring programmes to be carried out in that marine region. This, like the WFD, allows for flexible adaptation to the impacts of climate change at regional level. However, Member States are not required to take specific steps where there is no significant risk to the marine environment, or where the costs would be disproportionate taking account of the risks to the marine environment provided that any decision not to take action is properly justified (Preamble, para.11). This is also repeated in Article 13 in which is stated that the measures to achieve a good environmental status need to be cost-effective technically feasible. Furthermore a impact assessment, including cost-benefit analysis need to be carried out prior to the introduction of any new measure. Still marine strategies shall apply an ecosystem-based approach to the management of human activities, ensuring that the collective pressure of such activities is kept within levels compatible with the achievement of good environmental status and that the capacity of marine ecosystems to respond to human-induced changes is not compromised, while enabling the sustainable use of marine goods and services by present and future generations. (Article 1)



A review of the initial assessment and the determination of good environmental status, the environmental targets, the monitoring programmes and the programmes of measures shall take place every six years after their initial establishment (Article 17).

Paragraph 34 of the Preamble specifically refers to climate change since it recognises that in view of *“the dynamic nature of marine ecosystems and their natural variability, and given that the pressures and impacts on them may vary with the evolvement of different patterns of human activity and the impact of climate change, it is essential to recognise that the determination of good environmental status may have to be adapted over time. Accordingly, it is appropriate that programmes of measures for the protection and management of the marine environment be flexible and adaptive and take account of scientific and technological developments. Provisions should therefore be made for the updating of marine strategies on a regular basis.”* Consequently climate change is identified as an element which could make varying pressure on the impacts on ecosystems and the concept of good environmental status can be adapted when the impacts of climate change on the marine environment are more known.

The term ‘good environmental status’ is given a broad definition in the Directive and should take account of the *“structure, function and processes of the constituent marine ecosystems together with natural physiographic, geographic, biological, geological and climatic factors, as well as physical, acoustic and chemical conditions, including those resulting from human activities inside or outside the area concerned”* (Article 3(4)). Under climatic factors must be understood climate change. Furthermore the European Parliament stated in its position on the Directive in its first reading *“impacts on marine and coastal habitats and species resulting from man-made constructions have been minimised and do not adversely affect the structural and ecological integrity of benthic and associated ecosystems, nor the ability of coastal and marine habitats and species to adapt their range and distribution in the face of climate change. Meaning that an ecosystem based approach to achieve a good environmental status needs to be taken into account”*.⁶⁰

Furthermore adaptive management on the basis of the ecosystem approach will be applied with the aim of attaining good environmental status (Article 3). No definition is provided of adaptive management in this context, however its spirit can be found in

⁶⁰ European Parliament opinion 1st reading, TA/ 2006/482.



paragraph 34 as mentioned above and which stated that measures should be flexible and adaptive recognising the dynamic nature of marine ecosystems and climate change as one of the impacts on this ecosystem.

Article 14 provides exemptions on the achievement of the environmental targets or good environmental status within the time schedule. They are listed as follow:

- (a) action or inaction for which the Member State concerned is not responsible;
- (b) natural causes;
- (c) force majeure;
- (d) modifications or alterations to the physical characteristics of marine waters brought about by actions taken for reasons of overriding public interest which outweigh the negative impact on the environment, including any transboundary impact;
- (e) natural conditions which do not allow timely improvement in the status of the marine waters concerned.

Climate change is not included in this list, meaning that climate change is not a cause to allow an exemption to achieve the environmental targets or good environmental status. In the preparatory documents, the parliament added climate change as one of the exemptions in the position of the first reading on 14 November 2006⁶¹, however this amendment has been rejected by the common position of the European Council⁶².

In terms of who will implement the Marine Strategy Framework Directive, Article 7(1) requires Member States to designate the authority or authorities competent for the implementation of the Directive with respect to their marine waters by 15 July 2010.

There can be concluded that climate change considerations are integrated in the Marine Strategy Framework Directive. Climate change effects need to be taken into account when developing a marine strategy as well as in assessing the 'good

⁶¹ European Parliament opinion 1st reading, TA/ 2006/482.

⁶² COM (2007) 456 final. Communication from the commission to the European Parliament pursuant to the second subparagraph of Article 251 (2) of the EC Treaty concerning the Common position of the Council on the adoption of a European Parliament and Council Directive establishing a Framework for Community Action in the field of Marine Environmental Policy (Marine Strategy Framework Directive).



environmental status' of marine waters. Key elements in the development of a marine strategy related to climate change adaptation are for instance the fact that an ecosystem based approach need to be taken into account and measures and programmes to achieve a good environmental status need to be flexible and adaptive in order to be robust to deal with the uncertainty of climate change.

4.3.2.6 Marine Spatial Planning (MSP)

In November 2008 the Commission published a *Roadmap for Marine Spatial Planning*⁶³ in order to achieve common Principles in the EU as part of the Integrated Maritime Policy (IMP) of the EU. Herein was recognised that Marine Spatial Planning (MSP) can play an important role in cost-efficient adaptation to the impacts of climate change in maritime areas and coastal waters, since it is a tool to improve decision making. It provides a framework for arbitrating between competing human activities and managing their impact on the marine environment. Its objective is to balance sectoral interests and achieve sustainable use of marine resources in line with the EU Sustainable Development Strategy⁶⁴. MSP must be seen as a process that consists of data collection, stakeholder consultation and the participatory development of a plan, the subsequent stages of implementation, enforcement, evaluation and revision.

The White Paper on Adaptation stated that the follow-up of MSP will incorporate adaptation to climate change in maritime and coastal management.⁶⁵

4.3.2.7 Integrated Coastal Zone Management (ICZM)

Integrated Coastal Zone Management (ICZM) promotes the sustainable management of coastal zones and encourages decisions affecting coastal regions to be taken at the most appropriate level, through cooperation and integration planning, involving all the relevant players at the appropriate geographic level. ICZM is designed to increase contacts between sectors of government of the different local, regional and national governments and non-governmental organisations and other stakeholders so that policy-makers can have a clear picture of the needs of their coastal region. ICZM will only work with regular input from the businesses, local people and non-governmental

⁶³ COM (2008) 791 final. Communication from the Commission: Roadmap for Marine Spatial Planning: Achieving Common Principles in the EU.

⁶⁴ Council of the European Union, 26 June 2006. Renewed EU Sustainable Development Strategy as adopted by the European Council on 15/16 June 2006.

⁶⁵ COM (2009) 147 final, White Paper: Adapting to climate change: Towards a European framework for action.



organisations that live and work in the Union's coastal zones. (European Commission, 2001)

The Demonstration Programme on Integrated Coastal Zone Management (ICZM) was launched in 1996 by the European Union as part of its Environmental policy. One of the outcomes of this programme was a set of recommendation on a European Strategy for ICZM.⁶⁶ Although ICZM was established in the light of the Environmental policy of the European Union, ICZM is not just an environmental policy. While the need to protect the functioning of natural ecosystems is a core aim of the strategy, ICZM also seeks to improve the economic and social well-being of coastal zones and help them develop their full potential as modern, vibrant communities. In the coastal zone, these environmental and socio-economic goals are intrinsically interconnected. (European Commission 2001)

The Recommendation recommended Member States to take a strategic approach to the management of their coastal zones taking into account an ecosystem based approach for the protection of the coastal environment as well as to recognise the threat posed by climate change to coastal zones.

The main principles of ICZM are:

- (a) a broad overall perspective (thematic and geographic) which will take into account the interdependence and disparity of natural systems and human activities with an impact on coastal areas;
- (b) a long-term perspective which will take into account the precautionary principle and the needs of present and future generations;
- (c) adaptive management during a gradual process which will facilitate adjustment as problems and knowledge develop. This implies the need for a sound scientific basis concerning the evolution of the coastal zone;
- (d) local specificity and the great diversity of European coastal zones, which will make it possible to respond to their practical needs with specific solutions and flexible measures;

⁶⁶ Recommendation 2002/41(2002) OJ L148/24, Recommendation of the European Parliament and of the Council concerning the implementation of Integrated Coastal Zone Management in Europe.



(e) working with natural processes and respecting the carrying capacity of ecosystems, which will make human activities more environmentally friendly, socially responsible and economically sound in the long run;

(f) involving all the parties concerned (economic and social partners, the organisations representing coastal zone residents, non-governmental organisations and the business sector) in the management process, for example by means of agreements and based on shared responsibility;

(g) support and involvement of relevant administrative bodies at national, regional and local level between which appropriate links should be established or maintained with the aim of improved coordination of the various existing policies. Partnership with and between regional and local authorities should apply when appropriate;

(h) use of a combination of instruments designed to facilitate coherence between sectoral policy objectives and coherence between planning and management

Member States were invited to set up a national ICZM strategy taken into account the guiding principles of the recommendation and needed to be finalised in 2006. National ICZM strategies should allow all the different policy-makers who have a say in the management of coastal regions within a country to coordinate their actions far more effectively. National strategies aim to improve the compatibility of the many national sectoral laws and policies that affect the coastal zone, and would facilitate actions by local and regional authorities. In addition to the recommendation to establish national ICZM strategies, the Member States are recommended to conduct or update an overall stocktaking to analyse which major actors, laws and institutions influence the management of their coastal zone.⁶⁷ To support the implementation of the ICZM Recommendation an expert group has been set up by the Commission, the first meeting was held on 3 October 2002.

In 2007 the Commission reviewed the experience with the implementation of EU ICZM Recommendations. The conclusions of this evaluation exercise and the main policy directions for further promotion of ICZM in Europe are set out in the Commission

⁶⁷ Recommendation 2002/41(2002) OJ L148/24, Recommendation of the European Parliament and of the Council concerning the implementation of Integrated Coastal Zone Management in Europe.



Communication of 7 June 2007.⁶⁸ Herein was stated that only 65% of coastal EU Member States have submitted a report on the progress made in implementing the Recommendation. The reports cover often very different situations: newly developed national strategies, a new phase in a longer on-going national process of implementing ICZM, the results of stocktaking exercises and initial proposal for a coastal strategy. However, the Commission notes that the national ICZM reports provide only limited indications of effective implementation mechanisms. Turning the strategies into reality and significantly advancing ICZM in Europe will require continued and effective implementation efforts.⁶⁹

According to Feenstra *et al.* (1998) the most effective way to respond to climate change at the coastal zone is to develop an integrated approach taking into account all the other planning taking place in the coastal zone. (Feenstra *et al.*, 1998) At both the United Nations Conference on Environment and Development (UNCED)⁷⁰ and the World Coast Conference⁷¹ ICZM has been recognised as the most appropriate process to deal with current and long-term coastal problems. Climate change is one of those long-term coastal problems. ICZM is an iterative and evolutionary process, which not only deals with today's problems but also is flexible enough to adapt to as yet unforeseen issues that may arise in the future. Meaning that ICZM includes adaptation to climate change and sea-level rise by developing and implement a continuous management capability that can respond to changing conditions. (Feenstra *et al.*, 1998)

These findings can also be found within the European Commission itself. In *EU focus on coastal zones* the European Commission (2001) stated that good coastal zone management should explicitly acknowledge the uncertainty of future conditions and promote flexible and adaptable policies. Climate change is seen as one of these uncertain future conditions which ask for a flexible approach in order to meet these new challenges as they arise. Furthermore good coastal zone planning is also based on the 'precautionary principle' which stated that policy-makers should try to anticipate potential damage to coastal regions rather than waiting for things to go wrong before trying to put them right. (European Commission, 2001) In the review report of ICZM of

⁶⁸ COM (2007) 308 final, Communication from the Commission – Report to the European Parliament and the Council: an evaluation of Integrated Coastal Zone Management (ICZM) in Europe.

⁶⁹ COM (2007) 308 final, Communication from the Commission – Report to the European Parliament and the Council: an evaluation of Integrated Coastal Zone Management (ICZM) in Europe.

⁷⁰ United Nations Conference on Environment and Development (UNCED), Rio de Janeiro, Brazil, 3 to 14 June 1992.

⁷¹ World Coast Conference, Netherlands, 1 to 5 November 1993.



2007 was explicitly mentioned that ICZM contributes to the creation of an appropriate framework to promote comprehensive risk reduction and adaptation strategies in the coastal zones. Moreover, ICZM would contribute to ensure coherence between policies, plans and programmes, and the effective nesting and implementation of plans and programmes at different scales of intervention. Therefore adaptation to climate change is identified as a priority theme for further promotion for ICZM policies.⁷² According to one of the background papers to the Green Paper on a Future Maritime Policy for Europe⁷³ such ICZM policies will improve the resilience of coastal areas to adapt to change, provide space for coastal processes to operate and achieve a more equitable sharing of risk of risks *inter alia* by using financial instruments. It also stated that the implications of climate change should be borne in mind when planning future coastal development. (European Commission, 2006) This is reaffirmed in the White Paper on Adaptation and the corresponding working document on Climate Change and Water, Coast and Marine Issues: *“A more coherent and integrated approach to coastal planning and management via ICZM will assist adaptation efforts. The multi-disciplinary, interactive approach which underpins ICZM provides the flexible and multi-sectoral basis needed for developing effective adaptation measures.”*⁷⁴

Concluding that ICZM is a useful tool to develop an integrated adaptation response to climate change at the coastal zone and the principles of ICZM should be taken into account when establishing and implementing a coastal adaptation strategy to ensure that flexibility and adaptability will be built-in.

4.3.2.8 Integrated Maritime Policy (IMP)

The Integrated Maritime Policy (IMP) of the EU is established in 2007 by the launching of the Blue Book – an Integrated Maritime Policy for the European Union.⁷⁵ This was

⁷² COM (2007) 308 final, Communication from the Commission – Report to the European Parliament and the Council: an evaluation of Integrated Coastal Zone Management (ICZM) in Europe.

⁷³ COM (2006) 275 final, Green Paper Towards a future Maritime Policy for the Union: A European vision for the oceans and seas “How inappropriate to call this planet Earth when it is quite clearly Ocean” attributed to Arthur C. Clarke.

⁷⁴ SEC (2009) 386/2, Commission Staff Working Document accompanying the White Paper Adapting to climate change: Towards a European framework for action, Climate change and Water, Coasts and Marine Issues.

⁷⁵ COM (2007) 575 final, Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee and the Committee of the Regions – an Integrated Maritime Policy for the European Union.



the result of the Green Paper on a Future Maritime Policy for Europe⁷⁶ and the consultation round⁷⁷ on this Green Paper. The EU policies on the maritime environment where already broadly developed (e.g. maritime transport, industry, coastal regions, offshore energy, the marine environment, fisheries, etc.) though these were developed separately and no one looked at the broader link between them. Therefore the IMP has been established to examine in a systematic manner how these policies could be combined to reinforce each other and to forge a new vision for the management of the oceans. The underlying principles of IMP are sustainable and ecosystem based management of the maritime economy and marine environment based on scientific knowledge.⁷⁸ The Bleu Book lays the foundation for the governance framework and cross-sectoral tools necessary for an EU Integrated Maritime Policy and sets out the actions it will take in the coming years to deliver this. The Commission has also stated that it will:

- invite Member States to draw up national integrated maritime policies, working closely with stakeholders, in particular the coastal regions;
- propose in 2008 a set of guidelines for these national integrated maritime policies and report annually on EU and Member States' actions in this regard from 2009;
- and organise a stakeholder consultation structure, feeding into further development of the maritime policy and allowing exchange of best practices.⁷⁹

Related to climate change the IMP recognises that on the one hand oceans and seas play a key role in climate and weather patterns and on the other hand climate change will have an impact on the ocean and seas and the environment at large. There is

⁷⁶ COM (2006) 275 final, Green Paper Towards a future Maritime Policy for the Union: A European vision for the oceans and seas “How inappropriate to call this planet Earth when it is quite clearly Ocean” attributed to Arthur C. Clarke.

⁷⁷ COM (2007) 574 final, Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee and the Committee of the Regions – Conclusions from the Consultation on a European Maritime Policy.

⁷⁸ COM (2006) 275 final, Green Paper Towards a future Maritime Policy for the Union: A European vision for the oceans and seas “How inappropriate to call this planet Earth when it is quite clearly Ocean” attributed to Arthur C. Clarke.

⁷⁹ COM (2007) 574 final, Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee and the Committee of the Regions – Conclusions from the Consultation on a European Maritime Policy.



stated that the IMP can play a role in both mitigation (e.g. offshore wind, waved and tidal energy) and adaptation to climate change. Regarding to the latter the Green Paper stated that *“adaptation strategies are required to manage risks for coastal and offshore infrastructure, to organise sea defence and protect marine ecosystems sustaining maritime activities”*.⁸⁰ Under the actions of the Commission identified in the Bleu Book fall that the Commission will *“launch pilot actions to reduce the impact of and adapt to climate change in coastal zones”* and will *“support research projects to predict, mitigate and adapt to the effects of climate change on maritime activities, the marine environment, coastal zones and islands”*

According to the White Paper on adaptation IMP will provide a comprehensive framework to integrate adaptation efforts coherently into sectoral and specific policies and measures. Therefore an action is set out to ensure that adaptation in coastal and marine areas is taken into account in the framework of IMP.⁸¹

⁸⁰ COM (2006) 275 final, Green Paper Towards a future Maritime Policy for the Union: A European vision for the oceans and seas “How inappropriate to call this planet Earth when it is quite clearly Ocean” attributed to Arthur C. Clarke.

⁸¹ COM (2009) 147 final, White Paper: Adapting to climate change: Towards a European framework for action.



Conclusion

Adaptation together with mitigation is an important response strategy. Without early and strong mitigation actions the costs of adaptation will inevitably rise. The assessment of expected climate changes indicate that climate change will happen and is already happening. Yet there are still many uncertainties about the exact impacts and consequences of climate change. The fact that climate change cannot be avoided, has ensured that adaptation has been placed on the policy agenda of the international community.

Within the UNFCCC the key issues include: the support and funding to assist developing countries with impact and vulnerability assessment, and the transfer of knowledge, tools and technologies to increase the adaptive capacity of developing countries. Regarding to developed countries there is much less support, this is mainly because of the fact that the adaptive capacity of developed countries will normally be higher than that of developing countries. But as stated in this paper high adaptive capacity does not guarantee adaption actions. The national communications have shown that more and more actions are taken.

Within the CBD synergies between climate change actions and biodiversity are highlighted and guidance to exploit these opportunities can be found in several COPs and working papers such as the need to establish ecosystem based adaptation responses.

The IPCC is mainly engaged in the assessment of the impacts and vulnerabilities of climate change and proposes adaptation strategies for different sectors. In this way the IPCC provides states with a sound scientific basis for the development of an effective adaptation strategy. Within the EU this led, although stretched over a long period of time, to the adoption of the White Paper on adaptation. The White Paper provides a framework for future development of an EU adaptation strategy and highlights the areas to focus on within this development. Several guiding documents are already been developed (e.g. guidance on best practices for developing regional adaptation strategies and guidance on the inclusion of climate change in the WFD) Further it calls on member states to take action to cope with climate change and to cooperate and share information on adaptation strategies. Nevertheless, the adaptation strategy for the EU is not finished, as it stands the adaptation strategy would be ready by 2013.



The study has shown that according to the IPCC and the EU there are many options and opportunities to adapt to the negative effects of climate change in coastal areas. These range from technological options such as increased sea defences or flood-proof buildings, to policy options such as raising public awareness and spatial planning. Other adaptive measures include early warning systems for extreme events, better water management, improved risk management and conservation of biodiversity as in the restoration of wetlands.

The Water Framework Directive, Floods Directive, Marine Strategy Framework Directive, Integrated Coastal Zone Management and Environmental Assessment Directives (EIA and SEA respectively) have been highlighted as key instruments that will allow adaptation efforts to be taken forward for the water, coastal and marine sectors. They ask for a flexible, adaptive, integrated and ecosystem based approach and the need to take into account climate change. Furthermore they can cover many of the necessary legislative measures for climate change adaptation for coastal areas and marine waters. What is needed, however, is clear guidance on how this can be achieved at Member State level in an integrated and coordinated fashion.



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