



Brussels, 8.3.2011
DG ENV D.1 (2011) 236452

NOTE BY DG ENVIRONMENT

Subject: Towards Better Environmental Options for Flood risk management

INTRODUCTION AND PURPOSE OF THE NOTE

Severe floods with devastating impacts on European citizens, economic activities and the environment affect Europe every year, and due to climate change are likely to become more frequent and devastating. Several parts of Europe also face periods of droughts. Flood damage tends to increase due to two sets of factors: extreme weather events and changes in how we use our land, such as increased concentration of assets in urbanised areas on floodplains or conversion of forests.

There is a clear need to improve strategic long term flood risk management policies. Measures selected now to reduce flood risks need to be more robust and flexible in view of changes in climate and the uncertainties in foreseen impacts.

After a flood event has taken place, the recovery and review phase starts. This is an important moment to take stock of the lessons learnt and to re-evaluate the strategy for future measures to prevent flood damage as far as possible. The role of natural flood management and green infrastructure needs to be further strengthened in this context **Flood risk management should work with nature, rather than against it¹**. Building up green infrastructure – which requires investing in ecosystems – offers triple-win measures: (1) contribution to the protection and restoration of e.g. floodplain and coastal ecosystems, (2) mitigation of climate change impacts by conserving or enhancing carbon stocks or by reducing emissions caused by e.g. wetland and river ecosystem degradation and loss and, (3) provision of cost-effective protection against some of the threats that result from climate change such as increased floods.

Harnessing nature's capacity to absorb or control impacts in urban and rural areas, for instance by improving the soil's water storage capacity and conserving water in natural systems, helps alleviating the effect of droughts and preventing floods, soil erosion and desertification. This ecosystem-based approach is a more efficient way of adapting than simply focusing on physical infrastructure.

¹ Commission White paper on Adaptation to Climate Change.

Strengthening floodplain ecosystems through multi-functional green infrastructure can also have economic benefits, through the provision of jobs, investment and business opportunities in addition to environmental advantages.

Building dams and dykes, and rebuilding them and damaged buildings and infrastructure, after these dams and dykes have failed is very costly. It is clear that **flood protection measures such as dykes and dams are not the only solution**: natural, ecosystem-based water retention measures can be very cost-effective. Not only can multiple benefits for nature and environment be generated but also investment and maintenance costs can often be lower than hard engineering solutions. In addition ecosystem-based investments (such as floodplains) usually also make sense in direct socio-economic terms: they can provide new activities (tourism, eco-tourism, recreational and educational activities...) and opportunities for local development and jobs. Therefore, in order to effectively reduce flood levels it is important to explore all nature-based options along catchments and coast lines to maximise the retention of water in soils and in wetlands, and to use temporary storage areas.

When managing rivers, lakes and coastal areas, the **best environmental options** need to be identified, especially when new flood defence structure are considered that could lead to a degradation of water resources.

An example of such options is given by **natural water retention measures** to slow down or reduce the flow of water downstream leading to a more natural flow regime within a catchment, while allowing natural systems to store sufficient water which makes them more resilient if periods of drought follow.

Best environmental options can thus be achieved by investing in Green Infrastructure, which combines the restoration of ecosystem functioning (such as the investment in water and carbon cycles and restoring connectivity) with the provision of a service (in particular for climate change adaptation and disaster prevention). Protecting upper-catchment forests and restoring wetlands and water courses, as well as increasing soil water retention and groundwater recharge reduce the risks from climate-related floods and droughts, thereby protecting people's welfare and helping to minimise the loss of life, properties and other assets – all underpinned by integrated spatial management. Measures that are likely to be more cost-effective than traditional grey infrastructure such as dams and dikes include the preservation and restoration of floodplains, including reverting arable land into flood meadows; fostering biodiversity and climate-friendly agricultural use of peatlands and bogs where adequate, improving microclimate in urban areas by maintaining and increasing green spaces and corridors.

This note is complemented by an information package on ecosystem-based approaches to flood prevention including: 1) a slide show; 2) a limited set of relevant background documents and examples of best practices and information for further guidance.

This toolkit provides the policy background but also concrete and practical information on how to apply ecosystem-based approaches and which EU funding possibilities exist to improve current flood management and the protection of nature.

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1. WHAT IS THE EU LEGAL FRAMEWORK ON FLOOD RISK MANAGEMENT?

1.1. When and how shall flood risk management plans be prepared?

The **Floods Directive**², establishes a framework for the management of flood risks. The aim of the Directive is to reduce the adverse consequences to human health, economic activity, the environment and cultural heritage associated with floods. After Member States have identified areas which are subject to potential significant flood risk (by 2011) and prepared flood hazard and flood risk maps for relevant areas (by 2013), they need to prepare flood risk management plans. These plans are due for the first time at the end of 2015 and shall be reviewed every six years thereafter.

The Floods Directive leaves to the Member States the choice of the measures to put in place in order to reduce the adverse consequences related to floods. Article 7, requires that Member States set their own **flood risk management objectives**, and that these objectives shall focus on the reduction of potential adverse consequences. These objectives shall also, if appropriate, focus on non structural measures, and/or on the reduction of the likelihood of flooding.

The Flood Risk Management Plans (FRMP, Art. 7) need to include **measures to achieve the objectives**. So called "non-structural" measures, which reduce the likelihood of flooding, should have a prominent role in the implementation of the Directive. Non-structural measures range from early-warning systems to natural water retention measures.

The plans need to be **coordinated with the second cycle River Basin Management Plans** of the Water Framework Directive³ (2015-2021). It is important to consider the whole catchment when identifying where and how flood protection measures should be developed.

Importantly, Article 7 of the Floods Directive requires that Flood Risk Management Plans take into account "*...areas which have the potential to retain flood water, such as natural flood plains, the environmental objectives of article 4 of Directive 2000/60/EC, soil and water management, spatial planning, land use, nature conservation ...*". The plans may also include "*the promotion of sustainable land use practices, improvement of water retention as well as the controlled flooding of certain areas in case of a flood event*".

1.2. Why are better environmental options needed?

Coordination with the **Water Framework Directive (WFD)** and with Nature legislation are important and inherent components of the Floods Directive.

² Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks. OJ L 288, 6.11.2007, P.27. For more information : http://ec.europa.eu/environment/water/flood_risk/index.htm

³ Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. OJ L 327, 22.12.2000, p.27. For more information : http://ec.europa.eu/environment/water/water-framework/index_en.html

The development of **new physical modifications to water bodies**, if such changes are expected to lead to a deterioration of status of the water body, is only allowed under the conditions set in article 4.7 WFD. The construction of new structural measures to prevent flooding of a particular area is a typical example. One criterion, among others, that needs to be fulfilled is that the *"beneficial objectives served by those modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate costs be achieved by other means, which are **significantly better environmental options**"* (Art 4.7.d) WFD). This needs to be explained and justified in the River basin Management Plans. Flood plains, natural flood management and the development of so called Green Infrastructure in rural as well as urban areas have a great potential to offer better environmental options which provide multiple benefits and lower the costs.

1.3. How is nature protection and biodiversity policy linked to flood risk management?

During the last century, the biodiversity of Europe's freshwaters has suffered due to pollution and major physical changes in the rivers, lakes and wetlands (resulting among others from straightening of the river beds, dredging, constructing levees, building weirs, dams and artificial water reservoirs for numerous purposes including flood control). As a result, freshwater biodiversity is at risk.

As reported by EU countries under article 17 of the Habitats Directive, the conservation status of freshwater species of European Community interest is generally unfavourable, although there are some variations across bio-geographical regions.⁴

Key services of floodplain ecosystems are water retention, clearance of water and prevention of soil erosion – services which can considerably contribute to flood prevention and mitigation if the delivering ecosystems are in good health. Decisions on land use management, such as in floodplain areas, have however often been taken to the detriment of ecosystems and their services in the past.

Intact floodplains, though, play an important role in helping to alleviate floods by storing water and releasing it back slowly into streams and rivers. Coastal ecosystems such as salt marsh and barrier beaches provide natural shoreline protection from storms and flooding. Wetlands store carbon and water very efficiently, and act as all-time re-usable water retention basin. Furthermore, such nature-based solutions are often more cost-effective than traditional engineering solutions, and deliver a number of additional benefits for people (such as recreation possibilities) and nature (such as habitats for floodplain species).⁵

1.4. Which are the key nature legislation and policies to be considered?

Core element of the biodiversity policy is the implementation of the Habitats and Birds Directives – both are key legal instruments dedicated to habitat and species conservation

⁴ For more information, see: <http://biodiversity.eionet.europa.eu/article17/habitatsreport>

⁵ For further information on economic advantages of investing in nature, see TEEB (The Economics of Ecosystems and Biodiversity) reporting on <http://www.teebweb.org/>.

at EU level. The overall aim of the **Habitats Directive**⁶ is to promote the maintenance of biodiversity, taking account of economic, social, cultural and regional requirements. The main objective of the Directive is to achieve a favourable conservation status of over 1.000 animals and plant species and over 200 so called "habitat types" (e.g. special types of floodplain forests, wet meadows, wetlands, etc.), which are of particular European importance.

The **Birds Directive**⁷ ensures far-reaching protection for all of Europe's wild birds, identifying 194 species and sub-species among them as particularly threatened and in need of special conservation measures – amongst them are a substantial number of floodplain, coastal or wetland breeding or staging birds.

Member States are required to designate areas which are critical for the survival of the targeted species and habitats under both directives, amongst them a number of rare or threatened floodplain and wetland species. **These areas together form the EU Natura 2000 network.**

Member States need to take appropriate conservation measures to maintain and restore the habitats and species to a favourable conservation status. They must also avoid damaging activities that could significantly disturb these species or deteriorate the protected Natura 2000 sites. Special procedures laid down in Article 6 of the Habitats Directive have to be followed when planning new developments that might affect Natura 2000 sites. To assist the Member States in the understanding and correct application of the Habitats Directive, the Commission has produced a number of general interpretative and methodological guidance documents⁸. Investing in protection and restoration of floodplain, marshland and wetland ecosystems – and therefore protecting the habitats and species populating them – is a direct investment in flood prevention.

Protected areas falling under the Habitats Directive and Birds Directive have a special status under the WFD and the Floods Directive. They need to be included in the flood risk maps and nature protection must be taken into account in the flood risk management plans.

1.5. Which are the synergies with other key EU policy areas?

1.5.1. Soil management

According to the Floods Directive the flood risk management plans shall also take into account soil management. Urban and rural **soils are important** for flood mitigation: Well structured soil can act like a sponge, thus reducing the consequences of the heavy rainfalls and consequent flooding. Changes in rainfall patterns will tend to increase erosion of vulnerable soils and increase the rain of flooding. Soil organic matter is an important soil stabilizer. It keeps the soil structure in shape - physically and via its positive influence on soil organisms, like earthworms - allowing rainfall to percolate

⁶ Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. More information on the Habitats Directive on http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm.

⁷ Directive 2009/147/EC of 30 November 2009 on the conservation of wild birds. More information on the Birds Directive on http://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm.

⁸ These guidance documents can be downloaded from the Commission webpage: http://ec.europa.eu/environment/nature/natura2000/management/guidance_en.htm

rather than to become surface run off. The more structure and organic matter, the more can we rely on the water retention capacities of soil.

If we carefully consider soil organic matter to hold four times its weight in water, just an additional 1 % of it in could reasonably be expected to hold 150 tons of water, or cubic meters per hectare. A lot of water not contributing to river swelling and flooding!

Climate change will put further pressure on soil quality and will increase the risk of soil degradation and desertification in Europe that is already affecting the southern Member States and is expected to move gradually northwards. Soil organic matter (SOM) is the second biggest active carbon pool on the planet after the oceans. The soils in the EU alone store an amount of carbon which is roughly equivalent to almost 50 times our annual greenhouse gas emissions – an effective contribution to climate change mitigation.

1.5.2. Agriculture in floodplains

Landowners, or farmers, are important actors in flood risk management. Destroyed crops or soils, or polluted lands are some of the adverse consequences of floods that farmers may have to bear. However, floods also have an important natural function in restoring water balances and nutrients in farm land. Therefore, managing agricultural ecosystems to maximise the benefits of floods is important.

Landowners or farmers can also contribute to reducing flood risks by setting aside land permanently - or temporarily - to improve the storage of water.

The EU Common Agricultural Policy (CAP) can help preserving landscapes and foster agricultural uses that retain the capacity of the land to deal with floods and reduce their costs. The CAP also helps preventing the loss of agricultural land due to urban expansion that is often accompanied by soil sealing.

1.5.3. Forestry

The forestry sector is also important for flood risk management. Forests protect settlements and infrastructure as they prevent landslides, mudflows and avalanches. Forests play a key role in soil protection and water regulation, by preventing soil erosion and desertification as well as reducing the risks of floods. They limit the runoff and lower the wind speed at the same time as they enrich soils due to their coarse and fine roots contributing to increase stability.

Healthy, bio-diverse forests regulate water cycles playing a major role in the storage, purification and release of water to surface water bodies and underground aquifers. Forest soils buffer large quantities of water reducing flooding.

Forest management oriented to prevent flood risk is included in the national forest programmes, the main instrument used by Member States to manage forests. For example, 19% of forests are designated in Austria for this purpose.

At EU level the relevance of forests in relation to flood risk has been addressed in the EU Forest Strategy, in the Forest Action Plan and in the Commission Green Paper on "Forest

protection and information in the EU : Preparing forests for climate change",⁹ which underlines among the environmental functions of forests their ecosystem services such as soils protection and water regulation.

1.5.4. Environmental Impact Assessment/Strategic Impact Assessment (EIA/SEA)

The EIA and SEA Directives¹⁰ apply to flood risk management measures, and include the consideration of alternative solutions. As under article 4.7 of the Water Framework Directive, natural flood management can be a better environmental alternative which needs to be considered within the planning and assessment process.

2. WHY IS INTEGRATED FLOOD RISK MANAGEMENT OF FLOODS IMPORTANT?

2.1. Coordinating at the catchment level - a new approach

A hydrological catchment, also referred to as a drainage basin, river basin or watershed, is a unit of land in which all surface water is gathered into small watercourses and eventually into a single river channel at the outflow from the catchment. Catchments vary in size but all include an array of storage features including soils, wetland ecosystems, hollows and also a network of watercourses including ditches, streams and rivers.

Flood risk management requires coordination of a variety of actions, including planning of developments, land management, flood warning, community involvement and structures to reduce flood risk. Since actions that affect one part of a river or coastline can have consequences elsewhere, flood management measures are most effective when they are carried out in a coordinated way throughout a catchment and along a coastline.

Catchments are the ideal base for a flood management approach that examines the processes of runoff and storage and hence the causes of flooding. They are also a practical management unit for integrating agriculture, forestry, biodiversity protection, industry, housing and transport in a sustainable manner.

This is the reason why the River Basin Districts as identified under the Water Framework Directive are the units of management also for the Floods Directive¹¹.

The catchment management approach to flood risk management can offer real benefits to flood risk managers. It offers a framework where many plans can be brought together in a flexible way to manage current and future pressures. Importantly, it identifies new and relevant stakeholders and measures with a role to play in modern flood management. This greatly facilitates strategic planning in the context of climate change and provides a real opportunity for the integration and coordination of policy objectives.

⁹ COM(2010) 66 of 1.3.2010.

¹⁰ The Environmental Impact Assessment Directive 85/337/EEC as amended (a.k.a EIA), The Strategic Environmental Assessment Directive 2001/42/EC (a.k.a SEA).

¹¹ The Floods Directive also allows for smaller units to be identified (option used by Ireland and Italy), however the principle of using the catchment/river basin remains unchanged in those cases.

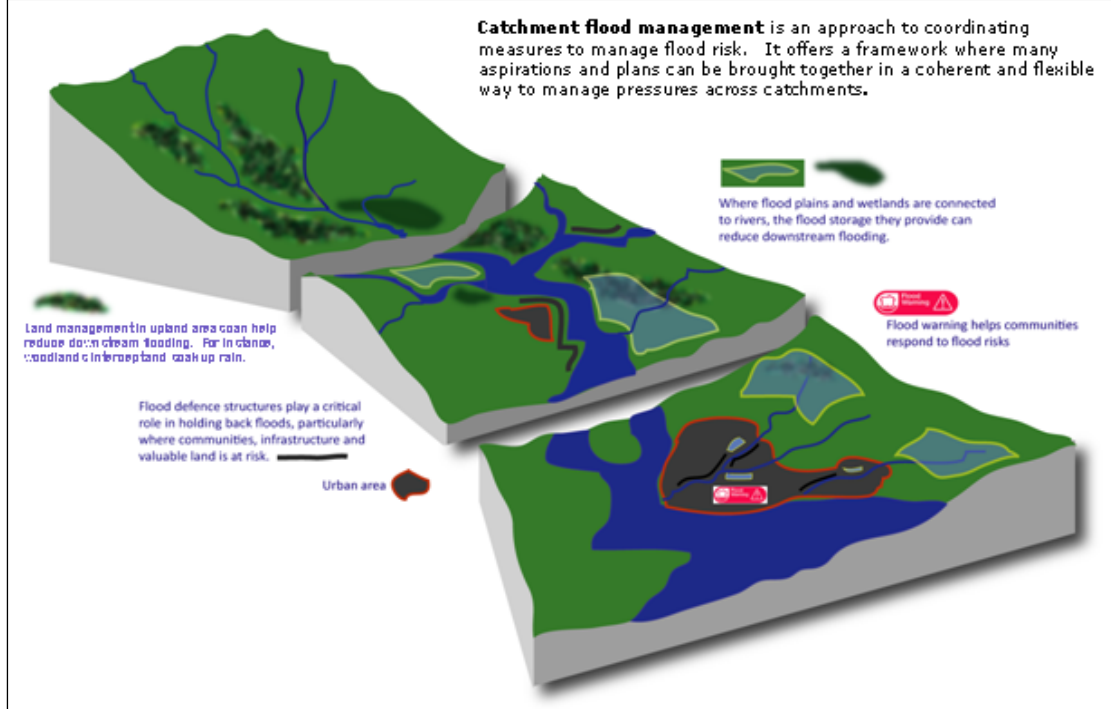


Figure 1 Catchment Flood Management (Image courtesy of S. Greig, Scottish Government)

River flooding may occur because of a combination of factors. By studying the flood processes within the catchment, these factors will be identified and measures can be taken to help alleviate the risk of and damage caused by the river flooding. Examples of measures that can be combined to reduce flood risk include development planning to avoid flood risk areas; building flood resilient properties and possible removal of properties at risk; better flood warning systems; soft and hard engineering in highly urbanised areas; natural flood management techniques such as the restoration of wetlands and meanders; and sustainable urban drainage schemes.

Cooperation between rural and urban areas and, in larger river basins, between neighbouring Member States can be developed and resources can be readily directed at the best combination of measures to reduce flood risk. The catchment approach is particularly suitable for climate change adaptation measures and water resources management plans, both strongly linked to economic, social and environmental sustainability.

2.2. What is natural flood management?

Traditionally, actions to manage flooding were dominated by local flood prevention “schemes” with concrete and other engineered defences that were developed by civil engineers with little regard to the character of the surrounding catchment and with limited engagement of other relevant stakeholders. Dams, dykes and weirs can have significant negative effects on water quality and quantity, as natural water flow is disrupted. Such man-made structures can have disadvantages also as regards vulnerability to other man-made or natural disasters, such as earthquakes. As our understanding of the interplay between rivers and the landscape around them has grown, other solutions become more important.

Working with nature and strengthening ecosystems and their services to reduce flooding is about restoring rivers natural ability to store or slow down flood waters. This can be achieved by Green Infrastructure restoring natural features and characteristics of catchments and coastlines, such as wetlands, floodplains, and upland forests.

For example, managed realignment is a process whereby sea walls are broken to allow land to become intertidal. This is now the preferred means for flood defence in many

landscape fragmentation, improve ecosystem resilience, adapt to climate change and promote integrated spatial planning.

Green infrastructure, such as marshes, floodplain forests and bogs, contribute to flood prevention. They also contribute to water storage and CO₂ intake. At the same time they provide space for species to react to changed climate conditions. Therefore, Green Infrastructure delivers multi-purpose benefits for climate change mitigation and adaptation, in addition to ensuring adequate protection of biodiversity and investments in natural capital, a *sine qua non* to sustain the functioning of ecosystems.

Green Infrastructure offers the tools for efficient, nature-based flood management. These are "better environmental options" in the sense of Article 4.7 of the Water Framework Directive as explained above.

Investing in floodplain ecosystems through multi-functional green infrastructure can also have economic benefits, through the provision of local jobs, investment and business opportunities. The case examples given in this document and the annex highlight these advantages, in addition to the environmental and flood prevention benefits.

3.2. Green infrastructure - strengthening ecosystems and their services

Building green infrastructure is also one of Europe's main contributions to reversing the trend of biodiversity loss by tackling habitat loss, degradation and fragmentation of Europe's territory, which are the biggest drivers of terrestrial biodiversity loss at EU level. Core areas for Green Infrastructure are within the Natura 2000 network, which protects ecosystems (such as rivers and floodplain forests, wet meadows and marshes) and covers around 20% of EU territory. For example, there are more than 3.000 Natura 2000 sites in the Danube river basin. Natura 2000 is not a system of strict nature reserves where all human activities are excluded. While the network also includes nature reserves, most of the land continues to be privately owned and the emphasis is on ensuring that management is sustainable, both ecologically and economically.

The connectivity of habitats and the provision of ecosystem services are linked. It is therefore important to ensure that the Natura 2000 network is spatially and functional coherent. Further benefits can be reaped from the development of and investment in green infrastructure outside the Natura 2000 network.

Europe's green infrastructure should serve the following purposes:

- Strengthening the functionality of ecosystems to deliver goods and services, such as water retention, as well as to mitigate and adapt to climate change effects, e. e.g. by buffering extreme flood events;
- Contributing to developing a greener and sustainable economy by investing in ecosystem services instead of merely technical solutions (e.g. using floodplain areas instead of only building dikes and mitigating adverse effects of transport and energy infrastructure);
- Combating biodiversity loss by increasing connectivity between core nature areas; increasing their ecological coherence and improving landscape

permeability (connecting rivers and their floodplains, restoring riparian areas, protecting small watercourses and favoring fish migration);

- Promoting integrated spatial planning by identifying multi-functional zones or by incorporating habitat restoration measures and other connectivity elements into various land-use plans and policies, such as natural flood risk management.

4. WHY IS INTEGRATED SPATIAL MANAGEMENT AND STAKEHOLDERS INVOLVEMENT IMPORTANT?

Integrated spatial planning has an important role to play in flood prevention through Green Infrastructure by enabling better land management, improving landscape coherence and helping to restore ecosystem functions. An integrated approach to spatial planning can increase landscape permeability and help establish multifunctional zones for flood prevention, while safeguarding Europe's biodiversity and its ecosystems' goods and services. In order to achieve these goals, it is necessary to bring together different policy sectors in an integrated and co-operative way, so that land-use priorities can be determined in a sustainable manner at a strategic level, over a sufficiently large geographical area (e.g. at municipal, regional or catchment level).

In practical terms, this means considering the impact on ecosystems and flood prevention of housing, energy and transport at all stages of the planning process.

Authorities and stakeholders at local or regional level should be engaged at the earliest possible stage in the planning process, particularly as they have a crucial role to play in its implementation. For the sake of coherence, these local and regional spatial planning strategies then need to be supported by an overall policy framework that sets clear objectives, targets and timetables.

The consultation of interested parties in the process of preparing Flood Risk Management Plans, will serve as a useful exercise to enable close coordination between the stakeholders involved in the implementation of the Natura 2000 network, the WFD and Floods Directive.

5. Climate change adaptation and Flood risk management

The 2007 4th IPCC Assessment Report concluded that flood patterns will change across the EU. Flood risk managers are already seeing signs of this which warrant taking climate change into account and adapting flood risk management policies.

In 2009 the European Commission issued a White Paper entitled "*Adapting to climate change: Towards a European framework for action*". The White paper highlighted the important role ecosystems and green infrastructure play in both climate regulation and in climate change adaptation. It suggested that "working with nature's capacity to absorb or control impacts in urban and rural areas can be a more efficient way of adapting than simply focusing on physical infrastructure." Resilient water ecosystems, such as green infrastructure, could play a crucial role in adaptation. The White paper also called for climate change to be taken into account both in the implementation of the Floods Directive and the Water Framework Directive.

The first follow-up action to this White paper was the *"River Basin Management in A Changing Climate - a Guidance document"* adopted by EU Water Directors in 2009¹². The document gives guidance on how to address climate change throughout the implementation cycle of both Directives.

The assessment of flood risks and planning to reduce them in view of climate change impacts must be done in an uncertain context. It will be crucial to consider if the measures to be taken by 2015 are the best ones over the long term or will be superseded by the changing climate. In this context the flexibility of the measures is an important criterion. The Guidance document states that in recent years flood management policy has shifted from defensive action towards management of risk and enhancing societies' ability to live with floods via increased use of non-structural flood protection measures.

Spatial planning, including regulation of floodplain development and relocation, should consider more 'room for rivers' and this could have beneficial effects for both floods and water scarcity. Non-structural measures, which do not involve large structural components, are more flexible and sustainable than hard measures. Yet, the latter may be indispensable in certain circumstances. Technical flood protection measures are often necessary to handle the effects of rare major floods events. Water managers are thus faced with the challenge of designing a site-specific mix of both types of measures, which may be altered as necessary or are robust enough to face changing conditions.

6. COSTS AND BENEFITS OF GREEN INFRASTRUCTURE FOR FLOOD RISK MANAGEMENT

The costs of natural flood management measures need to be compared to "hard-engineering" activities, and more often than not natural flood management measures will be found less expensive as regards both investments and maintenance costs. The long term perspective is crucial when assessing such costs.

It is increasingly recognised that attempts to control rivers only through hard-engineering activities may be counterproductive and that natural water retention measures may offer the best return in terms of societal benefits from flood control to other ecosystem services (food or material production, water quality regulation, biodiversity protection, recreation). Most strategies and projects for water management, disaster prevention or climate change adaptation are likely to mix both approaches, but it is important to have a solid understanding of all the costs and benefits.

When flood risk reduction measures are selected, flood management authorities often carry out cost-benefit assessments or multi-criteria-analysis, in order to identify and prioritise the measures to be taken. It is well recognised that measures to consider include those that have multiple benefits not just in terms of flood protection, but also for nature, water quality and the amenity values, that is natural or physical characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes.

¹²http://circa.europa.eu/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents/management_finalpdf/_EN_1.0_&a=d

The European Commission is currently undertaking studies to gather further information about the costs and benefits of natural flood retention measures – a lot of evidence is already available due to the TEEB studies.

EU-financed projects have shown that by restoring the river habitats through re-vegetation and the reconnection of the river gallery habitats, river regulation functions – such as runoff, drainage, discharge, retention and storage – were improved. Thus the overall health of rivers can be improved, to be more resilient to future disturbances and better able to cope with change and to support biodiversity.

The economic value of the restored services is often greater than the financial resources spent on the restoration actions. Restoring a floodplain for habitats and species (increasing the floodplain water retention) often represents a cost saving when taking into account damages due to flooding. For example, while lower Danube flood-risk mitigation costed around €180 million, damage for €400 million were caused by flooding in 2005 alone.

7. EU FUNDING FOR FLOOD RISK MANAGEMENT AND IMPROVEMENT OF FLOODPLAIN ECOSYSTEM SERVICES

7.1 Cohesion and solidarity (DG REGIO and DG EMPL)

Regarding European funding for natural disaster prevention programmes, **Cohesion Policy** (Cohesion Fund, European Regional Development Fund and European Social Fund) is available to assist the Member States and regions in improving the prevention of natural disasters. In the 2007-2013 programming period of Cohesion Policy about €5.8 billion are planned to be spent on 'risk prevention'.

Furthermore, Cohesion Policy provides significant support to cross-border, transnational and interregional cooperation projects regarding natural disaster prevention which is a priority of the 'European Territorial Cooperation' (ETC) objective, the former INTERREG programmes. The cross-border and transnational programmes provide an ideal basis for joint assessment and management of flood risk, across borders. Prevention of natural risks is also a priority in the macro-regional strategies: the Baltic Sea Strategy and, especially for flood prevention, the latest 'Danube Strategy' just approved in December 2010.

On the basis of the principle of 'shared management' of Cohesion Policy, Member States prepare development strategies with operational programmes and agree on them with the European Commission. Member States are responsible for budget allocation for the different measures, and for managing and implementing the operational programmes. Therefore, it is up to the Member State to decide how much money can be spent on specific measures on 'risk prevention' such as natural flood management, and projects are selected and implemented by competent national, regional and local authorities.

EU Solidarity Fund resources up to 1 billion EUR per year are available for recovery from major natural disasters depending on the level of the damage incurred in EU Memberstate and countries negotiating accession to the EU. Member States and countries negotiating accession to the EU can apply for financial assistance within 10 weeks after the damaging event has occurred.

Example: Polish State Forests have been granted approximately 50 mio EUR from the Cohesion Fund in the period of 2007-2013 to finance two projects for water retention (one in the mountain region and another one in the lowlands). These projects provide a viable alternative to engineering solutions such as big water reservoirs or levees. In addition to flood control, they offer other important ecosystem services such as improving water supplies to local communities and agriculture, soil protection and increasing biodiversity of forest ecosystems. This initiative will be implemented across several Natura 2000 sites.

7.2 Rural Development (DG AGRI)

Agriculture and forestry play a key role in producing public goods, notably environmental such as landscapes, farmland biodiversity, climate stability and greater resilience to natural disasters such as flooding, drought and fire. At the same time, many farming practices have the potential to put pressure on the environment, leading to soil depletion, water shortages and pollution, and loss of wildlife habitats and biodiversity.¹³

The measure "*Restoring agricultural production potential and introducing prevention actions*" of the Rural Development Regulation can support restorative and preventive measures against natural disasters which contribute to agricultural competitiveness. For the period 2007-2013, the financial allocation for the implementation of this measure from the European Agricultural Fund for Rural Development (EAFRD) is some €403 million.. Member States are responsible for the selection, contracting and payment of projects. Another rural development measure which can be used for the purpose of financing infrastructure related to water management, after fulfilling the necessary eligibility conditions, concerns "*Improving and developing infrastructure related to the development and adaptation of agriculture and forestry*"¹⁴. The allocation from the EAFRD for this measure for the period 2007-2013 is €5.1 billion.

7.3 LIFE

LIFE is the EU's financial instrument supporting environmental and nature conservation projects throughout the EU, as well as in some candidate, acceding and neighbouring countries. Since 1992, LIFE has co-financed some 3.115 projects, contributing approximately €2 billion to the protection of the environment. All LIFE strands can be used to co-finance projects on flood prevention, depending on their main objective:

- LIFE+ Nature and Biodiversity supports projects that contribute to the implementation of the EU's Birds and Habitats Directives, and that contribute to the EU's goal of halting the loss of biodiversity, e.g. in floodplains or coastal areas. The maximum co-financing rate is 75 percent, but usually it is 50 percent.
- LIFE+ Environment Policy and Governance supports technological projects that offer significant environmental benefits, for example process or efficiency improvements in flood prevention. This part of LIFE+ also helps projects that improve the

¹³ COM(2010)672 final of 18.11.2010 " THE CAP towards 2020 : Meeting food, natural resources and territorial challenges of the future, section 3.2.

¹⁴ Council Regulation (EC) No 1698/2005 of 20 September 2005 on support for rural development by the European Agricultural fund for Rural Development (EAFRD), Art.30

implementation of EU environmental legislation, that build the environmental policy knowledge base, and that develop environmental information sources through monitoring. Projects can be co-financed up to a level of 50 percent.

- LIFE+ Information and Communication co-finances up to 50 percent projects that spread information about environmental issues, such as flood prevention, climate change and conservation.

The LIFE-Nature program component explicitly allows the acquisition of land to secure its long term dedication to nature conservation purposes, and in particular for Natura 2000. This mechanism has been used in a substantial number of projects all over the EU to combine **nature conservation** and **flood protection**, for example by taking private agricultural floodplain land out of intensive farm use, and thus initiating large-scale groundwork that improve the local floodwater retention capacity (re-meandering of river, relocation of floodplains further inland). Due to the costs associated with earthworks and land acquisition, such projects tend to be rather expensive on average. However, this is justified by the long-term sustainability of the project investments, both in terms of biodiversity conservation and for flood protection (win-win).

On smaller scale, both under LIFE-Nature and LIFE-Environment, a number of projects have demonstrated the feasibility of various land management techniques, either for improving floodwater retention or to reduce the negative impact of flooding.

EU LIFE funding has contributed to large number of projects conserving freshwater ecosystems, which apart from nature conservation have the indirect effect of reducing flood risk. Some of these projects have been implemented in Natura 2000 sites (e.g. flood prevention by grassland protection in Belgium or restoration and management of the alluvial flood plain of the River Danube).

In the flood management programme along the Tisza River in Hungary covering the construction of six reservoirs and the relocation of some dikes, the need to protect ecologically valuable areas, in particular Natura 2000 sites, has been considered in the planning phase. The project, aimed primarily at reducing flooding risks, will bring additional benefits such as storage of water for irrigation and protecting biodiversity thanks to the restoration of wetlands.

For more information, please also consult the slide show and annexes to this note 1) a slide show; 2) a limited set of relevant background documents; 3) an annex with examples of best practices and information for further guidance.

More information is available on Europa webpage :

- Water and floods policies : http://ec.europa.eu/environment/water/index_en.htm
- Green infrastructure : http://ec.europa.eu/environment/nature/ecosystems/green_infrastructure.htm
- Nature and biodiversity : http://ec.europa.eu/environment/nature/index_en.htm
- LIFE: <http://ec.europa.eu/environment/life/index.htm>