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The Adequacy of EU Action on Flood Protection, focusing on the European Commission's recent Proposal

(IP/A/ENVI/FWC/2005-35)

Briefing Note

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BRIEFING NOTE

THE ADEQUACY OF EU ACTION ON FLOOD PROTECTION, FOCUSING ON THE EUROPEAN COMMISSION'S RECENT PROPOSAL (IP/A/ENVI/FWC/2005-35)

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1 INTRODUCTION AND BACKGROUND

Flooding is a natural phenomenon that only becomes a catastrophic event when human lives or property are affected. Worldwide, flooding is probably the number one cause of economic losses from a natural event, and no region is safe from being flooded.[i]

Between 1998 and 2002, Europe suffered over 100 major damaging floods, including the catastrophic floods along the Danube and Elbe rivers in 2002.[ii] The floods of August 2002 killed 52 people, left thousands homeless, and caused damage across Europe amounting to approximately 14 billion Euro.[iii] Not least because of this event, flooding has become one of the major environmental policy issues in Europe. In order to be better equipped to handle such disasters in the future, the European Commission has proposed a new directive on the assessment and management of floods.

1.1 Development of a European Initiative on Flooding

In the wake of the 2002 events, the EC Council of Ministers (Environment), following a French initiative, addressed the issue of precautionary and sustainable flood protection in Luxembourg on 17 October 2002. The next month, in Copenhagen, the European Commission and the Water Directors were requested to move forward on an EU-wide strategy for sustainable flood prevention as a basis for further Council decisions. To this end, a "Core Group on Flood Protection" was established by the Water Directors.

At the meeting in Copenhagen, officials also agreed to hold a high-level meeting on flood protection in Budapest at the end of November 2002, and an international workshop in Germany in early 2003. At this workshop, it was agreed that an ad-hoc drafting group[iv] should be formed to prepare a "best practice document".[v]

This best practice document, which is an update of the 2000 United Nations and Economic Commission for Europe (UN/ECE) Guidelines on sustainable flood prevention,[vi] lays out best practice examples on flood prevention, protection and mitigation.[vii] The document covers only river and flash floods, while marine and tidal floods are not taken into account. It is designed as a living document that needs continuous input and improvement. The character of the document is strategic rather than technical.

As a next step, the Water Directors concluded on their meeting in Rome at 24-25 November 2003 to promote a concerted EU Action Programme in order to improve flood risk management. The Commission Communication "Flood Risk Management", including the essential features of the proposed EU Action Programme, was introduced on 12 July 2004[viii] and was discussed at the Informal Environment Council of the Dutch presidency, held in Maastricht on 16-18 July 2004. On 14 October 2004, the Environment Council formally invited the Commission to submit a proposal for a "European Action Programme on flood risk management" before mid 2005[ix].

As a result, and supported by an impact assessment,[x] a proposal for a Directive on the assessment and management of floods[xi] was finally put forward in January 2006.

The objective of the Directive is to reduce and mange the risks which floods pose to human health, the environment, infrastructure and property, as Europe´s commitment to sustainable development could be severely compromised if appropriate action is not taken.

Therefore the Directive requires Member States to prepare flood risk maps for (a) floods with a high probability (once in 10 Years) (b) floods with a medium probability (once in 100 years), and (c) extreme events indicating areas which are at risk of flooding and the indicative damage that could occur. The plans should address all phases of the flood risk management cycle, i.e. prevention, protection, preparedness and taking into account the characteristics of a particular basin or sub-basin. Due to the diversity of situations across Europe concerning geography, hydrology and settlement structure, the Member States are given considerable flexibility regarding the level of protection required, measures to be taken and the timetables for implementing the flood risk management plans.

2 LINKAGE OF THE EU FLOODING POLICY TO OTHER POLICY AREAS

The "best practice document" agreed at the 2003 Bonn workshop and several statements from the Water Directors in Budapest and Bonn describe the importance of integrating the issue of flood protection into other policy fields, such as transportation, shipping, urban development, emergency management, and, in particular, nature conservation and soil policy.

However, legislation to date has not been integrated, and interests and decision-making procedures regarding regional planning, industry, agriculture and transportation are still mostly dealt with as separate dossiers. In the following, the most important policies influencing flood protection will be briefly summarised.

2.1 The Water Framework Directive

The Water Framework Directive (WFD)[xii] is currently the most important influence on water policy in Europe since it shifts the focus of policy-making from addressing problems individually, to integrated river basin management. Article 1 of the Directive not only requires Member States to achieve ecological standards for waters, but also lists "mitigating the effects of floods and droughts" among its objectives. A comprehensive river basin planning approach should include land use planning and agricultural policies, not only to achieve "good ecological status", but also to prevent floods.

While precautionary flood protection is not explicitly addressed in the Directive[xiii], it places greater emphasis on the preservation of wetlands and floodplains, and the structural / hydromorphological quality of water bodies. Furthermore, ensuring that water remains of a quality to secure a supply of drinking water for the population is mentioned amongst the objectives and this is a problem in flooded areas as flood water is likely to be contaminated with waste water.

The proposal for the floods directive provides an approach for linking the WFD with flood management. It builds on the main organisational aspects of the implementation of the WFD, requiring a synchronisation of planning cycles and allows the use of the same management bodies. The concept of action on a river basin district level is built upon as flood risk assessment should be carried out on this level. This allows Member States to integrate their flood plans into the river basin management plans cutting down on the necessary administration.

A further link between the WFD and the proposed floods Directive is established via the public participation requirements, since the two processes should be integrated (WFD Art. 14, Floods Directive Art 13(3)). Such an active involvement of all relevant stakeholders in water management is one of the pivotal elements of the concept of integrated water resources management (IWRM) as it allows for the integration and consideration of the views, needs and interests of water users and those affected by water management planning.

2.2 Other important policy areas

While flooding is not specifically addressed by the regulation defining **the Common Agricultural Policy** (CAP)[xiv] [xv], the 2003 revision offers several possibilities for improving flood prevention. Cross-compliance provide opportunities for soil protection which is intimately connected with reducing runoff and muddy flooding from farmland. The upcoming Rural Development Regulation also provides the opportunity for Member States to integrate flood concerns into their programme of measures though there is no compulsion for them to do so (e.g. natural disaster and prevention actions)[xvi].

The proposal for a **Thematic Strategy on Soil Protection** drawn up by the European Commission underlines that the integration of flood risk management and soil protection remains a difficult challenge. For the future development of the strategy, clear targets for reversing soil compaction and sealing could provide a valuable contribution to flood risk management.

It is widely debated that possible sea level rise and increase in strength and frequency of storms may increase coastal erosion and cause coastal floods (or inundation). Coastal areas are also at risk of flooding. The total value of economic assets located within 500 metres of the European coastline, including beaches, agricultural land and industrial facilities, is currently estimated at Euro 500 to 1,000 billion[xvii]. Since 1996, the European Commission has been working to identify and promote measures to improve the overall situation in coastal zones. **Integrated Coastal Zone Management** (ICZM) is a multi-disciplinary approach to promote sustainable management of coastal zones. It covers the full cycle of information collection, planning (in its broadest sense), decision making, management and monitoring. ICZM uses the informed participation and co-operation of all stakeholders to assess the societal goals in a given coastal area.

The issues of flooding is also discussed on the global level within the framework of the **IPCC** The purpose of the IPCC is to (a) assess available scientific information on climate change, (b) assess the environmental and socioeconomic impacts of climate change, and (c) formulate response strategies[xviii].

3 THE EFFECTS AND COSTS OF FLOODS

3.1 Effects on different sectors

Floods have negative consequences on a number of areas and cause a large amount of economic damage as well as personal losses such as damage to **housing**[xix]. Infrastructure such as **roads and transport networks** are likely to be badly effected as can **industrial** plants. The effects on **human health** can also be serious[xx]. Initial impacts include death due to drowning or heart attack as well as injury risk. Longer term effects can be caused by the contamination of drinking water (see Box 1) as well as an increase in the incidence of vector borne diseases due to the presence of standing water. Poisoning is also a risk if water contaminated with chemicals is introduced to drinking water. The beginning of longer term psychological problems are also apparent in the aftermath of a disaster.

Box 1. Waste water, drinking water and floods

The urban sewage system is often not designed to cope with severe floods[xxi]. The interaction between rivers, streams and sewers may not be adequately addressed in its design. The increased runoff in a flood event may actually mean that water from rivers back up sewers and increase flooding rather than alleviating it. Pumping stations may also fail as a result of their flooding. More research is needed into the interaction of sewers and other piped systems and the rivers into which they flow. In severe floods, the flood water from sewers may contaminate drinking water leading to the spread of water borne infections (such as *E. coli*, *Shigella*, hepatitis A, leptospirosis, giardiasis, campylobacteriosis).

The impact of floods depends very much on how the surrounding land is used. The interlinkages between **agriculture** and flooding are well documented[xxii] (though the economic costs to agriculture are less well covered, see Annex 3 for some information on this issue). Not only does the way land is used effect the risk of floods occurring but agriculture is one of the primary sectors affected when a flood does take place. For example, 100 000ha of agricultural land was affected by the major flooding event in central Europe in 2002.

The negative **environmental consequences** can be high, for example destruction of wetland areas negatively effecting biodiversity or flooding of industrial installations leading to pollution of water. Flooding does have some positive consequences, however. For example, floods can play an important role in recharging groundwater aquifers.

3.2 Economic methods for assessing flood management and their use

Different approaches may be used to assess alternative policy options[xxiii]. These include expert judgement and the scorecard approach, but the most detailed methods are based on monetary evaluations. **Cost-effectiveness analysis** (CEA) seeks to find the best way of using resources to achieve a given result. It is used when an objective has been decided on and the least costly way of achieving it must be found. **Cost-benefit analysis** (CBA) is carried out to compare the economic efficiency implications of alternative actions.

The benefits are contrasted with the costs within a common analytical framework. This is achieved by giving both an economic value. **Multi-criteria analysis** (MCA) is a structured approach used to determine overall preferences among alternative policy measures when each policy measure may achieve several objectives. It can be used to accommodate not just direct economic costs and benefits but also environmental and social impacts. An MCA can be closely linked to participatory approaches and include a variety of stakeholders.

In practice, CBA is the most common approach to assessing actions to deal with flooding and is already fairly institutionalised in some countries e.g. UK, Netherlands and Germany[xxiv]. There are however, some problems with the application of CBA. CBA tends to concentrate attention on quantifiable damages. In other words, damages to the residential sector are much better documented than damages to the environment or to agricultural land (see Annex 3). Floods may also have indirect or "ripple" effects which may be ignored in an assessment of damages. High levels of knowledge are not linked to the respective importance of each type of damage, e.g. human health and well-being (stress, anxiety…) are often considered as (one of) the most important damages but these are very difficult to capture with traditional assessment methods. Availability of data is often a problem and it is difficult to transfer data from one case to another particularly as the share of damages between different sectors vary between flood events. For this reason, in some countries, assessment practice has gone beyond a pure CBA, complementing the analysis with qualitative elements or using MCA instead, e.g. in France[xxv]. Though they cannot eradicate all of the uncertainties involved in a CBA and may introduce new uncertainties, MCAs do address the most criticised aspects of CBAs. However, they are more complicated than CBAs.

In practice, decisions at the strategic level are often the result of political bargaining, e.g. by specifying a certain protection level that needs to be guaranteed at any cost. Although such decisions may be informed by economic considerations, the protection level itself is not simply the result of an economic trade-off.

3.3 Economic assessment of floods and preventative measures

As stated above, the costs of the different aspects of flood damage are difficult to measure, however, some immediate costs of European floods are listed in Annex 4. It is also difficult to measure the effects of the various preventative measures since the link between measures and expected benefits is difficult to access and often unclear in the action plans. One major reason seems to be that expected benefits should come from the combination of sets of measures rather than from individual ones. Measures can be divided into four main sectors:

- **Information measures** consist of working out what the risk is of flooding and informing the general public. There is evidence this can be very cost effective but it is difficult to measure separately (see Annex 2).
- **Prevention measures** show positive impact although it is often difficult to quantify precisely. They involve cutting down on the use of flood prone areas/floodplains thus "giving more space to the river". Such measures are often difficult to implement politically since they require reducing existing human activities such as the placement of buildings for housing/industry, agriculture etc.

- **Protection measures** can include engineering measures such as the construction of reservoirs, but there is an increasing recognition that these cannot solve the problem and this approach must be combined with others such as paying more attention to the reduction of vulnerability to flooding events.
- **Emergency measures**, which may have significant impact on the level of damage; they are rarely included in flood action plans, but rather in civil protection policies. Yet, closer co-ordination between both planning and management processes may be of use in increasing protection at lower costs.

Estimates of the costs and benefits of flood prevention as are intended by the proposed Directive are provided by the corresponding Commission Impact assessment[xxvi]. It is estimated that flood maps will cost around €100 - €350 per km of river as a rule of thumb. Management plans depend on the objectives but for example, the UK Shoreline Management Plans cost €850 million and the Plans for the River Rhine, €12.3 billion. However, this is more than compensated for by the estimation of the reduction of potential damage at €40 billion.

4 IMPORTANCE OF INFORMATIONAL ISSUES

Information measures recommend themselves as relatively inexpensive tools, which are at the same time indispensable for sound and effective flood management strategies (see Annex 2).

Whether a protective or a preventive strategy is pursued, a residual risk of flooding will inevitably remain. In order to prevent losses of life and to limit damage to man-made assets, it is necessary to provide better and earlier information to the public (also referred to as a preparedness strategy). This includes risk mapping and communication, flood forecasting and early warning systems, as well as flood announcement. Providing timely and reliable information is key to ensuring the effectiveness of any flood risk management strategy. In addition, flood forecasting can also be used effectively to raise awareness for other flood prevention measures.[xxvii]

This is recognised by the proposal for the directive which mainly addresses how to assess flood risk. Member states must catagorise land into land with a potential risk of flooding or no potential risk. Flood maps must then be prepared for the land with a potential risk of flooding. Maps should show land which could be flooded by: floods with a high return probability (10 year return period); medium return probability (100 year) and low return probability (extreme events). The maps should show the likely depth and velocity of water and where erosion is probable. It is also proposed to indicate the likely economic effects, number of people affected and environmental effects connected to a flooding event. Carrying out this risk assessment should prepare Member States for flood events and form the basis for preparing flood risk management plans. At the same time, these maps can help raise awareness amongst the general population and influence their decision making, thus supporting the reduction of costs associated with a specific flooding event.

5 FIRST BRIEF ASSESSMENT OF THE PROPOSAL FOR A FLOODS DIRECTIVE

Overall, the proposed flood directive offers a good basis for improved and more transparent flood management in Europe, thus having the potential to reduce and manage the risks which floods pose to human health, the environment, infrastructure and property. Additionally, the following observations based on the current discussions and negotiations on the draft directive can be made:

* Based on the serious impacts that can be expected for human health, the environment, infrastructure and property, a European approach is needed for all river basins in Europe which are at risk of flooding and not only the transboundary ones (although some Member States are not yet persuaded);
* This issue particularly needs to be addressed due to the increased probability of extreme events resulting from climate change;
* Even though the impact assessment of the floods directive does not provide particularly detailed information on the financial consequences of flooding, the information is sufficient to conclude that this directive will have an overall positive impact;
* In order to direct flood management planning as well as to indicate the potential impact of a flooding event, the flood maps should include the potential damage associated with a flood scenario;
* It is crucial to integrate information on floods and management plans which already exist into the directive in order to avoid unnecessary repetition and administrative burdens and costs;
* At the same time, the intermediate reporting steps on the progress of implementation of the planned measures, while adding some administrative burden, should help to increase transparency and public information. Overall, the directive should cover not only the preparation but also the implementation of the flood risk management plans and progress made towards implementation of flood risk management plans should be included in the subsequent update;
* The linkages between water management and flood management are crucial, since flood management is an important part of IWRM (integrated water resource management). Therefore, linking the WFD and the floods directive on practical issues (deadlines, public participation) is positive, but should not systematically lead to the floods directive being the basis for exemptions to the WFD (leading to lower environmental standards). The need for specific flood protection measures which may negatively affect the environment should be closely assessed based on the regulations of the WFD which describe exemptions.
* Due to the interlinkages of coastal zone protection and inland water flood management, both elements should be integrated into the directive. At the same time, clear definitions are needed in this context, as well as specification of the requirements of both categories;
* The adoption of the floods directive might in some cases lead to changes in the economic value of land potentially affected by flooding due to increased transparency and greater access to information. This in turn might lead to changes in behaviour regarding land use/purchase (including the use of insurance against flooding as well as the terms of insurance). This can be considered a positive development since it should more closely reflect the actual situation and avoid

distortions based on limited information, increasing the overall welfare for society.

* Finally, since the level of protection required against flooding, the selection and implementation of measures to achieve this level of protection and the associated timetable, is in the hands of the Member States, the success of the directive on managing flood risks and reducing the associated damages will strongly depend on the commitment of the Member States.

ANNEX 1 – FUNDS

Financial sources

Financial sources will play a major role in future measures on effective flood prevention, protection and mitigation. Currently, the EU has different structural funds at the European level that provide Member States with an alternative to national funds:

- The European Regional Development Fund (ERDF) was created to reduce regional disparities in the Union, while at the same time encouraging the development and conversion of regions[xxviii] [xxix];
- The European Agricultural Guidance and Guarantee Fund (EAGGF) supports economic and social cohesion policy, rural development and the improvement of agricultural structures[xxx];
- The LIFE Financial Instrument for the Environment contributes to the development of innovative techniques and methods by co-financing demonstration projects [xxxi];
- The European Union Solidarity Fund (EUSF) was set up three months after the floods of August 2002 and provides rapid financial assistance in the event of major disasters which includes flooding[xxxii].

The first three funds essentially focus on accomplishing specific tasks (e.g. environment, specific regions and areas), not on the issue of flooding. Besides other issues, they could also be used to finance precautionary flood protection measures. The proposed directive does not, however, specify a source for funding for the activities suggested.

National legislation

At the national level, most European countries have different regulations and responsibilities for flood protection and flood risk management, including civil protection. Both issues are regulated by different laws (planning, water, housing, environmental, civil, nature conservation, agriculture). This may lead to conflicting responsibilities and objectives within Member States. European countries also focus on different aspects of flooding. For example, Germany focuses on precautionary measures, while Poland and the Czech Republic put most of their effort into flood management.[xxxiii] Within the EU, civil protection is based on the Art.3 para.1(u) of the European Treaty,[xxxiv] but has no specific laws regulating policy and procedures on this topic.

ANNEX 2 – INFORMATION ISSUES

Awareness of flood risks and knowledge of possible responses is key to minimising material damage and losses of lives. There is clear evidence that the damage caused by floods tends to be much higher if they only occur at long intervals, whereas the cost of recurring flooding events is relatively lower. In the Netherlands for instance, the flood of 1995 was far less damaging than the one that took place in 1993, despite the fact that the two events were comparable in their magnitude. The reason is that whereas the 1993 flood took the affected people by surprise, the information and awareness was much better in 1995. Having seen where the water can go, and how fast it can come, people were much better prepared for the second flood, and in particular knew better which valuables to save.

Information measures have proved to be efficient in several cases (Meuse, Bretagne, Saône…) and inexpensive as well. Very encouraging figures are available: e.g. a four hour delay allows a 40 to 50% reduction of damages in housing; the total damage may be reduced by 20 to 50% by removing furniture and equipment or by elevation[xxxv]. Public authorities are put under high pressure to this regard, as people are very demanding: alert has to be detailed, to provide practical information, to come at the correct time (not too early and not too late).

This points to the crucial relation between information and awareness of the risks imposed by floods – ultimately, awareness of flood risks is decisive for reducing the impacts in an emergency situation. Information measures can help to create such awareness, and to maintain it over time. Experience shows that the awareness of flood risks decreases rapidly after a flood has taken place, which implies that repeated information measures are necessary to keep awareness levels of the risks and appropriate responses high. A different type of informational measures is targeted at individual, small-scale protection measures that can be carried out at little or no extra costs; this concerns, e.g. the storage of valuable or dangerous items.

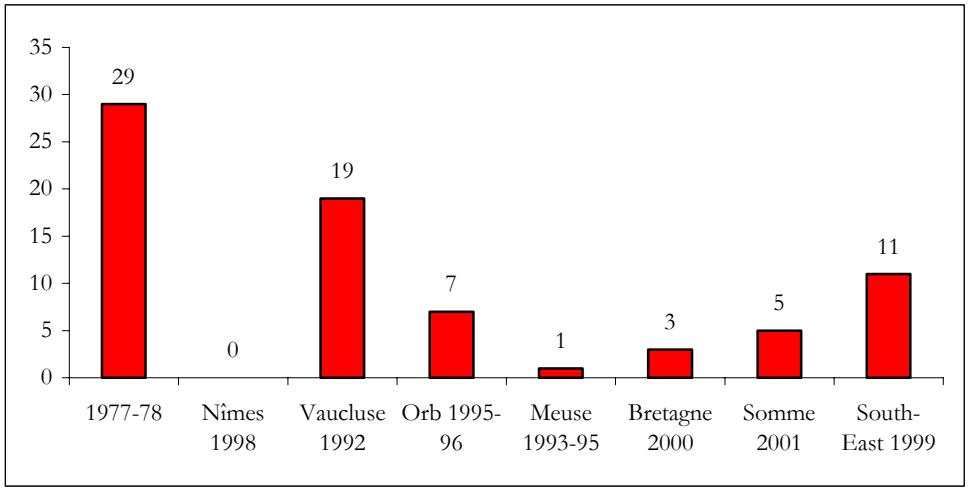
While such information and awareness measures are developed and implemented over a longer time period, irrespective of a particular flooding event, a different category of information measures concerns the early warning measures in the case of an actual flooding event. Every minute of increased reaction time will decrease the damage caused, as it give the affected population the needed time to safe valuable items and to carry out ad-hoc protection measures. As an illustrative indication, it has been estimated in the case of the Rhône that extending the warning time to more than 48 hours could reduce the damage by 20 to 40 per cent[xxxvi].

ANNEX 3 – ECONOMIC AGRICULTURAL LOSSES

Far less data on damages caused by floods to agriculture are available compared to the residential sector, for instance. In contrast to damages to housing or to other economic activities, figures found regarding mean unitary costs of damages are only based on theoretical *ex ante* estimates.

The share of damages to agriculture depends very much on the profile of the flooded area. The following table for several recent floods in France demonstrates this wide variability (average: 9%). Only overall figures for agriculture activity are available for these events, with no detail per type of activity for instance.

Share of damages to agriculture among all damages caused by recent flood events in



France (%)

Sources: quoted in Lamothe et al. (2005)[xxxvii]

The flood in Nîmes was urban only. The same appeared in the urban district of Bern in 1999: damages to agriculture counted for 2.6% of all damages (0.6% in the city if Bern) Burlando (2001)[xxxviii].

One difficulty with providing figures is methodological: "agriculture" covers several different types of activities, which are in very different positions towards floods, e.g. there is not much in common between prairies and horticulture in greenhouses. Besides, distinction has to be made between damages to production (crops, cattle) and damages to buildings. Therefore, two approaches may be applied:

- either the goal is to provide general figures at large scale: "gross averages" figures may be used as the specific type of production of each sector does not make any difference then.
- or the goal is to appraise local damages: detailed estimate is then necessary. Therefore, as costs estimates are based on damage functions, it is necessary to characterise types of sectors within the agricultural sector as a whole.

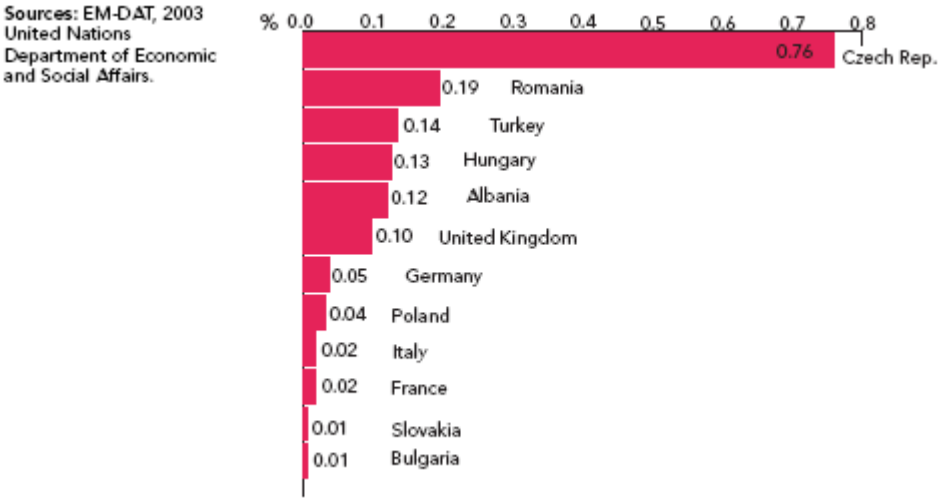
ANNEX 4 – FLOOD COSTS

Comparison of costs of damages of some recent flood events in France (in M€), source: Office International de l'Eau and Ecologic (2005)

Event	Houses	Economic activity	Agriculture	Roads and networks	Rescue	Overall cost
France, 1977-78	20	22	34	38	0,5	115
%	*18*	*19*	*29*	*33*	*<1*	*100*
Nîmes, 1998	157	245	-	236	(a)	637
%	*25*	*38*	*-*	*37*	*-*	*100*
Vaucluse, 1992	23	23	24	50	6	125
%	*18*	*18*	*19*	*40*	*5*	*100*
Orb, 1995-96	11 (b)	12	3	17	0,08	44
%	*26*	*27*	*7*	*39*	*1*	*100*
Meuse, 1993-95	148	175	15	25	-	348
%	*42*	*50*	*<1*	*7*	*-*	*100*
Bretagne, 2000	65	44	5	56 (c)	-	171
%	*38*	*26*	*3*	*33*	*-*	*100*
Somme, 2001	30	10	7	94 (c)	-	141 (d)
%	*21*	*7*	*5*	*67*	*-*	*100*
South-East, 1999	168	86	52	182 (c)	-	488 (e)
%	*34*	*18*	*11*	*37*	*-*	*100*

(a) Included in "Road and networks"
(b) Average = 4600€/house
(c) Roads, networks and public buildings
(d) Damage to the environment not included: 35 M€
(e) Damage to the environment not included: 42 M€

Annual average cost of floods as % of GDP in flood affected areas (underestimate as economic losses only reported for 34% of floods



[i] Kron W. (2002): Flood Risk = Hazard X Exposure X Vulnerability; in Wu et al. (eds): Flood Defence 2002, Science Press, New York Ltd., ISBN 7-03-008310-5.
[ii] Press release by the European Commission (2004) Flood protection: Commission proposes concerted EU action, Reference: IP/04/887, 12/07/2004
[iii] EM-DAT: The OFDA/CRED International Disaster Database www.em-dat.net – Université Catholique de Louvain, Brussels, Belgium.
[iv] The Group was co-chaired by France and the Netherlands. Members were Hungary, to provide input from the Budapest initiative, Germany, to provide input from the Bonn workshop; and the European Commission.
[v] Water Directors (2003): Initiative on flood prevention at the working-level meeting on flooding on 5/6 February 2003 in Bonn, available at http://forum.europa.eu.int/Members/irc/env/wfd/library?l=/framework_directive/floods_programme&vm=detailed&sb=Title.
[vi] United Nations and Economic Commission for Europe (UN/ECE) (2000): *Guidelines for sustainable flood prevention*, The Hague, Netherlands, 23-25 March 2000.
[vii] Water Directors Core Group on Flood Protection (2003): Best practices on flood prevention, protection and mitigation http://www.verkeerenwaterstaat.nl/object/?lc=uk&tb=Object&id=122
[viii] Commission of the European Communities (2004): Communication from the Commission to the council, the European Parliament the European economic and social committee and the committee for the regions Flood risk management, Flood prevention, protection and mitigation, COM(2004)472 final
[ix] See also Farmer, A. (2005). A European Union Directive on flood management. *Journal of Water Law*, 16: 85-89.
[x] In support of the proposed Directive, the Commission services prepared an Impact Assessment (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). Based on the data available from previous floods in different river basins, it examined two options for further action: A. a voluntary approach with non-binding recommendations and B. a combination of cooperation with a flexible legislative instrument. The impact assessment looked at what effects these two options would have. The first would have little economic impact in terms of investment (as no binding measures are imposed) however, in the longer term it might be expected to have negative effects on economic activities, trade and investment flows due to the lack of a co-ordinated approach to tackle flooding. Option B might have greater costs to start with but flood risk maps are only needed for the areas in danger of flooding and the longer term effects on competitiveness and economic development are expected to be positive. For these reasons, it was decided to proceed with a directive (option B).
[xi] Commission of the European Communities (2006) Proposal for a Directive of the European Parliament and of the Council on the assessment and management of floods. COM(2006) 15 final
[xii] European Parliament and the Council (2000) Directive of the European Parliament and of the Council concerning establishing a framework for community action in the field of water policy (2000/60/EC), 23 October 2000.
[xiii] Given that the Directive demands that there be no further deterioration of river systems, technical flood protection measures such as dikes etc. are possible just in specific cases. Article 4 WFD mentions overriding flood protection requirements among the possible reasons why a water body may be designated as heavily modified. In addition, extreme flooding events are identified as one possible justification for a temporary derogation.
[xiv] Council Regulation (EC) No 1782/2003 of 29 September 2003 establishing common rules for direct support schemes under the common agricultural policy and establishing certain support schemes for farmers and amending Regulations (EEC) No 2019/93, (EC) No 1452/2001, (EC) No 1453/2001, (EC) No 1454/2001, (EC) 1868/94, (EC) No 1251/1999, (EC) No 1254/1999, (EC) No 1673/2000, (EEC) No 2358/71 and (EC) No 2529/2001 Official Journal L270 of 21.10.2003, p. 0001 - 0069
[xv] Council Regulation (EC) No 1783/2003 of 29 September 2003 amending Regulation (EC) No 1257/1999 on support for rural development from the European Agricultural Guidance and Guarantee Fund (EAGGF) Official Journal L 270 , 21/10/2003 p. 0070 - 0077
[xvi] See also Dworak, Thomas; Zbignev Karaczun; Nadine Herbke et al. 2005: Deliverable 3 - WFD and Agriculture linkages at the EU level. Final Report about Rural Development Programmes. Ecologic/Warsaw Agricultural University, Berlin/Warschau, commissioned by: European Commission, DG Research.
[xvii] See http://www.eurosion.org/
[xviii] See www.ipcc.ch/

[xix] See EEA (2003) Mapping the impacts of recent natural disasters and technological accidents in Europe. Environmental issue report no. 35 for a list of recent European floods and their consequences.
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