



COMMISSION OF THE EUROPEAN COMMUNITIES

Brussels, 18.01.2006
SEC(2006) 66

COMMISSION STAFF WORKING DOCUMENT

Annex to the

Proposal for a

DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

on the assessment and management of floods

Impact Assessment

{COM(2006) 15 final}

TABEL OF CONTENTS

1.	Executive summary	3
2.	Procedural issues and consultation of interested parties	4
2.1.	Introduction	4
2.2.	Organisation and timing	4
2.3.	Consultation and expertise	4
3.	Problem definition.....	6
3.1.	What is the issue/problem that may require action?	6
3.2.	What are the underlying drivers of the problem?.....	7
3.3.	Who is affected, in what ways and, to what extent?	9
3.4.	How would the problem evolve, all things being equal?	10
3.5.	.Does the EU have the right to act?.....	11
4.	Objectives.....	13
4.1.	Introduction.....	13
4.2.	Objectives of the Flood Action Programme.....	13
5.	Policy options.....	15
5.1.	What is the basic approach to reach the objective?.....	15
5.2.	Which policy options have been rejected at an early stage?	16
5.3.	Which policy options have been considered?	17
6.	Analysis of impacts	20
6.1.	What are the likely impacts of Option A?.....	20
6.2.	What are the likely impacts of Option B?	21
7.	Comparing the options	24
7.1.	Summary and evaluation of the options	24
7.2.	What is the preferred option and why?	25
8.	Monitoring and evaluation	27
8.1.	How will the policy be implemented?	27
8.2.	How will the policy be monitored and reviewed?	27
8.3.	What are the arrangements for ex post evaluation of the policy?	27
	Annex 1: Stakeholders invited for the consultation process	29

1. EXECUTIVE SUMMARY

Floods cause considerable loss of life and the displacement of large numbers of people. They also cause enormous damage to infrastructure, to private and business property, and to the environment. As for future trends, two elements point to an increase of risk in Europe, firstly as a result of climate change and secondly due to more residential areas and economic assets being located in flood risk zones.

The numbers of citizens and assets at risk from flooding could be enormous. Preventive action would not only drastically limit the impacts on human health and the environment, but in particular create considerable economic benefits. Along the Rhine more than 10 million people live in areas at risk of extreme floods, with a flood damage potential of about €165 billion; compared to this figures, total costs for the Rhine Flood Defence Action Plan (1998-2020) are estimated at €12.3 billion. For the Oder river basin, shared between Poland, the Czech Republic and Germany, total costs for the Oder Basin Flood Action Programme (2004-2029) are calculated at €3.6 billion; a sum equal to the direct damage that occurred during one single flood disaster in 1997.

The preparation of this proposal was subject to intensive discussion and consultation during 2004 and 2005, in particular pursuant to the 2004 Commission Communication¹. The main forms of consultation were the regular meetings of EU Water Directors and a specifically created Stakeholder Consultation Forum consisting of Member States and other countries (Romania, Bulgaria, Norway, Switzerland), and relevant stakeholders and non-governmental organisations. Furthermore, there was intensive cooperation with the research community and in ongoing projects under Community research programmes.

As a first step, the Commission considered several options, from the “no policy” option to a prescriptive legislative instrument (detailed directive or regulation), as well as combinations of several options. The “no policy” option was not pursued further, as economic figures clearly show that for a number of regions the costs of developing and implementing flood risk management plans are in areas where risks are distinctly lower than the benefits of preventing and reducing future damage. Two options were considered more closely, namely a strictly voluntary approach using a Communication with non-binding recommendations (Option A), and a combination of cooperation with a flexible legislative instrument (Option B).

It was clear from the assessment of impacts that the most cost effective and appropriate regulatory level was Option B (a ‘package’ approach of voluntary and cooperation measures linked to and underpinned by a flexible legislative instrument). It would establish the principles of flood risk management, allow for prioritisation and leave flexibility to Member States in defining their desirable level of protection, the necessary measures and the time schedules for implementing them. Existing preparatory, planning and operational measures would be fully integrated, including the relevant transboundary cooperation, and a range of Community funding instruments and research would underpin implementation.

¹ COM(2004)472final of 12.07.2004

2. PROCEDURAL ISSUES AND CONSULTATION OF INTERESTED PARTIES

2.1. Introduction

This impact assessment has been prepared by the Commission to provide information on the problem that the EU Flood Action Programme (aiming at prevention, protection, preparedness, emergency response, and recovery and review) is designed to tackle, the options that were considered, and their impacts. It takes into account information provided through broad stakeholder consultation as part of the development of the EU Flood Action Programme.

2.2. Organisation and timing

After the devastating floods along the Danube and Elbe rivers in Central Europe and in Southern France in summer 2002, a number of Member States brought flood prevention and protection to the attention of the Council of Environment Ministers. The Council welcomed enhanced cooperation and was favourable towards a long-term strategy for flood prevention at European level.

In summer 2004, the Commission presented a Communication on Flood risk management, flood prevention, protection and mitigation (COM(2004)472). The Communication proposed to develop and implement a concerted EU Action Programme on flood risk management because flood events have the potential to undermine the EU's drive towards sustainable development, and because flood risks are increasing. Member States and Commission would work together to develop and implement a coordinated flood prevention, protection and mitigation action programme.

In October 2004 the Council adopted conclusions on flood risk management and agreed that, on the basis of the above Communication, the Commission and Member States, in consultation with other stakeholders, should develop and prepare a concerted European action programme. The Council invited the Commission to submit an appropriate proposal preferably before mid 2005.

2.3. Consultation and expertise

The Impact Assessment builds on external studies carried out by consultants²³ and information received from the Member States, candidate countries, EFTA countries and the wider group of stakeholders. Stakeholder meetings were held on 21 January, 11 April and 16 September 2005. From this wider stakeholder group a core group was identified to work on the development of the action programme. Regular exchanges also took place within the context of the informal structure established to oversee the implementation of the Water Framework Directive. This framework brings together the same extensive range of interested parties (see Annex 1 for a more extensive presentation of those included in the consultation process).

² *International Office for Water* (Paris) and *Ecologic* (Berlin), *Evaluation of the impacts of floods and associated protection policies*, June 2005

³ WRc plc, *Impacts of coastal flooding, flood mapping and planning*, November 2005

Building on the results of previous discussions, there was a final consultation with stakeholders in the form of an internet consultation which was open between 20 July and 14 September 2005 (http://europa.eu.int/comm/environment/water/flood_risk/consult.htm).

What were the results of the consultation?

One of the issues identified during the stakeholder consultation process was the need to start with a preliminary risk assessment in order to apply a risk-based approach and to identify those river basins and/or sub-basins where no further action has to be taken because there is no potential significant flood risks. This would allow for targeted action in 'risk' areas whilst avoiding action in 'no significant risk' areas. Secondly, the majority of Member States underlined the need for a flexible approach which:

- i. recognised the diversity of natural conditions across Europe;
- ii. was based - for inland waters - on an integrated approach to be applied within each river basin;
- iii. took account of existing actions at national and international level and avoided duplication;
- iv. was very closely co-ordinated with the implementation of the Water Framework Directive;
- v. was based on a step-wise approach to the elaboration of flood-risk maps, and the development and implementation of flood management programmes.

A total of 261 replies to the internet consultation were received: 59.8% of them from organisations and institutions (including Member States), and the other 40.2% from individuals. The replies were from EU Member States and Candidate Countries, half of them from Germany, Romania and the United Kingdom. A detailed account of the results can be found at: http://europa.eu.int/comm/environment/water/flood_risk/consult.htm

The main conclusion that can be drawn from this consultation is that an overwhelming majority of respondents either completely agree or largely agree with the idea that the EU Flood Action Programme should include a legal instrument imposing an obligation to pursue an integrated and co-ordinated approach based on the principle of solidarity and shared responsibility.

3. PROBLEM DEFINITION

3.1. What is the issue/problem that may require action?

In the period 1998–2002 floods comprised 43 % of all disaster events in Europe.⁴ During this period, Europe suffered about 100 major damaging floods, causing some 700 fatalities, the displacement of about half a million people, and at least €25 billion in insured economic losses.

The assets at risk from flooding can be enormous. For example, more than 10 million people live in the areas at risk of extreme floods along the Rhine, and the potential damage from floods amounts to €165 billion. Coastal areas are also at risk from flooding. The European Union's coastline extends for some 101,000 km across 20 of 25 Member States. Over the past 50 years the population living in European coastal municipalities has more than doubled to reach 70 million inhabitants in 2001. The total value of economic assets located within 500 metres of the European coastline, was estimated at between €500 and 1,000 billion⁵ in 2000.

In addition to direct damage caused by floods, floods may give rise to indirect damages such as clean-up costs, loss of clients and markets and loss due to disruption of production, which may even lead to the closure of businesses or SMEs. For example, as a result of the floods in Carlisle (UK) at the start of January 2005, jobs were lost and some businesses will not reopen.⁶

Floods may also have severe environmental consequences, for example when waste water treatment plants are inundated or when factories holding large quantities of toxic chemicals are affected. Floods may also destroy wetland areas and reduce biodiversity. In January 2000 a tailings dam failed in Baia Mare, Romania, because of heavy rain and melting snow. It resulted in the release of 100,000 m³ of cyanide-contaminated liquid into the Lapus stream, a tributary of the Somes/Szamos, Tisza/Theiss, and Danube Rivers, killing tonnes of fish in these rivers and poisoning the drinking water of more than 2 million people in Hungary.

There is also growing awareness of the significance of river flooding on human health, both physical and psychological. There may be substantial health implications when floodwaters carry pollutants, or are mixed with contaminated water from drains and agricultural land.

Floods already constitute a significant risk to human health, economic activity and the environment in Europe. However, two trends suggest that these risks will increase in the future. Firstly, the magnitude and frequency of floods are likely to increase as a result of climate change⁷ (higher intensity of rainfall and rising sea levels). Secondly, there has been a marked rise in the vulnerability due to the increase in the number of people and economic assets located in flood risk zones.

⁴ European Environmental Agency, Mapping the impacts of recent natural disasters and technological accidents in Europe, Environmental issue report no. 35, 2003

⁵ EUrosion: <http://www.euroasion.org>

⁶ http://www.bbc.co.uk/cumbria/weather/floods_january_2005/business_floods_jan05_index.shtml

⁷ IPCC (2001): Climate Change: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change. Edited by J.T. Houghton et al.

The Coastal Zone Management Subgroup of the Intergovernmental Panel on Climate Change (IPCC) has estimated that in Poland, a one-metre rise in sea level (by the year 2100) would increase by a factor of 10 the annual risk of flooding in the highly productive deltaic areas, and would triple the rate of coastal erosion⁸. Without further protection, the one metre rise would cause an annual inundation of 1,500 km² of agricultural land with a value of € 2.5 billion, as well as highly valuable historic, cultural and industrial centres.

The Foresight Future Flooding project⁹ produced a long-term (30 - 100 years) vision for the future of flood and coastal defences in the whole of the UK. Scenarios were used to deal with the uncertainties of the future and embodied different socio-economic visions of the UK, and different levels of climate change. The project found that over the next 100 years, if current levels of expenditure and approaches to flood management remain unchanged:

- River and coastal flood risk could increase between two and 20 times;
- Risk of flooding from rainfall could increase between three and six times;
- Annual economic damage could increase from € 1.5 billion to between € 2.2 billion and € 31 billion by the 2080s, depending on the scenario. This compares with growth of GDP of between two and 14 times over the same period; and
- The number of people at high risk of river and coastal flooding could increase from 1.6 million today, to between 2.3 and 3.6 million by the 2080s.

An example of a marked increase in the number of people and economic assets located in flood risk zones is the flood event that occurred in Paris in 1910. The damage at that time was 400 million francs which would correspond now to 1 billion euros and about 200,000 persons were affected. The same event would result nowadays in a damage of 8 to 9 billion euros and 500,000 persons affected¹⁰.

Consequently, flood events have the potential to undermine the EU's drive towards sustainable development and a competitive economy.

3.2. What are the underlying drivers of the problem?

Floods are natural phenomena which cannot be prevented. Various mechanisms may cause flooding, and a range of factors affect the occurrence and severity of a flood event.

River floods may occur whenever the capacity of the natural or man-made drainage system is unable to cope with the volume of water generated by rainfall or when flood defences fail. Rivers do not recognise political or administrative borders. Experience has shown that local flood protection measures taken in one place will have a knock-on effect for upstream/downstream areas. For example, if one area implements engineering solutions to evacuate the water from its stretch of the river as quickly as possible, this simply means that the water reaches its downstream neighbours faster. It is therefore imperative that flood protection is dealt with in a concerted and co-ordinated manner along the whole length of the river.

⁸ WRc plc, Impacts of coastal flooding, flood mapping and planning, November 2005

⁹ http://www.foresight.gov.uk/previous_projects/flood_and_coastal_defence/index.html

¹⁰ http://aquadoc.oieau.fr/france/spip/article.php3?id_article=184

River floods vary considerably in size and duration. In the case of large rivers such as the Danube, the Rhine and the Elbe, floods can occur a considerable time after the rainfall and last for days, weeks, or even months. On the other hand, flash floods are usually due to highly localised, very intensive rainfall. Flash floods can cause widespread destruction, especially if they occur at the same time as other natural events such as landslides/mudslides. Flash floods are fairly common in the Mediterranean and in mountain areas; they are a particular danger to people since they happen suddenly and with little warning.

Flooding of coastal areas can result from storms at sea with winds pushing high tides onto the land. In many areas, susceptibility to floods has increased due to coastal erosion. If marine storms coincide with high waters in river estuaries then there is the potential for extensive damage.

The root causes of floods (rainfall and sea levels) are natural phenomena and essentially uncontrollable. However, whether or not a given rainfall event, storm or high tide, results in flood damage is very much influenced by human actions such as: clearing of forests in the upper catchment area, straightening of rivers and suppression of natural flood plains, inadequate drainage and, most importantly, extensive building in areas at high risk of flooding. These human activities take place partly because of insufficient awareness of the flood risks in river basins and along coastal areas.

If no flooding occurs for a long time the awareness of flood risks decreases. As a result the priority for maintaining flood defence structures or emergency plans is likely to diminish as well. For example, a recent survey in France showed that the areas where awareness of flood risk is lowest are Paris and its surroundings, and the western part of the country. Yet, these two regions are considered to be at risk of flooding as demonstrated by the catastrophic floods of the Seine and the Loire in 1910 and 1856. However, as no severe flood events have occurred for nearly 100 years the sensitivity to and awareness of flooding in these regions has steadily declined.¹¹

Directly after a flood there is a strong demand by the public for quick action. This demand often results in ad hoc short-term measures which do not take full account of other concerns (water quality, agriculture, transport, physical planning, etc.) or future developments (e.g. climate change). Flood-related measures can negatively affect other local objectives (e.g. environmental) or other upstream or downstream regions.

Against this background, flood problems are often solved in too narrow a perspective, e.g. by taking only protection measures or only emergency response measures and by acting only at the level of each single Member State. But the way to manage flood risk efficiently and effectively is to take a coordinated, long-term and integrated approach. This would address the whole risk management cycle so as to prevent future damage (e.g. not building in flood-prone areas), to protect against floods (e.g. defence structures and creating more space for rivers), to prepare for a flood (e.g. flood forecasting, informing the public), and to plan for emergency response (e.g. emergency plans, including evacuation) and recovery and review.

¹¹ Evaluation of the impact of floods and associated protection policies, April 2005, Ecologic

3.3. Who is affected, in what ways and, to what extent?

In principle all users and inhabitants of river basins, and those living in coastal areas and areas at risk of flash floods will suffer if flood measures are ineffective. They can be affected in various ways:

- damage to human health, and casualties;
- damage to the environment, making it less healthy/attractive or even dangerous to live in;
- damage to economic assets (private property as well as infrastructure), both direct (caused by the flood itself) and indirect (e.g. disruption of economic activities due to destruction of buildings or infrastructure).

Flooding can have significant effects on human health, both physical and psychological. Substantial health implications can occur for example when floodwaters carry pollutants, or are mixed with contaminated water from drains and farmland. Exposure to floodwater may result in a number of illnesses, including gastroenteritis, leptospirosis, hepatitis A, irritation of the skin and eyes, and asthma attacks.¹² There will be mental health consequences as well, since the greatest impacts occur as a result of the psychological distress experienced during flooding and in its aftermath.¹³ In addition to the considerable stress of extensive damage, the threat of repeated floods, sometimes coupled with possible withdrawal of insurance cover, can make properties impossible to sell.

In Section 2.1 the consequences of floods are described for the river Rhine and along the European coasts. Let us consider the example of the Loire river basin, where there are currently around 300 000 inhabitants, 14 000 companies, 1 500 farms, 4 100 power plants and 1 550 public properties in an area that would be affected by a once-in-a-thousand-years flood. The damages that would be caused by such a flood are estimated at €6 billions.¹⁴ In England and Wales, the average annual damage caused by river and coastal flooding is estimated at just over € 1.5 billion¹⁵.

In terms of the economic damage caused by floods, companies and especially SMEs may not recover because all their capital has been destroyed. Some SMEs need weeks to become operational again so customers may go to other suppliers. The SMEs which drive Europe's prosperity are particularly vulnerable to floods.

The impact of floods on the environment can be positive or negative. About 2000 Natura 2000 sites are in areas at risk of (coastal) flooding. For certain species and habitats it is essential that an area is flooded regularly with clean water. However, wetland areas can be destroyed and biodiversity reduced in cases where industrial sites have been flooded and floodwaters carry pollutants. In addition, the way flood risks are managed affects the

¹² http://www.bbc.co.uk/cumbria/content/articles/2005/01/10/flood_health_advice_01_feature.shtml

¹³ Shakoor Hajat et al. (2003), The human health consequences of flooding in Europe and the implications for public health: a review of the evidence, Applied Environmental Science and Public Health 2003, Vol. 1, no. 1, p. 13–21

¹⁴ International Workshop 'Precautionary Flood Protection in Europe', 5 – 6 February 2003, Bonn

¹⁵ DEFRA (Flood Management Division), National Assessment of Defence Needs and Costs for flood and coastal erosion management (NADNAC), Summary report, June 2004

environment as well. By building structural flood defences close to a river or along the coast, the natural balance of transport of water and sediment may be disturbed in such a way that the functioning of the ecosystem is disrupted. On the other hand, non-structural measures for mitigating the effects of floods, such as the use of flood plains and wetlands (creating space for the river), may greatly enhance biodiversity.

3.4. How would the problem evolve, all things being equal?

At present a number of EU instruments partially address/contribute to the management of flood risk, viz.:

- By adopting the Water Framework Directive (WFD)¹⁶ the EU has thoroughly restructured its water protection policy, but although this Directive will contribute to mitigating the effects of floods, this is not one of its principal objectives.
- The Community Civil Protection Mechanism¹⁷ has been developed to facilitate the mobilisation of support and assistance from Member States in the event of major emergencies, including floods. However, while civil protection can provide adequate response to affected populations, it can not address the root causes of floods or prevent damage from happening.
- The European Commission has been supporting research on floods since the early 1980s through its successive Framework Programmes for research and technological development. European research has been successful in improving our understanding of floods and their consequences, as well as our capacity to estimate the likelihood and extent of floods in given areas. By promoting the integration of advanced Information and Communication Technologies, Community research has led to the development of tools and technologies for improved flood forecasting, interoperability of data and systems, digital mapping and better decision support systems for flood risk management and scenario analysis. As mentioned in the Communication of July 2004, there is a clear need to continue research into flood risk management, but instead of considering it in isolation, it should be seen as part of an integrated and comprehensive approach to river basin management.
- Following the 2002 floods in central Europe, the EU created the European Union Solidarity Fund (EUSF) as a specific instrument for granting rapid financial assistance directly after a major disaster to help the affected areas to return to living conditions that are as normal as possible. The EUSF does not compensate for private losses or damage covered by insurance and is not meant for long-term action.

The new Cohesion Policy and Common Agricultural Policy/Rural Development include provisions for Member States to use funds for flood-related measures. Member States may define the type of flood measures themselves. At present there is no policy framework available to apply an integrated long-term approach at river basin level

In river basins such as the Rhine, Oder, Meuse, Danube, Saar, Moselle and Elbe, the countries bordering these rivers have established bodies – international river commissions – to strive for a co-ordinated approach to river basin management. The degree of cooperation between

¹⁶ OJ L 327/1 of 22.12.2000

¹⁷ http://europa.eu.int/comm/environment/civil/prote/cp01_en.htm

countries in a river basin and the priority given to flood protection varies between the river basins is usually a function of the time that has elapsed since the last flood. Member States have undertaken and continuing to undertake national measures to deal with floods. As the character of floods and the degree of flood risks vary throughout Europe, so does the approach to flood risks. Several Member States have defined levels of protection whilst in other Member States there are no statutory rights to a particular level of protection. The Communication of July 2004 describes more activities by the Member States.

In summary, at present there is no targeted, concerted and coordinated approach at EU level towards flood risk management, while the potential risk to human health and life, the environment and economic assets is considerable as pointed out in the sections above. If nothing is done to change the situation:

- dealing with floods may remain mainly disaster-driven – improving the response after floods occur rather than reducing the risk of damage;
- there is no incentive for an integrated approach across the river basin to reduce and manage flood risks in an effective and coherent manner based upon the principles of solidarity and shared responsibility. Member States can still pass on problems from one region to another;
- the potential damage caused by flood events is expected to increase, on the one hand because of climate change, and on the other hand because of houses and offices are built in flood-prone areas, e.g. close to the coast, without knowing the risk of flooding, so it costs more to protect them against flooding;
- the implementation of existing plans for dealing with floods may be postponed/delayed due to a decrease of awareness and sense of urgency over time.

3.5. Does the EU have the right to act?

By reducing and managing the risks to human health, the environment and/or economic activity associated with floods the EU Flood Action Programme will help pursue the objectives of Community policy on environment in accordance with Article 174 of the Treaty:

- preserving, protecting and improving the quality of the environment;
- protecting human health;
- prudent and rational utilisation of natural resources;
- promoting measures at international level to deal with regional or worldwide environmental problems.

Article 175(1) of the Treaty is considered to be the appropriate legal basis for the EU Flood Action Programme, in line with related legislation on risk prevention/reduction and river basin management, such as Directives 96/82/EC (Seveso II Directive) and 2000/60/EC (Water Framework Directive).

The objectives of the EU Flood Action Programme – reducing and managing the risk associated with floods to human health, the environment and/or economic activity – cannot be sufficiently achieved by the Member States acting alone for the following reasons:

- transnational aspects: rivers do not recognise administrative or political boundaries. 70% of all freshwaters in Europe are part of a transboundary river basin;
- lack of Community action would damage Member States' interests. While there are some agreements on cooperation between individual Member States, the kind of (major) disaster which this action programme addresses calls for the implementation of the solidarity principle, thus making best use of available resources.

4. OBJECTIVES

4.1. Introduction

The discussion in Section 2 highlights the following problems:

- The potential consequences of floods for human life and health, the environment and economic activity in Europe are significant.
- Two trends point to an increase of flood risk in Europe: the magnitude and frequency of floods are likely to increase in the future as a result of climate change and there has been a marked increase in the number of people and economic assets located in flood risk zones.
- Although floods are natural phenomena which cannot be prevented, human activities are increasing both the likelihood and adverse impacts of flood events.
- At present there is no targeted, concerted and coordinated approach at EU level towards flood risk management, although some EU instruments make a partial contribution to flood prevention, protection and mitigation.

One of the main reasons for the negative impact of human activities is insufficient awareness of flood risks. Secondly, flood problems are often solved unilaterally by focusing on one specific area of a river basin or coastal zone, and not taking into account other objectives.

4.2. Objectives of the Flood Action Programme

The overall policy objective of EU Flood Action Programme is to reduce and manage the risks to human health, the environment and/or economic activity associated with floods.

In particular the action programme could help to:

- **protect human lives and human health against the negative impacts of flood events:** prevention and protection measures will reduce the impact of floods (reducing water depths or flow velocity); preparedness measures such as improved flood-forecasting and public information systems in response to flood warnings will also reduce risks to human lives and health of flood events;
- **protect and improve the quality of the environment:** prevention and protection measures in areas with housing (fuel oil tanks) or industrial activities (storage of hazardous chemicals) will lead to less detrimental releases of such pollutants; prevention measures such as restoration of flood plains and wetlands may improve biodiversity and habitats; vegetation buffer zones between agricultural land and river will reduce runoffs of pollutants as well as reduce soil erosion.
- **reduce damage caused by floods:** prevention and protection measures will lead to less damage to infrastructure, public and private property including housing, commercial and industrial estates.

- **achieve EU objectives in relation to sustainable development and economic activities.** In addition to environmental benefits, adequate flood risk management measures will reduce damage to vital infrastructure as well as economic activities themselves, such as SMEs and larger industrial sites in flood-prone areas. This will lead to less disruption of activities in the case of a flood, with accompanying social benefits for employees and residents in the area concerned.

5. POLICY OPTIONS

5.1. What is the basic approach to reach the objective?

The approach is:

- to assess whether a specific policy framework would be needed to address the current risks associated with floods;
- if yes, to provide the framework within which flood risk management measures would be taken, and identify such measures.

In its Communication of July 2004, “Flood risk management: flood prevention, protection and mitigation”, the Commission accepted the need for the development and implementation of a co-ordinated EU Flood Action Programme to reduce and manage flood risks throughout Europe. This approach was supported by the Council conclusions of October 2004 and further elaborated during the stakeholder process.

To reduce the risks to human health, the environment and economic activity associated with floods, it is essential that flood risk be managed in an integrated way, either at river basin level or in coastal areas. In addition, it is essential that the approach towards floods shifts from flood defence to flood risk management. Flood risk management implies that flood risks will be managed well before, during and after a flood event. This may also include accepting certain risks in some cases because the costs of providing protection would be disproportionate to the benefits. In terms of what has to be done, this would include:

- a. determining those river basins and sub-basins where there is now – or could reasonably be expected in the future - significant potential flood risk to human health and life, the environment and economic activity. For these river basins and sub-basins further action has to be taken;
- b. developing and implementing flood risk maps as a tool for planning and communication;
- c. improving co-operation and coordination through the development and implementation of flood risk management plans for each river basin and coastal zone where human health, the environment, economic activities or the quality of life can be negatively affected by floods;
- d. improving information exchange, sharing of experiences and the co-ordinated development and promotion of best practices;
- e. developing stronger linkages between the research community and the authorities responsible for water management and flood protection;
- f. improving co-ordination between the relevant Community policies;
- g. increasing awareness of flood risks through wider stakeholder participation and more effective communication.

5.2. Which policy options have been rejected at an early stage?

The following policy options have been thoroughly examined but rejected at an early stage and will be explained below:

- no action;
- amending existing legislation;
- a detailed prescriptive legislative instrument.

No action

No action is understood to mean maintaining the present approach to flood risks (i.e. there would be no action in addition to the policy framework currently in place). This would mean doing nothing to plan or act in an integrated and strategic way. Individuals, locals and regional authorities and Member States could all continue to consider flood risk management, but with little or no co-operation across boundaries of land ownership, administrative responsibility or national borders.

Chapter 2 set out the current potential damage to human life and health, the environment and economic assets.

If no action is taken:

- measures adopted to manage flood risks could just pass on problems to upstream or downstream regions, using resources inefficiently and ineffectively;
- taking account, within integrated river basin management, of other objectives like improving water quality and ecological status under the Water Framework Directive would not take place;
- action would remain mainly disaster-driven instead of managing the risks before, during and after a flood, as there would not be an overall strategy;
- flood risks would tend to be forgotten and not taken into account while making plans in flood-prone areas, thus increasing the potential damage to human life and health, the environment and economic activity in the event of a flood.

Given the potential risks to human life, economic assets and the environment, doing nothing is not an affordable option. Europe's commitment to sustainable development could be severely compromised if we do not take appropriate measures.

Amend existing legislation

The only possible element of existing legislation with the potential to accommodate flood risk management would be the Water Framework Directive. However, this Directive is intended to achieve good environmental status in European waters, but does not enshrine operational objectives on flood risk management. . Therefore, while the implementation of the Water Framework Directive and a flood protection directive should be closely co-ordinated, it is not thought appropriate to amend the directive to include flood management.

Prescriptive legislative instrument

Consultation on, and development of, the EU Flood Action Programme has shown that the causes and impacts of floods vary throughout Europe. Conditions are diverse and require different specific solutions. This diversity should be taken into account in the definition of the objectives and the planning and execution of measures to ensure the reduction and management of flood risks. A detailed prescriptive legislative instrument imposing a “one-size fits all” approach would not take this diversity sufficiently into account. Moreover, it would be too costly, and would not provide the solution with the best cost-benefit ratio.

5.3. Which policy options have been considered?

Two main options have been considered and will be explained below:

- Option A: Strictly voluntary approach delivered through a Communication with non-binding recommendations;
- Option B: Combination of cooperation between Commission, Member States and other involved parties plus a flexible legislative instrument.

Both approaches are explained below. Their respective impacts are discussed in Section 5 and the differences between them are compared in Section 6.

Option A. Strictly voluntary approach in the form of a Communication with non-binding recommendations

The development and implementation of action programmes would be based on voluntary political commitment by Member States and international river commissions.

The Communication would set out the essential features of the action programme as described in the Communication of 2004 on flood risk management:

- setting out an overall vision for managing flood risks;
- describing why any approach to flood risk management needs to recognise differences in flood causes and situations throughout Europe;
- suggesting a river basin approach to managing flood risks;
- recommending the application of the whole cycle of flood risk management – prevention; protection; preparedness; emergency response; recovery and lessons learned;
- encouraging Member States to exchange information and experiences and developing and promoting best practices;
- inviting the research community and authorities responsible for water management and flood risk management to develop stronger linkages;
- explaining how the EU Flood Action Programme will interface with non-EU countries and with the international river commissions which already exist.

A close alternative to this option is to combine a Communication with a Recommendation outlining in greater detail the steps to be taken to implement the Flood Action Programme. However, as Recommendations have no binding force, this option would be identical to having a Communication only and so was not further examined.

Option B: Combination of cooperation between Commission, Member States and other involved parties plus a flexible legislative instrument

This option is a combination of flexible non-binding mechanisms and flexible legislative instruments on those issues where progress needs to be guaranteed.

Cooperation between Member States, facilitated by the Commission, would lead to:

- improved exchange of information, sharing of experiences and development and promotion of best practices between Member States and other stakeholders;
- the development of stronger linkages between the research community and the authorities responsible for water management and flood risk management;

In addition the Commission would improve the co-ordination between the relevant Community policies by developing a targeted approach to EU funding possibilities. Relevant funding instruments have been proposed as regulations within the Common Agricultural Policy and the Cohesion Policy.¹⁸

The legal instrument would be ambitious in its scope but not prescriptive in its tools. It would translate the approach of the Communication on Flood risk management of July 2004 and the discussions during the stakeholder consultation process into operational actions. It would include the following obligations:

1. **Preliminary flood risk assessment:** it is essential that action will only be taken in areas where significant flood risks exist or are reasonably foreseeable in the future. If in a particular river basin or sub-basin no potential significant flood risk exists or is reasonably foreseeable in the future, Member States would be able to identify them in the preliminary flood risk assessment. For these river basins and/or sub-basins no further action would have to be taken.
2. **Flood risk maps:** taking into account the possible exceptions provided for in the preliminary flood risk assessment, flood risks would be mapped for the river basins and sub-basins with significant potential risk of flooding, in order to:
 - increase public awareness;
 - support the process of prioritising, justifying and targeting investments and developing sustainable policies and strategies;
 - support flood risk management plans, spatial planning and emergency plans.

¹⁸ Proposals for Cohesion Policy Regulations 2007-2013 COM(2004)492final, COM(2004)494final, COM(2004)495final and COM(2004)496final of 14.7.2004; Regulation on Rural Development Fund adopted as Council Regulation (EC) No 1698/2005, OJ L277 of 21.10.2005

Where maps conforming to the requirements of the directive already exist for river basin districts or parts thereof, Member States may use these existing maps for the purposes of satisfying the directive.

3. **Flood risk management plans:** taking into account the possible exceptions provided for in the preliminary flood risk assessment, flood risk management plans would be developed and implemented at river basin/sub-basin level to reduce and manage the flood risk. These plans would include the analysis and assessment of flood risk, the definition of objectives and deadlines, and identification and implementation of sustainable measures applying the principle of solidarity: not passing on problems to upstream or downstream regions and preferably contributing to reduction of flood risks in upstream and downstream regions.

To take account of the diversity in flood events and impacts throughout Europe, the following issues would not be prescribed in a legal instrument, but would be left to the Member States:

- detailed objectives and deadlines for managing flood risks, e.g. setting a common level of protection which has to be achieved everywhere and within a certain time frame;
- accompanying measures.

Clearly the appropriate level of protection will vary from river basin to river basin and even within each river basin. For example, high levels of protection might be required in the vicinity of major cities, or near sites of particular cultural or historic significance. Within each river basin the Member States will determine the level of protection most appropriate for each locality.

As flood risks may change over time due to climate change and changes in land use, it would be important to regularly review and where necessary update the three elements of the legal instrument.

6. ANALYSIS OF IMPACTS

6.1. What are the likely impacts of Option A?

In general, Option A would stimulate more cooperation and coordination at river basin level in the short-term. However, it is not unlikely that in the medium and long term, cooperation and coordination would diminish and priorities would change and move away from flood risk management due to decreased awareness.

6.1.1. *Economic impacts*

Economic impacts in terms of extra investments in managing flood risks would be negligible as no binding measures would be imposed to implement the action programme.

Economic impacts in terms of potential flood damage to humans, the environment and economic assets would always depend on the approach and the actions taken by the Member States and the regions. Potential damages may be reduced in one region because of a preventive approach, but could prove to be less effective if the approach in a neighbouring region is focused more on protection. For example, if one region adopts engineering solutions to evacuate the water from its stretch of the river as quickly as possible, this simply means that the water reaches their downstream neighbours faster. Hence, because of the lack of an overall plan at river basin level it would not be possible to avoid that measures could be taken that have negative effects on upstream or downstream regions and this may well mean that limited resources are used in an inadequate way. Moreover, it would be very difficult to create continuous awareness of flood risks - except immediately after a flood event – which would result in further developments in flood prone areas and hence in a higher potential impact of floods in the medium and long term.

This option is expected to make no contribution to economic activities, trade and investment flows in the short term. In the medium and long term however, option A would not avoid that economic activities, trade and investment flows could be negatively affected if no adequate action is taken. Industries/SMEs may need to close down if buildings or infrastructure is destroyed.

6.1.2. *Social impacts*

Option A would not avoid a loss of jobs, e.g. in SMEs in the medium and long term, if floods are not properly managed and SMEs have to close because of flooding.

With future developments such as climate change, option A would not avoid public health and safety being negatively affected in the medium and long term as there is no need to manage flood risks at river basin level.

Members of the public may not understand why there is inadequate coordination between measures for flood risk management and measures for achieving good ecological status under WFD, although those measures affect the same river basins.

6.1.3. *Environmental impacts*

In the case of transboundary river basins Member States may come to different conclusions concerning diagnosis, approaches and measures, irrespective of the unity of the shared river system. Member States may take different and possibly even contradictory routes, without coordinating measures and deadlines, resulting in ineffective management of flood risks.

6.2. **What are the likely impacts of Option B?**

6.2.1. *Economic impacts*

The economic impacts of cooperation through the open method of coordination would be negligible as it includes no binding measures, and there are provisions governing of cooperation projects in the new Cohesion policy. Moreover, the development of flood risk maps and flood protection plans would be important tools to use in deciding on the priorities for EU funds to be used in flood protection programmes.

The flexible legislative instrument would have budgetary consequences for public authorities as they have to develop preliminary flood risk assessment, flood maps and flood risk management. In general terms, the costs arising from these obligations would depend on the size of the river basin districts.

The costs of preliminary flood risk assessment would depend on the information already available, as is the case for example in the Loire, Danube, Rhine or Oder basins. Furthermore, research by the European Commission Joint Research Centre will deliver, conveniently within the timeframes proposed, flood risk maps for all Member States at a scale of 1:1000000 and 1:250000 respectively. These will be available free of charge to Member States, thus further reducing administrative costs for Member States.

Flood maps and flood risk management plans would only have to be developed for those river basins or sub-basins where there are potential or reasonably predictable significant risks.

The costs of producing flood risk maps would depend on the decisions made by the Member States on scale, level of detail and presentation (paper, electronic, etc.). Maps for the whole of the Rhine cost around €270,000, and there was a lot of background information already available. For the Loire, costs are estimated at €3 million. In England and Wales advanced and multi-purpose flood maps are on the internet, available to each citizen by entering a post code, and the costs are estimated at €55 million, whole for Scotland cost is estimated at €2.4 million. Generally the average cost of producing flood risk maps can be estimated at between €100 and €350 per km² of river basin.

On the costs of implementing measures under flood risk management plans, there are already some examples from recent experience within the EU, namely:

- the total investment costs for the Rhine Flood Defence Action Plan (1998-2020) are estimated at €12.3 billion, i.e. about 7% of the potential damage (i.e. the value of assets in flood-prone areas). One of the objectives of the Flood Defence Action Plan is to reduce the potential flood damage by 25% by 2020, this translates into a reduction of over €40 billion;
- for the Oder River, shared between Poland, the Czech Republic and Germany, costs for full implementation of the Oder Basin Flood Action Programme are calculated at

€3.6 billion, with the choice of measures and the decision on the most cost-effective solution supported by research supplied by the European Commission Joint Research Centre. These full implementation costs are to be spread over more than 25 years and are equal to the direct damages incurred during one single flood disaster in 1997;¹⁹

- for the Vidourle river basin in France, where flash floods occur, the estimated costs for the implementation of a four-year action plan are almost €29 million, which is equivalent to approximately 4% of the estimated damage that occurred in the river basin in 2002;
- in the action plan for the Loire, total capital costs are calculated at €583 million, which is about 10% of the potential damage in a worst case scenario. The action plan will reduce potential damages by 10-15 %; which translates into a potential reduction in damage costs of around €600 to 900 million;
- in England and Wales the total investment costs for Catchment Flood Management Plans are approximately €30-35 million and for the Shoreline Management Plans approximately €8.25 million, whilst for England alone the capital value of assets at risk is estimated to be approximately €370 billion (at 2004 prices) and the average damages with the defences now in place at just over €1.5 billion per year.²⁰

The administrative costs of flood risk management plans depend on the objectives and measures defined by the Member States. Preparatory and operational steps towards flood risk management already available in a range of river basins and regions will reduce related costs, as will efforts by the European Commission's Joint Research Centre, in particular by comparing and modelling different scenarios and arriving at the solution with the best cost-benefit ratio.

Option B would have a positive impact on the competitive position of EU industry. EU industries would be less affected or disturbed by flood events, in terms both of frequency and impact. It would help to improve the conditions for investment and for the proper functioning of markets by reducing the likelihood and impact of flood events, so there would be less chance of disruption of production.

It would result in more cross-border investment flows because of the river basin approach. Member States could decide to invest in measures which are not on their territory but which are (also) advantageous for their rivers and/or coasts. A good example is one of the projects within the IRMA project ('INTERREG Rhine Meuse Activities'). An area between the German towns of Xanten and Wesel along the Rhine, called the Bislicher Insel, was turned into a retention area. As this measure would bring significant advantages downstream for the Netherlands as well, a part of the IRMA money awarded to the Netherlands was transferred to Germany and used to cover the costs.

Both elements of Option B would stimulate research and development, e.g. modelling at river basin level, and would result in more cost effective measures.

¹⁹ International Commission for the Protection of the Oder River, Action Programme Flood Protection in the Oder River Basin, Wroclaw 2004; <http://www.mkoo.pl/index.php?mid=1&aid=3>

²⁰ DEFRA (Flood Management Division), National Assessment of Defence Needs and Costs for flood and coastal erosion management (NADNAC), Summary report, June 2004

Co-ordination within river basins districts - including identification of river basins, river basin districts, and the competent authorities - will be the same as under the WFD. Hence, Option B would not entail establishing new public authorities or restructuring existing public authorities.

This option would have a generally positive impact on economic growth and employment, as less money would be spent on (expensive) recovery measures and more money on long-term, preventive, protection and preparedness measures. An example of the effectiveness of preventive measures is shown by the destructive floods which occurred in Switzerland in August 2005. In the Engelberger Aa region, flood protection measures were undertaken after the floods in 1987. It was calculated that investment in preventive measures of about €17 million avoided estimated losses of €64 million.

The Meuse floods of 1993 and 1995 show the benefits of being well prepared and well aware of the risks. Although the floods were similar, the damage to private property was considerably lower in 1995.²¹

6.2.2. *Social impacts*

Option B will decrease the likelihood of health risks related to flood events, e.g. psychological distress by reducing the likelihood and impact of floods. It would have a positive impact on the functioning of the labour market, as companies and industries are less affected or disturbed by flood events.

Producing flood risk maps will mean the public is better informed about flood risks, resulting in increased public awareness. There should be monetary benefits from this raised awareness since when people are aware of the risk they are likely to be more receptive to flood warnings and be “more inclined to protect themselves and their property (e.g. by simple flood proofing measures)”.²² This is borne out by the example of the Meuse in 1993 and 1995 mentioned in Section 5.1.1.

By establishing a close link between the WFD and the legislative instrument on Flood risk management and synchronizing the two processes from 2015, the activities under both pieces of legislation will be clearly communicated to the public. The public can get actively involved in the development and implementation of flood risk management plans.

6.2.3. *Environmental impacts*

Firstly, the negative consequences of flooding on the environment would be decreased. By mapping the areas at risk of flooding, Member States can prevent future activities that affect the environment (like waste water treatment plants, chemical industries, etc.) in flood prone areas or adapt those activities to the flood risks.

Secondly, the close links with the WFD ensure not only that flood-related measures will not have a negative effect on the ecological status of water bodies, but will indeed result in measures that contribute to the ecological status. Member States will be looking more for cost efficient measures that benefit both floods and WFD.

²¹ Evaluation of the impact of floods and associated protection policies, Office International de l’Eau and Ecologic, April 2005

²² Requirements for Flood Mapping: Scoping Study, Scottish Environment Protection Agency

7. COMPARING THE OPTIONS

7.1. Summary and evaluation of the options

The table below summarises the impacts of Options A and B.

	Option A	Option B
Economic impacts		
Financial costs	0	Preliminary assessment: Flood maps: vary per river basin, rule of thumb: €100 to €350 per km FRMP: depend on objectives set, €8.25 million UK Shoreline Management Plans to €12.3 billion for River Rhine
Reduction of potential damage	In the short-term Or immediately after flood event	Depends on objectives set by MS, e.g. Rhine: reduction of €40 billion
Economic activity /trade and investment flows	None (short term) - (medium and long term)	+
Establishing new public authorities	Not necessary	Not necessary
Impact on economic growth and employment	None (short term) - (medium and long term)	+
Social impacts		
Public health and safety	None (short term) - (medium and long term)	+
Increased public awareness	None (short term) - (medium and long term)	+
Impact on number of jobs	None (short term) - (medium and long term)	+
Understanding of EU policies and activities – relation with WFD	-	+
Environmental impacts		

Potential damage to environment by floods	None (short term) - (medium and long term)	+
Potential damage to environment by measures	none	+
Create win-win situations between WFD and floods	none	+

None: no impact

- negative impact

+ : positive impact

7.2. What is the preferred option and why?

The preferred option is B (combination of cooperation and a Directive). Option A (voluntary approach, no binding mechanism) is not likely to significantly differ from the “no action” scenario in the medium and long term.

As explained in this Impact Assessment, action under Option A would not be compulsory, so it is less likely that the necessary preventive and management measures would be taken. There would be short-term benefits – e.g. cooperation and coordination at river basin level - but these benefits would be offset by medium- and long-term costs broadly similar to those generated by a “no action” scenario. Option A would not be able to substantially reduce flood risks. The voluntary arrangement would result in cost-inefficient measures that were not coordinated at river basin level and could pass on problems to upstream or downstream regions.

Option B (combination of cooperation and flexible legislative instrument) would entail a balanced approach using flexible non-binding mechanisms where possible and legislation only for those issues where progress has to be guaranteed. The legislation would include three obligatory elements (preliminary risk assessment, flood risk maps and flood risk management plans) focusing on increasing the awareness of flood risks and improving the management of flood risks through coordination at river basin level. As the causes and impacts of floods vary throughout Europe, the Member States would be allowed to choose their own objectives (level of protection) and the measures to achieve them. Hence Member States would define their ambitions, but these ambitions would be achieved in a cost-efficient and effective way through coordination at river basin level and by applying the principle of solidarity. Figures on e.g. the Rhine, Oder and Loire show that the costs of flood risk management measures are much less than the costs of potential damage.

Because of the potential benefits, as set out in the evaluation of the options above, Option B is preferred. As regards the type of legislative instrument:

- a Decision would not provide flexibility in terms of implementation as it is binding in its entirety, and so would not allow for a regionalised approach;
- a Regulation would entail prescribing the level of flood protection, measures and deadlines; a level of detail that is considered unnecessary;

- a Directive would provide the necessary regulatory framework for improving coordination and planning at river basin level while leaving key elements (level of protection, measures and deadlines) to Member States.

8. MONITORING AND EVALUATION

8.1. How will the policy be implemented?

Implementation of the action programme would be based on coordination of the three distinct but closely interlinked components, namely:

- exchange of knowledge and experience, as well as further targeted research efforts;
- efforts towards best use of EU funding tools; and
- legislative instrument (Directive).

All three are underpinned by an informal process similar to the successful process for guiding and implementing the WFD, i.e. bringing together key actors from Member States, EFTA countries, Candidate Countries, industry and environmental NGOs in a participatory process.

8.2. How will the policy be monitored and reviewed?

The legislative instrument (directive) provides for a transparent step-by-step approach of preliminary risk assessment, mapping flood risks, and producing flood risk management plans. Development of these steps will follow a line of public participation and ex-ante evaluation of the risk perception, as well as ex-post reports, evaluation and review. Reporting to the Commission will follow the six-year implementation cycles, with mid-term reports due after three years.

Finally, the informal process guiding implementation of the WFD has established a system of indicators to monitor transposition, reporting and compliance which can also be used for the proposed Directive.²³ Information on flood risk management will be included and made publicly available through the “Water Information System for Europe”²⁴ which is currently being developed as a joint activity by DG Environment, the European Environment Agency, the Commission’s Joint Research Centre, and Eurostat.

8.3. What are the arrangements for ex post evaluation of the policy?

Firstly, informal cooperation between the Commission and the Member States will provide for regular and transparent exchanges of information, identifying challenges, solutions, etc.

Secondly, the Commission will prepare regular reports on the implementation progress. These reports will, where appropriate, also include elements of ex post evaluation, review and amendment of preliminary flood risk assessments, flood risk maps and flood risk management plans. Reporting through the “Water Information System for Europe” will not only drastically ease the administrative burden but should also bring considerable synergies. It should also give easy access to all the relevant information and action required under the three key management steps under the Directive.

²³ <http://europa.eu.int/comm/environment/water/water-framework/scoreboard.html>

²⁴ <http://europa.eu.int/comm/environment/water/water-framework/transposition.html>

Thirdly, evaluation of implementation will be complemented by similar assessments of the other two components of the Flood Action Programme, namely the exchange of information and knowledge and research efforts, and promotion of best use of funding instruments.

ANNEX 1: STAKEHOLDERS INVITED FOR THE CONSULTATION PROCESS

- Member States, Candidate Countries and EFTA Countries
- International river commissions:
 - International Commission for Protection of the Rhine,
 - International Commission for Protection of the Danube River,
 - International Meuse Commission,
 - International Commission for Protection of the Escaut/Scheldt,
 - International Commission for Protection of the Elbe,
 - International Commission for Protection of the Oder River,
- European Environment Agency
- European organisations:
 - European Environment Bureau (EEB);
 - WWF,
 - European Insurance Association (CEA),
 - European Union of Developers and House Builders (UEPC),
 - European Federation of Geologists (EFG),
 - European Water Association (EWA),
 - EUREAU,
 - Environmental Platform of Regional Offices (EPRO),
 - Union of the Electricity Industry (Eurelectric),
 - COPA-COGECA,
 - Council of European Municipalities and Regions (CEMR),
 - ELO / European Land Owners' Organisation ASBL.