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Making society an active participant in
water adaptation to global change

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Executive summary

This policy review constitutes a policy background for the BeWater project in four Mediterranean river basins; one of which is in North Africa. The review provides the institutional backdrop for Africa within the framework of the African Union instruments for Climate Change and Water, whereas the EU policy review is more detailed and presents a contribution to the ongoing European dialogue on climate change adaptation with an initial focus on the water policy sector but incorporating the energy, agriculture and the environment policy sectors. The treatment of policy sectors individually, especially for broad issues such as climate, does not reflect our reality and is becoming increasingly irrelevant as our understanding of the impacts of the complexity of climate change becomes greater. Policy-wise, this underlines the need for a more clear understanding of the inter-linkages, overlaps and inconsistencies between sector policies when, and if, they address the issue of climate change.

Concerning the European Union, a review of EU Policies and Analyses indicate 2 priorities for the EU in their policy response to climate change. One is for the EU to meet its already proclaimed targets and obligations both at the EU level and at the international level. The other priority is to build a future strategy and supporting legislation for the EU to reduce the impacts of climate change on the security, economic health and well-being of its constituents. The achievement of the targets is easier to conceptualize but for the latter, there must be a consolidated consideration across policy sectors, since that is the sectoral nature of where climatic impacts will fall.

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2 Background

This policy review is part of the European dialogue on climate change adaptation with an initial focus on the water policy sector but incorporating the energy, agriculture and the environment policy sectors. The treatment of different policy sectors individually, especially for broad issues such as climate, does not reflect the real world and is becoming increasingly irrelevant as our understanding of the impacts of the complexity of climate change becomes greater. Policy-wise, this reflects the need for a more clear understanding of the interactions, conflicts and overlaps of sector policies when, and if, they address the issue of climate change.

With the water, energy, agriculture and the environment sectors being so intrinsically linked, the process of climate change adaptation needs to include the alignment of these sectors on this issue. The commitment of the EU to address climate change with strategies, and ultimately policy, will be confronted by the fact that the coherence between these policy sectors is not always evident. A major challenge in the adaptation process will be to ensure policies and activities are integrated, and will require that existing sector policies addressing climate do not interfere or contradict each other.

Mitigation of climate change, as well as adaptation, is a strategic priority for the European Union. Member States are making efforts to reduce greenhouse gas (GHG) emissions while supporting non-EU states to do likewise¹. However on a European scale, policy needs to be developed in a direction that will synergise policy sectors and integrate greater public participation in order to build an effective and cross-sectoral response to what is essentially the cross-cutting issue and challenge of climate change.

The world populations are under pressure to adapt to climate change in a number of sectors, but most noticeably in water and energy management. Hydro meteorological records and climate projections clearly indicate that water resources are vulnerable and will be strongly affected by climate change, particularly through the overall increase in water and atmospheric temperatures, changes in precipitation patterns and a rise in sea level. In the near future, the expected increase in global temperature by 2100 ranges from 1.1°C to 6.4°C compared to 1990 levels. In Europe, the expected increase in temperature is between 2.5° to 4°C with a corresponding decrease in annual precipitation from 10% in the North to 40% in the South. Consequently, the South and South-eastern region of Europe can anticipate more frequent and intense drought events which will reduce the already challenged water availability in these regions. Along with the temperature increases, the total amount of

¹ European Commission – Climate Action http://ec.europa.eu/clima/policies/brief/eu/index_en.htm (2013)

precipitation will decrease, but heavy rainfall events will occur more frequently. Sea levels are also expected to rise as much as 60 cm by the end of the 21st century due to oceanic thermal expansion and the melting of glaciers².

Pressures on natural resources will increase from these impacts climate change as well as growing demands on the energy, water and agriculture from changing global trends of population growth and rising economic activity. The solution to these issues requires a holistic approach, and must avoid duplication of effort and conflicting policies, but to achieve this will also require a deeper insight into the current state of energy, water, agriculture and the environment policy sectors.

² For all Climate Change statistics: European Environment Agency. (2012). *Climate change, impacts and vulnerability in Europe 2012*. Copenhagen: European Environment Agency.

2.1 Climate change Adaptation

Climate change adaptation aims at reducing the risk and damage from current and future harmful impacts cost-effectively or exploiting potential benefits. The European Commission defines adaptation as “Adaptation means anticipating the adverse effects of climate change and taking appropriate action to prevent or minimise the damage they can cause, or taking advantage of opportunities that may arise. It has been shown that well planned, early adaptation action saves money and lives later³.” These actions combined with mitigating measures are the most effective and response to climate change which are available to us at the moment.

Some of the anticipated risks from climate change include; more erratic precipitation patterns either annually or in distribution of intensity, and increased temperatures of land, air or water. Some examples of adaptation actions include using limited water resources more efficiently, adapting building codes to future climate conditions and extreme weather events, construction of flood walls and raising dykes for anticipated sea level rises, development of drought tolerant crops, promotion of indigenous forest cover species better adapted to storms and fires, adapting spatial development plans and corridors to facilitate shifting species migrations⁴. Adaptation can encompass national or regional strategies as well as practical steps taken at community level or by individuals. Adaptation measures can be anticipatory but are more often reactive. Adaptation applies to natural and environmental as well as to human systems.

2.2 Climate change and EU Sector Policy

Review of EU water, energy, agricultural and environmental sector policy identifies the need for greater coherence to address climate change adaptation collectively. The current climate-oriented policies relevant to these sectors tend to have independently focused mitigation targets, such as implementing the chemical directive *Sustainable Use of Pesticides Directive 2009/128/EC* with *National Action Plans* (see more detail in Section 6.8). Furthermore, the policies, either individually or as a collective, do not adequately address the following issues:

- anticipation of climate change impacts in relation to current mitigation targets
- identification of vulnerable areas in the sectors' fields of activities
- promoting and integrating public participation

³ European Commission website – Climate Action (2013) <http://ec.europa.eu/clima/policies/adaptation/>

⁴ EC Green paper: Adapting to climate change in Europe – options for EU action (2007)

In order for a climate change policy to work uniformly as a practical, responsive and inclusive solution these individual sectoral differences will need to be addressed. It should be added however that where there gaps in sector policy on climate change (such as in participation or addressing adaptation), an overarching policy approach to climate change can be one of the tools to bring some policy coherence among the sectors.

2.3 Nexus Thinking

2.3.1 Bonn 2011: The Water, Energy and Food Security Nexus

Formulating a unilateral strategy to effectively mitigate and adapt to the adverse effects of climate change across all sectors and scales with a balanced and synergetic structure requires a *revised approach for policy management*. The current system in place assumes sectors such as water, energy agriculture and environment to be separate entities but this does not reflecting reality since there are clear overlaps and interdependencies between the sectors. The Bonn 2011 Conference on Nexus Thinking aimed to improve management and policy development with a more holistic approach. The Conference was organised in preparation for the Rio+20 summit and provided evidence that improved water, energy and food security can be achieved through a nexus approach. The nexus perspective is not a new concept as such, but it is new management approach for the European Community policy makers. The Bonn2011 conference propounded that applying a greater management scope across water, energy, and food security would improve efficiency and help to identify and build on more synergies across sectors. Understanding the interconnectivity of these sectors is a step towards applying a nexus framework that covers consequences in all sectors in order to improve policy strategies. These consequences include climate change as it applies to each sector, and thus should contribute collectively within a nexus approach to a Climate Change Policy development. The Water Energy and Food Security Nexus – Solutions for the Green Economy was a German contribution to the UN Conference on Sustainable Development in Rio 2012 which was supported by other EU member states as a valid reform to improve policy coherence and effectiveness. Understanding the nexus approach can help to address a cross-sector approach that overcomes sector-bias on the management and implementation of a common climate change strategy.

Objective: To unify initially the three sectors of water, energy and food security under the same framework where policies can be managed and developed better without hindering one another.

Analysis: The nexus perspective is not a new concept but the Bonn2011 conference did introduce the European community to the holistic approach to policy making. The reform is a

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progression from an overly simplistic but standard model that regarded policy sectors as independent structures to an overall EU Community policy framework. The nexus discussion is presently limited to three sectors but is the beginning of a movement away from conventional, segregated sector approach. Limitations within the nexus discussion derive essentially from the terminology - affecting the direction and interpretation of the reform – but also gaps in knowledge – indicating that more research is required on the interconnectivity and relationships of sector policies.

This issue has been addressed since 2011, and in the 2013 Nexus Conference held in Berlin, some issues on terminology were addressed, one of which was the comparison of Nexus to IWRM⁵. Both IWRM and the Nexus are based on the view that segmented sectorial planning and decision making is likely to lead to unsustainable development pathways and inefficiencies in the development of resources and their allocation between uses and users. Therefore, both concepts see the need to promote greater co-ordination between inter-linked resource producing and consuming sectors and to clearly recognize the consequences of decisions made in one sector for the other sectors. Both concepts also have the same emphasis on changing the way policy and decision making occurs in order to improve human welfare and social equity, allow sustainable growth and protect essential environmental resources. They are both part of the general approach to sustainable development and today underpin work on the Green Economy and Green Growth.

Under the *IWRM* rubric much attention had been focused on the need to consider land and water management in an integrated way in order to help ensure both water and food security. What was relatively new was the general realization that energy use and security also had to have a place in co-ordinated management approaches. It is of course true that for many years specific cases illustrating the linkages between water, food and energy have been cited, such as the impact of subsidised energy prices for irrigated agriculture on the demand for water. However, with concerns over climate change and the search for low carbon alternative energies it was increasingly acknowledged that the relationships between water, food and energy went beyond such specific examples and needed to be treated in a more holistic way.

The key difference between the Nexus and IWRM is that IWRM starts with the water resource when considering the interrelationships between water, food and energy. In an idealized form the Nexus approach seeks to look at all three elements as an interrelated system.

⁵ The Nexus Approach vs IWRM - Gaining Conceptual Clarity, http://www.water-energy-food.org/en/news/view_1612/the-nexus-approach-vs-iwrm-gaining-conceptual-clarity.html

2.3.1.1 *Nexus and Terminology*

Clear definitions of terminology are vital for policy makers to work together and towards the same goals. The nexus aims to achieve security for the water, energy and food security sectors. The definition of security is important as this can have different priorities depending on the scope and timeline considered. The definitions initially used for the Nexus approach are provided below:

Water security is defined in the Millennium Development Goals as ‘access to safe drinking water and sanitation’, both of which have recently become a human right. However the nexus perspective also includes the availability of and access to water for *other human and ecosystem uses*.

Energy security has been defined as ‘access to clean, reliable and affordable energy services for cooking and heating, lighting, communications and productive uses’ (UN), and as ‘uninterrupted physical availability [of energy] at a price which is affordable, while respecting environment concerns’.

Food security is defined by the Food and Agriculture Organisation as ‘availability and access to sufficient, safe and nutritious food to meet the dietary needs and food preferences for an active and healthy life’. Adequate food has also been defined as a human right.

The focus of these definitions is largely on *access*, which is important, but does not consider timelines or the importance of inter-relationships with other sectors for security, and therefore fall short of supporting the reforming ideas of the nexus. Of more relevance to the nexus is the more recent UN water security in a paper in 2013 which states that “The capacity of a population to safeguard sustainable access to adequate quantities of and acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability.”⁶ This definition goes further to address sustainable, long-term water security. Ecosystems and the livelihoods of human populations are now considered as priorities for access to water resources, and this is a step towards nexus thinking on security and coherence in other policy sectors.

2.3.1.2 *Knowledge Gaps in the Nexus*

⁶ Water Security & the Global Water Agenda: A UN-Water Analytical Brief (2013)

The nexus perspective is initially focussing on three sectors but does establish a precedent for policy to acknowledge the interdependencies between sectors. This practice will be present as the EU develops mitigation and adaptation strategy that ultimately results in policies that will be complementary between sectors. During the Bonn2011 conference, knowledge gaps were identified on the data of the interdependencies between the sectors and on useful case studies. This situation has improved considerably and in 2014 there are now a number of thought-pieces and case studies available that either address the nexus discussion or provide case studies of the application of a nexus approach to multi-sector management.⁷

⁷ <http://www.water-energy-food.org/en/knowledge.html> This section of the website introduces and presents key documents, presentations, links and other information on the nexus. It aims to build a comprehensive online archive of Nexus-related knowledge products for decision-makers in politics and the corporate world, researchers, experts and other interested users.

2.4 Public Participation

The European Union states that it aims to keep citizens informed about and involved in environmental matters and to improve the application of environmental legislation by approving the Convention on access to information, public participation and access to justice in environmental matters; namely the Aarhus Convention. Terminology as by the Aarhus Convention⁸:

- 'The public' means: one or more natural or legal persons and, in accordance with national legislation or practice, their associations, organisations or groups.
- 'the public concerned' means: the public affected or likely to be affected by, or having an interest in, the environmental decision-making procedures.

2.4.1 The Aarhus Convention

The Decision on the Aarhus Convention was adopted by the EC on 17 February 2005 (Decision 2005/370/EC). The Convention consists of two main directives; Directive 2003/4/EC on public access to environmental information, and Directive 2003/35/EC providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending with regard to public participation and access to justice Council Directives 85/337/EEC and 96/61/EC.

2.4.1.1 Public Access to Environmental Information Directive 2003/4/EC

Objective: To ensure the right of access to environmental information held by or for public authorities.

Analysis: Access to information is critical for the public to make an informed decision and contribute productively to policy. The directive aims to improve the distribution of environmental information: Member States are required to ensure, so far as is within their power, that any environmental information that is compiled by them or on their behalf is up to date, accurate and compatible within the EU. The focus of information distribution tends to be on telecommunication: *Member States shall take the necessary measures to ensure that public authorities organise the environmental information which is relevant to their functions and which is held by or for them, with a view to its active and systematic dissemination to the public, in particular by means of computer telecommunication and/or electronic technology, where available.* Achieving a quality standard is clearly difficult over such a range of scale and content across EU Member States and there is room to improve the application of this

⁸ Directive 2003/35/EC of the European Parliament and of the Council

directive to standardise compatibility for environmental information, allow for easier knowledge sharing and a greater understanding by the public of environmental and related issues.

Participation: The focus of this directive is to ensure the public are informed. This is the first and most important step to a productive, inclusive participating public but is far from obliging public participation in design and decision-making processes.

2.4.1.2 Early Stage Public Participation for Environmental Plans and Programmes Directive 2003/35/EC

Objective: To provide for public participation in respect of the drawing up of certain plans and programmes relating to the environment, and to improve the public participation and providing for provisions on access to justice within Council Directives 85/337/EEC and 96/61/EC.

Analysis: The Directive instructs Member States to include the public via clear, up to date and relevant information with early and effective opportunities to participate in the environmental decision-making procedures, and the obligation of national and regional authorities to incorporate the public response into the environmental plans and programmes. Early stage participation is important as inclusion builds trust and understanding between stakeholders in the environment. The directive does not however make it clear when and how public participation must be incorporated. The EIA process requires early public participation but is only limited to particular projects of specified large scale and/or intensive environmental impact. Stricter guidelines should be established in order to broaden the spectrum of plans and programmes that require public participation and to what extent the inclusion should be.

Participation: The aim of this directive is to instruct Member States to both inform the public and to engage public participation at the early stages of environmental plans and programmes. This is an important role but more adequate policy should be reviewed for latter stages of environmental plans and programmes i.e. during operation and maintenance, and decommissioning.

3 Climate change and the Water Sector

This section identifies climate change effects on the water sector and it emphasizes on the natural, rather than human impact on water bodies. This emphasis is a necessary condition in order to evaluate the extent to which the appropriate EU Water Policy addresses identified issues caused by climate change. The EU Water Policies are also reviewed in terms of another issue which was identified in the introduction: the extent and manner in which it promotes public involvement in the process of managing Europe's waters. The following chart gives an overview of the effects of Climate change on the main water bodies and agriculture sector⁹:

Water Body	Impacts Caused or Highly Affected by Climate change
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River Flood	Droughts
	Floods
Surface Waters	Increased water pollution, salinization
	Decreased drinking water availability
Groundwaters	Soil moisture deficits, salinization
	Shorter winter recharge period
Marine Environment	More microbes
	Changes in stratification
Coastal Flooding	Coastal erosion
	Floods
Public Water Supply and drinking water	Less freshwater
	Droughts
Agriculture	Pests and diseases
	Floods and droughts

The effects which are presented above are general and refer impacts which can be expected across Europe. More information on the effects of climate change on water can be found in Annex II. It should be noted that the extent and type of effects will differ across the various regions of Europe.

⁹ Malta Environment and Planning Authority. (2010). *Integrating climate change considerations in the Water Catchment Management Plan for the Maltese Islands*.

3.1 EU Water Policies: Objective and Analysis

The EU strives to create an effective and coherent water policy since the 1970s. This section examines the major directives, regulations and communications applying to Europe's water resources. The identified effects of climate change on water bodies are used as a guide to select the relevant policies, which address them. The EC platform on Environment and Water¹⁰ identifies 15 policies which deal with the issues of protecting Europe's water resources. All of these key policies are listed in Annex IV, but only 11 of them are analysed here¹¹. The relevant water policies are reviewed in terms of their objective, analysis of the extent to which they address climate change and the level of public participation promoted in their texts.

3.1.1 Bathing Water Directive (Directive 2006/7/EC, Date: 2006)

Objective: To preserve, protect, and improve the quality of the environment and to protect human health by ensuring good bathing water quality.

Analysis: The directive discusses many pollution and quality issues with bathing water which rise from various activities in surface and groundwater and the marine environment. A study from the University of Wageningen suggests that climate change will create a favourable setting for countless new pathogens and vectors for diseases. Increased temperature and precipitation will be beneficial for the development of both in the bathing waters and higher chances of infection, which will result in increased risk on human health. An increased growth of algae and cyanobacteria can also be expected, which will result in an increase in harmful toxins. Overall, it is expected that climate change will affect the epidemiology of waterborne diseases¹². The survey concludes that meeting the standards of the new European bathing water directive will not in itself be sufficient to guarantee bathing waters of sufficient quality once the environmental changes due to climate change become a fact¹³.

Participation: Article 11 of Directive 2006/7/EC urges Member States to encourage public participation in the implementation of this Directive and to ensure the provision of opportunities for the public to find out how to participate, and to formulate suggestions,

¹⁰ Available on http://ec.europa.eu/environment/water/index_en.htm

¹¹ Water policies not relevant to this review: Discharge of Dangerous Substances, 2006/11/EC; Environmental Quality Standards, 2008/105/EC; Industrial Emissions Directive, 2010/75/EU; Detergents Regulation, No 648/2004

¹² Gubler, D., Reiter, P., Ebi, K., Yap, W., Nasci, R., & J.A. Patz. (2001). Climate Change and Variability in the US: Potential Impacts on Vector- and Rodent-Borne Diseases. *Environmental Health Perspectives*, pp. 223-233.

¹³ Roijackers, R. M., & Lüring, M. F. (2007, October). Climate Change and Bathing Water Quality. The Netherlands: Wageningen University.

remarks or complaints. The public's main contribution is aimed at using their assistance to identify bathing water basins. This participation ensures that the public's demands are heard, but it does not encourage the public to regulate habits or behaviour which may contribute to protecting their health and the quality of the bathing waters. Increasing the level of awareness about the potential increase in risk to bathing waters due to climate change will help protect human health, but can also increase the quality of public participation.

3.1.2 Marine Strategy Framework Directive (MSF Directive 2008/56/EC, Date: 2008)

Objective: To achieve or maintain good environmental status in the marine environment by 2020; to protect, preserve and restore marine environment and to maintain biodiversity.

Analysis: This Directive was adopted in July 2008 with the aim of reversing pollution, climate change¹⁴ and other negative effects on Europe's marine environment. The MSF directive discusses the effects of climate change and the need to adapt the status of marine environment and waters over time due to climate change impact. The Directive acknowledges that climate change is already affecting the marine environment and will continue to trigger changes in biological, chemical and physical processes. As a result, each Member State - cooperating with other Member States and non-EU countries within a marine region - are required to develop corresponding strategies for their marine waters. The strategy must consist of a detailed assessment of the state of the environment, a definition of "good environmental status" (GES) at regional level and the establishment of clear environmental targets and monitoring programmes. In addition, each Member State must draw up a programme of cost-effective measures, based on a cost-benefit analysis of the proposed measures. A setback in the process of mitigating the climate change effects on the marine environment is the lack of a specific programme of measures given to the Member States, in order to achieve GES. However, the MSFD does outline 11 major GES descriptors

¹⁴ European Commission. (2011). Commission Staff Working Paper {SEC (2011) 1255 final}. *Relationship between the initial assessment of marine waters and the criteria for good environmental status*. - "Climate change influences different components of ecosystems, notably species distribution and composition/abundance in a community. Climate-related pressures, such as atmospheric air/water gaseous exchange rates, and also pH, temperature, salinity, water flow (tidal and ocean currents), sea level and wave exposure, may change in space and time. The gradual change in pH driven by the storage of carbon dioxide in the sea from anthropogenic activities, known as ocean acidification, is expected to have significant adverse effects on a range of marine ecosystems, habitats and species. The determination of GES may therefore need to be adapted over time to take account of ongoing changes caused by climatic variations. In developing their respective marine strategies, Member States need to specify, where appropriate, any evidence of climate change impacts, and incorporate such changes into the way they determine the characteristics of GES and set their environmental (state) targets. It is also important to state the assumptions upon which targets for specific components are based, i.e. in relation to other parts of the ecosystem which may change in the future due to natural variation and climatic processes or due to changes in pressures upon them."

which alleviate the process. The Directive also recognizes the fact that pollution, climate change effects and the marine environment are trans-boundary concepts, and calls for necessary transboundary cooperation among the Member States.

3.1.3 Drinking Water Directive (Directive 98/83/EC, Date: 1998)

Objective: To protect the health of the consumers in the EU and to make sure the water is wholesome and clean.

Analysis: This directive lays down the essential quality standards of water intended for human consumption, which originate from fresh water basins and surface and groundwater for public water supply and drinking water. Directive 98/83/EC does not recognize the effects on water quality and availability resulting from climate change; effects which can include irregular or extreme precipitation, increased temperatures, coastal erosion, salinization or mineralization, and increased release of persistent organic pollutants (POPs) trapped in the soil, water and ice¹⁵. Under all these challenging conditions, Member States are obliged to maintain good quality and availability of public water supply and drinking water.

This directive is clearly aimed at beneficiary consumers but falls short of including climate related impacts on quality which may lead to increase in water-related diseases and impacts on economic impacts such as on local food production and processing requirements.

Participation: Involving the public in the process of improving the state of the drinking water is not mentioned as a necessary action in this Directive.

3.1.4 Floods Directive (Directive 2007/60/EC, Date: 2007)

Objective: Aims to reduce and manage the risks that floods pose to human health, the environment, cultural heritage and economic activity. The directive is connected to the WFD and applies to the management of river basins.

Analysis: The implementation of the Directive is to be coordinated with the Water Framework Directive 2000/60/EC regarding flood risk management plans and river basin management. All assessments, maps and plans prepared are to be made available to the public, which reinforces the rights of the public to access this information and to have a say in the planning process.

¹⁵ UNEP/AMAP Expert Group. (2011). *Climate change and POPs: Predicting the Impacts*. Geneva: Secretariat of the Stockholm Convention. – The report states that releases of POPs trapped in soil, water and ice will increase due to rising global temperatures. One example: glaciers melting faster means more of the POPs trapped in those glaciers are being re-released more quickly.

The Directive requires Member States to assess the risk of flooding from all sources except flooding from sewerage systems. Its aim is to reduce and manage the risks that floods pose to human health, the environment, cultural heritage and economic activity. It recognizes that floods are a natural phenomenon which is influenced by human actions and climate change¹⁶. The Directive calls for a management plan of all inland and coastal waters on each Member State territory, which is to be systematically updated and accounting for possible climate change effects: "Flood risk management plans should focus on prevention, protection and preparedness. [...]The elements of flood risk management plans should be periodically reviewed and if necessary updated, taking into account the likely impacts of climate change on the occurrence of floods¹⁷." The requirement to include climate change effects in the revision of the mitigation efforts shows that the Floods Directive aims to address the vulnerabilities posed by this factor. However, since human actions also influence the flows of water, this makes distinguishing between the effects of human activities and climate change on the frequency and intensity of flooding challenging. A key in applying the Floods Directive to climate change challenges would be to identify which climate change impacts on flooding are measurable, and thus help to develop the appropriate measures and management techniques that can be implemented on a more local scale such as smaller river basins.¹⁸

An obstacle to prepare this floods management plan from the Directive level is the fact that it requires the availability of detailed topographic and socio-economic data for each Member State's river basins. Such information is not always available.

Participation: Chapter V of the Floods Directive calls for Member States to act upon achieving coordination with the EU Water Framework Directive in the field of public participation and information. It calls for the efficient involvement of all "interested parties" in the implementation process of the Directive and for publicly accessible information on the flood risk management plans. These guidelines, laid out in Directive 2007/60/EC, are not very specific and Member States are allowed the possibility to involve the public in whichever manner they choose, with the main requirement to supply open and updated information. The subject of public participation in preparing flood risk and flood hazard maps as well as development of flood risk management plans was discussed at the specific workshop organised in the framework of the WFD/Floods Directive Common Implementation

¹⁶ Floods Directive 2007/60/EC, Article 2

¹⁷ Floods Directive 2007/60/EC, Article 14

¹⁸ Quevauviller, P. (2012). *Scientific Support to the Implementation of the EU Floods Directive*. European Commission: DG Research, Directorate I "Environment". - The implementation of the EU flood policy and its operational features, including those linked to climate change adaptation and mitigation, represents huge scientific challenges and research needs which are clearly highlighted in the White Paper on adaptation to climate change.

Strategy and a set of recommendations were adopted¹⁹. In addition the EC website of DG Environment and the Implementation of the Floods Directive does refer to the Aarhus Convention as a part of the Directive's implementation process²⁰. Overall, the lack of stricter guidance and obligation to involve the public results in the Member States not always using the full potential of the public's contribution.

3.1.5 Ground Water Directive (Directive 2006/118/EC, Date: 2006)

Objective: To protect groundwater from deterioration and chemical pollution.

Analysis: The groundwater directive sets the quality criteria for the groundwater ecosystem and water supply intended for human consumption. It focuses on the assessment of the chemical status of groundwater and the identification and reversal of significant and sustained upward trends in pollutant concentrations. The directive clearly identifies that the source of pollutants originates from human activity and does not mention climate change in its text. As discussed above, climate change does impact on groundwater resources by intensifying distribution of water pollutants and increasing the degradation rate of pesticides and organic pollutants. New topics that have emerged since the adoption of the Water Framework Directive and the Groundwater Directive, such as impacts of climate change, changing pollutant environments and emerging pollutants need to be included in both awareness-raising and implementation of the Directive among the Member States.

Participation: Directive 2006/118/EC does mention the involvement of civil society in its text but does not provide Member States with guidelines on how to their involvement. The implementation and the involvement of the public in the policy making process is implied by the rules laid out in Article 14 of the overarching Water Framework Directive.

3.1.6 Urban Waste Water Directive (Directive 91/271/EEC, Date: 1991)

Objective: To protect the environment from the adverse effects of urban waste water discharges and discharges from certain industrial sectors and concerns the collection, treatment and discharge of:

- Domestic waste water;
- Mixture of waste water;
- Waste water from certain industrial sectors.

Analysis: Waste water is generally a mixture of domestic waste water from baths, sinks, washing machines and toilets, and waste water from industry. It often contains rainwater

¹⁹ Bucharest workshop report on public participation in Flood Directive implementation

²⁰ Available on: http://ec.europa.eu/environment/water/flood_risk/implem.htm

runoff from roofs, roads and other impermeable surfaces²¹. The waste water treatment infrastructure is essential for public health and a clean environment, thus it is a main priority to have a well-functioning treatment system. In recent years, the effects of climate change, together with the new and more stringent environmental standards have put extra pressure on treatment infrastructures to be renewed and improved. Climatic extreme events such as unseasonal and increased intensity of rainfall overload sewage and rainwater run-off infrastructures, resulting not only in flooding but the surface distribution of contaminated waters. Older sewer stocks may also become vulnerable to infiltration of ground water with time which will damage the water quality and increase flooding problems. Reduced rainfall also poses a threat, as it requires higher standards of sewage treatment, described in the statutory environmental requirements²². Demographic developments and increasing urbanization add extra pressures on the water sector and the urban waste water management.

This Directive aims to minimize the effects of discharge on the environment, but it does not recognize climate change as a factor which can influence the environment and pose additional pressures to the waste water infrastructure.

Participation: The Urban Waste Water Directive discusses the involvement of civil society in the process of achieving its goals. It requires periodic updates to be available on the disposal of waste water and sludge and to keep the citizens informed on the quality of waste water treatment. It does not, however, promote adaptation or good practices for the public, such as reducing the level of domestic contamination and ultimately the purification process.

3.1.7 Water Framework Directive (Directive 2000/60/EC)

Objective: To achieve a good ecologic and chemical status for all surface waters by 2015.

Analysis: The Water Framework Directive (WFD) has become the main instrument for protecting Europe's water resources. The Directive provides scope to adapt to climate change through the cyclical river basin planning process which lays out strict requirements for the quantity and quality of water. In a 2007 review, following 7 years implementation of the WFD, it was noted that, "further clarification is needed as to how and at what stages climate change can be considered in river basin management planning²³." At that time there

²¹ "Consultation on a draft National Policy Statement for Waste Water." (2010). Defra. Available on: <http://archive.defra.gov.uk/corporate/consult/waste-water/101116-wastewaterpolicy-condoc.pdf>

²² "Consultation on a draft National Policy Statement for Waste Water." (2010). Defra. Available on: <http://archive.defra.gov.uk/corporate/consult/waste-water/101116-wastewaterpolicy-condoc.pdf>

²³ Dworak, T. (2007). *Climate Change and the EU Water Policy: Including Climate Change in River Basin Planning*. Ecology Vienna.

was no clear identification of the points of pressures from climate change on water resources. However, in recent consultations and reviews of the WFD in the Fitness Check and the EU Water Blueprint exercise, the WFD was at least seen as being flexible enough to allow for adaptation measures. Adaptation responses to climate change will need to be local - at the river basin scale, but the river basin management planning in order to reach WFD objectives allows for that. It is well recognised that it is not possible to prescribe adaptive responses at the EU level and EU policies should rather guide, support and enable local adaptation responses. To this extent, Water Directors of EU Member States adopted in December 2009 a Guidance document on adaptation to climate change in water management to ensure that the River Basin Management Plans (RBMP) are climate-proofed. Some recommendations were applicable for the 1st cycle of the river basin management planning (2004-2012), but the Guidance Document targeted mostly Member States' preparations for the 2nd cycle of the RBMPs now ongoing (2013-2021).

The Impact Assessment of the Blueprint to Safeguard European Water resources presented in 2012 performed a review of the vulnerability of water and environmental resources to climate change and man-made pressures, based on various in-depth assessments:

- The future water situation and developments in the water sector have been examined in Europe until 2050 by the ClimWatAdapt project in terms of vulnerability to water scarcity, droughts and floods (see final report and annexes). A downscaled climate change scenario points to an increase of the occurrence of droughts and floods. However, vulnerability to water scarcity is more dependent on socio-economic development (land use, water use) than on climate change exposure. ClimWatAdapt results have been integrated into the European Climate Adaptation Platform.
- In the context of the Impact Assessment for the Blueprint, by refining the results of ClimWatAdapt, the Joint Research Centre of the European Commission developed a baseline scenario bringing together climate, land-use and socio-economic scenarios and a multi-criteria optimization of different policy scenarios for water resources availability and use. The methodology and the results are described in the support studies "A multi-criteria optimisation of scenarios for the protection of water resources in Europe" and "Evaluation of the effectiveness of Natural Water Retention Measures".
- Regarding the latter, complementary action is on-going, aiming for a better understanding of the costs, benefits and implementation issues of policies and measures to boost ecosystem storage capacity for water in Europe.

- A complementary study (ADWICE)²⁴, reviewed existing knowledge on the potential effects of Climate change on Drinking Water Resources across the EU. It proposed a methodology to assess the vulnerability of drinking water resources in the EU and provided possible avenues for further scientific research and actions that may be taken by decision-makers at different levels, based on the identified gaps and issues.
- The Blueprint also included recommendations for ensuring that climate change is taken into account in the implementation of the Floods Directive, and assessed the need for further measures to enhance water efficiency in agriculture, households and buildings.
- At the regional scale, a substantial research effort has been undertaken under the recently completed Preparatory Action "Climate of the Carpathians": The CARPATCLIM project improved the base of climate data in the Carpathian Region for applied regional climatological studies such as a Climate Atlas and/or drought monitoring. The CARPIVIA and CARPATHCC projects assessed the vulnerability of the Carpathian region to climate change in combination with other anthropogenic pressures, and performed an inventory of potential and already implemented adaptation measures, focusing on ecosystem-based adaptation measures.

Participation: This Directive sets the criteria and provides guidance on how the public can contribute to the process of protecting Europe's waters. The WFD emphasizes that the success of this directive relies on the close participation of the public. In particular WFD Article 14 promotes the active participation of all interested parties in the development of River Basin Management Plans and requires Member States to inform and consult the public. As stated within the WFD Directive: "To ensure the participation of the general public including users of water in the establishment and updating of river basin management plans, it is necessary to provide proper information of planned measures and to report on progress with their implementation with a view to the involvement of the general public before final decisions on the necessary measures are adopted."²⁵ Involvement of stakeholders and the civil society is also identified in the "Common Implementation Strategy of the WFD" from the year 2000. Participants may be involved as observers of the Strategic Co-ordination Group and as participants in specific working groups. The level of involvement should be on a case-by-case basis, which will ensure parties can contribute through an effective participation and a full understanding of the different elements in the process.

²⁴ <http://advice.biois.com/> Adapting Drinking Water resources to the Impacts of Climate change in Europe

²⁵ Water Framework Directive, 2000/60/EC, Art. 46

3.1.8 Water Scarcity and Drought Policy (COM/2007/ 0414, Date: 2007 - Amendment: 2012)

Objective: To ensure good quality water in sufficient quantity and to ensure the good status of all water bodies across Europe.

Analysis: The Communication on Water Scarcity and Droughts identifies the importance of climate change mitigation and places it among the priorities for EU regional policies. From an infrastructure perspective, the biggest challenge is the lack of funds to invest in solutions. The Communication further elaborates on the identified knowledge gaps and the importance of high quality knowledge and information for applying efficient pricing policies, making water-saving a priority and improving efficiency, as in other sectors managed by the EU. In its 2012 Amendment, the challenge of climate change was again acknowledged: "Climate change is expected to worsen the impacts of already existing stresses on water as changes in precipitation, combined with rising temperatures, will cause significant changes in the quality and availability of water resources. A combination of adaptation measures must be included in the policy answers to water scarcity and drought."²⁶

Participation: The Communication on Water Scarcity and Droughts promotes best practices to increase the level of public participation in achieving its goals. An example from Zaragoza, Spain²⁷ illustrated that introducing a comprehensive program based on updated water devices, equipment and water-metering couple with raised public awareness resulted in the saving of 1.2 billion litres per year and the lowest consumption of water per inhabitant.

3.2 Extract from EU Guidance on integrating climate change into 2nd and 3rd cycles of the River Basin Management Planning

Which guiding principles are put forward in this Guidance?

The following table gives an overview of the overall guiding principles proposed in the different blocks of this Guidance Document²⁸.

²⁶ Report on the Review of the European Water Scarcity and Droughts Policy, {SWD(2012) 380 final}

²⁷ Water Scarcity and Drought Policy, COM/2007/ 0414, Section 2.5, "Good Practices"

²⁸ COMMON IMPLEMENTATION STRATEGY, FOR THE WATER FRAMEWORK DIRECTIVE (2000/60/EC), Guidance document No. 24, RIVER BASIN MANAGEMENT IN A CHANGING CLIMATE

Issue	Guiding principles
<i>Climate modelling, projections, scenarios, potential impacts and uncertainty</i> (chapter 3)	
Models, projections and scenarios (section 3.1)	<ol style="list-style-type: none"> 1. Climate projections and scenarios should be used for improving river basin management planning. 2. It is crucial to have a clear understanding of the assumptions made and the uncertainties related to these assumptions. 3. The best climate change model or scenario for a certain region or river basin should be decided on a case-by-case basis, because there is no “one-size-fits-all” model or scenario for Europe.
Managing the water environment based on uncertainty of projections and scenarios (section 3.3)	<ol style="list-style-type: none"> 4. Despite uncertainty in models, 'doing nothing' is not an option. For the next river basin management cycle, accept uncertainty where it is rational to do so and take first actions for adaptation to climate change. 5. Take best available scientific information into account. 6. Use a range of climate projections or scenarios in the analyses for river basin management planning in order to accept and work within the context of an uncertain future. 7. Prefer adaptation options which are robust against a range of future changes or postpone commitment to a particular projection of the future by building flexibility into your system.
How to build adaptive capacity for management under climate change? (chapter 4)	
Using ongoing research and adaptation activities to increase knowledge at river basin scale (section 4.2.1)	<ol style="list-style-type: none"> 1. Link river basin management adaptation activities to national and regional climate change adaptation strategies and activities. 2. Check existing relevant science and research information on climate change modelling and impacts in the river basin. 3. Make use of good-practice examples coming, e.g. from existing research and implementation experience regarding adaptation strategies and measures. 4. Look beyond the borders of your river.
Data collection and building of partnerships (section 4.2.2)	<ol style="list-style-type: none"> 5. Evaluate coverage of data (e.g. meteorological, hydrological, water quality, soil moisture data, stake, damage

4.2.2)	cost data, etc).
	6. Use the WFD consultation process (Art. 14) to bring in sector-specific knowledge and data from key stakeholders.
	7. Ensure communication and coordination on climate change adaptation issues between different levels of management within an RBD.
	8. Work in cross-sectoral partnerships and across administrations. Ensure that climate change aspects are discussed between the relevant public administrations, in stakeholder meetings and discuss how relevant water-related sectors can contribute to adaptation.
	9. Make sure to receive information related to the influence of climate change on other sectors which are directly related to water management (e.g. agriculture-water demands, water needs for energy production, etc).
	10. Integrate cross-sectoral delivery of adaptation measures and coordinate activities with land use planning.
Broadening the audience and increasing its capacities - Awareness-raising, education and training (section 4.2.3)	11. Include the issue of climate change impacts in the river basin in your RBD awareness-raising activities as part of the WFD public participation process.
	12. Establish staff training and capacity building programmes on climate change issues, e.g. to introduce staff to climate change modelling, scenarios and projections.
Looking beyond the borders (section 4.2.4)	13. Develop joint or coordinated adaptation strategies in transboundary RBDs.

Water Framework Directive (WFD) and adaptation (chapter 5)

Assessing pressures and impacts on water bodies (section 5.3)	1. Assess, over a range of timescales, direct influences of climate change and indirect influences where pressures are created due to human activities adapting to climate change.
Monitoring and status assessment (section 5.4)	2. Maintain both surface and groundwater surveillance monitoring sites for long time series. Set up an investigative monitoring programme for climate change and for monitoring climate change “hot spots”, and try to combine them as much as possible with the results from the operational monitoring programme.
	3. Include reference sites in long term monitoring

	programmes to understand the extent and causes of natural variability and impact of climate change.
Objective setting (section 5.5)	4. Avoid using climate change as a general justification for relaxing objectives, but follow the steps and conditions set out in the WFD.
Economic analysis of water use (section 5.6)	5. 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.
How to do a climate check of the Programme of Measures? (section 5.7.2)	6. 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. 7. Favour measures that are robust and flexible to the uncertainty and cater for the range of potential variation related to future climate conditions. Design measures on the basis of the pressures assessment carried out previously including climate projections. 8. Choose sustainable adaptation measures, especially those with cross-sectoral benefits, and which have the least environmental impact, including GHG emissions.
What to do if other responses to climate change are impacting on the WFD objective of good status? (section 5.7.3)	9. Avoid measures that are counterproductive for the water environment or which decrease the resilience of water ecosystems. 10. Apply WFD Article 4.7 to adaptation measures that are modifying the physical characteristics of water bodies (e.g. reservoirs, water abstractions, dykes) and deteriorate water status. 11. Take all practicable steps to mitigate adverse effects of counterproductive measures.
Flood risk management and adaptation (chapter 6)	
Overall guiding principle on flood risk management and adaptation (section 6.1)	1. Start adapting flood risk management to potential climate change as soon as possible, when information is robust enough, since full certainty will never be the case. Follow the guiding principles set out for the WFD.
Preliminary flood risk assessment (section 6.2)	2. Understand and anticipate as far as possible climate change impact on flood patterns. 3. Use best available information and data.

	<p>4. Homogenize time series, and remove bias as far as possible.</p> <p>5. Understand and anticipate as far as possible increased exposure, vulnerability and flood risk due to climate change. for establishing areas of potential significant flood risk</p>
Flood Hazard and Risk Maps (section 6.3)	<p>6. When identifying the different flood scenarios, incorporate information on climate change</p> <p>7. Present uncertainties surrounding climate change in maps transparently.</p> <p>8. Use the 6-year review of flood maps to incorporate climate change information</p>
Flood Risk Management Objectives ¡Error! No se encuentra el origen de la referencia. (section 6.4.1)	<p>9. Incorporate climate change in setting flood risk management objectives</p> <p>10. Ensure coordination at catchment level, also respecting the Directive's coordination requirements at RBD/unit of management level</p>
Awareness raising, early warning, preparedness (section 6.4.2)	<p>11. Include climate change scenarios in ongoing initiatives and in planning processes.</p>
Measures ¡Error! No se encuentra el origen de la referencia. (section 6.4.3)	<p>12. Perform a climate check of flood risk measures</p> <p>13. Favour options that are robust to the uncertainty in climate projections</p> <p style="padding-left: 40px;">a. Focus on pollution risk in flood prone zones</p> <p style="padding-left: 40px;">b. Focus on non-structural measures when possible</p> <p style="padding-left: 40px;">c. Focus on "no-regret" and "win-win" measures</p> <p style="padding-left: 40px;">d. Focus on a mix of measures</p> <p>14. Favour prevention through the catchment approach</p> <p>15. Take account of a long term perspective in defining flood risk measures (e.g. with respect to land use, structural measures efficiency, protection of buildings, critical infrastructure, etc).</p> <p style="padding-left: 40px;">e. Include long-term climate change scenarios in land-use planning</p> <p style="padding-left: 40px;">f. Develop robust cost-benefit methods which enable taking into account longer term costs and benefits in</p>

	view of climate change.
	g. Use economic incentives to influence land use [Link insurance]
	16. Assess other climate change adaptation (and even mitigation) measures on their impact on flood risks:
	h. Hydropower and flow regulation
	i. Link with water scarcity
Links to WFD (section 6.4.4)	17. Pay special attention to the requirements of WFD Article 4.7 when developing flood protection measures
	18. Determine on the basis of robust scientific evidence and on a case-by-case basis whether an extreme flood allows for the application of WFD Article 4.6.
	19. Pay special attention to the vulnerability of protected areas in view of changed flood patterns
Drought management and water scarcity and adaptation (chapter 7)	
Overall guiding principle on drought management, water scarcity and adaptation (section 7.2)	1. Use the Water Framework Directive as the basic methodological framework to achieve climate change adaptation in water scarce areas and to reduce the impacts of droughts.
River basin management plans as a tool for addressing water scarcity and droughts (section 7.2)	2. Make full use of the Water Framework Directive environmental objectives, e.g. by the requirement to achieve good groundwater quantitative status to ensure a robust water system, which is more resilient to climate change impacts.
	3. Determine, on the basis of robust scientific evidence and on a case-by-case basis, whether a prolonged drought allows for the application of WFD Article 4.6, and take into account climate change predictions in this case-by-case approach.
	4. Pay special attention to the requirements of WFD Article 4.7 when developing measures to tackle water scarcity under a changing climate and which may cause deterioration of water status.
Monitoring and Detecting Climate Change Effects (section 7.3)	5. Diagnose the causes that led to water scarcity in the past and/or may lead to it in the future.
	6. Monitor water demand closely and forecast it, based

	<p>on improved knowledge about demands and trends.</p> <p>7. Collect as much high quality information as possible to anticipate changes to water supply reliability, which may be imposed by climate change, in order to detect water scarcity early.</p> <p>8. Distinguish climate change signals from natural variability and other human impacts with sufficiently long monitoring time series.</p>
Adaptation measures related to water scarcity & droughts (section 7.4)	<p>9. Take additional efforts to prevent water scarcity and be better prepared to tackle the impacts of droughts.</p> <p>10. Incorporate climate change adaptation in water management by continuing the focus on sustainability (sustainable balance between water availability and demand).</p> <p>11. Follow an integrated approach based on a combination of measures (compared to alternatives based on water supply or economic instruments only).</p> <p>12. Build adaptive capacity through robust water resources systems.</p> <p>13. Involve stakeholders for engagement to realise decisive measures to tackle water scarcity.</p> <p>14. Assess other climate change adaptation and mitigation measures on their impact on water scarcity and drought risks.</p>

4 The Energy Sector and Climate Change

The main impact from the energy sector activities on climate change is the carbon footprint and other types of pollution. Main drivers behind climate change mitigation are to reduce emissions and encourage sustainable use of fossil fuels, while at the same time increasing energy efficiency, the use of renewable energy and biofuels. The Energy sector policy is subdivided into the following areas of focus²⁹:

- **European energy policy**
Energy policy for Europe, Market-based instruments, Energy technologies, Financial instruments
- **Internal energy market**
The market in gas and in electricity, Trans-European energy networks, Infrastructure, Security of supply, Public procurement, Taxation
- **Energy efficiency**
Energy efficiency of products, Buildings and services
- **Renewable energy**
Electricity, Heating and cooling, Biofuels
- **Nuclear energy**
Euratom, Research and technology, Safety, Waste
- **Security of supply, external dimension and enlargement**
Security of supply, External relations, European Energy Charter, Treaty establishing the Energy Community, Enlargement

Energy efficiency and renewable are important for the reduction in emissions of GHG but the energy policy as a whole does not consider the implications of the impacts of climate change on energy production. All current forms of energy production systems have a direct or indirect effect on water and are therefore vulnerable to climate change as water resource priorities and availability will change. Different methods of energy production vary considerably in terms of demand on water resources and impacts on air quality. Diversifying energy production methods can decouple the relationship of increased energy to increased emissions and consumption of water resources. Current EU policy is focused on climate change mitigation i.e. GHG emission reduction, and does not consider this relationship or how adaptation will be needed to ensure energy security for the future.

²⁹ Summaries to EU legislation – Energy http://europa.eu/legislation_summaries/energy/index_en.htm (Jan 2014)

This section will review the extent to which EU energy policies address climate change. Production of energy has a relationship with other EU policy sectors including Water, environment and agriculture. Policies affecting the energy sector that are covered in other areas of this report are listed below.

Field	Policy	Covered in which sector:		
		Agriculture	Water	Environment
Air	Air Quality Directive 2008/50/EC			■
	Sustainable Use of Natural Resources Strategy			■
	Industrial Emissions Directive 2010/75/EU			■
	EU Emissions Trading System Directive 2003/87/EC			■
Water			■	■
Land Use	Water Framework Directive 2000/60/EC		■	■
	Water Scarcity and Drought Policy COM 2007/0414			■
	Sustainable Use of Natural Resources Strategy			

4.1 Energy Sector Policy: Objectives and Analysis

4.1.1 European Energy Policy

4.1.1.1 Energy 2020: A strategy for competitive, sustainable and secure energy (Communication 2010/1346, Date: 2010)

Objective: European energy policy is threefold: combating climate change, limiting the EU's external vulnerability to imported hydrocarbons, and promoting growth and jobs, thereby providing secure and affordable energy to consumers.

Analysis: The primary goals of the strategy are to provide safe, secure and efficient energy with a minimal effect on the environment. Energy accounts for 80% of all greenhouse gas (GHG) emission in the EU³⁰, and hence a key focus of the energy policy is to reduce air pollution. This response is an approach to how energy production affects climate change but does not address how climate change affects energy production.

³⁰ EEA: Energy and non-energy-related greenhouse gas emissions (2007)

Participation: This policy makes no reference to public. The view of the policy with regards to the consumer is that they are the end point beneficiary of the process and at no point gives opportunity to include or integrate public input.

4.1.1.2 Energy Security and Solidarity Action Plan (Communication 2008/0781, Date: 2008)

Objective: Security and solidarity are essential factors contributing to an efficient energy policy. The European Union intends to change its energy policy by putting the accent on these two values. The aim is to reduce energy consumption by almost 15 % and energy imports by 26 % by 2020. In this perspective, the proposed plan, organised around five main points, should contribute to achieving these aims.

Analysis: The Plan sets out five main points –

- First is to address **infrastructure needs and the diversification of energy supplies**. This aim focuses on mitigation methods to reduce emissions produced by energy production by 20% by 2020. The policy does not consider what impact climate change could have on this target or the methods and does not consider any kind of climate change adaptation.
- Second is **external energy relations**: the document identifies that the interdependence between States is tending to increase but does not review this in the context of climate change.
- Third, **oil and gas stocks and crisis response mechanisms**: the Commission proposes to revise European legislation concerning emergency strategic oil stocks³¹, as well as the directive on the security of supply of natural gas³². The EU plans to be more transparent about the quantities of emergency oil stocks but does not consider the impact of climate change in its decision making.
- Fourth, **energy efficiency**: the European Union undertakes to achieve a 20 % improvement in energy efficiency by 2020 as part of the ‘20-20-20 objectives’³³. Again this section of the policy does not consider climate change further than promoting mitigation through aiming for lower emissions targets.
- Fifth, to **make the best use of the European Union’s indigenous energy resources**: the EU produces 46% of its total energy consumption. 9% of the energy

³¹ [Directive 2006/67/EC](#) imposing an obligation on Member States to maintain minimum stocks of crude oil and/or petroleum products

³² [Directive 2004/67/EC](#) concerning measures to safeguard security of natural gas supply

³³ European leaders committed themselves to reduce primary energy consumption by 20% compared to projections for 2020. Energy efficiency is the most cost-effective way of reducing energy consumption while maintaining an equivalent level of economic activity

consumed within the EU comes from renewable sources. The EU intends to increase the share of these energy sources to 20% by 2020. The policy sets out ambitious targets, such as decarbonising the EU electricity supply by 2050. The policy does not consider the potential obstacles from adverse impacts from climate change and does not give enough detailed instruction as to how member states can achieve these goals.

Participation: There is no consideration for public awareness or participation in this Action Plan policy.

4.1.1.3 Strategy for Sustainable Development (Communication 2001/264, Date: 2001)

Objective: To formulated a long-term strategy in order for sustainable development to be achieved in the energy sector in accordance with other sector policy development.

Analysis: This strategy, which complements the Lisbon Strategy³⁴, provides an EU-wide policy framework to deliver sustainable development. The sections regarding climate change are focused on mitigation of emissions and biodiversity loss. The strategy misses the opportunity to incorporate adaptation to climate change to achieve more secure and more sustainable development.

Participation: The strategy does not include public awareness or participation in its process. Inclusion of the public changes habits in different ways to top down policy enforcement: a more positive response from the public's habits allows for greater sustainability targets to be achieved.

4.1.2 Internal Energy Market

4.1.2.1 Priority Interconnection Plan (Communication 2006/846, Date: 2006)

Objective: An efficient energy infrastructure is essential for the internal energy market to work properly and to achieve the European Union's targets for sustainable development, competitiveness and secure energy supplies. This requires considerable investment in the existing gas and electricity networks along with efficient development of their interconnections.

³⁴ The Lisbon Strategy for growth and jobs, launched in 2000 by the European Council, was the EU's joint response to facing the challenges of globalisation, demographic change and the knowledge society. It aimed at making Europe more dynamic and competitive to secure a prosperous, fair and environmentally sustainable future for all citizens.

Analysis: Interconnection of networks allows the transmission of electricity and gas between markets organised on a national basis, and is key to setting up trans-European gas and electricity networks. Interconnected networks are vital to the development of healthy competition and constitute a prerequisite to successfully creating an internal energy market. This policy does not consider the impacts of climate change but improved energy networks do limit the risk of supply shortage by promoting diversification of energy sources, and facilitating introduction of a "green network" based on renewable energies. These benefits will in turn help member states become more resilient to the adverse effects of climate change in the future.

Participation: There is no consideration for public awareness or participation in this policy.

4.1.2.2 Trans-European Energy Networks (Decision 2003/1229/EC, Date: 2003)

Objective: This Decision defines the nature and scope of Community action to establish guidelines for trans-European energy networks (TEN-E). It covers the objectives, priorities and broad lines of action by the EU in respect of trans-European energy networks. These guidelines identify projects of common interest, including those which have priority, among trans-European electricity and natural gas networks.

Analysis: Although the decision does not mention climate change, the policy does aim to improve the resilience and potential for adaptation to the adverse effects of climate change, especially for security and sustainability of supply. In this policy, Member States are expected to promote the interconnection, interoperability and development of trans-European energy networks and access to such networks in accordance with EU law in force. The principles of the TEN-E are to improve:

- The effective operation and development of the internal energy market
- energy cohesion with isolated regions of the community
- security of energy supplies
- sustainable development and protection of the environment

Participation: Due to the nature of this decision it is not surprising there is no public participation: the coordination of transnational energy networks operates at such a broad scope that public inclusion is arguably counterproductive. However, secure energy supply is a very important subject for the public and inclusion of public awareness would be likely to increase public confidence in the system and the policy.

4.1.3 Energy efficiency

4.1.3.1 Energy Efficiency for the 2020 Goal (Communication 2008/772, Date 2008)

Objective: To improve energy efficiency as part of European efforts to address the key energy challenges of climate change, energy security and competitiveness.

Analysis: The European Environment Agency (EEA) concluded in a study on Energy Efficiency and Energy Consumption in the transport sector (2012) that energy efficiency is probably the most cost-effective way of reducing energy consumption, while maintaining an equivalent level of economic activity. Energy efficiency and energy consumption are intrinsically linked: improved energy efficiency reduces waste and resources required to produce energy requirements, thereby reducing emissions and improving energy security.

Participation: The Communication comments that most Member States have introduced a variety of information measures. These range from measures aimed at altering general public behaviour, such as public awareness raising campaigns, public training and education, advice on energy use and general information sources like web tools and publications, to measures that target business entities and the private sector. The latter consist of sector-focussed information campaigns, trainings for professionals, energy audits and energy efficiency publications for professional stakeholders. However, not all Member States are engaged in these activities.

4.1.3.2 Action Plan for the Energy Efficiency (Communication 2006/545, Date: 2006)

Objective: The Commission has adopted an Action Plan aimed at achieving a 20 % reduction in energy consumption by 2020. The Action Plan includes measures to improve the energy performance of products, buildings and services, to improve the yield of energy production and distribution, to reduce the impact of transport on energy consumption, to facilitate financing and investments in the sector, to encourage and consolidate rational energy consumption behaviour and to step up international action on energy efficiency

Analysis: The Action Plan is intended to improve energy-efficient infrastructure, products and systems in the internal energy market. The aim, with regard to climate change, is to improve energy efficiency, which affects consumption and mitigates demand on resources. The plan does not consider the impact of climate change on infrastructure or on the energy

consumption targets and therefore does not address elements of changing consumption patterns or adaptation.

Participation: The plan does not address public awareness or participation.

4.1.4 Renewable energy

4.1.4.1 Renewable Energy Directive (Directive 2009/28/EC, Date: 2009)

Objective: This Directive establishes a common framework for the promotion of energy from renewable sources. It sets mandatory national targets to Member States for the overall share of energy from renewable sources in gross final consumption of energy and for the share of energy from renewable sources in transport. It lays down rules relating to energy transfers between Member States, joint projects between Member States and third countries, guarantees of origin, administrative procedures, information and training, and access to the electricity grid for energy from renewable sources. It establishes sustainability criteria for biofuels and bioliquids.

Analysis: The directive aims to increase the use of energy from renewable sources, together with energy savings and increased energy efficiency, in order to reduce greenhouse gas emissions and comply with the Kyoto Protocol. This approach is focused on mitigation and does not consider the implications of climate change impacts on the energy sector. It does, however, initiate coherence between the objectives of this Directive and the EU's environmental legislation guidelines which should be integrated during assessments, planning or licensing procedures for renewable energy installations. This forward thinking contributes to greater policy coherence with sectors.

Participation: The directive does address public participation with particular reference to Directive 2003/4/EC on public access to environmental information. This allows the public to have access to information and be involved in the decision making process. However the directive fails to give clear guidelines with common direction as to how the public should be included and what would be gained from their involvement. This allows member states to avoid the public processes.

4.1.4.2 Biomass Action Plan (Communication 2005/628, Date: 2005)

Objective: Essential elements of this policy are, within the context of stronger economic growth, the need to reduce non-renewable energy demand; increase the uptake of renewable energy sources, given the potential to produce them domestically; to diversify energy sources; and enhance international cooperation.

Analysis: The Plan aims to achieve better competitiveness, sustainability, and security of supply of energy yet fails to address climate change in its scope of context. The approach of the plan is to mitigate climate change by introducing more sustainable approaches to replace those with greater GHG emissions, although it does not state this directly. Further work must be done to incorporate the impacts of biomass energy on climate change (and other sectors such as water), and vice versa, into energy policy in order for informed and coherent decisions to be made to mitigate and adapt to climate change across the energy sector.

Participation: There is no mention of public participation or awareness included in this document.

4.1.4.3 EU Strategy for Biofuels (Communication 2006/34, Date: 2006)

Objective: To further promote biofuels in the EU and developing countries, ensure that their production and use is globally positive for the environment and that they contribute to the objectives of the Lisbon Strategy, taking into account competitiveness considerations.

Analysis: In the EU, transport is responsible for an estimated 21% of all greenhouse gas emissions that are contributing to global warming, and the percentage is rising³⁵. Processed from biomass, a renewable resource, biofuels are seen as a direct substitute for fossil fuels in transport and can readily be integrated into fuel supply systems. The communication focuses on mitigation response to climate change; in particular to the reduction of greenhouse gas emissions.

Participation: Biofuels present an opportunity to dramatically reduce emissions in transport, a significant contributor to climate change, with very little change in infrastructure, technology, or consumption in society. The application of this technology and related policies directly affect many public activities, therefore greater awareness and participation from the initial stages would increase acceptance of the use of biofuels in day to day life.

4.1.5 Nuclear energy

Application of Article 35 of the Euratom Treaty Verification of the operation and efficiency of facilities for continuous monitoring of the level of radioactivity in the air, water and soil - Report, 1990-2007 (Communication 2007/847, Date: 2007)

Objective: This report refers to activities that took place between 1990 and 2007 to verify the operation and efficiency of national installations for monitoring levels of radioactivity in the air, water and soil.

³⁵ EU Strategy for Biofuels – Communication from the Commission (2006)

Analysis: Nuclear Energy production is vulnerable to the effects of climate change, being dependent on water, which is directly impacted by climate change. This relationship however is not considered in the text of the Article. As a whole the legislation regarding nuclear energy makes no reference to climate change or the possible impacts from climate change in the future.

Participation: This report makes no reference to public awareness or participation.

4.1.6 Security of supply, external dimension and enlargement

4.1.6.1 Sustainable power generation from fossil fuels (Communication 2006/843, Date: 2006)

Objective: This Communication is presented in the follow-up to the Commission Green Paper on “A European Strategy for Secure, Competitive and Sustainable Energy³⁶” adopted in March 2006. Its aim is to present a global view of the actions needed for the continued contribution of fossil fuels, particularly coal, to the security and diversification of energy supply for Europe and the world in a way that is compatible with sustainable development and climate change policy objectives

Analysis: The focus of the Paper is to reduce the impact of climate change by reducing emissions from fossil fuel power production. This is of particular importance for coal, which is traditionally the key fossil fuel in power production (used to generate some 30% of EU electricity in 2005) and also by far the most carbon-intensive³⁷. This Communication, and the Green paper preceding it, limits its focus to mitigating factors for climate change i.e. GHG emission reduction, and acts only as a contributing step to the larger picture of climate and energy. It looks at the consumption of fossil fuels but misses the opportunity to address the impacts of fossil fuels on climate change.

Participation: The original Green paper does not mention public participation, and this follow up policy gives only a minimal reference to public awareness; stating only that it would design an affordable public awareness strategy. This appears to be more of an afterthought with no clear guidelines.

4.1.6.2 Strategic Oil Stocks Directive (Directive 2006/67/EC, Date 2006)

³⁶ Available here: http://europa.eu/documents/comm/green_papers/pdf/com2006_105_en.pdf

³⁷ Sustainable power generation from fossil fuels: aiming for near-zero emissions from coal after 2020. COM(2006) 843

Objective: In order to ensure the security of its oil supply, the EU obliges Member States to guarantee minimum stocks of petroleum resources that can be used in the event of a supply crisis to replace a shortfall.

Analysis: The obligation of the Member States to build up and maintain a minimum petroleum reserve gives security of supply of petroleum resources to the EU. Due to the importance of oil in the EU's energy mix, the EU's strong external dependence for supply of petroleum products and the geopolitical uncertainty in many producer regions, it is vital to guarantee consumers' continuous access to petroleum products. The directive itself does not consider the effect of climate change on the effectiveness of existing stockpiles of oil and how climate change impacts may affect demand and/or resources of oil in the EU.

Participation: No public awareness or participation is mentioned in the directive. This is a missed opportunity to develop strategies and better equipped responses to supply crisis scenarios.

4.1.6.3 Security of Supply of Natural Gas (Regulation 2010/994, Date: 2010)

Objective: The regulation aims to safeguard the security of gas supply by ensuring both prevention of shortfall and a coordinated response in the event of a supply disruption and by securing the proper and continuous functioning of the internal gas market.

Analysis: This Regulation establishes provisions aimed at safeguarding the security of gas supply by ensuring the proper and continuous functioning of the internal market in natural gas, allowing for exceptional measures to be implemented when the market can no longer deliver the required gas supplies. By providing for a clear definition and attribution of responsibilities among natural gas undertakings, the Member States and the EU are able to implement both preventive action and the response reaction to disruptions of supply. This Regulation also provides transparent mechanisms, in a spirit of solidarity, for the coordination of planning for, and response to, an emergency at Member State, regional and EU levels. Climate change is not discussed in this regulation or in the original Directive (2004/67/EC).

Participation: No public awareness or participation is mentioned in this regulation or in the original Directive (2004/67/EC).

4.1.6.4 European Energy Charter Treaty (Decision 1998/181/EC, Date: 1998)

Objective: The aim of the Treaty is to establish a legal framework to promote long-term cooperation in the energy sector based on the principles enshrined in the European Energy Charter.

Analysis: The Energy Charter Treaty establishes a framework for international cooperation between European countries and other industrialised countries with the aim of security of energy supply for the EU. The Treaty sets out the following provisions on competition, transparency, sovereignty, taxation and the environment. In particular to the environment principles the treaty dictates the "polluter pays" policy. This favours market-led pricing which reflects environmental costs and benefits. This is an effective and simplistic way to target negative point source outputs on the environment and ultimately climate change, but the treaty does not clearly identify these effects in the context of climate change and therefore only achieves mitigation methods without a wider view to the consequences of adverse climate change affects and the possible benefits of climate change adaptation.

Participation: Public awareness or participation is not included in this treaty.

5 Climate change and the Environment Sector

The EU Environment sector policy overlays a number of other sectors- including water, agriculture and energy sectors. In order to achieve a cohesive, inclusive and consistent strategy to combat the adverse effects of climate change, the EU's environmental policy must be taken into account.

The scope and content of the EU's Environmental policy is presented in three main sources which all have a slightly different content. The first is the Sixth Environment Action Programme (EAP) of the European Community (2002-2012) which sets out seven thematic strategies for the operation of the 6th EAP³⁸. Second are fifteen thematic strategies released in a document, *The European environment - State and outlook (2010)* by the European Environmental Agency (EEA). Thirdly is the current environmental policy website of the European Commission³⁹, which is categorised into eight separate fields. All three are presented in the table below. The varying boundaries and terminology of strategies is counterproductive for coherence: comparing sector policy is made difficult as the sectors themselves are difficult to quantify or define and therefore makes an appraisal of climate change adaptation within the environmental sector more complex.

Table: Sources of Environmental Sector Policy Structure

EAP Thematic Strategies (2005)	EEA Thematic Strategies (2010)	EC policy website (2013)
<ul style="list-style-type: none"> • Air • Waste prevention and recycling • Soil • Marine Environment • Pesticides • Natural resources • Urban Environment 	<ul style="list-style-type: none"> • Air pollution • Material resources and waste • Soil • Marine and coastal environment • Water resources: quantity and flows • Biodiversity • Understanding climate change • Mitigating climate change • Adapting to climate change • Land use • Consumption and the environment • Freshwater quality 	<ul style="list-style-type: none"> • Air • Waste • Soil • Water • Chemicals • Nature and Biodiversity • Civil protection • Noise

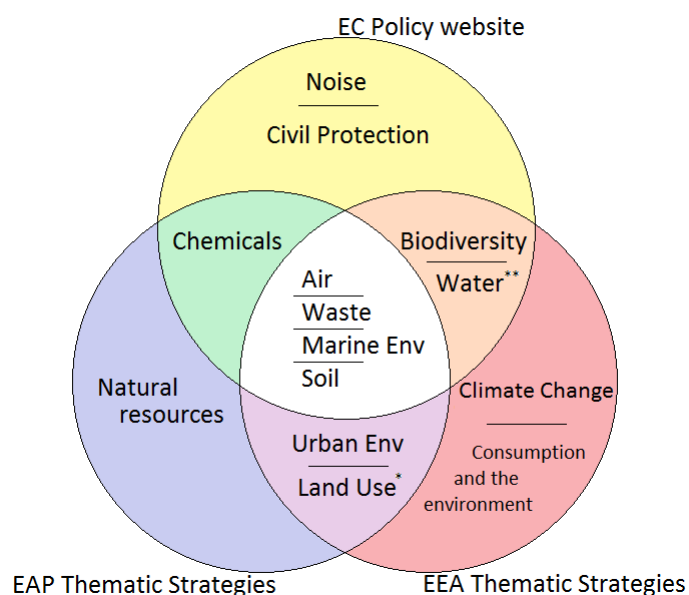
³⁸ http://ec.europa.eu/environment/newprg/archives/strategies_en.htm

³⁹ http://ec.europa.eu/policies/environment_consumers_health_en.htm

- | | | |
|--|---|--|
| | <ul style="list-style-type: none"> Urban environment | |
|--|---|--|

Separately the three sources do not sufficiently address the adequate areas of the environment sector. The evolution of what areas are included is also inconsistent, for example, the Pesticides field, included in the 2005 EAP thematic strategies is excluded from the 2010 EEA thematic strategies but is then incorporated in the 2013 EC website fields. The European Commission needs to be clearer as to which fields formulate the environmental sector policy to simplify actions required to integrate with potential future sector policy such as climate change. The Venn diagram below shows the degree of integration between the three sources:

Diagram: Environmental Policy Integration



*The EC website includes Land Use as part of the Natural Resources field and is therefore covered by both sources.

**The Water field specifically refers to; 'Water resources: quantity and flows' and 'Freshwater quality', which are mutually covered by both sources.

Air, Waste, Marine Environment and Soil fields remain a constant in all three sources. These combined with the five fields (Urban Environment, Land Use, Biodiversity, Water and Chemicals) that are observed in more than one of the three sources constitute elements of environmental policy that are relevant to climate change (see table below). These policies are selected for review to ascertain the extent, if at all, they address climate change.

[Escribir texto]

Table: Selected Relevant Environment Policy

Field	Relevant Policy
I. Air	<ul style="list-style-type: none"> • Ambient Air Quality Directive 2008/50/EC • Revision of EU Emissions Trading System (EU ETS) • Industrial Emissions Directive (IED) 2010/75/EU
II. Waste prevention and recycling	<ul style="list-style-type: none"> • Waste Framework Directive 2008/98/EC • Marine Strategy Framework Directive 2008/56/EC
III. Marine Environment	<ul style="list-style-type: none"> • Soil Thematic Strategy
IV. Soil	<ul style="list-style-type: none"> • Thematic Strategy on the Urban Environment
V. Urban Environment	<ul style="list-style-type: none"> • Thematic Strategy on the Sustainable Use of Natural Resources
VI. Land Use	<ul style="list-style-type: none"> • Geological Storage of Carbon Dioxide Directive 2009/31/EC
VII. Biodiversity	<ul style="list-style-type: none"> • Birds Directive 2009/147/EC • Habitats Directive 92/43/EEC
VIII. Water resources*	<ul style="list-style-type: none"> • Bathing Water Directive 2006/7/EC • Drinking Water Directive 98/83/EC • Floods Directive 2007/60/EC • Ground Water Directive 2006/118/EC • Urban Waste Water Directive 91/271/EEC • Water Framework Directive 2000/60/EC • Water Scarcity and Drought Policy COM/2007/ 0414
IX. Chemicals	<ul style="list-style-type: none"> • Sustainable Use of Pesticides Directive 2009/128/EC • EU Nitrates Directive 91/676/EEC • Persistent Organic Pollutants POPs (Regulation No 850/2004, Date: 2004)

*(Water Resources Policies are evaluated in section 3 of this report)

5.1 Environmental Policy: Objectives and Analysis

5.1.1 Air

5.1.1.1 Ambient Air Quality Directive (Directive 2008/50/EC, Date: 2008)

"Ambient air" refers to outdoor air in the troposphere, excluding workplaces, as defined by Directive 89/654/EEC where provisions concerning health and safety at work apply and to which members of the public do not have regular access⁴⁰.

⁴⁰ Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC

Objective: To define and establish objectives for ambient air quality designed to avoid, prevent or reduce harmful effects on human health and the environment as a whole.

Analysis: The Air Quality Directive sets out to reduce air pollutants at source and to identify and implement the most effective emission reduction measures at local, national and community level. The margins of tolerance are in reference to relevant World Health Organisation standards, guidelines and programmes. Emissions of many air pollutants have decreased substantially over the past decades, resulting in improved air quality across Europe. However, air pollutant concentrations are still too high, and air quality problems persist⁴¹, as a result respiratory, carcinogenic and cardiovascular problems in the exposed human population are more frequent⁴². Air pollution also affects ecosystems, in particular, harming sensitive vegetation during the growing season⁴³.

The Directive does not mention climate change in its text and in a separate report by the European Environmental Agency it was concluded that although future projected climate change is expected to increase ozone concentrations, this would likely be outweighed by reduction in ozone levels as a result of expected future emission reductions⁴⁴. However, a European survey shows that Europe is not well prepared to cope with “unexpected” extreme thermal stress events. There is an estimated 1-10% increase of mortality for every 1 degree increase in temperature⁴⁵. Therefore, while some reports suggest that coordinated reduction of air pollution is a sufficient effort to combat impacts of climate change, more research and discussions must be carried out to integrate the conclusion of the EEA into the Air Quality Directive. Verifying the emission reduction requirement in order to combat anticipated effects on air quality due to rising temperatures would give a clearer by the Directive future strategies and policies linked to climate change.

Participation: Inclusion of public awareness and dissemination of information is one of the aims of the Directive. Article 26 urges Member States to ensure that the public are informed, adequately and in good time, of air quality measures, as well as any relevant exemption or postponement decisions made. “Member States shall make available to the public annual reports for all pollutants covered by this Directive”⁴⁶. Finally, Member States shall inform the public of the competent authority charged with the responsibility to manage the Directive on

⁴¹ <http://www.eea.europa.eu/themes/air/intro> European Environmental Agency (2013)

⁴² http://ec.europa.eu/research/environment/themes/projects_en.htm#1 EC Research & Innovation (2008)

⁴³ <http://www.epa.gov/glo/basic.html> EPA Ground level ozone basic information (2012)

⁴⁴ EEA Report CC, impacts and vulnerability in Europe (2012)

⁴⁵ cCASHh Project CC and adaptation strategies for human health in Europe (2004)

⁴⁶ Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC

their behalf. While this ensures the public are aware of the targets and limitations set by the Directive, it does not give an opportunity for the public to contribute information or concerns, nor does it promote education of the public to regulate their life style decisions (e.g. types of personal transport) that would contribute to air quality.

5.1.1.2 Revision of EU Emissions Trading System Directive Commission staff working document (2008) (Directive 2003/87/EC, Date: 2008)

Objective: The objective of the directive is to reduce GHG emissions from EU countries and 3 EEA -EFTA states (Iceland, Liechtenstein and Norway). The Revision addresses four main topics of emissions trading, namely: (1) scope, (2) robust compliance and enforcement, (3) further harmonisation and increased predictability and (4) linking with emissions trading systems in third countries and appropriate means to involve developing countries and countries in economic transition.

Analysis: The EU Emissions Trading System Directive (EU ETS) works on the 'cap and trade' principle. A 'cap', or limit, is set on the total amount of certain greenhouse gases that can be emitted by the factories, power plants and other installations in the system. The cap is reduced over time so that total emissions fall. In 2020, emissions from sectors covered by the EU ETS are expected to be 21% lower than in 2005. The emissions capped are from more than 11,000 heavy energy-using installations in power generation and manufacturing industry, as well as all flights to and from the EU and the three EEA-EFTA states. These sectors account for around 45% of the EU's greenhouse gas emissions⁴⁷. The Directive focuses on mitigation methods with no account for adaptation; however this simple approach does allow the strategy to be applied, with very quantifiable elements, and has the potential to cost-effectively reduce emissions.

Participation: Public participation is not considered in the original document and the revision also overlooks this as a concern, which reflects the Revision's perspective on adaptation.

⁴⁷ European Commission: The EU Trading Systems Factsheet (2013)

5.1.1.3 Industrial Emissions Directive (Directive 2010/75/EU, Date: 2010)

Objective: The Industrial Emissions Directive (IED) is the successor of the IPPC Directive 2008/1/EC⁴⁸ and in essence is about minimising pollution from various industrial sources throughout the European Union.

Analysis: Industrial production processes account for a considerable share of the overall pollution in Europe (emissions of greenhouse gases and acidifying substances, wastewater emissions and solid waste), suggesting its importance for consideration in a climate change adaptation policy. The IED is based on several principles, namely: an integrated approach, best available techniques, flexibility, inspections and public participation. The text includes terms for industry to take 'all the measures necessary to achieve a high level of protection of the environment as a whole' but does not refer to climate change directly. There is clearly scope in the IED for guidelines for industrial stakeholders' adaptive measures which could easily address climatic impacts and contribute to a broader EU climate change strategy.

Participation: In article 24, Member States are required to ensure that the public concerned are given early and effective opportunities to participate. However there is no clear role or strategy on how to address the public and incorporate their input into policy, which leaves open the degree of actual participation that is required.

5.1.2 Waste Prevention and Recycling

5.1.2.1 Waste Framework Directive (Directive 2008/98/EC, Date 2008)

Objective: To protect the environment and human health by preventing or reducing the adverse impacts of the generation and management of waste and by reducing overall impacts of resource use and improving the efficiency of such use.

Analysis: The following shall be excluded from the scope of this Directive due to the fact that they are covered by other Community legislation:

⁴⁸ Directive 2008/1/EC of the European Parliament and of the Council concerning integrated pollution prevention and control

Waste waters covered by Urban Waste Water Directive 91/271/EEC
Animal by-products including processed products covered by Regulation (EC) No 1774/2002, except those which are destined for incineration, landfilling or use in a biogas or composting plant
Carcasses of animals that have died other than by being slaughtered, including animals killed to eradicate epizootic diseases, and that are disposed of in accordance with Regulation (EC) No 1774/2002
Waste resulting from prospecting, extraction, treatment and storage of mineral resources and the working of quarries covered by Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries

The Waste Framework Directive aims to address the relationship between economic growth and waste production. The priorities of the approach are applied in a hierarchical order in waste prevention and management legislation and policy: prevention; preparing for re-use; recycling; other recovery (e.g. energy recovery; and disposal). The Directive does not directly address climate change; however it does acknowledge, as is reflected in a report by the EEA, the production of greenhouse gas emissions from solid waste. The report finds that better management of municipal solid waste – i.e. meeting the Landfill Directive's waste diversion targets - can reduce greenhouse gas emissions significantly⁴⁹ and concludes that effective waste management reduces GHGs which contribute to climate change, and can help Member States reach emission reduction targets⁵⁰. The Directive also suggests considering the use of bio-waste as a potential source of energy.

Some climate change impacts linked to waste include greater flood risk and increased precipitation in some areas. These risks enhance the distribution of toxic agents through the water table and could potentially undermine current standards of waste disposal. Therefore it is recommended that the Waste Framework Directive should be reviewed with the goal of enhancing integration with climate change adaptation strategies to minimize these impacts to the environment.

Participation: In article 8 - Extended producer responsibility – the Directive requires publicly available information on the extent to which a product is re-usable and/or recyclable. While this is an important step for individuals to make an informed decision, it requires that

⁴⁹ Waste opportunities: Past and future climate benefits from better municipal waste management in Europe. EEA 2011.

⁵⁰ Kyoto Protocol (1997) Protocol to the United Nations Framework Convention on CC - Objective: To protect human health and the environment against adverse effects resulting or likely to result from human activities which modify or are likely to modify the ozone layer.

infrastructure is in place to give the public options to re-use or recycle products – which is not yet the current reality. The directive does however instruct Member States to provide opportunity for the public to participate in the elaboration of the waste management plans and waste prevention programmes, and have access to these plans once elaborated. It does not, however, promote adaptive practices for the public, which can help reduce the amount of domestic and other consumer waste produced.

5.1.3 Marine Environment

5.1.3.1 Marine Strategy Framework Directive (Directive 2008/56/EC, Date: 2008)

Objective: To achieve or maintain good environmental status in the marine environment by 2020; to protect, preserve and restore marine environment and to maintain biodiversity.

Analysis: This Directive was adopted in July 2008 with the aim of reversing pollution, climate change⁵¹ and other negative impacts on Europe's marine environment. The MSF directive discusses the effects of climate change and the need to adapt the status of marine environment and waters over time due to its impact. Climate change is already affecting the marine environment and will continue to trigger changes in biological, chemical and physical processes. As a result, each Member State - cooperating with other Member States and non-EU countries within a marine region - are required to develop strategies for their marine waters. The strategy must consist of a detailed assessment of the state of the environment, a definition of "good environmental status" (GES) at regional level and the establishment of clear environmental targets and monitoring programmes. In addition, each Member State must draw up a programme of cost-effective measures, based on a cost-benefit analysis of the proposed measures. A setback in the process of mitigating the climate change effects on the marine environment is the lack of a specific programme of measures given to the Member States, in order to achieve GES. However, the MSFD does outline 11 major GES descriptors, which alleviates the process. The Directive also recognizes the fact that

⁵¹ European Commission. (2011). Commission Staff Working Paper {SEC (2011) 1255 final}. *Relationship between the initial assessment of marine waters and the criteria for good environmental status*. - "Climate change influences different components of ecosystems, notably species distribution and composition/abundance in a community. Climate-related pressures, such as atmospheric air/water gaseous exchange rates, and also pH, temperature, salinity, water flow (tidal and ocean currents), sea level and wave exposure, may change in space and time. The gradual change in pH driven by the storage of carbon dioxide in the sea from anthropogenic activities, known as ocean acidification, is expected to have significant adverse effects on a range of marine ecosystems, habitats and species. The determination of GES may therefore need to be adapted over time to take account of ongoing changes caused by climatic variations. In developing their respective marine strategies, Member States need to specify, where appropriate, any evidence of climate change impacts, and incorporate such changes into the way they determine the characteristics of GES and set their environmental (state) targets. It is also important to state the assumptions upon which targets for specific components are based, i.e. in relation to other parts of the ecosystem which may change in the future due to natural variation and climatic processes or due to changes in pressures upon them."

pollution, climate change effects and the marine environment are trans-boundary concepts, and calls for cooperation among the Member States.

Participation: The MSFD has a strong public participation aspect. It urges Member States to provide all relevant information to the public, especially the environmental targets, monitoring programmes and measures included in the marine strategy. The general public is encouraged to be part of the establishment, implementation, and updating of the marine strategies. Also, “all interested parties are given early and effective opportunities to participate in the implementation of this Directive⁵².”

5.1.4 Soil

5.1.4.1 Soil Thematic Strategy (Communication 2006/231, Date: 2006)

The Soil Directive 2004/35/EC has been halted since 2006 by a blocking minority (UK, France, Germany, The Netherlands, Austria and Malta). The view of the opposition is that different EU policies (for example on water, waste, chemicals, industrial pollution prevention, nature protection, pesticides, agriculture) are sufficiently contributory to soil protection and are opposed to additional legislation in this area. In the interim, the Soil Thematic Strategy is the foremost EU policy in terms of collaborative legislation by member states to combat soil degradation.

Objective: The current proposal aims at addressing the issue of the lack of specific Community legislation on soil protection by establishing a common strategy for the protection and sustainable use of soil based on the principles of integration of soil concerns into other policies, preservation of soil functions within the context of sustainable use, prevention of threats to soil and mitigation of their effects, as well as restoration of degraded soils to a level of functionality consistent at least with current and approved future use.

Analysis: The Soil Thematic Strategy has four key pillars: awareness raising, research, integration and legislation. The document calls for the Commission to provide an opportunity for better integration of soil concerns at an early stage of project planning in a review of the Environmental Impact Assessment Directive 85/337/EEC. This action successfully allocates responsibility of the specific regional soil requirements to developers, but is limited only to new developments requiring the EIA process and therefore does not cover ongoing industrial or agricultural activity.

⁵² Marine Strategy Framework Directive, 2008/56/EC, Art. 19.1

The four key pillars of the Soil Thematic Strategy are important for the understanding and anticipation of the adverse effects of climate change such as erosion or degradation of quality due to increased concentrations of contaminants. However this Strategy alone is not enough for direction required at an EU level to reverse the existing trends of soil degradation or to adapt to predicted climate change threats.

Participation: The Commission has organised several public events dedicated to soil issues but the absence of clear participation guidelines allows for Member States to avoid interaction practices that include the public, and to limit activities to awareness-raising.

5.1.5 Urban Environment

5.1.5.1 Thematic Strategy on the Urban Environment (Communication 2005/0718, Date: 2005)

Objective: The measures offered under this Strategy aim to contribute to a better implementation of existing EU environment policies and legislation at the local level by supporting and encouraging local authorities to adopt a more integrated approach to urban management and by inviting Member States to support this process and exploit the opportunities offered at EU level. If implemented at all levels, the Strategy will ultimately contribute to improve the quality of the urban environment, making cities more attractive and healthier places to live, work and invest in, and reduce the adverse environmental impact of cities on the wider environment, for instance as regards climate change⁵³.

Analysis: The report clearly identifies the vulnerability of urban areas to climate change (such as flooding, heat waves, more frequent and severe water shortages) while at the same time noting the strategic potential urban areas must assist in both adapting to climate change and mitigating greenhouse gas emissions. The Strategy gives clear instruction that integrated urban management plans should incorporate measures to limit environmental risk to enable urban areas to better deal with climate change. This includes solutions such as incorporating risk prevention, anticipating the impacts of climate change (e.g. increased flooding) or progressively reducing dependency on fossil fuels⁵⁴.

Participation: The Strategy states that "Solutions need to be tailor-made, based on wide consultation of the public and other stakeholders, and targets must reflect the local

⁵³ Thematic Strategy on the Urban Environment: The Objectives of the Strategy (2006)

⁵⁴ Thematic Strategy on the Urban Environment: Environmental Challenges Facing Urban Areas (2006)

situation⁵⁵." This Directive promotes a strong public participation in order to adopt input to better implement policy and to adapt to climate change.

5.1.6 Land Use

5.1.6.1 Thematic Strategy on the Sustainable Use of Natural Resources (Communication 2005/670, Date: 2005)

Objective: To achieve more sustainable use of natural resources, thereby improving resource efficiency, and mitigating the negative environmental impacts of resource use.

Analysis: The strategy aims at reducing the negative environmental impacts of resource use by decoupling economic growth and environment impacts. The policy does not reference adaptation to climate change although other policy sectors acknowledge the climate-sensitive nature of natural resource sectors such as agriculture, hydropower and forestry. The text does recognise a need to improve the understanding and knowledge of Europe's resource consumption, its negative environmental impact and significance within the EU and globally but is far from recognizing impacts of climate change on natural resource use.

Participation: The Strategy draws attention to the importance of raising awareness among stakeholders and citizens of the significant negative environmental impact of resource use, which can ultimately be extended to include environmental impacts of climate change. However it does not provide Member States with guidelines on achieving or integrating public input.

5.1.6.2 Geological Storage of Carbon Dioxide Directive (Directive 2009/31/EC, Date: 2009)

Objective: This Directive establishes a legal framework for the environmentally safe geological storage of carbon dioxide (CO₂) to contribute to the fight against climate change.

Analysis: Carbon dioxide capture and geological storage is a bridging technology that will contribute to mitigating climate change. It consists of the capture of carbon dioxide (CO₂) from industrial installations, its transport to a storage site and its injection into a suitable underground geological formation for the purposes of permanent storage⁵⁶. The purpose of environmentally safe geological storage of CO₂ is permanent containment of CO₂ in such a

⁵⁵ Communication from the Commission to the Council and the European Parliament on Thematic Strategy on the Urban Environment {SEC(2006) 16 }

⁵⁶ Geological Storage of Carbon Dioxide Directive 2009/31/EC

way as to prevent and, where this is not possible, eliminate as far as possible negative effects and risks to the environment and human health. The contribution to climate change adaptation is purely a mitigation strategy to contain or remove CO₂ from the atmosphere. The Directive does not attempt to identify possible risks or make note the potential effects of climate change on geological environments used for storage of CO₂.

Participation: Member States are instructed to make environmental information relating to geological storage of CO₂ available to the public in accordance with applicable EU legislation. The Directive does not outline how public could be involved or how public input may be taken up.

5.1.7 Biodiversity

5.1.7.1 Birds Directive (Directive 2009/147/EC, Date: 2009)

Objective: This Directive relates to the conservation of all species of naturally occurring birds in their wild state in the European territory of the Member States, applying to birds, their eggs, nests and habitats. It covers the protection, management and control of these species and lays down rules for their exploitation and management.

Analysis: Member States are expected to take the requisite measures to maintain the population of the birds naturally occurring in their wild state at a level which corresponds in particular to ecological, scientific and cultural requirements. However, with changing climates at a global level, this expectation maybe evolve outside individual member control as migration patterns of birds may alter due to the changes in summer/winter conditions. An EU wide, comprehensive and integrated approach towards the maintenance and enhancement of ecosystems and the goods and services they provide is needed⁵⁷, with improved monitoring and analysis as well as adopting a trans-boundary scope to account for behaviour change of species in response to climate change.

Further research between climate change and European Biodiversity is needed and it is recommended that a precautionary approach is adopted in developing new policy and a focus on communication between member states to achieve greater co-ordination at EU level and contribute to coherence with other policies.

Participation: There is no public participation mentioned in this directive.

5.1.7.2 Habitats Directive (Directive 92/43/EEC, Date: 1992)

⁵⁷ European Commission. White paper - Adapting to CC : towards a European framework for action (2009)

Objective: To contribute towards ensuring bio-diversity through the conservation of natural habitats and of wild fauna and flora in the European territory of the Member States. As part of this Directive each Member State is required to contribute to the establishment of Natura 2000 areas⁵⁸.

Analysis: Healthy, natural habitats have numerous beneficial points that reduce and mitigate the impacts of climate change by limiting activities such as deforestation, land degradation and flooding. They help reduce carbon emissions and aid in the removal of carbon dioxide from the atmosphere⁵⁹. However, the Habitats Directive does not mention climate change or the potential adverse effects. Its focus remains on member state conservation of natural habitat of wild flora and fauna. This can leave these habitats vulnerable to the effects of altering precipitation patterns, rising mean temperatures and other impacts climate change may impose on biodiversity.

Participation: The only participation of the public to the implementation of this Directive is awareness-raising in a report made available every six years.

5.1.8 Chemicals

5.1.8.1 Sustainable Use of Pesticides Directive (Directive 2009/128/EC, Date: 2009)

The problem of the greenhouse impacts of human activities has broadened in scope from the original priority of the CO₂-climate problem⁶⁰: the effects of climate change are changing the reactions and distribution of contaminants in the environment. EU chemical policy has numerous legislative treaties which restrict the trade and use of hazardous chemicals (Rotterdam Convention on Prior Informed Consent (1998) and Stockholm Convention on Persistent Organic Pollutants (2001) respectively). In comparison, the Sustainable Use of Pesticides Directive has a unique focus of sustainability which inherently links it to climate change adaptation.

Objective: This Directive establishes a framework to achieve a sustainable use of pesticides by reducing the risks and impacts of pesticide use on human health and the environment and promoting the use of integrated pest management and of alternative approaches or techniques such as non-chemical alternatives to pesticides.

⁵⁸ Natura 2000 is the **centrepiece of EU nature & biodiversity policy**. It is an EU-wide network of nature protection areas established under the 1992 [Habitats Directive](#)

⁵⁹ Convention on Biological Diversity – Biodiversity and Climate Change Action <http://www.cbd.int/climate>

⁶⁰ Ramanathan et al (1987) Climate-chemical interactions and effects of changing atmospheric trace gases

Analysis: The Directive is focused on climate change mitigation via National Action Plans aimed at setting quantitative objectives, targets, measures, timetables and indicators to reduce risks and impacts of pesticide use on human health and the environment⁶¹. This systematic approach allows policy decisions to have robust quantitative evidence but still lacks adequate legislation to implement planned action to prevent or minimise the predicted adverse effects of climate change and/or take advantage of opportunities that may arise⁶².

Anticipated chemical risks from climate change are linked to increases in temperature, which will enhance the toxicity of contaminants and increase concentrations of tropospheric ozone regionally, and will also likely increase rates of chemical degradation with resulting serious adverse consequences for human health in urban and polluted regions⁶³.

More intense precipitation expected for areas of northern regions of Europe increases the potential for pesticide and POP runoff into the water table and transboundary transportation of pollutants. The growing threat of thawing permafrost exposes previously frozen organic carbon and transportation of metals, POPs and other contaminants into the water resources⁶⁴. Conversely, decreases in precipitation, expected in the southern regions of Europe, will reduce chemical runoff but may increase persistence of pesticides and salinization. These factors need to be considered further when considering the current Sustainable Use of Pesticides Directive targets.

Participation: This Directive follows the guidance of Directive 2003/35/EC⁶⁵ and provides opportunity for public participation in the preparation and modification of National Action Plans. It ensures that the public is given timely and effective opportunities to participate in order to incorporate the concerns and preferences of the public as well as achieving an increased awareness of growing risks of pesticides.

5.1.8.2 Nitrates Directive (Directive 91/676/EEC, Date: 1991)

Objective: To prevent nitrates from agricultural sources polluting ground and surface waters and to promote the use of good farming practices.

⁶¹ Sustainable Use of Pesticides Directive 2009/128/EC

⁶² <http://ec.europa.eu/clima/policies/adaptation/> (2013)

⁶³ Noyes et al (2009) The toxicology of CC: Environmental contaminants in a warming world

⁶⁴ http://www.enr.gov.nt.ca/live/pages/wpPages/soe_contaminants.aspx

⁶⁵ Directive 2003/35/EC: providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending with regard to public participation and access to justice Council Directives 85/337/EEC and 96/61/EC

Analysis: It is observed that the Nitrates Directive does not mention climate change but it refer to containing the negative impacts which may follow from it⁶⁶. It has close links with other EU policies concerning water, air, climate change and agriculture, and its implementation yields benefits in all these areas⁶⁷. The Directive has the objective to reduce water pollution induced by nitrates and it sets limits for its use and advices on safe practices during rainy periods, problematic climatic conditions and irrigation. The effectiveness of the Nitrates Directive is difficult to analyse, due to the fact that Member States often apply different assessment criteria on most waters⁶⁸. While the Directive is dated (1991), follow-up reports on implementation and studies show a greater awareness of climate change issues and that fact that this Directive should overlap positively with other policies related to climate change. "The field of application of the Nitrates Directive overlaps with EU policies related to the limitation of pollutants responsible for acidification, eutrophication and ground-level ozone pollution (sulphur dioxide, nitrogen oxides, volatile organic compounds and ammonia)²⁰, the control of industrial emissions, including from intensive livestock units²¹, and climate change strategies."⁶⁹

Participation: Involving the public in the process of preventing nitrates pollution is not mentioned within the Nitrate's Directive. An explanation may stem from the fact that the Directive is dated from 1991, when the emphasis on public participation was not fully developed in EU policy.

5.1.8.3 Persistent Organic Pollutants POPs (Regulation No 850/2004, Date: 2004)

Objective: To protect human health and the environment from persistent organic pollutants by prohibiting, phasing out, or restricting production, the placing on the market and use of substances subject to the Stockholm convention on POPs, or the 1998 Protocol to the 1979

⁶⁶ Climate change puts pressure on the nitrates directive through its effects on surface and groundwater. Nitrate leaching occurs when the soil is saturated with water and nitrate is washed below the root zone by percolating rainfall or irrigation. Increased precipitation and river flooding also increases the risk of nitrates being transported to other water sources.

⁶⁷ European Commission. (2010). *Environment Factsheets: EU Nitrates Directive*. - "All activities related to livestock and fertilizer management release nitrous oxide (N₂O) and methane (CH₄), greenhouse gasses with a global warming potential 310 and 21 times higher than CO₂ respectively. If fully implemented, the Nitrates Directive could cut N₂O missions by 6% on 2000 levels by 2020, for example, and contribute to climate change mitigation."

⁶⁸ European Commission. (2010). *Environment Factsheets: EU Nitrates Directive*.

⁶⁹ European Commission. (2007). Commission Staff Working Document {COM (2007) 120 final}. *Report from the Commission to the Council and the European Parliament on the Implementation of Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources for the period 2000-2003*.

Convention on Long-Range Trans-Boundary Air Pollution on POPs, and by minimizing the release of these substances where possible.

Analysis: POPs are found in surface and groundwater and are highly dangerous to human health. They are transported across international boundaries far from their sources, even to regions where they have never been used or produced. Climate change is increasing their impact- rising global temperatures will accelerate the release of POPs trapped in soil, water and ice. The Regulation does not mention climate change as a factor in POP releases. It focuses on pollutants which qualify as POPs and seeks way to contain their spread. Research between climate change and POPs is still relatively new, and current evidence suggests climate change will enhance POPS contamination and increase POPS exposure in some areas and regions. With these current knowledge gaps it is recommended that a precautionary approach is adopted in developing new policy on POPs and climate change, combining this with a multi-disciplinary approach which can contribute to coherence with other policies.

Participation: Besides involving stakeholders, this Regulation states that Member States should give the public timely and effective opportunities to participate in the implementation process. All the environmental information should be publicly available, which will also assist in increasing public awareness for the hazards which arise from POPs⁷⁰. The EC launched stakeholder consultations on the update and implementation of the regulation which closed at the end of 2012.⁷¹ The results have yet to be released.

⁷⁰ Persistent Organic Pollutants, Regulation No 850/2004, Art. 17

⁷¹ European Commission. (2012). *Consultation on Update of the European Union's Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants (POPs)*. See http://ec.europa.eu/environment/consultations/pops_en.htm

6 Climate change and the Agriculture Sector

6.1 Climate change Risks to Agriculture

Agricultural activity can also contribute to GHG emissions which exacerbates climate change processes and impacts. However there is potential within the sector to mitigate climate change and adapt susceptible areas. A major risk of climate change impact associated to the agricultural sector across Europe an increase in mean temperature. Modelling results show that annual mean temperature in Europe is likely to increase more than the global mean temperature. This will affect soil organic carbon stocks due to increased desertification, higher levels of erosion and increased threats of wild fires; thereby accelerating the release of carbon dioxide and methane into the atmosphere thus making the problem worse .

A second risk from climate change will be decreased mean rainfall accompanied by a greater risk of sudden, heavy rain events. Precipitation patterns as well as other elements of the hydrological cycle are predicted to alter: with droughts weakening protective plant cover and intense rainfall accelerating erosion. Recent studies suggest that over recent decades there has been a significant increase of soil degradation.

6.2 Agriculture Sector Policies: Objective and Analysis

The two main pillars of the agricultural sector policy are the Common Agricultural Policy (CAP) and the Rural Development Policy (RDP). Over 77% of the EU's territory is classified as rural (47% is farm land and 30% forest) and is home to around half its population (farming communities and other residents)⁷². Due to the size and scale of agricultural activity, as well as the intrinsic relationship with climate and the environment, there are many subsequent policies that contribute mitigation and adaptation strategies. These policies overlap with other policy sectors (shown in the table below). As part of the CAP reform there have been efforts to simplify agricultural policy so as to ensure that policies, the mechanisms chosen to implement them and the necessary legal framework are never more complex than is necessary to achieve the intended objectives effectively. This is a significant step as the agricultural sector must be compatible with broad policy objectives such as climate change, environment, and energy.

Field	Policy	Covered in which sector:		
		Energy	Wate	Environment

⁷² http://europa.eu/rapid/press-release_MEMO-13-631_en.htm (June 2013)

			r	
Air	Air Quality Directive 2008/50/EC			■
Soil	Soil Thematic Strategy			■
Chemicals	Pesticides Directive 2009/128/EC		■	■
	EU Nitrates Directive 91/676/EEC		■	■
Biodiversity	Birds Directive 2009/147/EC			■
	Habitats Directive 92/43/EEC			■
Water	Floods Directive 2007/60/EC		■	
	Ground Water Directive 2006/118/EC		■	
	Water Framework Directive 2000/60/EC		■	
	Water Scarcity and Drought Policy COM 2007/ 0414		■	
Land Use				■
Energy	Sustainable Use of Natural Resources Strategy	■		
		■		
	Biomass Action Plan			
	EU Strategy for Biofuels COM 2006/34			

6.2.1 Common Agricultural Policy

Objective: To ensure a decent standard of living for farmers and to provide a stable and safe food supply at affordable prices for consumers. The CAP has changed considerably since it was established in 1962, and continues to change today. The Commission presented in 2010 a Communication on "The CAP towards 2020", which outlines options for the future CAP and launched the debate with the other institutions and with stakeholders. In 2011 the Commission presented a set of legal proposals designed to make the CAP a more effective policy for a more competitive and sustainable agriculture and vibrant rural areas, and on 26 June 2013 a political agreement on the reform of the CAP was reached between the Commission, the European Parliament and the Council.

On 16 December 2013 the Council of EU Agriculture Ministers formally adopted the four Basic Regulations for the reformed CAP as well as the Transition Rules for 2014. This follows on the approval of these Regulations by the European Parliament in November. On 20 December 2013 the four Basic Regulations and the Transition Rules were published in the Official Journal. Since the role of the CAP is to provide a policy framework that supports and encourages producers to address these challenges while remaining coherent with other EU policies, this translates into three long-term CAP objectives: viable food production,

[Escribir texto]

sustainable management of natural resources and climate action and balanced territorial development.

Analysis: The CAP is an evolving policy set to address the current needs and challenges of the agriculture sector. Between 2014 and 2020 the CAP intends to significantly invest in three environmentally-friendly farming practices: crop diversification, maintaining permanent grassland and conservation. Organic farming is to be encouraged as it respects the natural life cycles of plants and animals. Farmers are expected to be rewarded for the non-market value services they deliver to the wider public, including landscapes, farmland biodiversity, and climate stability. The latter two can contribute to addressing impacts of climate change, and it is promising to see the acknowledgement of climate stability as a valued service.

The new CAP plans to rise to the challenge of changing climate. “Given the pressure on natural resources, agriculture has to improve its **environmental performance** through more sustainable production methods. Farmers also have to adapt to challenges stemming from changes to the climate by pursuing climate change mitigation and adaption actions (e.g. by developing greater resilience to disasters such as flooding, drought and fire).”⁷³

Participation: There has been, especially recently, a clear demonstration of the EU to engage public participation into the reform of the CAP. This includes the 2010 debate for the public to comment on the Common Agricultural Policy’s future, objectives, principles and contribution to the ‘Europe 2020’ strategy and the recent consultations which were built into the new CAP. However there is little promotion of the public in the implementation of the CAP, including adapting consumption practices that can assist the agricultural sector to themselves adapt to upcoming climate pressures.

6.2.2 Rural Development Policy

Programming period 2007 to 2013 (Amended with Council Decision 2009/61/EC, Date: 2009)

Objective: These strategic guidelines reflect the multifunctional role farming plays in the richness and diversity of landscapes, food products and cultural and natural heritage throughout the Community⁷⁴.

⁷³ Overview of CAP Reform 2014-2020, Agricultural Policy Perspectives Brief, December 2013

⁷⁴ 2006/144/EC: Council Decision on Community strategic guidelines for rural development (2006)

Analysis: This Policy addresses the fundamental relationship between agriculture and environment and aims to protect and enhance the EU's natural resources and landscapes in rural areas, and contribute to three EU-level priority areas:

- biodiversity and the preservation and development of high nature value farming and forestry systems and traditional agricultural landscapes;
- water;
- and climate change.

Climate change mitigation is touched on briefly when the text acknowledges appropriate agricultural and forestry practices can contribute to the reduction in greenhouse gas emissions and preservation of the carbon sink effect and organic matter in soil composition. However there are no guidelines to identify areas vulnerable to climate change impacts. Instead, more focus is given on the link between agriculture and the environment.

Participation: Member states are advised to improve governance and policy implementation. Information and public awareness is required to ensure timely involvement of the different actors to be considered in the preparation of national strategies and later implementation. However the document does not actually outline an approach for Member States to include public participation, which can result in a lack of public contribution to the process.

7 EU Climate Change Policy

7.1 Adaptation and Monitoring

7.1.1 European Earth monitoring programme (Regulation 911/2010, Date: 2010)

Objective: The EU establishes the European Earth monitoring programme which forms the Global Monitoring for Environment and Security (GMES) initiative, and the rules relating to its initial operations during the period 2011-2013. Its primary objective is to provide, under EU control, information services which give access to accurate data and information in the field of the environment and security which is tailored to the needs of users. In doing so, GMES aims to foster better exploitation of the industrial potential of policies of innovation, research and technological development in the field of Earth observation. GMES should be, inter alia, a key tool to support biodiversity, ecosystem management, and climate change mitigation and adaptation.

Analysis: Land monitoring services are important for monitoring biodiversity and ecosystems and support climate change mitigation and adaptation measures and the management of a wide range of resources and policies, most of which relate to the natural environment: soil, water, agriculture, forests, energy and utilities, built-up areas, recreational facilities, infrastructure and transport. Climate change monitoring is one of the six areas addressed by the GMES program

Participation: The regulation intends to make data available to public and private sectors. Much of the direct participation in terms of contribution comes from the research community, and the present program includes measures to support take-up of services by users. There are no guidelines to the extent, detail or accessibility required for Member States to contribute.

7.1.2 Adapting to Climate Change Green Paper (Communication 2007/354, Date: 2007)

Objective: A consultation on the future direction of EU policy with regards to Europe's adaptation to climate change. It states why action must be taken and lays down the relevant guidelines.

Analysis: The paper urges the European Community to adopt strategies of adaptation, working in partnership with its Member States and globally with partner countries. It is clear

[Escribir texto]

in this document that climate change adaptation methods are essential to address the impacts of climate change and that adaptation actions must be consistent with mitigation actions and vice versa. An integrated, cross-sectoral and holistic approach is encouraged in the paper with a focus on data sharing to reduce uncertainty. The ethos of the nexus is not replicated in this document as the cross-sector approach is suggested only for research and not as a framework to better manage sector policy. Advances in research are a necessary part of progression and enable greater resilience to climate change, however a more integrated approach to sector policy decision-making is required to build an effective climate change strategy.

Participation: Public participation is limited to an awareness strategy: the Green Paper seeks mainly to support sustained communication and raise public awareness about climate impacts and adaptation.

7.1.3 Seventh Framework Programme (2007 to 2013) (Decision 1982/2006/EC, Date: 2006)

Objective: The Seventh Framework Programme for Research, covering the period 2007 to 2013, is an opportunity for the EU to match its research policy to its ambitions in terms of economic and social policy by consolidating the European Research Area (ERA). The Framework Programme is organised around four main programmes and has been greatly simplified so as to be more effective and more accessible to researchers.

Analysis: The Seventh Framework Programme promotes growth, sustainable development and environmental protection, including addressing the problem of climate change. While the Seventh Framework Programme does not specifically attempt to address the impacts of climate change, one of its objectives is to strengthen industrial competitiveness and to meet the research needs of other Community policies. More detail should be given to the importance of climate change to the European Community as security of resources; the environment, energy, and agriculture is a prerequisite to industrial competitiveness and the impacts outreach to many EU keystone policy sectors. Promoting excellence in scientific and technological research and contributing to the creation of a knowledge-based society is a vital element to strategies combating climate change. In the context of climate change however this decision requires stricter guidelines and greater focus to achieve consistent contributions that anticipate the adverse effects of climate change and take appropriate action to prevent or minimise the damage from climate change, or take advantage of opportunity that may arise.

[Escribir texto]

Participation: There no reference to public participation or awareness in the Seventh Framework Programme, but there is a clear invitation for the research community, and even SMEs to take part in the Programme. There is a commitment to promote excellence in scientific and technological research, development and demonstration through four programmes: cooperation, ideas, people and capacities.

7.2 Winning the Battle against Global Climate change (Communication 2005/0035, Date: 2005)

Objective: An analysis of the costs and benefits of limiting climate change, following EU commitments to the Kyoto Protocol.

Analysis: This Communication responds to the request of the European Council at its March 2004 meeting for a cost benefit analysis which takes account both of environmental and competitiveness considerations, as preparation for a discussion on medium and longer term emission reduction strategies, including targets. On the basis of the analysis undertaken by the Commission, it recommends a number of elements which should be included in the EU's future climate change strategies. It also proposed dialogue with key partners during 2005 in order to prepare the EU's position for future international negotiations. The conclusions of the communication focused on five main elements to achieve the most efficient and least-cost mix of adaptation and mitigation actions over time to meet objectives while maintaining economic competitiveness. They include:

- The broadening of participation
- The inclusion of more policy areas
- Enhanced innovation
- The continued use of market based and flexible instruments
- The inclusion of adaptation policies

These elements are important to improved policy making with regard to climate change but the paper did not take into account the possibility of sector policy conflicting or contradicting one another.

Participation: This paper is a valuable resource in policy reform to improve participation, innovation, and adaptation to climate change and they certainly provided a good first example for climate strategy. It also laid the groundwork for future collaboration with partner countries such as the recent discussions between the EU and the GCC countries

8 African Union: Water Resources and Climate change

8.1 Functioning of the African Union

This section consists of a review of water and climate-related instruments that address the African continent as a whole. By default this normally refers to Declarations and other policy statements originating within the African Union Commission (AUC), but can even implicate its predecessor the Organisation for African Unity (OAU). The African Union was developed along the lines of the European Union and has ten commissioners overseeing departments including political affairs, agriculture and peace and security. Its founding charter mandates it to work for democracy, human rights and development, while it also promotes investment in the continent and sends peacekeepers to security-troubled areas. Fifty-three countries in Africa are members of the AU. Morocco is the only African country that does not belong. The AU headquarters is in Addis Ababa, Ethiopia.

8.2 African Union and Climate change

As with other parts of the world, such as the European Union, African Union-scale policy that is linked to climate change has its origins in natural resources management, especially water resources, and the environment. One of the earliest examples is the OAU's *African Convention on the Conservation of Nature and Natural Resources* launched in 1966. Its fundamental principle commits member states 'to adopt the measures to ensure conservation, utilization and development of soil, water, flora and fauna resources in accordance with scientific principles and with due regard to the best interests of the people. With the evolution of the OAU into the African Union, we see that there is an ongoing recognition of the problem of desertification on the continent, and that climate change is considered to be a key factor. The next major declaration by the AU implicating natural resources, and of interest to this study, is the Sharm El-Sheikh Declaration on Water and Sanitation (2007) which prioritized issues of access to water and improved sanitation (similar to the Millenium Development Goals). The Declaration was adopted by the African Union Heads of State and Government in July 2008, and *also includes commitments for countries to put in place adaptation measures to improve the resilience of countries to the increasing threat of climate change and variability to water resources*. 2007 was a pivotal year in the African Union's recognition of the climate change challenge for the continent, and saw the start of a number of Declarations and strategies for addressing climate on the continent.

AU Climate change Issues and Regulations⁷⁵

Issue	Major regime regulations
Climate change	Action Plan of the Environment Initiative of NEPAD (2003) Decision and Declaration of the Africa Union on Climate Change and Development in Africa (2007) Tunis Declaration and Action Plan (2007) Algiers Declaration on Climate Change (2008)
Deforestation and desertification	Decision on the Implementation of the Green Wall for the Sahara Initiative (2007) Action Plan of the Great Green Wall for the Sahara and Sahel Initiative (2009)
Sustainable development	Climate Information for Development in Africa Programme (2007)

Source African Union(AU). *OAU/AU Treaties, Conventions, Protocols, Charters* (2010).
<http://www.africa-union.org/root/au/Documents/Treaties/treaties.htm>

The table above illustrates how the African Union views the cross-sectoral nature of climate change, with deforestation, desertification and sustainable development being key issues.

8.3 Africa EU Declaration on Climate change

The African Union's response to climate change contains a clear security line for economic and social stability. In its Declaration on Climate change and Development in Africa adopted in January 2007, member states of the AU acknowledged Africa's vulnerability to climate change and that 'climate change could endanger the future well-being of the population, ecosystems and socio-economic progress of Africa'. Later in 2007, the Intergovernmental Panel on Climate change (IPCC) concluded that Africa is one of the continents which are the most vulnerable to climate variability and change owing to 'multiple stresses and low adaptive capacity', and despite the fact that some adaptation is taking place 'this may be insufficient for future changes in climate'. In the Decision on Climate change during this meeting, the Assembly:

- takes note of the report of the Commission on Climate change and Development in Africa;

⁷⁵ The African Union's response to climate change and climate security, Jo-Ansie van Wyk, monograph of papers presented at the International Conference on Climate Change and Natural Resources Conflicts in Africa, 14–15 May 2009

- expresses grave concern about the vulnerability of Africa's socioeconomic and productive systems to climate change and variability and to the continent's low mitigation and response capacities;
- endorses and commends the development of the report "Climate Information for Development Needs: An Action Plan for Africa – Report and Implementation Strategy";
- urges member states and Regional Economic Commissions (RECs), in collaboration with the private sector, civil society and development partners, to integrate climate change considerations into development strategies and programmes at national and regional levels;
- calls upon Africa's cooperation partners to support the member states and RECs to effectively integrate adaptation and mitigation measures into their development plans and to implement them; and requests the Commission, the ECA and the ADB to develop and implement the Action Plan

8.4 Tunis Declaration for International Solidarity to Face Climate change 2007

Tunisia hosted, on November 18-20, 2007, the International Solidarity Conference on Climate change Strategies for African and Mediterranean regions. This conference was placed under the High Patronage of H.E. Zine El Abidine Ben Ali, President of the Republic of Tunisia, and participation of 30 ministers from African and European countries, the executive secretaries of the UN-Convention on BD, Climate change and Desertification, The IPCC President and high representatives of the more than 30 International and Regional organizations and Institutions. The participants, at the end of the Conference, declared that they will:

- Integrate Climate change adaptation within development strategies;
- Develop capacity for elaborating and implementing Climate change adaptation strategies;
- Reinforce capacities for public information and sensitization
- Implement programs for the transfer of relevant information and experiences and of appropriate technologies
- Strengthen, expertise, cooperation and solidarity for prevention and action against climatic extremes in the most vulnerable countries;
- Endeavour to promote renewable energies and energy efficiency in all sectors in order to attenuate the negative effects of Climate change;

- Reinforce South-South and North-South cooperation, while promoting the flow of information and free exchanges;
- Seek to mobilize the necessary financial resources for establishing attenuation and adaptation strategies and the corresponding plans of action.

One of the elements of the above Declaration is that a number of actions are linked to external actors, and climate change actions, from the international community. This is a combination of the growing awareness of the international community on climate change impacts on Africa and the beginnings of climate change regulation within the African Union. Of the recommended actions to be taken up, the following illustrate the cross-sectoral nature of the challenge perceived by the participants:

- Adaptation to climate change in agriculture and the management of natural ecosystems
- Adaptation to climate change for better management of water resources
- Adaptation to climate change as regards Energy and infrastructure
- Preparedness for health impacts and natural disasters

8.5 Water, Climate and Development – WACDEP 2010 ⁷⁶

This program is the operationalization of the Sharm El Shaikh Declaration of 2008 which, in addition to addressing access to water and sanitation, also commits countries to put in place adaptation measures to improve the resilience of countries to the increasing threat of climate change and variability to water resources. On November 2010, during the 3rd Africa Water Week, the extra-ordinary session of the African Ministers Council on Water (AMCOW) adopted a decision recommending that the Global Water Partnership (GWP) and partners operationalize the Water, Climate and Development Programme (WACDEP). The programme supports the implementation of climate change commitments in the Sharm el Sheikh Declaration and is part of AMCOW's work programme. The Water, Climate and Development Programme aims to integrate water security and climate resilience in development planning processes, build climate resilience and support countries to adapt to a new climate regime through increased investments in water security. Adaptation to climate change converges on the goal of water security for all: harnessing water's social and productive potential and limiting its destructive force.

⁷⁶ http://www.amcow-online.org/index.php?option=com_content&view=article&id=142&Itemid=94&lang=en

The programme runs from May 2011 to April 2016. Initially, WACDEP starts in eight African countries and five transboundary river basins / aquifers all over the continent.

The initiative will be implemented at local, national and transboundary basin level and aim to specifically promote global-regional-national linkages. Initially, the programme will start in the following 8 countries: Burkina Faso, Burundi, Cameroon, Ghana, Mozambique, Rwanda, Zimbabwe, and Tunisia. For the BEWATER Project, Tunisia is of special importance and highlights the complementarity of this project with WACDEP.

8.6 African Water Vision⁷⁷

The African Water Vision, much like the Millenium Development Goals, is a strategic document to outline a common and coherent way forward with the management of Africa's water resources and its challenges. It is produced by the UN Economic Commission for Africa (UNECA), the African Union, the African Development Bank and supported by the World Bank. The Vision encompasses 2 areas of strategy; natural and human as follows:

Natural threats

- The multiplicity of trans-boundary water basins;
- Extreme spatial and temporal variability of climate and rainfall, coupled with climate change;
- Growing water scarcity, shrinking of some water bodies, and desertification.

Human threats

- Inappropriate governance and institutional arrangements in managing national and transactional water basins;
- Depletion of water resources through pollution, environmental degradation, and deforestation;
- Failure to invest adequately in resource assessment, protection and development;
- Unsustainable financing of investments in water supply and sanitation.

The Vision document addresses most frequently climate variability rather than climate change, although climate change is mentioned, with the main climate challenges identified as being drought, desertification and floods. Concerning these challenges a framework for action towards the attainment of the Vision has been defined with milestones and targets

⁷⁷ <http://www.icp-confluence-sadc.org/documents/africa-water-vision-2025-equitable-and-sustainable-use-water-socio-economic-development>

towards the Vision. This framework is based on a structure of driving forces that have been identified as key to influencing the management of water resources for the future on the continent. They include:

- *Socio-economic* – widespread poverty
- *Demographic* – population growth, urbanisation, increased frequency of communicable diseases
- *Environmental* – climate variability, drought, desertification, floods and natural disasters
- *Governance* – accountability, transparency, good governance, institutional and regulatory arrangements, stakeholder participation
- *Technology* – information and data gaps (ground and surface water)
- *International factors* – transboundary nature of water, but also other issues such as shared economic strategies, food security and energy.

8.7 Gaborone Declaration on climate change and Africa's development

Held in Gaborone, Botswana, in 2013, this Declaration addresses the preparations for the African Union for the upcoming twenty-first session of the Conference of the Parties to the United

Nations Framework Convention on Climate change to be held in Paris in 2015. It has a tighter African focus, calling for Member States to commit a percentage of their national budgets to the environment, develop strategies for scaling up, and to promote ownership of the solutions. The participants to the Declaration pledge “To agree that the national adaptation plan process should not be prescriptive, but should rather facilitate country-owned, country-driven action, that the formulation of national adaptation plans should build on and complement existing adaptation planning...” To carry forward this action it was announced to establish a steering committee within the NEPAD Planning and Coordinating Agency to be composed of one representative from the African Union Commission, the United Nations Economic Commission for Africa, the New Partnership for Africa's Development Planning and Coordinating Agency, the African Development Bank, and the secretariat and the Bureau of the African Ministerial Conference on the Environment. There is also a strong recognition of the need for stakeholder participation, particularly “the private sector, civil society organizations, women and youth groups”. In terms of sector activity, this declaration very clearly identifies agriculture as a priority issue for dealing with climate change, especially with 2014 being the African Year of Agriculture, Food security and Nutrition. With agriculture described as being the economic backbone of Africa, the

economic impacts of climate change are a clear entry point for the AU's climate change strategy building for the future.

9 Summary: EU Water and Cross-Cutting Sector Policies in the Context of Climate change

This section will highlight some of the sector policy issues that are relevant to the building of a climate change strategy for the EU. The present reality of how the policy sectors of water, energy, agriculture and environment address climate change will be addressed, along with other issues such as public participation in the policy processes.

9.1 Across Sectors

The 3 main sectors where conflict potentially arises in terms of resource management is with water, energy and environment. One study from the energy / business sector⁷⁸ shows that while the WFD aims to create good conditions for water bodies, the strict standards it requires will seriously hinder the use and expansion of hydropower. As the power industry has already endured general technical and financial burdens recently, the new environmental requirements will be too costly to fully implement, especially for smaller businesses. According to the organization, achieving such a good level of water quality is of secondary importance compared to the importance of power generation and any further tightening of the WFD standards should be avoided, since the objective of clear water resources would require a tremendous financial investment.

In his analysis of the WFD and renewable energy, author J. Abazaj elaborates on the pressure the WFD puts on the hydrological sector and the inconsistencies which arise between the Water Framework Directive and the Renewable Energy Directive in the hydropower sector, the impact of these inconsistencies and the possibility of reconciliation between the two directives. For the Renewable Energy Directive, hydropower facilities represent an important instrument for achieving of the main objective, the production of renewable energy. In this perspective, the construction of new facilities and the refurbishment of old sites is incentivized and projected. On the other hand, hydropower facilities represent environmental pressures on the biological, hydro-morphological, chemical and physical quality elements of the water resource. Therefore, from the WFD perspective, the construction of new facilities needs to be fully compliant with strict measures in order not

⁷⁸ VGB PowerTech. (n.d.). The EU Water Framework Directive and its Possible Effects on Hydropower.

to cause deterioration of the ecological status of water bodies⁷⁹. This makes, in some cases, the required investment for the construction of new (or the renovation of already existing) facilities too high. Consequently we arrive at two conflicting objectives related to the European Directive provisions that will either have an impact on hydropower generation or water resources quality. The lack of a coordinated provision already is the basis of conflict discussion and will continue to generate uncertainties if not addressed in the future of overarching climate change policy⁸⁰. At the very least this illustrates the necessity for a cross-sector consultative discussion for a coherent but also ultimately mutually acceptable policy response to climate change in the EU.

Some contributors to the recent Fitness Check of the Water Framework Directive mentioned that a divergence of objectives exists between the Directive on Renewable Energy Sources and EU water policy, due to the pressure to add new hydropower capacity and to intensify biomass production.

Finally, one of the emerging perspectives in recent years is the Nexus perspective, which is seen by its proponents as a natural progression for improving understanding of the interdependencies between sectors, and to develop a joint perspective on the common challenges understanding and problem solving to EU policy. Expanding policy scope makes for more informed decision making, better adaptation to environmental change, increased resilience and more responsive legislation. While this is often compared to IWRM, the nexus approach suggests that IWRM does indeed embrace other sectors in its management philosophy, but from a water perspective; while a nexus approach addresses multiple sectors equally for a policy perspective.

9.1.1 Water Sector Policy and Climate Change

Of the eight core policies reviewed from the EU Water Policy Sector, four out of the eight address climate change clearly as an issue and a future challenge. These include the Marine Directive, the Floods Directive, the Water Scarcity and Drought Directive and the Water Framework Directive. The latter two have recently come under review with the EU Fitness Check on water policy. The Bathing Water Directive makes mention of climate change but does not appear to acknowledge the fact that climate change will likely require adaptation of this Directive in order to maintain its present status of implementation. The Drinking Water

⁷⁹ Abazaj, J. (2010). Reconciliation of Inconsistent Frameworks: An Analysis of the WFD and the Renewable Energy Directive. Lund University.

⁸⁰ Abazaj, J. (2010). Reconciliation of Inconsistent Frameworks: An Analysis of the WFD and the Renewable Energy Directive. Lund University.

Directive, the Groundwater Directive and the Urban Waste-Water Directive do not clearly address climate change.

9.1.2 Energy Sector Policy and Climate Change

Of the fifteen energy sector policy instruments reviewed, ten of them addressed climate change to one degree or another with three of the ten clearly addressing climate change as an issue. They included the Energy 2020 and the Energy Efficiency for 2020 instruments, and the Renewable Energy Directive. Most of these instruments tend to focus on reduction of Greenhouse Gases (GHGs) and how they can reduce the impacts of energy consumption on climate and the environment. Policy implements that address oil, natural gas and nuclear energy do not address climate change. There is very little discussion on how climate change may affect the production of energy, for example knock-on impacts of climate change on water resources and hydropower or biofuel production. Consequently this suite of policies appears to be largely demand-driven with limited concept of changing consumption patterns or adaptation.

9.1.3 Environment Sector Policy and Climate Change

Of the fourteen EU Environment Policy implements reviewed, the majority (twelve) address climate change as part of their focus but to varying degrees. Surprisingly, policy reviewed here dealing with biodiversity appears to score low, with policy structure being prescriptive with no acknowledgement of impacts on climate change. This can reflect the conservation perspective existing at the time these regulations were introduced, but in total the suite of Environment Policy implements reviewed show sensitivity to climate change issues.

9.1.4 Agriculture Sector Policy and Climate Change

Of the two Agriculture Policy instruments reviewed, the newly amended Common Agricultural Policy clearly identifies the issue of climate change and calls upon stakeholders in the sector to address them. The Rural Development Policy does identify climate change as a challenge but less so than the CAP, with more of a focus on agriculture and environment rather than climate change.

9.1.5 EU Climate Change Policy Instruments

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The instruments selected for review reflect the mix of policy activities as well as the institutional stakeholders involved. Responses to the challenges of climate change range from data and information-collection to the full promotion of adaptation. There is a distinct international element present with references to the Kyoto Protocol and Global Monitoring, which suggests that while future EU policy on climate change will be confronted with the internal variations of other sector policies, this policy will not be formulated exclusively inside an EU policy box.

9.2 Participation

The sector policy review addressed if, and to what degree, the policies from the different sectors address the issue of climate change **and** to what degree these policies facilitate public participation. Participation in policy activities has a strong relevance to this study since it implies stakeholder action, which in itself is key to adaptation. If we are to bring adaptation from stakeholders into the policy arena, it will be to a large extent the vehicle of participatory processes that will carry it. Public participation in the EU is guided by the Aarhus Convention with the aim of improving the management of our water and other natural resources, especially in the face of climate change, and also to avoid the following issues that arise when the public is not involved⁸¹:

- the public is not properly informed about resource management and climate change challenges;
- the public's values and concerns are not adequately taken into account in decision-making;
- due to lack of consultation, innovative solutions are rarely presented and / or employed
- distrust grows within the public, and a corresponding lack of willingness to accept the measures imposed becomes ingrained in the public perception.

In a number of the policies reviewed, the EU obliges Member States to implicate the public in the implementation process of its policies, but it does not provide guidelines or clear indications on how or to what extent this is expected to be achieved. This interpretation is left to the relevant authorities in the respective State, but often these authorities are unfamiliar or inexperienced with the subject⁸². This can lead to authorities promoting only

⁸¹ Slavíková, I. L., & prof. Ing. Jiřina Jílková, C. (2008, May). Implementing the Public Participation Concept into Water Management in the Czech Republic – Critical Analysis. University of Economics in Prague

⁸² Hophmayer-Tokich, (2008), S. Public Participation under the EU Water Framework Directive – processes and possible outcomes. The Netherlands: University of Twente, (2008).

the minimum required by the directives - such as focusing only on dissemination practices, providing information or at most a minor consultation. Involving the public becomes even more challenging with integrated water management on river basins, as called for in the WFD, or in the multi-sectoral nexus approach since both would involve authorities and stakeholders who have their own very important agendas which essentially overlay the same space. The same results are valid not just for the water sector- the EU's energy policy sector is faced with the same challenges and has been criticized for a weak public involvement by the European Commission in the process of achieving Europe's energy goals for the programme "20% renewable energy by 2020"⁸³ and the social involvement of the EU's Biofuel Policy⁸⁴.

9.2.1 Demand-Driven Response

Another issue linked to resources management in the face of climatic challenges is attempts by EU Policy sectors (especially energy and agriculture) to achieve security while continuously meeting the rising water, food and energy demands. This puts enormous pressure on the Member States and the respective multiple industries involved. With a bias in favour of supply-side measures, this pressure will only increase unless the general public and consumers change consumption patterns and habits. This is a concern, as a growing body of evidence suggests that Governments are unlikely to reach climate change targets if they focuses solely on supply-side and dismisses demand-side measures. This will require changes in consumption patterns and behaviour. While these demand-type reduction measures alone are not enough to achieve, say, the 20% reduction in emissions aimed for by the EU, they can be of great assistance to achieving this goal. However, achieving or trying to promote social change within a policy framework but without tools and mechanisms for public participation is almost impossible.

9.3 Reliable Information and Data

Actors within the Research Community and also the Business Sector also advocate for more comprehensive inputs of another type: that of more reliable data. The World Business Council for Sustainable Development states that policy measures need to include better and more reliable climate change risk data, models and analysis tools. Business needs reliable

⁸³ Watts, A. (2012, May 19). EU violates Aarhus Convention in '20% renewable energy by 2020' program: <http://wattsupwiththat.com/2012/05/19/eu-violates-aarhus-convention-in-20-renewable-energy-by-2020-program/>

⁸⁴ Kaphengst, Wunder, Timeus (Ecologic Institute, 2012) The Social Dimension of EU Biofuel Policy, Ecologic Briefs

water, energy and climate change data, models and analysis tools in order to assess risk and make informed decisions or plans. Reliable meteorological and hydrological data should be collected at national, sub-national and watershed levels. The tools and systems used to collect and analyse these data also must be consistent and complementary⁸⁵. This will allow business to partner with policy-makers, legislators, researchers and others to help achieve the goals set out by the EU Water and Energy Policies.

10 Conclusions

There is limited value in a direct comparison between the AU and the EU Policy instruments, even if the African Union is essentially modelled upon the European Union. The AU Declarations and strategies are not enforceable in the same fashion as EU Directives, but it is interesting to note that AU Climate Change Declarations and related instruments are strongly influenced by international protocols such as the UNFCCC and the AU - EU Declarations. While this may initially be viewed as the easy influence of the international community over the African continent, it does reflect the possibility and choice of the AU to benefit from lessons learned outside of the continent, where environmental policies and climate change discussions are much longer-established. Also, one must bear in mind the size of the African continent and the relatively young but growing challenge of arranging 50-plus members into a common voice with the African Union as their representative. AU Declarations, supported by the International Community, are for the present the most pragmatic and realistic approach to providing guidance to AU Member States, at which level most policy instruments are developed and applied.

Concerning the European Union, a review of EU Policies and Analyses, indicate 2 priorities for the EU in their policy response to climate change. One is for the EU to meet its already proclaimed targets and obligations both at the EU level and at the international level. The other priority is to build a future strategy and supporting legislation for the EU to reduce the impacts of climate change on the security, economic health and well-being of its constituents. The achievement of the targets is easier to conceptualize but for the latter, there must be a consolidated consideration across policy sectors, since that is the sectoral nature of where climatic impacts will fall.

⁸⁵ World Business Council for Sustainable Development, (2009). Water, Energy and Climate Change.

11 Annex I

Selected Sources

Climate change is addressed by a growing number of sources. The context of its relation to the EU Water and Energy policies is still relatively undeveloped and the following information sources are a selection of the few which address this relation. The rest of the sources presented here give the necessary background information behind the rest of the topics discussed in this review: the lack of enough public participation in tackling climate change and the inter-linkages between the water and energy sector in terms of management and legislation. All sources were gathered through an internet research and references from EU and Member State publications, scientific publications and sources from other actors such as International Organizations. A selection of the most recent and relevant websites and publications is presented here which address the current state of climate change activities on a European level. Most of the information in this report is derived from the publications presented in this section.

The websites are generally open platforms for information exchange and include recent papers, researches and databases. The literature sources are reports which discuss the topics of water, energy and their overlapping climate change aspect. More than a few sources recognize the rising need for better EU Policy coordination between the water and energy sectors.

11.1 Websites

*Climate-Adapt website*⁸⁶: a newly initiated website by the European Commission (EC), which addresses the need for a common platform for information exchange on the topic of climate adaptation and mitigation.

The EC launched the Climate change Adaptation Platform in June 2012, in light of the rising importance of climate change adaptation. It is a platform, where people can access and share information on expected climate change effects, current and future vulnerability of sectors; national and transnational adaptation strategies; adaptation case studies; and other supporting tools. The goal of this platform is to provide all information needed to help stakeholders incorporate climate change into their decision-making processes. Information is openly accessible and the site provides case studies and examples.

⁸⁶ Available on: <http://climate-adapt.eea.europa.eu/>

*Centre for Climate Adaptation*⁸⁷: a website with an aim to be constantly updated with current information on Europe's vulnerabilities related to climate change, for information sharing.

The theme 'Europe in a changing climate' presents a summary of Europe's vulnerabilities, the impact of the projected climate change and the consequences for the countries and sectors involved. The website updated with new information to reflect as currently as possible the changes in climate, the vulnerabilities and adaptation strategies. There are links to related websites, You Tube videos and other presentations in the media that shed more light on the possible impacts of climate change. The website aims to provide information for persons searching for a quick, but well-substantiated summary of the impact of climate change in their country or their field of interest.

*Euroclima*⁸⁸: is a joint Environmental Programme between the European Union and Latin America, focusing on climate change. It is not linked directly the European context of this review, but an international and European perspective on the topic.

Euroclima aims to contribute to a better understanding between the decisional entities in Latin America and the scientific community about the problems and consequences of climate change in order to integrate them into sustainable development policies.

*United Nations Economic Commission for Europe (UNECE)*⁸⁹: UNECE's major aim is to promote pan-European economic integration. It offers a broader view not just on the topic of climate change but also serves as a multilateral platform for policy dialogue, development of regulations and norms and more.

⁸⁷ Available on: <http://climate-adapt.eea.europa.eu/>

⁸⁸ Available on: <http://www.euroclima.org/>

⁸⁹ Available on: <http://www.unece.org/>

12 Annex II Effects of Climate change on the Water Sector

Water Body

Climate change Effect

River

Droughts, floods

Climate change affects the quantity and quality of Earth's water resources on a global scale. In Europe, these changes are reflected in an increased number of extreme precipitation, droughts, floods and heat waves. North Europe is facing the highest risk of floods, due to the shift of snow-melting from spring to winter and increased frequency of short-duration precipitation. Heavy rainfall will also occur more often, bringing attention to the issues of flash flooding, urban drainage, water management, erosion, slope stability and groundwater recharge. The winter season is expected to become milder and shorter, with less snowfall which will in turn decrease the spring floods. The summer in Central and Eastern Europe will be marked by longer periods of dry, warm weather and a reduced water flow in rivers. In the Mediterranean, the extreme increase in temperatures will be responsible for continuous droughts, flash floods, forest fires and loss of agricultural production.

Surface water

Increased water pollution and decreased drinking water availability

The increase in temperatures will bring about changes in the physic-chemical conditions of standing water and low-flow situations such as groundwater. The heavy rainfalls followed by longer periods of droughts may intensify water pollution but may also increase the degradation rate of some pesticides and organic pollutants. River run-off will overall decrease, due to the small increase in winter but bigger decrease and evaporation during the summer. The expected increase in sea level may lead to saline intrusion and increase the

concentration of salt of freshwaters.

Groundwater

Soil moisture deficit, shorter winter recharge period

Groundwater is affected by climate change through its effects on precipitation, temperature, the soil and plants and amount of greenhouse emissions in the atmosphere. The increase in temperatures accompanied by overall decreased precipitation will lead to longer periods of soil moisture deficit, lower groundwater recharge and higher contamination levels. As with surface waters, the expected increase in sea level may lead to saline intrusion and increase the concentration of salt in groundwater.

Marine environment

More microbes, changes in stratification

The increase in sea surface temperature will lead to shifts in species composition and their life cycle. There will be more algae and microbes which will change the stratification of water.

Coastal flooding

Coastal erosion and flooding

Many European cities are faced with the increasing threat of coastal flooding, because they are exposed to the raise in sea level. If no action for adaptation measures is taken, some of them will even disappear under the sea level by 2085, resulting in a loss of land of between 2000 and 17 000 km². The frequency of floods and coastal erosion is expected to increase.

Public water supply and drinking water

Less freshwater, droughts

Problems related to public water and drinking water will increase throughout Europe with the Mediterranean as a most problematic zone. This region relies on precipitation as a source of groundwater and decrease in precipitation will also decrease the availability of freshwater with reduced summer water flows and water runoff. Worse case scenarios predict water drought issues on daily bases which will affect the

economy and the population of Europe and the Mediterranean in particular. Agriculture and tourism will naturally suffer too, especially in places where water supply is an issue even now (like islands). Only north Europe is not expected to suffer negatively from the decrease in water supply.

Agriculture

Pests and diseases, floods and droughts

The expected effects on agriculture and water will vary across Europe. Northern Europe could identify some beneficial opportunities, but this will be reflected with the opposite extreme effect in the South. The increase in temperatures in Northern Europe will allow for higher crop yields and the introduction of new crops. Lower winter temperatures and ground frosting will allow for a longer growing season. The change in climate will also bring adverse effects, such as the spreading of pests and diseases. Heavy storms and floods resulting from extreme droughts or precipitation could also present a danger to soil quality and result in crop losses. Central and Eastern Europe will experience mixed effects, including longer growing seasons due to decrease in precipitation and higher crop yields. However, the negative effects of climate change are expected to dominate this region of Europe. There will be a general increase in water demand for agricultural purposes in order to compensate for the evaporation rates due to higher temperatures. The water balance of soils will be disrupted and there will be even more pressure on water abstraction on the already limited resources. The Mediterranean will experience the most negative effects in agriculture which will in turn shrink the local GDP and employment levels.

13 Annex III Effects of Water and Climate change on the Energy Sector⁹⁰

Hydropower

Hydropower is a main source of renewable electricity and was responsible for 89% of the world's renewable energy generation in 2006 with a main production source in the developed world. Hydropower does not need to consume water in order to produce electricity; it only uses and then releases water with a certain delay but no water is wasted during this process. The only loss is triggered when air temperatures are high, which leads to evaporation. Climate change affects this type of renewable energy source by affecting the sustainable upstream water use and the precipitation patterns.

Solar energy

Solar energy is also becoming a popular tool in reducing greenhouse emissions. It is dependent on water and needs about 277m³ of water to produce 1000 GJ of energy (the average use of 5 individuals annually in Europe). Naturally, limited water availability obstructs the production of solar energy.

Wave energy

This is a new form of renewable energy, which is not yet fully developed. However, experts believe it holds a large potential for energy production and if it comes into use, it will be naturally dependent on using water, but without consuming it. In this case, the expected disturbance of precipitation and water loss through evaporation due to climate change will have an impact on wave energy production.

Crude oil

The process of pumping oil from reservoirs is becoming increasingly reliable on water, requiring 10% more water

⁹⁰ "Water, Energy, and Climate Change". (2009). World Business Council for Sustainable Development. Available on: <http://www.c2es.org/docUploads/WaterEnergyandClimateChange.pdf>

each year, depending on the maturity of the oil field. Between 2-8 m³ of water is required for extraction, drilling, flooding and treating in order to produce 1000GJ⁹¹. In certain cases, such as enhanced oil recovery, the water use is even greater. Climate change is expected to negatively affect the availability of many sources of water. The high dependency of oil extraction on the availability of water will lead to disruptions in the production process during periods of limited water supply.

Biomass for conversion to biofuels The amount of water required for biomass production depends on the crop water requirements which vary depending on the local climate. Countries with high precipitation and moderate temperatures use up around 24000m³ per 1000GJ, whereas regions with hot and dry climate require about five times more. The estimation of water dependency for biofuels is difficult; however it is certain that water is essential to biomass production and its conversion to biofuels.

Coal mining Coal is the largest source of electricity in the world. Open pit coal mining uses around 2 m³ per 1000GJ, whereas underground mining can use from 3 to 20 m³ of water per 1000GJ.

Nuclear power Nuclear power requires water for its cooling systems in two ways: open-loop water-cooling uses water extracted from a river, lake or the sea and after cooling process is complete, water returns to source. The closed-loop water cooling uses water as it flows in a closed circuit. Usually, around 555m³ per 1000GJ of water is lost (evaporated) during the process and the remaining water is returned. 1666m³ is used per 1000GJ.

Uranium mining and milling This energy process requires about 2-8m³/1000GJ water for dust control, re beneficiation and re-vegetation of mined surfaces.

⁹¹ Average consumption of 5 individuals in a developed country

