

Development of a national strategy for adaptation to climate change adverse impacts in Cyprus

CYPADAPT

LIFE10 ENV/CY/000723

Examination and analysis of European and International policies and legislative framework with respect to climate change
DELIVERABLE 1.3





Acknowledgements

This report was produced under co-finance of the European financial instrument for the Environment (LIFE+) as the third Deliverable (D1.3) of the first Action (Action 1) of the CYPADAPT project (LIFE10ENV/CY/000723) during the implementation of its second Activity (Activity 1.b) on the “Examination and analysis of European and international policies and legislative framework with respect to climate change”.

The CYPADAPT team would like to acknowledge the European financial instrument for the Environment (LIFE+) for the financial support.

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Abbreviations and acronyms

AAU	Assigned Amount Unit
CAP	Common Agricultural Policy
CCS	Carbon capture and storage
CER	Certified Emission Reduction
CO ₂	Carbon dioxide
COP	Conference of the Parties
ECCP	European Climate Change Program
ERU	Emission Reduction Unit
ETS	Emissions Trading System
GHG	Greenhouse gas
ICZM	Integrated Coastal Zone Management
LDC	Least Developed Countries
NWP	Nairobi Work Programme
OECD	Organisation for Economic Co-operation and Development
PoM	Programme of Measures
SIDS	Small Island Developing States
UNFCCC	United Nations Framework Convention on Climate Change
WFD	Water Framework Directive





Executive summary

In the framework of this report, the European and international legislative framework and policies on climate change mitigation and adaptation are being recorded and analyzed. The analysis of the international framework on climate change covers the United Nations Framework Convention on Climate Change (UNFCCC) and the major milestones of the Conferences of the Parties of the UNFCCC, such as the Kyoto Protocol.

On the European level, the policies developed for achieving the commitments agreed under the UNFCCC as well as the initiatives undertaken for further action on climate change, are recorded. Following, the analysis focuses on climate change adaptation and, more specific, on sectoral policies that, inter alia, foresee measures for adapting to climate change.



1. Introduction

The existing legislative framework and policies on climate change applied worldwide as well as on European level may be classified into two main categories: (i) policies for mitigating greenhouse gas (GHG) emissions (ii) policies for adapting to the adverse impacts of climate change.

Although international and European policy on climate change in the past had primarily focused on mitigation, it is now clear that objectives of human well-being in the future should be addressed, stressing the importance of adaptation. Adaptation to the adverse effects of global warming and climate change is necessary in order to reduce the vulnerability of natural and human systems.

2. International framework on climate change (1)

The first international treaty on climate change took place in Rio de Janeiro in 1992, at the United Nations Conference on Environment and Development, which it is also known as the United Nations Framework Convention on Climate Change (UNFCCC). The main objective of the Convention is to mitigate the emissions in the atmosphere from all greenhouse gases not controlled by the Montreal Protocol (hereinafter referred to as GHG) and at the same time provide for adaptation of ecosystems, human well-being and economic development under changing climatic conditions. It entered into force in March 1994 and 194 nations (referred to as “Parties”) have signed it, including Cyprus.

The Convention divides countries into three main groups according to differing commitments: (i) the Annex I Parties which include the industrialized countries that were members of the OECD (Organisation for Economic Co-operation and Development) in 1992 as well as the countries with economies in transition (the EIT Parties), (ii) the Annex II Parties which consist of the OECD members of Annex I, and (iii) the Non-Annex I Parties which are mostly developing countries. Annex II Parties are required to financially assist Non-Annex I countries to fulfill their commitments under the Convention and to facilitate technology and know-how transfer towards the EIT Parties and the developing countries. Due to the fact that in 1992, when Cyprus signed the Convention, it was a developing country, it is listed in the Non-Annex I countries.



Among its commitments (Article 4 of the Convention), the Convention foresees that all contracting parties will:

- Develop national inventories of anthropogenic emissions and removals of all greenhouse gases (GHG) not controlled by the Montreal Protocol ;
- Develop programmes for mitigating climate change and measures to facilitate sufficient adaptation to climate change;
- Promote technologies and practices for controlling, reducing or preventing anthropogenic emissions of GHG not controlled by the Montreal Protocol;
- Preserve and enhance sinks and reservoirs of all GHG not controlled by the Montreal Protocol;
- Prepare for adapting to the impacts of climate change and develop appropriate and integrated plans for coastal zone management, water resources and agriculture as well as for the protection and rehabilitation of areas affected by droughts, desertification and floods;
- Take into account of climate change considerations when developing national policies and employ methods to minimize potential adverse effects from the implementation of climate change mitigation and adaptation measures;
- Promote research, observation and development of databases on climate change in order to increase understanding and decrease any uncertainties on climate change and on the impacts of response strategies;
- Promote information exchange on the issue;
- Raise awareness and public participation.

A key element of the UNFCCC is that the parties are meeting annually in the Conference of the Parties (COP) to assess the progress of dealing with climate change. The most recent one took place in Durban in South Africa (December 2011) referred to as COP17 (i.e. the 17th annual meeting).

This treaty although legally non-binding, included provisions for updates (called “protocols”) that would set mandatory emission limits. The principal update of UNFCCC is the “Kyoto Protocol”. Following the Kyoto Protocol the main policy milestones on climate change achieved by the UNFCCC, are the “Nairobi Work Programme”, the “Bali Road Map”, the “Cancun Agreements” and recently the “Durban Platform”.



2.1. Kyoto Protocol

The Kyoto Protocol was adopted after intensive negotiations during the third COP which took place in December 1997 in Kyoto, Japan. The Kyoto Protocol outlined the greenhouse gas emissions reduction obligation for Annex I countries, along with what came to be known as the Kyoto mechanisms such as emissions trading, clean development mechanism and joint implementation [2,3].

The Kyoto Protocol has a legally binding character for the developed countries to reduce their GHG emissions in contrast with the Convention which encouraged them to stabilize their emissions. In specific, the Kyoto Protocol commits developed country Parties (Annex I to the Convention) –in total 37 industrialized countries and the European community- to reduce emissions of the six major greenhouse gases to an average of 5% below their 1990 levels in the timeframe addressed by the Kyoto Protocol, i.e. 2008-2012 [2,3].

The targets vary from 8% such as for the E.U. member states to 5% for Croatia, while some other countries, such as Australia and Iceland, are allowed to increase their greenhouse gas emissions by 8% and 10%, respectively (Annex B). The Protocol assigned higher reduction targets on developed nations under its central principle of “common but differentiated responsibility” [4].

The Protocol entered into force on 16 February 2005 in accordance with Article 23, that is once 55 Parties to the UNFCCC, including the Annex I Parties which are responsible for at least 55 % of the total carbon dioxide emissions in 1990, ratify it. Cyprus ratified the Kyoto Protocol on 16 July 1999 as a non-Annex B party, meaning that Cyprus was not assigned with any quantified emission reduction or limitation target. Currently, 192 Parties to the UNFCCC have ratified the Kyoto Protocol, while the total percentage of Annex I Parties emissions is 63.7%. However, UNFCCC Parties that have not signed the Protocol yet may accede to it, at any time [5].

The Kyoto Protocol offers flexibility regarding the methods countries could use to meet their commitments, through three market-based mechanisms thereby creating what is now known as the “carbon market”[6]. These mechanisms, which are also referred to as Kyoto mechanisms, are presented next:



- 1) **Emissions trading.** The targets for limiting or reducing emissions assigned to Annex B countries of the Protocol, are also expressed as levels of allowed emissions, or “assigned amounts” over the 2008-2012 commitment period, which are further divided into “assigned amount units” (AAUs). Through this mechanism, countries that do not exceed their assigned amounts, may sell their excess units to countries that are over their targets [7].
- 2) **Clean Development Mechanism (CDM).** This mechanism allows countries with an emission reduction or limitation target to create carbon sinks on suitable sites in developing countries and to earn certified emission reduction (CER) credits from each equivalent tonne of CO₂ avoided, which can be used for meeting Kyoto targets [8].
- 3) **Joint implementation (JI).** This mechanism allows Annex B countries with emission reduction or limitation targets to earn emission reduction units (ERUs) by sponsoring foreign research to decrease emission levels in other Annex B countries. The ERUs may be used afterwards for meeting Kyoto targets [9].

2.2. Nairobi Work Programme

The Nairobi Work Programme (NWP) was adopted during the twelfth COP that took place on 6-17 November 2006 in Nairobi, Kenya. The main objective of the NWP is to support action towards climate change adaptation in all Parties and especially in developing countries, including the Least Developed Countries (LDC) and the Small Island Developing States (SIDS). In particular, it aims to improve understanding and assessment of impacts, vulnerability and adaptation to climate change and to increase the ability to make decisions on a sound scientific, technical and socio-economic basis on how to adapt successfully both in current and future climate change challenges. In its implementation, apart from the Parties, intergovernmental and non-governmental organizations, the private sector, communities and other stakeholders can be engaged [10].

The NWP contains nine areas of work [11]:

1. Methods and tools
2. Data and observations



3. Climate modelling, scenarios and downscaling
4. Climate related risks and extreme events
5. Socio-economic information
6. Adaptation planning and practices
7. Research
8. Technologies for adaptation
9. Economic diversification

2.3. Bali Road Map

The Bali Road Map was formed during the thirteenth COP which took place on 3-15 December 2007 in Bali, Indonesia. The Bali Road Map foresees a number of forward-looking decisions that represent the key tracks for achieving a secure climate future. It includes the Bali Action Plan, which sets the grounds for a new negotiating process for tackling climate change in order to enable the full implementation of the Convention up to and beyond the end of the first commitment of the Kyoto Protocol (2012). The Plan is structured upon five pylons, namely on (i) shared vision, (ii) mitigation, (iii) adaptation, (iv) technology and (v) financing [12].

2.4. Cancún agreements [13,14,15]

The Cancun Agreements are a set of significant decisions reached during the sixteenth COP of the UNFCCC in Cancún, Mexico which was held from November 29 to December 10, 2010. The agreements represent key steps for the future in order to reduce greenhouse gas emissions and to assist developing nations sustainably adapt to climate change.

Among the most important agreements, are the commitment for a maximum rise of 2°C in temperature above pre-industrial levels, the boost of the development and diffusion of new innovative climate-friendly technologies by 2012 and the establishment of a “Green Climate Fund” for developing countries.



With regard to adaptation, the agreement on the establishment of the Cancún Adaptation Framework was achieved, which aims at reducing vulnerability and building resilience in developing country Parties. The framework is based on better planning and implementation of adaptation measures through increased financial and technical support, and through strengthening and/or establishing regional centres and networks. The framework also lies on research, assessments and technology cooperation on adaptation, as well as on strengthening education and public awareness. An “Adaptation Committee” was also established for promoting adaptation actions, with its role being the provision of technical support and guidance to countries, the strengthening of knowledge-sharing and the promotion of synergy between stakeholders.

2.5. Durban Platform

During the seventeenth COP of the UNFCCC which was held in Durban, South Africa, from November 28 to December 9, 2011, the Parties agreed to seamlessly move into a second commitment period in 2013 and extend the Kyoto Protocol. The new treaty, referred to as the "Durban Platform for Enhanced Action", foresees a new legal and universal emission reduction agreement by 2015 which will be adopted by 2020. It worth noting that for the first time, developing countries such as China and India, as well as the US which had refused to ratify the Kyoto Protocol, are committed to reduce their emissions, too [16].

3. European framework on climate change

The European Commission has taken many initiatives since 1991, when the first Community strategy was issued concerning the reduction of CO₂ emissions. At European level, policy measures have been initiated through the European Climate Change Program (ECCP).

The first ECCP (2000-2004) was launched in June 2000 aiming at the identification and development of the necessary elements for the implementation of the Kyoto Protocol. The second ECCP was launched in October 2005 aiming at further reduction of greenhouse gas emissions in synergy with the “Lisbon strategy” for increased economic growth and job creation. Several working groups have been established under ECCP-II to review ECCP-I, to



deal with aviation, to examine CO₂ emissions from cars, to investigate possibilities of carbon capture and storage as well as adaptation policies, and to impose rules as to the reduction of greenhouse gas emissions from ships [17].

The EU legislation on climate is rather vast and it is mainly focused on to the following areas:

- Greenhouse Gas Monitoring and Reporting
- EU emissions trading system
- Effort sharing decision
- Carbon capture and storage
- Transport/Fuels
- Ozone layer protection
- Fluorinated gases

3.1. EU Climate and Energy Package

To comply with the requirements of the Kyoto Protocol on GHG emission reductions while increasing energy security and enhancing its competitiveness, the EU leaders endorsed in 2007, a series of ambitious climate and energy targets for 2020, the so-called "20-20-20" targets. These targets envisage a reduction of at least 20% in GHG emissions below 1990 levels, a 20% reduction in primary energy consumption as a result of better energy efficiency as well as the 20% of energy consumption to come renewable sources [18].

The legislation framing these targets was proposed in 2008 which resulted in the EU Climate and Energy Package. The core of the package comprises four pieces of complementary legislation:

Emissions Trading System (ETS). The European ETS foreseen under the Directive 2009/29/EC, sets emission limits for CO₂ and nitrous oxide to certain industries (e.g. power plants, combustion plants, cement factories) operating in the EU, while it continues expanding its application to other GHG and installations, including aviation (from 2012). The system is based on the allocation and use of a certain number of tradable emission allowances, which will be progressively reduced so as to reach the target of 21% reduction in emissions by 2020 in comparison to the emission levels of 2005. So far, it covers almost half of the EU CO₂ emissions and about 40% of its total greenhouse gas emissions [19].



Effort Sharing Decision. The Effort Sharing Decision foreseen under Decision 406/2009/EC, sets annual emission limits for 2020 to each Member State according to its wealth, ranging from -20% (for the poorest) to +20% (for the richest) compared to the 2005 levels, with Cyprus being allocated with the reduction target of 5%. It applies to sectors not falling under the ETS, such as transport, housing, agriculture and waste as well as to all greenhouse gases. The overall aim is to achieve a reduction in emissions from the non-ETS sectors of 10% by 2020 compared with 2005 levels [20].

20% renewable energy by 2020. This target, being set under the Directive 2009/28/EC on renewable energy, requires that the EU share of renewable sources in the total energy consumption and in the transport sector reaches 20% and 10% by 2020, respectively. On a national level, these targets are being defined based on the share of energy from renewable sources in the gross final consumption of each Member State for 2020 [21].

Carbon capture and storage (CCS). The EU, recognizing the significant potential for mitigation in CO₂ emissions from the safe use of carbon capture and storage technology, intends to further promote such applications and to establish their technical and economic viability. Therefore, the EU encourages the demonstration of CCS plants until 2015 in order to make them commercially viable by 2020 [22].

3.2. Green and White Paper on adaptation (10, 19)

On June 2007, the Commission adopted a Green Paper entitled "Adapting to climate change in Europe – options for EU action" proposing several options for action to deal with the effects of climate change. The purpose of the Green Paper was to launch a consultation on the necessity for adaptation to climate change and on the role of the EU policy regarding this issue. In particular, it lays down the observed and expected impacts of climate change to the different sectors in Europe and suggests that action should be undertaken on European level as well as on national, regional, local and individual level in order for the results to be fruitful. In addition the Paper highlights the potential for the EU to play a leading role at international level too, by setting the example around the globe on how a coherent, coordinated and forward planning strategy can deal with the threat of climate change [23].

Finally, a strategy based on four-pillars of action is proposed, namely (i) early action



supported by sufficient knowledge gained on the field, (ii) integration of adaptation into the external EU policy, (iii) research and information exchange on knowledge gaps regarding adaptation and, (iv) coordination and active stakeholder involvement in the preparation of adaptation strategies [23].

Based on the consultation on climate change adaptation launched by the Green Paper as well as on other research efforts that identified action on the field, the European Commission in 2009 presented the White Paper entitled “Adapting to climate change: Towards a European framework for action”, which constitutes the framework for integrating adaptation measures into existing EU sectoral policies in order to reduce Europe’s vulnerability to climate change adverse impacts. The framework complements and supports action by Member States as well as international cooperation on adaptation while it will continue evolving as further evidence arises [24].

The White Paper recognizes and further promotes the need for a two-fold response to climate changes; that is to reduce greenhouse gas emissions (GHG) and at the same time to undertake adaptation actions. It supports the EU's commitment for a 20% reduction in its emissions by 2020 compared to 1990 levels, while it stresses the necessity for a new agreement on further reductions in emissions on an international level, by proposing a 30% reduction for the EU provided that other developed countries agree to comparable reductions [24].

The White Paper adopted a two-phased adaptation approach. Phase 1 (2009-2012) sets the grounds for the implementation of a comprehensive EU adaptation strategy during phase 2, which will launch in 2013. Phase 1 (2009-2012) is structured upon four pillars of action: (i) developing a knowledge base on the likely impacts of climate change in the EU and of the different adaptation options, (ii) mainstreaming adaptation into sectoral policies at European level to reduce the vulnerability of sectors, (iii) employing a set of policy instruments (market-based instruments, guidelines, public-private partnerships) for achieving the desired results and (iv) extending cooperation in European and international level. Phase 2 has not been presented yet [24].

3.3. Water resources

The document “Climate Change and Water, Coasts and Marine Issues” (2009) accompanying the Commission’s White Paper on adaptation to climate change, states that the water policy in the EU should include the adaptation perspective, especially for the implementation of RBMP under the WFD, as well as to assess the need for additional measures to enhance water efficiency and the ecosystem storage capacity. Furthermore, it recognizes that the impacts of climate change on water are uncertain and thus it is essential to take into consideration demand and supply-side measures, natural and man-made/engineered solutions as well as behavioural changes [25].

3.3.1. Water Framework Directive [26,27,28,29,30]

The main EU legislative piece on water policy is embodied in the Directive 2000/60/EC which actually establishes a framework for Community action in the field of water policy or, in short, the EU Water Framework Directive (WFD). Its general aims are to achieve "good status" for all waters by 2015, to promote integrated water management at river basin level, to ensure sustainable long-term use of water resources and to actively involve public in water decision making. Although the issue of adaptation to climate change is not explicitly addressed in the WFD, the process layout for achieving its main aims sets the pathway for understanding climate change impacts on the reference conditions of water resources by closely monitoring the status of water bodies, identifying and eliminating human pressures on them through the development of the Programme of Measures (PoM) and thus, enhancing their resilience towards climate change in the long-term. In addition, the WFD adopts a cyclic management approach for the re-assessment of the river basin management plans in order to include increasing knowledge gained over time on climate change impacts. Consequently, achieving the objectives of the WFD will support adapting to climate change. A schematic representation of the river basin management process foreseen under the WFD is presented in the following figure.

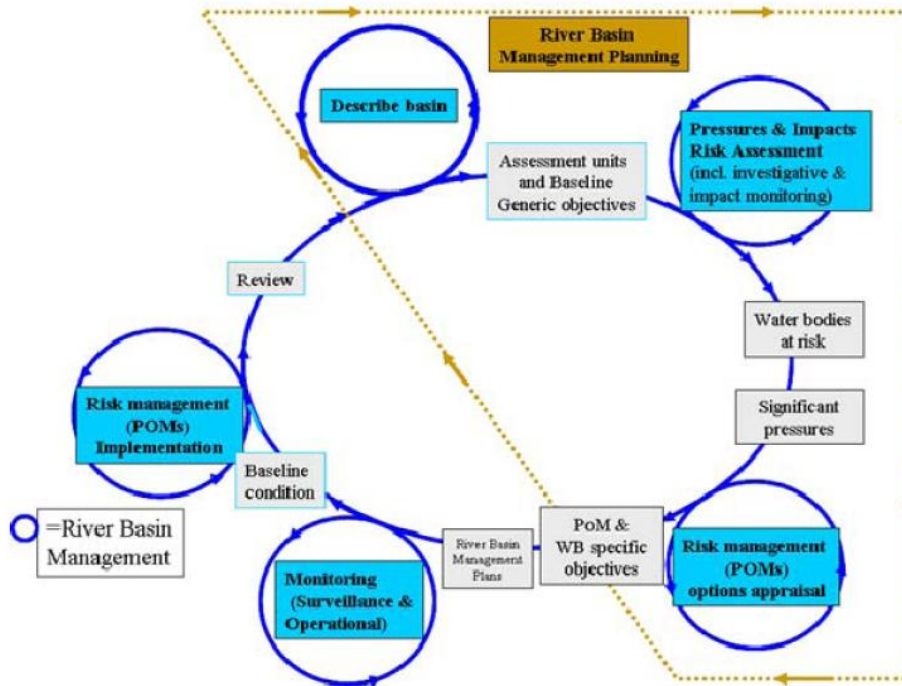


Figure 3-1: Schematic representation of the river basin management process under the WFD [29]

Furthermore, one of the objectives of the “Guidance document on adaptation to climate change in water management”, which was issued by Water Directors of EU Member States in 2009, was to ensure that the River Basin Management Plans are taking into consideration the impacts of climate change on the source. More specifically, it suggests that only the measures that are robust to climate change impacts and do not increase the burden of climate change should be considered for inclusion in the future River Basin Management Plans. The proposed process for checking whether the measures take into consideration climate change impacts, is illustrated in the following flow chart.

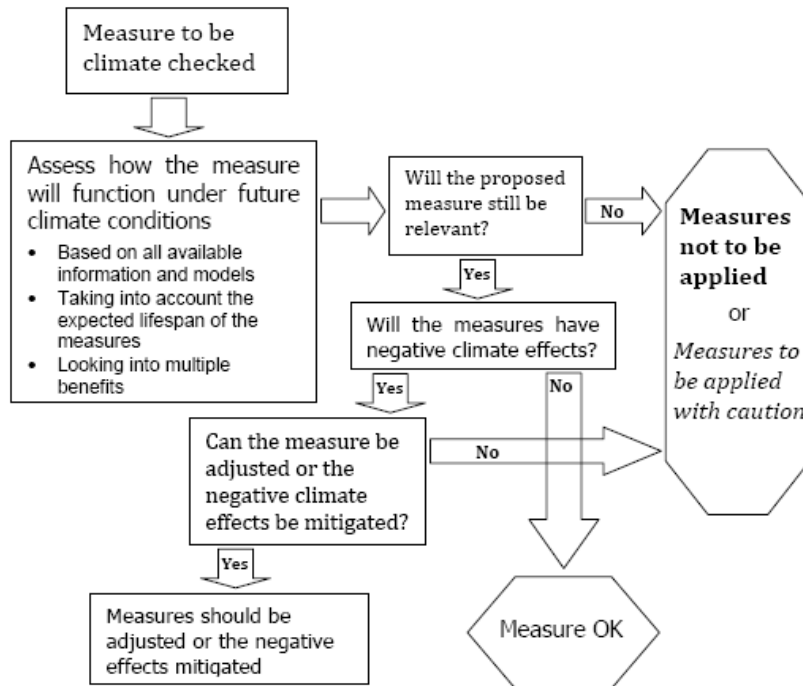


Figure 3-2: Checking process for the approval of measures under the context of climate change [29]

To ensure that the EU water policy will be successfully implemented and will overpass old and emerging challenges, the EU will release by the end of 2012 the “Blueprint to Safeguard Europe's Water”, which will be based on several policy recommendations on water resulted from four on-going assessments, one of them being the assessment of the vulnerability of water resources to climate change and other man made pressures. The overall objective of the Blueprint is to safeguard water availability and quality in order to satisfy the needs of both people and natural ecosystems.

3.3.2. *Water scarcity and droughts [29,31,33]*

In the Communication from the Commission to the European Parliament and the Council “Addressing the challenge of water scarcity and droughts in the European Union” which was issued in 2007 and endorsed by the Council, a set of policy orientations were identified and proposed for future action. These policy orientations evolve around seven axis, namely (i) right water pricing, (ii) efficient water allocation and funding, (iii) improving drought risk



management, (iv) considering water supply infrastructure, (v) promoting water efficient technologies and practices, (vi) disseminating the need for a water saving culture in Europe and (vii) enhancing knowledge and data collection. An important issue that is tackled within the text, is the adherence with a clear water hierarchy when dealing with water management, that is firstly implement water saving measures and then consider additional water supply infrastructure. The Communication is considered relevant to adaptation to climate change impacts on water resources, as it provides orientation for addressing the impacts of water scarcity and drought and for incorporating the proposed options in water policy.

The Drought Management Plan Report developed by the Water Scarcity and Droughts Expert Network in 2007, in continuance to the Commission's Communication, fosters adaptation to climate change, as it identifies the policies that can decrease the risks associated with droughts, reduce vulnerability and increase resilience to droughts by promoting proactive management and contingency planning. According to the report, a Drought Management Plan should be structured upon three basic components: 1) an early warning system for droughts, 2) a set of thresholds and their respective indicators for each drought stage and 3) a program of mitigation measures corresponding to each drought stage.

3.3.3. *Floods Directive [29,34]*

The Directive 2007/60/EC on the assessment and management of flood risks, in contrast with the Water Framework Directive, does explicitly take into account climate change impacts on floods and provides a framework for adaptation. In particular, the Directive foresees by the end of 2013 the identification of areas where potential flood risk exists through a preliminary flood risk assessment and the development of flood hazard maps and flood risk maps. The preliminary flood risk assessment must include historical records of floods and their impacts as well as the potential adverse impacts of future floods taking into account -inter alia- long term developments and in specific the impacts of climate change on the occurrence of floods.

Following, the Directive foresees by the end of 2015 the development of flood risk management plans with a view to avoid and reduce the adverse impacts of floods. These plans must be periodically reviewed every 6 years and if necessary updated, taking into consideration additional insight gained on the climate change impacts regarding the



occurrence of floods. The purpose of flood risk management plans encompasses the concept of adaptation to climate change, since it focuses on prevention, protection and preparedness measures for addressing flood risk and the climate change impacts on future flood risk.

3.4. Biodiversity [35,36]

In 2006, the Commission with its Communication “Halting the loss of biodiversity by 2010 – and beyond” recognized the need to support biodiversity adaptation to climate change, as well as to ensure that biodiversity will not be negatively affected by climate change adaptation and mitigation measures. Among the four key policy areas for action and the ten priority objectives that were identified in the Communication, “Biodiversity and climate change”, constituted the third policy area with the main objective being to support biodiversity adaptation to climate change. In the Annex I of the Communication, the EU Action plan to 2010 and beyond is laid down. In regard to adaptation, the overall target for substantially strengthening resilience of EU biodiversity to climate change by 2010 is set. This target foresees three areas for action:

1. Development of a comprehensive programme of priority actions to support biodiversity adaptation to climate change in the EU [by 2008].
2. Assessment [by 2008] and strengthening [by 2010] coherence, connectivity and resilience of the protected areas network (Natura 2000 and non-Natura protected areas).

This action aims to protect species and habitats from climate change and to maintain favourable conservation status for them with the use of appropriate tools, such as flyways, buffer zones, corridors and stepping stones in order to allow the most resilient habitats and species to migrate and to address habitat fragmentation.

3. Preliminary assessment of the habitats and species in the EU which are mostly threatened by climate change [by 2007], followed by a detailed assessment and identification of appropriate adaptation measures [by 2009], and initiation of their implementation [by 2010].

In the same direction, the White Paper “Adapting to Climate Change – Towards a European Framework for Action” adopted by the European Commission in 2009, also recognized the



importance of ecosystem resilience and encouraged the development of measures which address biodiversity loss and climate change in an integrated manner to fully exploit co-benefits and avoid ecosystem feedbacks that accelerate global warming.

Following, in the EU Biodiversity Strategy to 2020 presented in the Communication of the Commission in 2011, six mutually supportive and inter-dependent targets that are expected to contribute towards halting biodiversity loss and the degradation of ecosystem services were set. As a result, all targets are considered relevant to adaptation, with the second target on the maintenance and enhancement of ecosystems and their services being the most relevant one. This target foresees the establishment of “green” infrastructure to increase ecosystem resilience and reduce biodiversity loss and the restoration of at least 15% of the degraded ecosystems. Restoration schemes are important for adaptation as they can provide links or corridors between isolated nature reserves or create space in which species may survive.

3.5. Forests [37,38]

With regard to climate change, the EU Forest Strategy has focused so far on the role of forests for mitigating climate change. The first time that adaptation-related actions were included in the EU policy on forests was in 2006 with the Commission’s Communication on an EU Forest Action Plan and in particular with the Key action 6. Key action 6 foresees that the Commission should continue support research, training and studies on the impacts of, and adaptation to climate change while encourages Member States to assess the impacts of climate change, raise awareness, exchange experiences and promote activities towards adaptation. However, Key action 9 of the Forest Action Plan on the enhancement of the protection of EU forests is also considered to contribute towards adaptation as the current risks for forests such as fires, biotic agents and atmospheric pollution are expected to increase with climate change.

In 2010, the Green Paper “Forest protection and information in the EU: preparing forests for climate change”, a discussion was initiated on the issue of forest management and protection in Europe and how it should be modified in order for forests to continue to perform all their functions under climate change. More specific, in this paper the main challenges that the EU forests are facing due to changed climatic conditions and the



available tools for forest protection and monitoring are being presented.

3.6. Soils [39,40]

The Thematic Strategy for Soil Protection of the Commission's Communication issued in 2006, recognizes the degradation processes and threats that soils are subject to, such as erosion, decline in organic matter, local and diffuse contamination, sealing, compaction, decline in biodiversity, salinisation, floods and landslides, which could lead arid or sub-arid climatic conditions to desertification. In addition it recognizes climate change as one of the origins of those threats as well as the two-way interaction of climate change and soils.

The Communication culminates to the conclusion that a Framework Directive on Soils should be adopted aiming to address those threats with the parallel integration of its principles to national and Community policies. In addition, the need for further research on identified knowledge gaps and for enhancement of public awareness on issues regarding soil protection is highlighted. Among the commitments of the Commission for future action is to address the interaction between soil protection and climate change in terms of policy coherence on the level of research, economy and rural development.

Although adaptation to climate change impacts on soils is not explicitly mentioned in the text, it is considered relevant as it takes into consideration climate change impacts when dealing with the threats for soils. However, the adoption of the proposed Directive was finally blocked in 2010 and no further progress has been made by the Council since.

3.7. Marine areas [25,29,41,42]

In 2007, the Commission recognized with its Communication on an Integrated Maritime Policy for the European Union that climate change will affect the marine environment with the consequent impacts for maritime activities and committed that it will support research to predict, mitigate and adapt to the climate change impacts. Furthermore, an Integrated Maritime Policy is expected to provide a coherent policy framework for addressing maritime



activities from a cross-sectoral perspective which will enable the integration of adaptation efforts for marine areas into specific policies.

In the same direction, the Marine Strategy Framework Directive 2008/56/EC which was adopted one year after, foresees a common framework for countries belonging in the same European marine regions to cooperate in order to achieve good environmental status of the EU's marine waters by 2020. The implementation of this Directive is expected to contribute towards preventing deterioration in the quality of the marine environment and increasing resilience to climate changes. The review and update of marine strategies every six years as envisaged in the Directive, provides a mechanism for regular updating to take account of new information (e.g. on climate change impacts) thus facilitating adaptation efforts by ensuring that climate change considerations are incorporated into marine strategies.

3.8. Coastal zones [41,43,44,45]

The Recommendation of the Council on the implementation of Integrated Coastal Zone Management (ICZM) in Europe (2002/413/EC) adopted in 2002, provides for Member States to take a strategic approach to the management of their coastal zones by allowing for integration of policy across different sectors, levels of governance and neighbouring countries. It was recognized that coastal zones are threatened by, inter alia, climate change and in particular by the sea level rise, the increasing frequency and intensity of storms and by the impacts climate change entails for coastal zones, such as coastal erosion and flooding.

In the Commission's communication of June 2007 on the evaluation of the ICZM, adaptation to climate change and risks was highlighted as a priority theme for the further promotion of the ICZM. The prioritization of adaptation was based on the risk that climate changes could affect key economic activities in the coastal zone and consequently an urgent and integrated approach is required in order to reduce the risks effectively.

Furthermore, in October of the same year, the Commission within its Communication on an EU Integrated Maritime Policy, included in its action plan the development of a strategy to alleviate the consequences of climate change in coastal regions and committed to launch pilot actions to reduce the impact of and adapt to climate change in coastal zones and to support research in the field of prediction, mitigation and adaptation to the effects of



climate change on the coastal zones.

In 2010, the EU made substantial progress towards strengthening the legal framework for integrated coastal zone management in the Mediterranean, by adopting the decision to ratify the ICZM Protocol to the Barcelona Convention.

3.9. Agriculture and fisheries [46,47,48]

Although the objectives of the current Common Agricultural Policy (CAP) of the EU do not include climate change adaptation, there is a number of measures foreseen under the CAP that can be used to counterbalance adverse climate effects while its main role is to provide financial support for the implementation of these measures. Examples of such measures aim to:

- increase water use efficiency and reduce run-off, which can contribute to coping with decreased water availability for irrigation under climate changes,
- promote the use of crop varieties better adjusted to new weather conditions (e.g. more resilient to heat and drought),
- reduce soil erosion - degradation and enhance soil fertility for facing reduced crop productivity anticipated by climate changes,
- restrict the use of chemical fertilizers and pesticides for protecting soil and water quality which are threatened by further deterioration due to climate changes,
- reduce risk for livestock during extreme weather events (heat waves, floods, windstorms etc) which are expected to increase both in frequency and intensity due to climate changes by improving outdoor as well as indoor conditions,
- provide advisory services and training.

In addition, since the 2003 CAP reform, the subsidies provided are decoupled from production volumes, allowing for the application of more sustainable practices and moving away from intense agricultural activities, thus further facilitating adaptation for agriculture.

It is important to note that, with the Commission's communication of 2010 entitled "The CAP towards 2020: Meeting the food, natural resources and territorial challenges of the future", the potential of the agricultural sector for climate change mitigation and adaptation is highlighted, as well as the vulnerability of the sector towards climate change impacts. Among the three objectives set for the future CAP, the second objective foresees the



sustainable management of natural resources and climate action to pursue climate change mitigation and adaptation actions in order to better enable agriculture to respond to climate change. The communication also suggests options for future action related to climate change, such as to integrate climate change issues in the rural development policy and to focus financial support on these issues.

The common fisheries policy has a key role in managing fish populations and, to the extent that climate change affects fish stocks, it could be considered that, although it does not explicitly refer to climate change adaptation, it contributes towards this direction. More specific, the common fisheries policy aims inter alia to prevent overfishing and to protect marine ecosystems, to support fishermen from losses and damages incurred during extreme weather events and to prevent the spreading of harmful Invasive Alien Species.

3.10. Public health

The European Environment and Health Action Plan 2004-2010 presented in the Commission's Communication in 2004, opened the path for introducing climate change issues into health policy in the EU. More specific, the Action Plan foresees that research should be strengthened in order to fill the knowledge gaps and address potential emerging threats to health. Following, the Council in its "Conclusions on Environment and Health", further defined emerging threats by including climate changes as well and urged for the development of tools in order to project, prevent and effectively respond to them. In addition, the European Parliament suggested the enhancement of cooperation between different competent agencies for the implementation of early warning systems to prevent harmful climate change effects on health and called for the implementation and development of new and existing pathogen reduction technologies to respond adequately to the new threats posed by climate change, such as the increased presence of emerging viruses and undetected pathogens.

In 2007, the White Paper "Together for Health: A strategic approach for the EU 2008-2013" was adopted – also commonly referred to as the EU Health Strategy-, recognized amongst others the need for protecting citizens from health threats such as climate changes and laid down the actions required. In particular, with the White Paper work was assigned to the Commission for strengthening surveillance mechanisms and response as well as for



investigating the health aspects of adaptation to climate change. The investigation should cover issues such as the effect from extreme weather events on public health and the assessment of the EU health systems and infrastructure capacity to cope with climate changes.



4. Conclusions

After examining a plethora of policies, strategies and action plans implemented and goals set at European and international level, it is concluded that a solid framework for promoting and enhancing climate change action is being systematically constructed during the last decades with the UN being the pioneer in this field followed by the EC which further elaborated towards this direction. Climate change mitigation policies were the first to be developed while climate change adaptation policies are being progressively promoted recently.

Action on adaptation has been further promoted in the EU through a series of tools such as consultation documents, action plans and strategies. These tools set goals for the future and seek to ensure that climate change adaptation will be taken into consideration when developing new policies while only a few of them have led to their actual enactment through legislation, i.e. Directives. These Directives (namely the Water Framework Directive, the Floods Directive and the Marine Strategy Framework Directive) foresee inter alia the implementation of several measures that are considered to contribute towards climate change adaptation.

Finally, although the majority of policy areas which are considered to be potentially affected by climate changes have already been addressed in a certain degree, there are other policy areas that have not yet been specifically addressed at all (e.g. energy, tourism, infrastructure).



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