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## COMMISSION STAFF WORKING DOCUMENT

### Report on the progress in implementation of the Floods Directive

*Accompanying the document*

### COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL

#### **The Water Framework Directive and the Floods Directive: Actions towards the 'good status' of EU water and to reduce flood risks**

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## TABLE OF CONTENTS

1. SUMMARY .....	3
2. CONTEXT .....	4
3. APPROACHES TAKEN BY MEMBER STATES .....	5
4. HISTORY OF FLOODING .....	6
5. IDENTIFICATION OF POTENTIAL SIGNIFICANT FUTURE FLOODS .....	10
6. PREDICTING THE IMPACT OF POTENTIAL FUTURE FLOODS .....	11
7. IDENTIFICATION OF AREAS OF POTENTIAL SIGNIFICANT FLOOD RISK .....	11
8. TAKING ACCOUNT OF CLIMATE CHANGE AND OTHER FUTURE CHANGES .....	13
9. INTERNATIONAL COORDINATION .....	17
10. PREPARATION OF FLOOD HAZARD AND FLOOD RISK MAPS .....	19
11. CONCLUSIONS .....	23
12. ANNEX .....	25

## 1. SUMMARY

There has been a multitude of approaches across Europe in assessing the risk of flooding and implementing the requirements of the Floods Directive. Eighteen Member States decided to undertake a Preliminary Flood Risk Assessment as described by the Directive across their entire territories and for all potential sources of flooding. Other Member States used transitional measures: Luxembourg and Latvia decided to use existing risk assessments to identify flood risk areas across their whole territories. Belgium, Italy, the Netherlands, Portugal and Slovakia decided to use existing flood hazard and flood risk maps across their whole territories and did not undertake a Preliminary Flood Risk Assessment as described by the Directive. Germany, Spain, and the United Kingdom used a mixture of approaches across their territories.

Where information is available Member States should use records of historic floods in assessing where there is a significant risk of future flooding. Twenty two Member States provided information on historic floods some dating back to the 1<sup>st</sup> century but most relating to floods since the 1950s. The most common historical floods were from rivers.

Results from the assessment of flood risk have been used to identify areas where there is potential significant flood risk and to assess the resulting potential impacts on people's health, the economy, environment and cultural heritage. Around 8,000 such areas have been identified by 23 Member States with Croatia identifying the most (2,976). Flooding from rivers was, as for historic floods, the most common source associated with flood risk areas and the economy was the most common aspect to be potentially impacted in these areas.

Flood hazard and flood risk maps have been prepared by most Member States with the potential flooding from rivers being most often mapped. Most Member States with a coastline have also mapped potential sea water flooding. In some Member States it seems that flooding from a number of sources has been combined in a single map.

The assessment of flood risk would ideally include an assessment of the impact of climate change and other long term changes, such as from changes in land use, that would have an impact on flooding consequences. Even though the consideration of climate change beyond available or readily deliverable information was not a requirement of the Floods Directive at this cycle of implementation, 14 Member States considered climate change in their assessment of flood risk and 11 Member States other long terms changes. 11 Member States have also taken climate change into account when preparing their flood maps.

Member States are required to cooperate and coordinate with other Member States sharing river basins that cross national borders. This appears to have been done in all Member States for the assessment of flood risk and in the preparation of flood maps in cross border river basins, with the River Commissions such as those for the Danube and Rhine playing key roles in coordination and information exchange.

The next step is for Member States to use the maps to develop Flood Risk Management Plans by December 2015.

## 2. CONTEXT

Floods have the potential to cause fatalities, displacement of people and damage to the environment, to severely compromise economic development and to undermine the economic activities of the European Union. The development of a Directive on floods was considered after the huge and devastating floods that struck Central Europe in 2002. The EU Directive on the assessment and management of flood risks [2007/60/EC], often referred to as the 'Floods' Directive, was adopted on 23 October 2007 and came into force on 26 November 2007. Whereas the Water Framework Directive [2000/60/EC] is concerned with the protection of water as a resource, the purpose of the Floods Directive is the establishment of a framework for the assessment and management of flood risks.

The approach to the reduction of the adverse consequences for human health, the environment, cultural heritage and economic activity associated with floods in the European Union is based on a six year cycle of planning, subject to the application of transitional arrangements in the first cycle. During each cycle, the FD is to be implemented in Member States in three stages.

During the first stage, the Directive requires Member States to make a preliminary assessment of flood risk (referred to as Preliminary Flood Risk Assessments-PFRAs) over their territory leading to the identification of any areas that are at significant risk of flooding at the present time or in the future (referred to as 'Areas of Potential Significant Flood Risk-APSFRs'): this should have been completed by December 2011.

During the second stage, the risk areas should be mapped (referred to as Flood Hazard and Risk Maps-FHRMs for the APSFRs identified) showing how far floods might extend, the depth or level of water and the impacts that there might be on people, the economy, environment and cultural heritage. The size of risk areas will vary according to the severity of flooding events and - because of this - different likelihoods or probabilities of flooding (for example a 1% event) should be considered and mapped. The assessment of flood risk and mapping must be coordinated between the Member States sharing river basins that cross national boundaries. Maps should have been prepared by December 2013.

The maps are to be used in the development of flood risk management plans (FRMPs) during the third stage, to be completed and published by December 2015 thereby harmonizing with the WFD River Basin Management Plan (RBMP) cycle. The FRMPs should focus on the reduction of the potential adverse impacts of flooding on people's health, the economy, environment and cultural heritage, with measures on flood prevention, protection, and preparedness.

Some Member States have a legacy of assessing and managing the risk of flooding and already have and use flood maps. These Member States are able to make use of existing flood risk assessments and maps subject to certain conditions described in the Directive. As a result, not all Member States have produced Preliminary Flood Risk Assessments or identified Areas of Potential Significant Flood Risk as required by the Floods Directive for part or the whole of their territory. Under the same transitional measures, Member States are also able to use existing flood risk management plans as long as their content is equivalent to that described in the Directive.

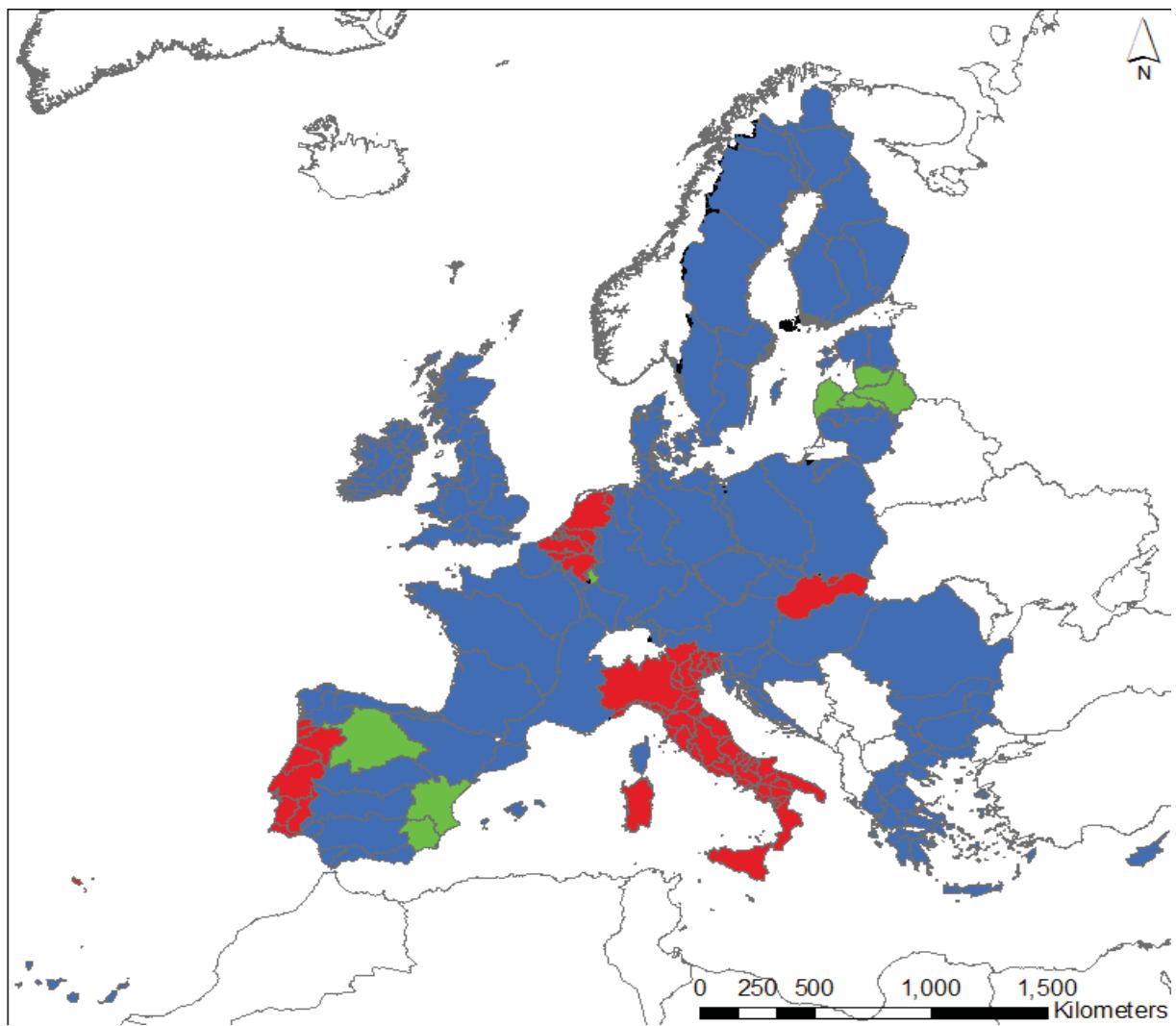
### **3. APPROACHES TAKEN BY MEMBER STATES**

The standard approach of the Directive is for Member States to undertake a preliminary assessment of flood risk across their territories and use the results to identify areas where there are present or future potential significant risks of flooding. The assessments should also consider all potential sources of flooding such as from rivers, lakes, coastal waters, groundwater and surface water flooding from heavy rainfall. Artificial structures holding water, such as dams, reservoirs and canals, also represent a potential significant source of flooding, particularly if there were to be a catastrophic failure of the structure.

Member States were also able to use existing flood risk assessments if they were suitable for identifying areas at significant risk of flooding from all potential sources and in all parts of their territory. If existing risk assessments did not cover all potential sources of significant flooding or the whole country, then a new preliminary flood risk assessment was required for those specific flood sources and/or for areas/river basins not previously assessed.

Maps showing the hazards and risks from flooding are required for those areas identified as being at a significant risk of flooding. Some Member States already had existing maps and they were able to use these (if the information provided is equivalent to that described by the Directive) rather than producing new maps.

Because there were differences within and between Member States in terms of existing flood risk assessments and flood hazard and flood risk maps, there is a multitude of approaches taken across the EU. This is illustrated in Map 2.1. The river basins and Member States coloured blue indicate where a preliminary flood risk assessment under the Floods Directive has been undertaken leading to the identification of areas of potential significant flood risk in their river basins for potentially significant sources of flood. In those river basins or Member States coloured green existing flood risk assessments have been used to identify areas of potential significant flood risk for relevant sources of flooding. Finally in those river basins and Member States coloured red it was decided to use existing flood hazard and flood risk maps without undertaking a preliminary flood risk assessment (as described in the Floods Directive) leading to the identification of areas of potential significant flood risk.



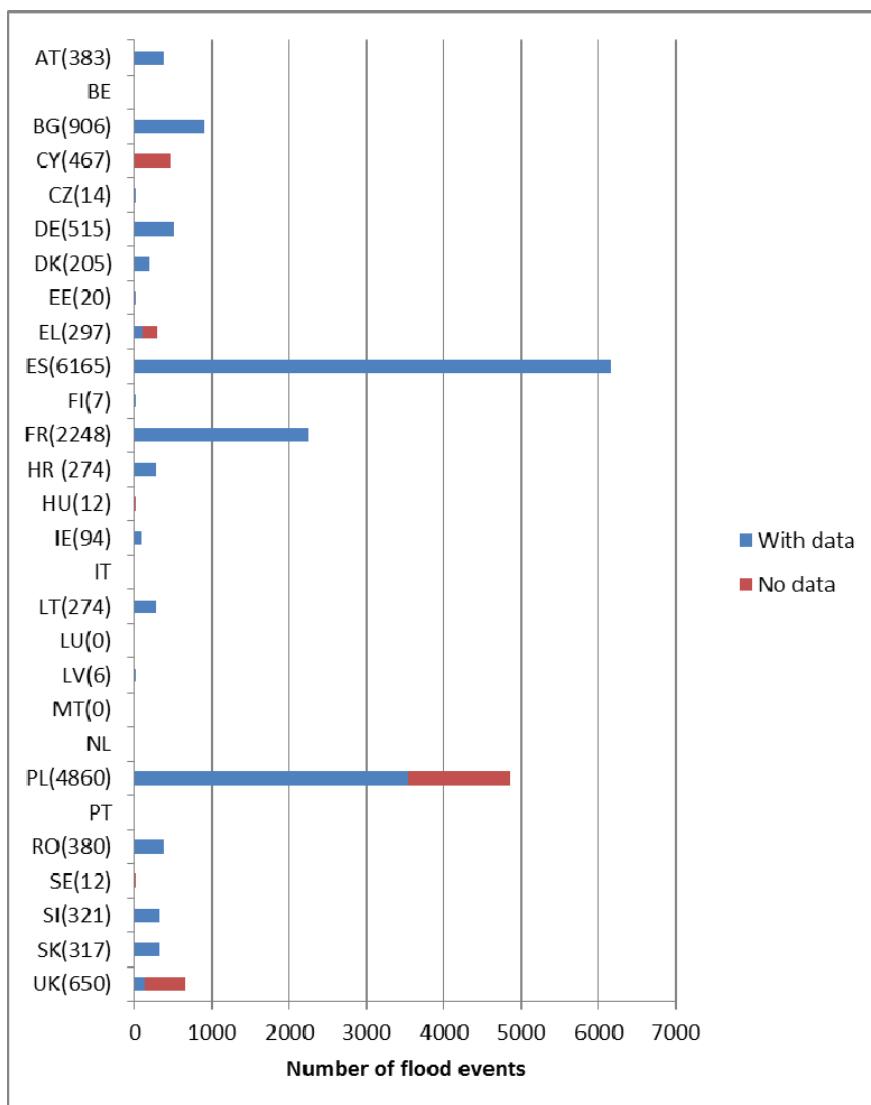
**Map 2.1** Approaches used by Member States in assessing flood risk and identifying areas of potential significant flood risk

#### 4. HISTORY OF FLOODING

The assessment of flood risk takes account of historical significant floods, where records are available. Historic records may include records on the land area covered by, and the duration of, floods and the subsequent adverse impacts on people, the economy, environment and cultural heritage.

Member States reported on the historic flood events that were considered in their preliminary flood risk assessments.

**Figure 3.1 Number of reported historic flood events by Member State**

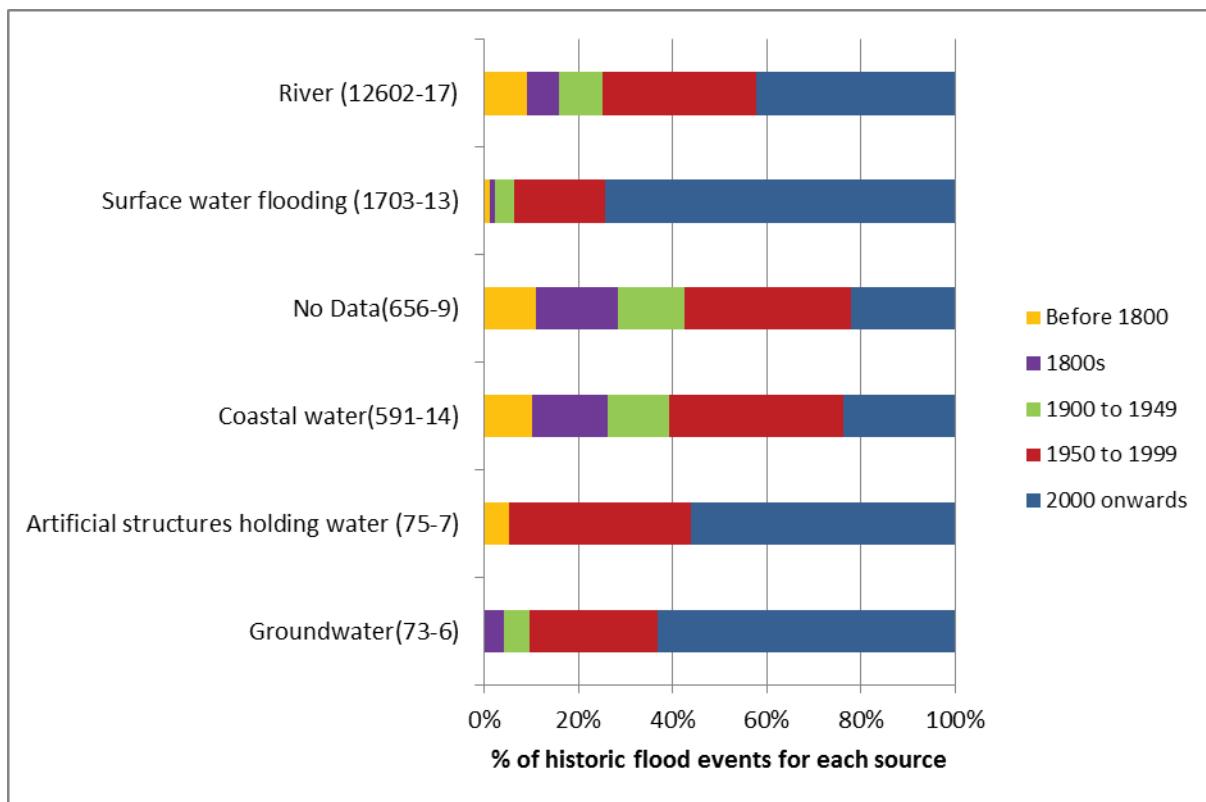


Belgium, Italy, the Netherlands and Portugal did not report information on historic flood events because they decided to use existing flood risk assessments and flood risk maps. Slovakia reported information on historic floods even though it was decided to use existing flood risk assessments. Member States reported flood events with data on type and consequences. When this was not possible, a description of the event was provided: this equates to “No data”.

The largest number of historic flood events reported was by Spain (6,165) followed by Poland (4,860) and France (2,248). A number of Member States (e.g. Hungary, Sweden and the UK) reported historic floods with no supporting information on sources of flood, their impacts and dates: these are indicated as “No data” in Figure 3.1.

Figure 3.2 summarises the time periods covered by the reported historic flood events. The oldest flood event dated back to 100 AD from Spain. Most of the oldest events relate to river and coastal water floods probably because of the extent of the impact they had on people. The highest proportion of recent flood events are for surface water flooding from heavy rainfall events and groundwater floods. Around 60% of events were recorded from 2000 onwards.

**Figure 3.2 Time periods of reported historic flood events**



Based on data from AT, BG, CY, CZ, DE, DK, EE, EL, ES, FI, FR, HR, HU, IE, LT, LV, MT, PL, RO, SE, SI, SK, UK. The numbers in brackets after the source of flood refers to "the number of events reported" from "the number of Member States".

By far the most common source of reported historical flood events is river water floods (66% of events) followed by surface water flooding from heavy rainfall (20%) and coastal water floods (16%). The least common sources are from artificial structures holding water and groundwater (both 1%).

Member States undertaking a preliminary assessment of flood risk were required to make an assessment of which sources of flood were potentially significant in terms of past and potential future impacts on people, the economy, environment and cultural heritage based on readily available information including the historic flood events described above.

Table 3.1 summarises the sources of floods that Member States considered to be significant and should be included for more detailed assessment of the potential significant risk they represent.

**Table 3.1 Summary of the sources of flooding considered by Member States to be significant, not significant and not relevant**

	Rivers	Lakes	Surface water flooding	Ground water	Coastal waters	Tsunamis	Artificial structures containing water	Canals	Reservoirs or impoundments
AT	Green	Grey	Green	Grey	Yellow	Grey	Grey	Grey	Grey
BE	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
BG	Green	Grey	Green	Green	Green	Grey	Green	Grey	Grey
CY	Green	Grey	Green	Grey	Grey	Grey	Green	Grey	Green
CZ	Green	Grey	Green	Green	Yellow	Grey	Green	Grey	Green
DE	Green	Grey	Green	Green	Green	Grey	Green	Grey	Grey
DK	Green	Grey	Yellow	Yellow	Green	Grey	Yellow	Grey	Grey
EE	Green	Green	Green	Green	Green	Grey	Green	Grey	Green
EL	Green	Grey	Green	Grey	Grey	Grey	Green	Grey	Grey
ES	Green	Grey	Green	Green	Green	Grey	Green	Grey	Grey
FI	Green	Green	Green	White	Green	Grey	Green	Grey	Green
FR	Green	Grey	Green	Green	Green	Grey	Green	Grey	Grey
HR	Green	Grey	Green	Yellow	Green	Grey	Green	Grey	Grey
HU	Green	Grey	Green	Green	Yellow	Grey	Grey	Grey	Grey
IE	Green	Green	Green	Green	Green	Grey	Green	Grey	Grey
IT	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
LT	Green	Grey	Green	Grey	Green	Grey	Green	Grey	Green
LU	Grey	Grey	Green	White	Yellow	Grey	Grey	Grey	Grey
LV	Green	Grey	Grey	Yellow	Green	Grey	Green	Grey	Grey
MT	Green	Grey	Green	Green	Green	Grey	Green	Grey	Grey
NL	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
PL	Green	Green	Grey	Grey	Green	Yellow	Grey	Green	Green

PT									
RO									
SE									
SI									
SK									
UK									

Key:

	Potentially significant source of flooding
	Not considered as a significant source
	Not relevant
	No information
	Not undertaken a preliminary flood risk assessment as per the Directive

Flooding from rivers and surface water flooding from heavy rainfall were considered to be significant sources by most Member States undertaking an assessment. Coastal water flooding was also considered by most Member States with a coastline though it was not always considered as being significant. The consideration of flooding from sewerage was considered by a few Member States, as was the significance of flooding from tsunamis, by at least two Member States.

## 5. IDENTIFICATION OF POTENTIAL SIGNIFICANT FUTURE FLOODS

The assessment of flood risk can take into account historic events where they were considered to be significant in terms of the effects on people's health, the economy, environment and cultural heritage. However, just because some flood events may have been significant in the past does not necessarily mean that they are now or will be in the future, or vice versa. This is because there is likely to have been significant changes in land use and built up areas since some flood events occurred, particularly the older ones. The chance of the recurrence of any particular flood event in any location is also likely to be affected by changes in climate.

As well as using appropriate historic records of flooding, Member States have also used other tools and methods to assess the significance of potential future floods. In some cases flood simulations and (simplified) modelling using digital representations of the landscape around potential sources of floods have been used to calculate flood areas and to produce flood maps. These maps may have also been combined with land use maps to identify potential significant floods. In others cases historical floods may have been reconstructed and mapped.

At the European level the most common source of potential future flooding was again river water floods (76% of the derived potential events) and the least from groundwater and from artificial structures containing water (both 2%).

## **6. PREDICTING THE IMPACT OF POTENTIAL FUTURE FLOODS**

As well as assessing where significant future floods may occur with the coverage and depth of water over the flooded land, Member States had to assess the potential impacts on people's health, the economy, environment and cultural heritage. The approaches used by Member States to assess the impacts of flooding were very diverse.

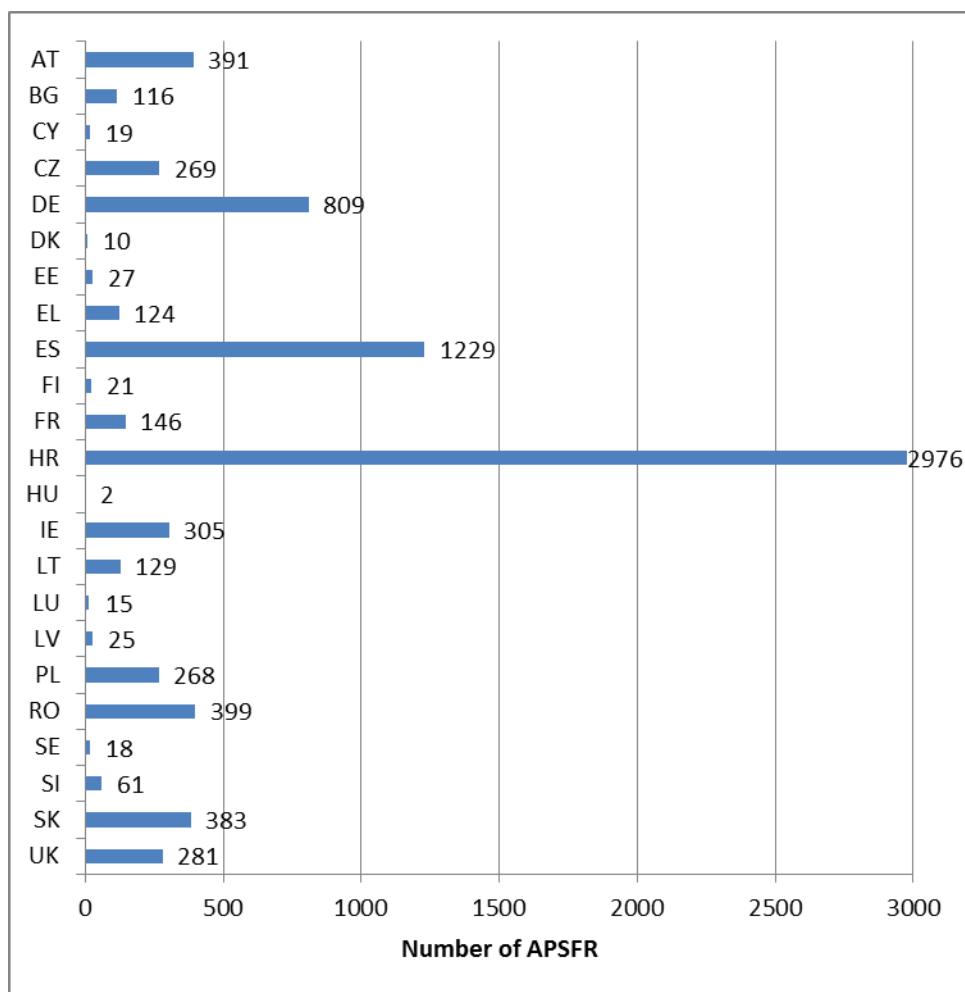
For some Member States there was a lack of information that made a detailed assessment of the impacts of potential future floods difficult. However, nearly all Member States considered the potential impacts on people's health, the economy, environment and cultural heritage though often it was not clear what specific criteria had been used to define a significant impact: expert judgment was often used.

More quantitative approaches included the use of flood risk indicators often associated with indices of risk, with thresholds of significance based on the number of people and residents potentially affected, the total economic damage, and if any vital economic activities would be threatened.

## **7. IDENTIFICATION OF AREAS OF POTENTIAL SIGNIFICANT FLOOD RISK**

The results of the preliminary flood risk assessment should be used to identify present and future areas of potential significant flood risk (APSFR). Figure 6.1 shows the number of APSFR identified by Member States. Croatia has identified the most APSFRs (2,976) followed by Spain and Hungary and Malta the fewest.

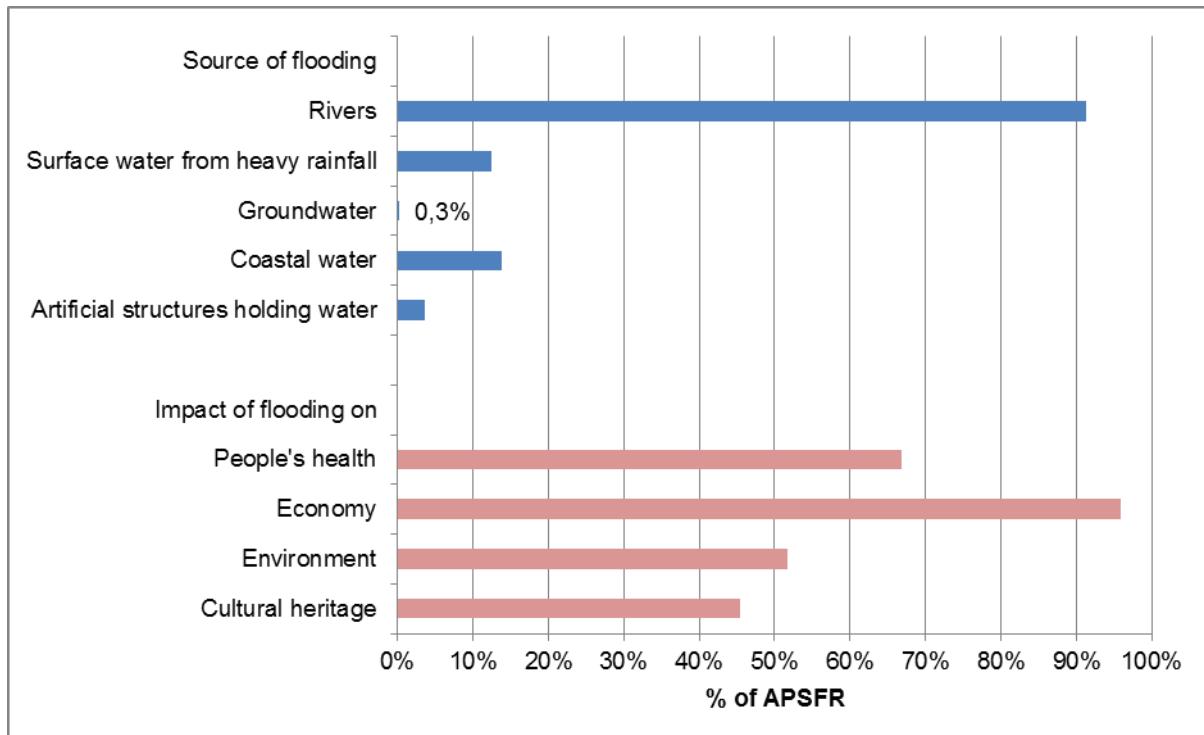
**Figure 6.1 Number of identified Areas of Potential Significant Flood Risk**



Based on 8013 identified APSFRs from AT, BG, CY, CZ, DE, DK, EE, EL, ES, FI, FR, HR, HU, IE, LT, LU, LV, PL, RO, SE, SI, SK, UK; MT did not identify any APSFRs (December 2015); BE, IT, NL and PT did not identify new APSFRs under the present exercise. The APSFRs in the UK were those identified for the Directive's preliminary flood risk assessment undertaken for some parts of the UK and for some sources of flooding: in other parts of the UK existing risk assessments were used for some sources of floods. HU identified large geographical areas. PT identified a number of risk zones based on historic data. Note that when comparing the numbers in table 6.1 to the number of APSFRs per MS in the Annex more than one source of flooding often applies to an APSFR.

Figure 6.2 summarises the source of floods and potential impacts associated with the APSFRs. The types of flood associated with APSFRs follow a similar pattern as for historic and potential future floods. 91% of APSFRs were associated with river floods and only 0.3% with groundwater floods. Potential impacts on the economy were associated with the greatest proportion (96%) of APSFRs.

**Figure 6.2 Sources and impacts of floods associated with Areas of Potential Significant Flood Risk**



Based on 8013 ASPRs from AT, BG, CY, CZ, DE, DK, EE, EL, ES, FI, FR, HR, HU, IE, LT, LU, LV, PL, RO, SE, SI, SK, UK;

Areas of potential significant flood risk can be viewed on a European level by clicking on the following link: <http://www.eea.europa.eu/themes/water/interactive/floods-directive-pfra-apsfr>.

## 8. TAKING ACCOUNT OF CLIMATE CHANGE AND OTHER FUTURE CHANGES

Where possible the effects of climate change on the occurrence and impacts of flooding may have been considered when undertaking a first assessment of flood risk but climate change will have to be taken into account when current risk assessments are reviewed and revised in the future.

Land use planning is also an important factor in flood risk management by, for example, reducing the probability of flooding by controlling land use in flood source areas. Floodplains are increasingly regarded as potential natural water retention areas, or for providing space to the river. The commitment of land use planners and decision makers at the local level is needed to control development of such flood prone areas.

Fourteen of the 23 Member States undertaking a Directive Preliminary Flood Risk Assessment have considered the potential effects of climate change (Table 7.1). Often trends from the Intergovernmental Panel on Climate Change or national research programmes have been used but it was mostly unclear how. Some Member States provided more detailed information. Germany, for example, refers to modelling, statistical assessment and scenario building.

In most Member States that have considered other long term developments (e.g. Austria, Bulgaria, Cyprus, Slovakia and Latvia) it was unclear from the reporting how they were assessed.

**Table 7.1 Summary of which long term changes have been considered in the assessment of flood risk by Member States**

MS	Climate change	Development of settlements	Development of infrastructure	Socio-economic developments
AT				
BE	Directive Preliminary Flood Risk Assessment not undertaken			
BG				
CY				
CZ				
DE				
DK				
EE				
EL				
ES				
FI				
FR				
HR				
HU				
IE				
IT	Directive Preliminary Flood Risk Assessment not undertaken			
LT				
LU	Directive Preliminary Flood Risk Assessment not undertaken			
LV				
MT				
NL	Directive Preliminary Flood Risk Assessment not undertaken			

MS	Climate change	Development of settlements	Development of infrastructure	Socio-economic developments
PL				
PT	Directive Preliminary Flood Risk Assessment not undertaken			
RO				
SE				
SI				
SK				
UK				

Key

Long-term trend considered
Long-term trend not considered
Not reported

The impact of climate change on the occurrence of floods should, where possible, be taken into account in a preliminary flood risk assessment and in the subsequent reviews of the preliminary flood risk assessment and flood risk management plans. Table 7.2 shows, 11 Member States have taken climate change into account when preparing their flood maps. For example, in Sweden the medium probability flood maps for river and lake flooding took account of predicted changes in climate to 2098. In Denmark, three future climate change scenarios were included in preparing medium probability maps for river and coastal flooding: for example, a 30 cm increase in sea level was considered.

**Table 7.2 Summary of how climate change was accounted for in the preparation of flood maps**

	1	2	3	4	5	6
AT	Yes	Yes	Yes	Yes	Yes	Yes
BE	No	No	No	No	Yes	Yes
BG	Not reported as of December 2015					
CY	Yes	No	No	No	Yes	No
CZ	No	No	Yes	No	Yes	Yes

	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
DE	Yes	No	No	No	Yes	Yes
DK	Yes	Yes	Yes	Yes	Yes	Yes
EE	No	No	No	No	No	No
EL	Not reported as of December 2015					
ES	No	No	No	No	No	No
FI	Yes	Yes	Yes	Yes	Yes	Yes
FR	Yes	No	Yes	No	No	No
HR	Not reported as of December 2015					
HU	No	No	No	No	No	No
IE	Yes	No	No	No	No	No
IT	No	No	No	No	No	No
LT	Yes	Yes	Yes	No	No	Yes
LU	No	No	No	No	No	No
LV	No	No	No	No	No	No
MT	Not reported as of December 2015					
NL	No	No	No	No	No	No
PL	No	No	No	No	No	No
PT	Reported late					
RO	No	No	No	No	No	No
SE	Yes	No	No	No	No	No
SI	No	No	No	No	No	No
SK	Yes	No	Yes	No	Yes	Yes
UK	Yes	No	Yes	No	Yes	No

### **Key to columns**

1	Climate change has been taken into account
2	Climate change trend scenarios have been obtained from international research programmes
3	Climate change trend scenarios have been obtained from the national research programmes
4	Flood hazard scenarios are based on modelling of changes in flood hazard in relation to climate change
5	Flood hazard scenarios included trend analysis of historical data of hydrological and meteorological observations
6	Flood hazard scenarios included a statistical assessment of historical climate data

## **9. INTERNATIONAL COORDINATION**

Member States sharing river basins that cross international borders must cooperate in their assessments of flood risk and coordinate their identification of areas of potential significant flood risk in the shared basins. Based on the Water Framework Directive, there are 128 RBDs designated in the EU, of which 49 are international. If each national part of an international RBD is counted separately, the total number of RBDs is 170 of which 91 have an international component where the assessment of flood risk should be coordinated.

Often coordination is achieved through international river commissions, such as the International Commission for the Protection of the Danube River and the International Commission for the Protection of the Rhine.

Bilateral border commissions are also relatively common, providing a formalised mechanism for two Member States to exchange information and coordinate actions to manage flood risk as well as other water management issues. Similarly, various international coordination and working groups have been established to carry out specific roles in flood risk management, including decision-making, the provision of advice (e.g. between Ireland and the UK), coordination of measures and the implementation of flood risk management measures (e.g. in the Danube).

Member States sharing river basins and areas of potential significant flood risk should also exchange information with the relevant Member States prior to the preparation of flood maps. There seems to have been exchange of information in all Member States sharing river basins (and those with available information) for most, if not all, of their shared basins (Table 8.1). International River Commissions play a significant role in this information exchange. For example, for Austria information was exchanged via the Danube, Rhine and Elbe River Commissions, for Belgium (Flanders) via the Scheldt and the Meuse River Commissions and for Germany via the Rhine, Elbe, Meuse and Danube River Commissions. Information is exchanged between Ireland and the UK using the Floods Directive Cross Border

Implementation Group and the Floods Directive Cross Border Technical Working Group. Data is shared and the mapping output reviewed to ensure it is consistent.

**Table 8.1 Summary of the prior exchange of information on the preparation of flood maps between Member States sharing flood risk areas**

MS	Number of cross border river basins with flood risk areas shared with another Member State	Number of cross border river basins with flood risk areas shared with another Member State where information was exchanged
AT	3	3
BE	7	6
BG	Not reported as of December 2014	
CY	0	Not applicable
CZ	0	Not applicable
DE	8	5
DK	0	Not applicable
EE	0	Not applicable
EL	Not reported as of December 2014	
ES	1	1
FI	2	2
FR	4	4
HR	Not reported as of December 2014	
HU	1	1
IE	2	2
IT	3	3
LT	2	2
LU	1	1
LV	2	2
MT	Not reported as of December 2014	
NL	4	4

MS	Number of cross border river basins with flood risk areas shared with another Member State	Number of cross border river basins with flood risk areas shared with another Member State where information was exchanged
PL	3	1
PT	Reported late (of the 22 critical areas identified by Portugal, there are three in international rivers, one on the Tagus River and two on the Douro River)	
RO	4	4
SE	1	1
SI	2	2
SK	0	Not applicable
UK	2	2

## 10. PREPARATION OF FLOOD HAZARD AND FLOOD RISK MAPS<sup>1</sup>

Maps showing the hazards and risks of flooding should have been prepared and made available to the public by December 2013.

The maps should show at least the hazards and risks to potentially affected people, areas of economic activity, and, where present, installations which might cause accidental pollution should they be flooded, and other vulnerable features such as nature protection areas. Maps should be prepared covering a range of different probabilities of occurrence of flooding events (e.g. those with low, medium and high probabilities).

Most Member States (22) have published maps on flooding from rivers and in some cases (e.g. Cyprus) no distinction is made between river flooding and flooding from surface water run-off resulting from heavy rainfall (Table 9.1). There is no specific distinction made between sources of flooding in the maps prepared by the Czech Republic, the Netherlands and Slovakia. Potential flooding from the failure of water bearing structures has been mapped in some areas of Spain (dams), Sweden (impoundments), and in the UK (reservoirs). Other than the Netherlands and Sweden, all Member States with a coastline (that have provided information) have prepared specific maps on coastal flooding.

<sup>1</sup>

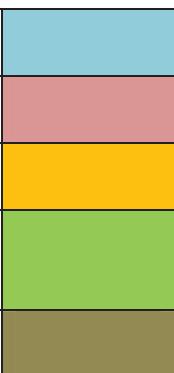
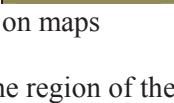
Member State reporting still under assessment. Information subject to change.

**Table 9.1 Summary of sources of flooding for which flood maps have been prepared by Member States**

	Rivers	Surface water run-off	Coastal water	Groundwater	Artificial structures holding water	Sewers
AT						
BE						
BG	Not reported as of December 2014					
CY						
CZ		1		1		
DE						
DK						
EE						
EL	Not reported as of December 2014					
ES						
FI						
FR						
HR	Not reported as of December 2014					
HU						
IE						
IT						
LT						
LU						
LV						
MT	Not reported as of December 2014					
NL		1	1	1		
PL						
PT	Reported late					

	Rivers	Surface water run-off	Coastal water	Groundwater	Artificial structures holding water	Sewers
RO						
SE						
SI						
SK		1		1		
UK						2

#### Key

Published for all relevant areas	
Published in some but not all relevant areas	
Need for maps assessed but not published	
Not published or assessed or no clear information	
Flood source not relevant to Member States	

1 Specific sources of flooding are not clear on maps

2 Mapped with surface water flooding in one region of the UK

Maps have been made available to the public in the majority of Member States. In most of these Member States, maps showing low, medium and high probabilities of flooding have been prepared: in few Member States, medium and low probability maps were prepared. In most maps, the potential extent of flood water is shown and in over half of maps the depth of flood water is shown.

A review of the methods used by (23) Member States in preparing their flood maps shows that most of them used a 1% probability for mapping the medium probability events. A range of probabilities from 0.01% to 0.5% (11 Member States use 0.1%) were used for extreme events, and a range of probabilities from 2% to 20% for the high probability, relatively common events.

Maps showing the potential impacts of flooding most often include an indication of the number of inhabitants potentially affected for each of the probabilities and sources of flooding. Potentially more inhabitants would be affected by flooding from low probability or extreme, rare events than from medium or high probability (more common) events. Information is available from 17 Member States on the number of potentially affected inhabitants from medium probability river floods (Table 9.2). The values are for specific areas identified by the preliminary flood risk assessment as being at risk or at the level of the river basin. Because of differences in the probabilities of flooding and in the methods used to

calculate the numbers of affected inhabitants, the numbers between Member States are not directly comparable but are intended to provide a general overview of the scale of the potential effect on exposed inhabitants. Table 9.2 Summary of number of potentially affected inhabitants from medium probability river floods

MS	Overall Inhabitants potentially affected (1000's)	
	In identified flood risk areas	In river basins
AT	343	
BE		270
BG	Not reported as of December 2015	
CY	15	
CZ		290
DE	1759	
DK	Information not available	
EE	Low probability floods only mapped	
EL	Not reported as of December 2015	
ES	1150	
FI	20	
FR	1412	
HR	Not reported as of December 2015	
HU	Low probability floods only mapped	
IE	73	
IT		6185
LT		16
LU	River flooding not significant	
LV	Not known	
MT	Not reported as of December 2015	
NL		1284

PL	406	
PT	Not processed yet due to late reporting	
RO	769	
SE	Source of flooding not available	
SI	32	
SK	102	
UK *	127	127

Note:

\* Excluding England and Wales. Scotland and Northern Ireland also provided values at the river basin level which included the specific flood risk areas.

For around two thirds of the Member States maps also showed (when relevant) the potential impacts on the economy, the location of potential sources of pollution (if flooded) and impacts on the environment. Half of the Member States showed impacts on cultural heritage.

## 11. CONCLUSIONS

1. Eighteen Member States decided to undertake a Preliminary Flood Risk Assessment as described by the Directive across their whole territories and for all potential sources of flooding.
2. Luxembourg and Latvia decided to use existing risk assessments to identify flood risk areas across their whole territories.
3. Belgium, Italy, the Netherlands and Portugal decided to use existing flood hazard and flood risk maps and did not undertake a Preliminary Flood Risk Assessment as described by the Directive. Slovakia undertook a risk assessment and identified areas of potential flood risk but then decided to use existing flood hazard and flood risk maps.
4. Germany, Spain and the United Kingdom used a mixture of approaches across their territories.
5. Twenty two Member States provided information on historic floods some dating back to the 1<sup>st</sup> century but most relating to floods since the 1950s. The most common historical floods were from rivers.
6. Around 8,000 areas of potential significant flood risk have been identified by 23 Member States with Croatia identifying the most (2,976). Flooding from rivers was the most common source associated with the areas and the economy was the most common aspect to be potentially impacted in these areas.

7. Flood hazard and flood risk maps have been prepared by most Member States with the potential flooding from rivers being most often mapped. Most Member States with a coastline have also mapped potential coastal water flooding. In some Member States it seems that flooding from a number of sources has been combined in a single map.
8. Climate change was considered by 14 Member States when assessing the risk of flooding and 11 Member States considered other long terms changes such as potential changes in land use. 11 Member States have also taken climate change into account when preparing their flood maps.
9. Many Member States have coordinated their assessments of flood risk in river basins that they share with other Member States. Many have also exchanged information prior to the preparation of their flood maps. River Commissions such as those for the Danube, Rhine, Elbe and Scheldt have played key roles in coordination and the prior exchange of information.

## 12. ANNEX

### **The assessment and mapping of flood risk per Member State**

#### **Introduction**

In the following pages the assessment and mapping of flood risk is briefly discussed per Member State with the following structure (text applies to all Member States):

#### **Types of flooding**

Type of floods examined by the MS.

#### **History of flooding**

The assessment of flood risk takes account of historical floods where records are available. Historic records may include records on the land area covered by, and the duration of, floods and the subsequent adverse impacts on people's health, the economy, environment and cultural heritage.

#### **Areas at risk of flooding now and in the future**

The assessment of flood risk can take into account historic events where they were considered to be significant in terms of the effects on people's health, the economy, environment and cultural heritage. Just because some flood events may have been significant in the past does not necessarily mean that they are now or will be in the future, or vice versa. This is because there is likely to have been significant changes in land use and built up areas since some flood events occurred, particularly the older ones. The chance of the recurrence of any particular flood event in any location is also likely to be affected by expected changes in climate.

Areas of potential significant flood risk can be viewed on:

<http://www.eea.europa.eu/themes/water/interactive/floods-directive-pfra-apsfr>

#### **Flood Hazard and Flood Risk maps**

Maps showing the hazards and risks of flooding should be prepared and made available to the public. The maps should show at least the hazards and risks to potentially affected people, areas of economic activity, and, where present, sources of potential pollution should they be flooded, and other vulnerable features such as water abstractions and nature protection areas. Maps should be prepared covering a range of different probabilities of occurrence of flooding events (e.g. those with low, medium and high probabilities). Maps are required for the areas identified as being at a significant risk from the relevant types of flood such as those associated with the identified areas of potential significant flood risk shown above.

Examples of Members State Flood Hazard and Risk Maps can be viewed on:

[http://ec.europa.eu/environment/water/flood\\_risk/implem.htm](http://ec.europa.eu/environment/water/flood_risk/implem.htm)

#### **The next steps**

The maps are to be used in the development of flood risk management plans that need to be completed and published by 22 December 2015. The plans should focus on the reduction of the adverse impacts of flooding on people's health, the economy, environment and cultural

heritage, with planned measures and actions on flood prevention, protection, and preparedness.

Information on the EU Floods Directive can be found on:

[http://ec.europa.eu/environment/water/flood\\_risk/index.htm](http://ec.europa.eu/environment/water/flood_risk/index.htm)

A pan-European Flood Hazard and Flood Risk map viewer will be hosted by the European Environment Agency in the near future:

<http://www.eea.europa.eu/themes/water/interactive/by-category/floods-directive>

## AT-Austria

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- **Types of flooding**

Austria undertook a preliminary assessment of the risk of flooding from all relevant sources which included rivers and surface water flooding from heavy rainfall, dams and reservoirs, and groundwater. The authorities in Austria reviewed past events and found that river flooding had caused the most impact.

- **History of flooding**

Records of flooding from rivers are the most common in Austria, going back to the 1890's, with some 173 events since the year 2000. There are fewer records on floods from surface water flooding, with only 14 since the year 2000.

- **Areas at risk of flooding now and in the future**

The location and risk of future floods were largely predicted using geographic computer modelling and impact assessments on human health, economy, cultural heritage sites and environment.

Climate change can potentially significantly affect the risk of flooding. The vulnerability of river catchments to climate change was assessed using information in the computer models to estimate the potential increase in flood risk from river flooding because of climate changes; the predicted effects of climate changes on flood risk has also been assessed by using spatial planning data and expert knowledge.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development have also been considered in Austria.

Austria shares a total of three international river basins (the Danube, the Elbe and the Rhine) with Czech Republic, Germany, Slovakia, Hungary, Switzerland, Slovenia and Liechtenstein as immediate neighbours. The assessment of flood risk in these three international basins has been coordinated between the respective national authorities, and it is the intention that one joint flood risk management plan will be produced for each basin.

The following areas of potential significant flood risk were identified for Austria:

<b>Region</b>	<b>Number of areas</b>	
	<b>Rivers</b>	<b>Surface water flooding from heavy rainfall</b>
Austria	385	6

- **Links to reports on assessment of flood risk and maps in Austria**

Title	Source
Overview map	<a href="http://wisa.bmlfuw.gv.at/wasserkarten/hochwasser/risikogebiete.html">http://wisa.bmlfuw.gv.at/wasserkarten/hochwasser/risikogebiete.html</a>
Background documents	<a href="http://wisa.bmlfuw.gv.at/fachinformation/hochwasserrisiko/risikobewertung/hintergrunddokumente.html">http://wisa.bmlfuw.gv.at/fachinformation/hochwasserrisiko/risikobewertung/hintergrunddokumente.html</a>
Flood Hazard and Risk Maps	<a href="http://wisa.bmlfuw.gv.at/wasserkarten/hochwasser/gefährtenkarten.html">http://wisa.bmlfuw.gv.at/wasserkarten/hochwasser/gefährtenkarten.html</a> <a href="http://wisa.bmlfuw.gv.at/wasserkarten/hochwasser/risikokarte.html">http://wisa.bmlfuw.gv.at/wasserkarten/hochwasser/risikokarte.html</a>  <a href="http://wisa.bmlfuw.gv.at/fachinformation/hochwasserrisiko/Gefahren--und-Risikokarten.html">http://wisa.bmlfuw.gv.at/fachinformation/hochwasserrisiko/Gefahren--und-Risikokarten.html</a>

## BE-Belgium

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- **Types of flooding**

Belgium decided before December 2010 to prepare flood hazard maps and flood risk maps and to establish flood risk management plans. Belgium applied Floods Directive transitional measures and was able to make use of existing flood risk assessments for the mapping of risk of flooding from all relevant sources which included rivers, coastal waters, surface water flooding from heavy rainfall, dams and reservoirs, and groundwater.

- **History of flooding**

Belgium did not have to identify historical floods as per the Floods Directive as the decision to prepare flood hazard maps and flood risk maps and to establish flood risk management plans had already been taken.

- **Areas at risk of flooding now and in the future**

Belgium did not communicate potential future floods or areas of potential significant flood risk as the decision to prepare flood hazard maps and flood risk maps and to establish flood risk management plans had already been taken.

No information was reported on the possible impact of climate change and spatial planning policies such as those on land use and infrastructure development

Belgium shares a total of seven international river basins with France, the Netherlands, Germany, Luxembourg, Austria, Liechtenstein and Switzerland. The assessment of flood risk in six of the international basins is formally coordinated between the respective national authorities and there is an informal arrangement for the seventh.

- **Links to reports on assessment of flood risk and maps in Belgium**

Title	Source
Flood Hazard and Risk Maps	<a href="http://geoapps.wallonie.be/inondations/#BB_OX=-4432.83020066045,262796.8709254085,-1729.6873253746744,185860.2711878757">http://geoapps.wallonie.be/inondations/#BB_OX=-4432.83020066045,262796.8709254085,-1729.6873253746744,185860.2711878757</a> <a href="http://environnement.wallonie.be/inondations/">http://environnement.wallonie.be/inondations/</a>
Wallonia Geoportal	<a href="http://Geoportail.wallonie.be">http://Geoportail.wallonie.be</a>
Flemish Geoportal	<a href="http://www.waterinfo.be/default.aspx?path=NL/Loketten/geoloket">http://www.waterinfo.be/default.aspx?path=NL/Loketten/geoloket</a>
Policy Priorities 2012-2013	Beleidsbrief Mobiliteit en Openbare Werken , Beleidsprioriteiten 2012-2013 (1778 (2012-2013) – Nr. 1)
Environmental assessment for the purpose of drafting the river basin management plans for	Milieubeoordeling ten behoeve van de opmaak van de stroomgebiedbeheerplannen voor Schelde en Maas

the Scheldt and Meuse (notification document)	(kennisgevingsdocument)
Water Policy Document	Tweede Waterbeleidsnota, incl. Waterbeheerkwesties (Voorontwerp in openbaar onderzoek van 19 december 2012 tot 18 juni 2013)
Flemish framework for flood risk management	Vlaams kader voor overstromingsrisicobeheerplannen Onderbouwing en bevindingen van meerlaagse veiligheid uit het ORBP-project (IMDC)
	Meerlaagse Waterveiligheid: resultaten van de ORBP-studie (VMM)
Legal references for Wallonia	<a href="http://wallex.wallonie.be/index.php?doc=16557&amp;rev=17454-10324">http://wallex.wallonie.be/index.php?doc=16557&amp;rev=17454-10324</a>

## BG-Bulgaria

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- **Types of flooding**

Bulgaria undertook a preliminary assessment of the risk of flooding from all relevant sources which included rivers, coastal waters, surface water flooding from heavy rainfall, snow melt, dams and reservoirs, and groundwater.

- **History of flooding**

Records of flooding from rivers and surface water flooding from heavy rainfall are the most common in Bulgaria, going back to the mid-19<sup>th</sup> century, with hundreds of significant flood events being recorded since 2000. There are fewer records on floods from sea water, groundwater and from reservoirs (e.g. dam failures).

- **Areas at risk of flooding now and in the future**

The location and risk of future floods were predicted using computer models using data from past flood events. Future floods with a probability of occurrence of 1% or greater were modelled.

Climate change can potentially significantly affect the risk of flooding. In Bulgaria, the impact of climate change on this risk has not been studied enough to include in the assessment at this time and further data gathering and modelling are needed.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development have been considered in Bulgaria.

Bulgaria shares four international river basins with Romania, Greece, Turkey, Serbia and the Former Yugoslav Republic of Macedonia. The assessment of flood risk in these international basins has been coordinated between the respective national authorities.

The following areas of potential significant flood risk were identified for Bulgaria:

Region	Number of areas			
	Rivers	Surface water flooding from heavy rainfall	Coastal	Dams and reservoirs
Bulgaria	105	12	11	12

- **Flood Hazard and Flood Risk maps**

Bulgaria has not yet published these maps.

- **Links to reports on assessment of flood risk in Bulgaria**

Title	Source
Preliminary Risk Assessment Methodology Part A (in Bulgarian language)	<a href="http://www3.moew.govtment.bg/files/file/Water/Povarhnostnivodi/PORN/Chast_A_28062011.pdf">http://www3.moew.govtment.bg/files/file/Water/Povarhnostnivodi/PORN/Chast_A_28062011.pdf</a>
Preliminary Risk Assessment Methodology Part B	<a href="http://www3.moew.govtment.bg/files/file/Wat">http://www3.moew.govtment.bg/files/file/Wat</a>

(in Bulgarian language)	<a href="er/Povarhnostnivodi/PORN/Chast_B_28062011.pdf">er/Povarhnostnivodi/PORN/Chast_B_28062011.pdf</a>
PFRA BG1000 (in Bulgarian language)	<a href="http://www.bd-dunav.org/content/upravlenie-na-vodite/upravlenie-na-riska-ot-navodneniia/predvaritelna-ocenka-na-riska-ot-navodneniia-v-dunavski-rayon-za-baseynovo-upravlenie/porn-v-dunavski-rayon/">http://www.bd-dunav.org/content/upravlenie-na-vodite/upravlenie-na-riska-ot-navodneniia/predvaritelna-ocenka-na-riska-ot-navodneniia-v-dunavski-rayon-za-baseynovo-upravlenie/porn-v-dunavski-rayon/</a>
PFRA BG2000 (in Bulgarian language)	<a href="http://bsbd.org/v2/bg/index_bg_2934486.html">http://bsbd.org/v2/bg/index_bg_2934486.html</a>
PFRA BG3000 (in Bulgarian language)	<a href="http://bd-ibr.org/details.php?p_id=243&amp;id=276">http://bd-ibr.org/details.php?p_id=243&amp;id=276</a>
PFRA BG4000 (in Bulgarian language)	<a href="http://www.wabd.bg/bg/index.php?option=content&amp;task=view&amp;id=987&amp;Itemid=72">http://www.wabd.bg/bg/index.php?option=content&amp;task=view&amp;id=987&amp;Itemid=72</a>

## CY-Cyprus

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- **Types of flooding**

Cyprus undertook a preliminary assessment of the risk of flooding from all relevant sources which included rivers, coastal waters, surface water flooding from heavy rainfall, dams and reservoirs and groundwater.

- **History of flooding**

Records of flooding from rivers and surface water flooding from heavy rainfall are the most significant types of floods in Cyprus, going back to 1973 (surface water) and 1981 (rivers), with four significant flood events recorded from 2000 to 2001. There are no records on historic floods from sea water, groundwater or from reservoirs (e.g. dam failures).

- **Areas at risk of flooding now and in the future**

In Cyprus, the location and risk of future floods were predicted using an eight-step methodology, which was developed under public consultation. It identified river basins 10 km<sup>2</sup> or larger and a number of criteria for land use, in conjunction with the information from historical floods and took into account any flood protection measures that had been implemented.

Climate change can potentially significantly affect the risk of flooding. In Cyprus the potential for climate change to increase the number and consequences of extreme flood events was based on research in both Cypriot and international literature.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development have also been considered in Cyprus.

Cyprus does not have any international river basins.

The following areas of potential significant flood risk were identified for Cyprus:

<b>Region</b>	<b>Number of areas</b>	
	<b>Rivers</b>	<b>Surface water flooding from heavy rainfall</b>
Cyprus	19	6

- **Links to reports on assessment of flood risk and maps in Cyprus**

<b>Title</b>	<b>Source</b>
Implementation of the Law 70(I) of 2010 for Floods	<a href="http://www.moa.gov.cy/moa/wdd/Wdd.nsf/guide2_en/guide2_en?OpenDocument">http://www.moa.gov.cy/moa/wdd/Wdd.nsf/guide2_en/guide2_en?OpenDocument</a>
Flood Hazard and Risk Maps	<a href="http://www.moa.gov.cy/moa/wdd/Wdd.nsf/all/410903B9E6BB3FF5C2257D2D003B0D46?opendocument">http://www.moa.gov.cy/moa/wdd/Wdd.nsf/all/410903B9E6BB3FF5C2257D2D003B0D46?opendocument</a>

## CZ-Czech Republic

- **Types of flooding**

The Czech Republic undertook a preliminary assessment of the risk of flooding from all relevant sources which included rivers, surface water flooding from heavy rainfall, dams and reservoirs, and groundwater.

- **History of flooding**

Records of flooding from rivers go back to the 1970's, with 12 significant flood events being recorded from 2000 to 2010. There are fewer (1 from 1950 to 1999) records on floods from reservoirs (e.g. dam failures) and none from surface water flooding.

- **Areas at risk of flooding now and in the future**

The location and risk of future floods were largely predicted using geographic computer models with information on the location of floodplains and residents that could be affected by flooding. This was done by looking at the chance a flood could occur and its impact on human health, environment, cultural heritage and economic activity.

Climate change can potentially significantly affect the risk of flooding. The vulnerability of river catchments to climate change was assessed; models were used to estimate the potential increase in flood risk from river flooding because of climate change.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development have also been considered in the Czech Republic.

The Czech Republic shares three international river basins with Austria, Germany, Poland and Slovakia. The assessment of flood risk in these three international basins has been coordinated between the respective national authorities.

The following areas of potential significant flood risk were identified for the Czech Republic:

<b>Region</b>	<b>Number of areas</b>
	<b>Rivers</b>
Czech Republic	269

- **Links to reports on assessment of flood risk and maps in the Czech Republic**

<b>Title</b>	<b>Source</b>
Czech PFRA report	<a href="http://www.povis.cz/html/">http://www.povis.cz/html/</a>
Report on PFRA methodology in CZ	<a href="http://www.povis.cz/html/">http://www.povis.cz/html/</a>
Preliminary Flood Risk Assessment in the Danube River Basin, ICPDR	<a href="http://www.icpdr.org/main/activities-projects/implementation-eu-floods-directive">http://www.icpdr.org/main/activities-projects/implementation-eu-floods-directive</a>

## DE-Germany

- **Types of flooding**

Germany undertook a preliminary assessment of the risk of flooding from all relevant sources which included rivers, coastal waters, surface water flooding from heavy rainfall, dams and reservoirs, and groundwater.

- **History of flooding**

Records of flooding from rivers are the most common in Germany, going back to 1717, with some 162 significant flood events being recorded between 2000 and 2011. There are fewer records on floods from sea water, surface water flooding (e.g. snow melt) and from reservoirs (e.g. dam failures).

- **Areas at risk of flooding now and in the future**

In Germany, the location and risk of future floods were largely predicted using computer models, statistical assessments and scenario building. The focus was on river, surface water and coastal water flooding rather than on groundwater flooding which was considered to be a contributory source to river flooding rather than as primary source requiring a specific assessment.

Climate change can potentially significantly affect the risk of flooding. The vulnerability of river catchments and coastal waters to climate change was assessed and computer models were used to estimate the potential increase in flood risk from river and coastal flooding because of climate changes.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development have also been considered.

Germany shares eight international river basins with other countries; including the Danube which is shared with 18 other countries and the Rhine which is shared with eight other countries. The assessment of flood risk in these international basins has been coordinated between the respective national authorities, and it is the intention that one joint flood risk management plan will be produced for each basin.

The following areas of potential significant flood risk were identified for Germany:

<b>Region</b>	<b>Number of areas</b>	
	<b>Rivers</b>	<b>Surface water flooding from heavy rainfall</b>
Germany	793	4

- **Links to reports on assessment of flood risk and maps in Germany**

Title	Source
Bund/Länder-Arbeitsgemeinschaft Wasser	<a href="http://www.lawa.de/documents/HWGK15062010_b72.pdf">http://www.lawa.de/documents/HWGK15062010_b72.pdf</a>
Reporting to the European Commission in accordance with Directive 2007/60/EC	<a href="http://www.wasserblick.net/servlet/is/11875/?lang=de">http://www.wasserblick.net/servlet/is/11875/?lang=de</a>
Flood Hazard and Risk Maps	<a href="http://hwrn.env.disy.net/cadenza/pages/map/default/index.xhtml;jsessionid=2447CC5FDCC7528E5B89F9F97E8D112D">http://hwrn.env.disy.net/cadenza/pages/map/default/index.xhtml;jsessionid=2447CC5FDCC7528E5B89F9F97E8D112D</a>  <a href="http://geoportal.bafg.de/mapapps/resources/apps/IKSE_DE/index.html?lang=en">http://geoportal.bafg.de/mapapps/resources/apps/IKSE_DE/index.html?lang=en</a>  <a href="http://geoportal.bafg.de/mapapps/resources/apps/IKSE_DE/index.html?lang=de">http://geoportal.bafg.de/mapapps/resources/apps/IKSE_DE/index.html?lang=de</a>  <a href="http://geoportal.bayern.de/bayernatlas/L7ExSNbPC4sb6TPJDblCAiLPd0Fv2v9OnIrPrA5rbixOP8hEaFIVXrbAcpGQCaUdhZLLGbowYS60u-YtLhY0kUWLQgjSEXX5-Kuqtw9VW0A6R1VeXxdtqx57-R6J0Iy-WemlZmvb4egSghqukS-706Gw1qptfavVUOmICxAQ2_Md9iV4hfp0XUqH9xPa-3sC7YqmpF11TbyNK-mjxUEuKYV_57irBnFI_H7X7NgwTE/L7E59/Wemde/Iy-7c/J0Id2">http://geoportal.bayern.de/bayernatlas/L7ExSNbPC4sb6TPJDblCAiLPd0Fv2v9OnIrPrA5rbixOP8hEaFIVXrbAcpGQCaUdhZLLGbowYS60u-YtLhY0kUWLQgjSEXX5-Kuqtw9VW0A6R1VeXxdtqx57-R6J0Iy-WemlZmvb4egSghqukS-706Gw1qptfavVUOmICxAQ2_Md9iV4hfp0XUqH9xPa-3sC7YqmpF11TbyNK-mjxUEuKYV_57irBnFI_H7X7NgwTE/L7E59/Wemde/Iy-7c/J0Id2</a>  <a href="http://www.stadtentwicklung.berlin.de/umwelt/wasser/hochwasser/de/hw-gefahrenkarten.shtml">http://www.stadtentwicklung.berlin.de/umwelt/wasser/hochwasser/de/hw-gefahrenkarten.shtml</a>  <a href="http://cms.mv-regierung.de/hochwassergefahrenkarten/">http://cms.mv-regierung.de/hochwassergefahrenkarten/</a>  <a href="http://www.flussgebiete.nrw.de/index.php/HWRMRL/Gebietsansicht/TEZG_Maas_Nord">http://www.flussgebiete.nrw.de/index.php/HWRMRL/Gebietsansicht/TEZG_Maas_Nord</a>

## **DK-Denmark**

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- **Types of flooding**

Denmark undertook a preliminary assessment of the risk of flooding from rivers and coastal waters. Coastal flooding is of the most relevance to Denmark. Surface water flooding from heavy rainfall and groundwater flooding are not considered further but might also be expected to occur.

- **History of flooding**

Records of flooding from sea water are the most common in Denmark, going back to the year 1532, with some 20 significant flood events being recorded between 2000 and 2008. Denmark has limited data on historic river flooding as they did not cause large amounts of damage, with the exception of one area (Holstebro).

- **Areas at risk of flooding now and in the future**

In Denmark for coastal floods, potentially significant future floods were identified based on a methodology taking into account historic sea water floods and climate change predictions. For river flooding, there was only one significant historic flood so the method to identify potentially significant future floods was based on catchment characteristics, such as size and potential for damage.

Climate change can potentially significantly affect the risk of flooding. In Denmark the vulnerability of river catchments and coastal waters to climate change was assessed. Coastal flooding considered the average rise of sea water level due to climate change in the next 50 years (2060). Changes in the frequency and strength of storms due to climate change were not considered.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development have not been considered in Denmark.

Denmark shares one international river basin with Germany. It is deemed there is no significant flood risk in this basin.

The following areas of potential significant flood risk were identified for Denmark:

<b>Region</b>	<b>Number of areas</b>	
	<b>Rivers</b>	<b>Coastal</b>
Denmark	4	9

- **Links to reports on assessment of flood risk and maps in Denmark**

Title	Source
Forslag til udpegning af risikoområder på baggrund af en foreløbig vurdering af oversvømmelsesrisikoen fra vandløb, søer, havet og fjorde	<a href="http://www.masterpiece.dk/UploadetFiles/10852/36/Fællesrapport_Oversvømmelsesdirektiv_230311.pdf">http://www.masterpiece.dk/UploadetFiles/10852/36/Fællesrapport_Oversvømmelsesdirektiv_230311.pdf</a>
Flood Hazard and Risk Maps	<a href="http://miljoegis.mim.dk/cbkort?profile=miljoegis_oversvoemmelssdirektiv">http://miljoegis.mim.dk/cbkort?profile=miljoegis_oversvoemmelssdirektiv</a>

- **Types of flooding**

Estonia undertook a preliminary assessment of the risk of flooding from all relevant sources which included rivers, coastal waters, surface water flooding from heavy rainfall, dams and reservoirs and groundwater.

- **History of flooding**

Records of flooding from rivers are the most common in Estonia, with eight significant flood events recorded from 2005 to 2011. Five floods occurred from coastal waters in 2005 and two floods originated from surface water flooding after heavy rainfall that took place between 2000 and 2003. Records from before 2000 were not available.

- **Areas at risk of flooding now and in the future**

In Estonia, the location and risk of future floods was largely based on those significant past floods that were considered likely to occur again in the future. Maps were produced based on readily available information and the focus was on areas where high numbers of people could be affected. Floods from dam breaks were not included as it was thought any future floods could be prevented by suitable protection measures.

Climate change can potentially significantly affect the risk of flooding. In Estonia there is already evidence of an increase in the average temperature between January and May and, to some extent, in June, with an associated effect on the retreat of snow and ice. This may actually decrease the risk of river flooding. However, there may be more surface water flooding from heavy rainfall as the frequency of extreme storms increases. Predicted changes in sea level have also been included.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development were not considered in Estonia.

Estonia shares one international river basin with Latvia and one with Latvia and Russia. The assessment of flood risk has been discussed with Latvia and the two countries have agreed that there are no potential significant risk areas in the shared basin. Co-operation between Estonia and Russia does not include flood issues.

The following areas of potential significant flood risk were identified for Estonia:

<b>Region</b>	<b>Number of areas</b>		
	<b>Rivers</b>	<b>Surface water flooding from heavy rainfall</b>	<b>Coastal</b>
Estonia	8	10	15

- **Links to reports on assessment of flood risk and maps in Estonia**

Title	Source
Estonian Ministry of the Environment web page	<a href="http://www.envir.ee/1158172">http://www.envir.ee/1158172</a>
Press release	<a href="http://www.envir.ee/et/uudised/valminud-uleujutusohuga-seotud-riskide-esialgne-hinnang">http://www.envir.ee/et/uudised/valminud-uleujutusohuga-seotud-riskide-esialgne-hinnang</a>
All documents for the Preliminary Assessment	<a href="http://www.envir.ee/et/uleujutusohuga-seotud-riskide-esialgne-hinnang">http://www.envir.ee/et/uleujutusohuga-seotud-riskide-esialgne-hinnang</a>
Preliminary Assessment	<a href="http://www.envir.ee/sites/default/files/yleujutusohugaseotudriskidearuanne.pdf">http://www.envir.ee/sites/default/files/yleujutusohugaseotudriskidearuanne.pdf</a>
Legal transposition of the Directive	<a href="https://www.riigiteataja.ee/akt/13335702">https://www.riigiteataja.ee/akt/13335702</a>
Üleujutusohuga seotud riskide esialgne hinnangu aruanne (flood risks associated with the initial assessment report), KESKONNAMINISTEERIUM 2011	Available on the Estonian Ministry of the Environment web page: <a href="http://www.envir.ee/orb.aw/class=file/actio_n=preview/id=1180240/%DCleujutusohuga+seotud+riskide+aruanne.pdf">http://www.envir.ee/orb.aw/class=file/actio_n=preview/id=1180240/%DCleujutusohuga+seotud+riskide+aruanne.pdf</a>
Üleujutusohuga seotud riskide esialgne hinnang, Keskkonnaministri 17.jaanuar 2012. JUHISE NING TEGEVUSKAVA KOOSTAMINE ÜLEUJUTUSRISKIDE HALDAMISEKS (COMPIILATION OF FLOOD RISK PLAN MANAGEMENT)	Available on the Estonian Ministry of the Environment web page: <a href="http://www.envir.ee/orb.aw/class=file/actio_n=preview/id=1182293/Juhise+ning+tegevuskava+koostamine+%FCelujutusriskide+haldamiseks.pdf">http://www.envir.ee/orb.aw/class=file/actio_n=preview/id=1182293/Juhise+ning+tegevuskava+koostamine+%FCelujutusriskide+haldamiseks.pdf</a>
Veeseaduse ja kemikaaliseaduse muutmise seadus. Vastu võetud 16.06.2010 Estonian Water Act transposing the requirements of the Floods Directive	Available at: <a href="https://www.riigiteataja.ee/akt/13335702">https://www.riigiteataja.ee/akt/13335702</a>
Flood Hazard and Risk Maps	<a href="http://xgis.maaamet.ee/xGIS/XGis?app_id=MA21&amp;user_id=at&amp;bbox=307661.290322581,6375000.797338.709677419,6635000&amp;LANG=1">http://xgis.maaamet.ee/xGIS/XGis?app_id=MA21&amp;user_id=at&amp;bbox=307661.290322581,6375000.797338.709677419,6635000&amp;LANG=1</a>

- **Types of flooding**

Greece undertook a preliminary assessment of the risk of flooding from all relevant sources which included rivers, surface water flooding from heavy rainfall and dams and reservoirs. No information on coastal water flooding was available at the time of the assessment but more recent investigations have identified events and coastal water floods are being considered. No historical groundwater floods were identified and areas with potential groundwater floods were considered to be already included in areas of potentially significant flood risk.

- **History of flooding**

All types of floods that occurred in the past have been included. As a result 297 historic river floods have been considered as significant, but no data exist for 191 of them. Three of the river floods occurred in the 1800s.

- **Areas at risk of flooding now and in the future**

The criteria used to define significant historical floods were human casualties; monetary compensation and the size of the flooded area. The criteria used to define significant future floods require more clarity, but it appears that the results from the identification of significant historical floods, the identification of areas where flooding can occur and areas with potentially significant adverse consequences of future floods were combined to evaluate future flooding.

Climate change can potentially significantly affect the risk of flooding. In Greece, this was effectively not considered as the data are not sufficient for an informed prediction of the effect of climate change on the frequency of flooding.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development have not been considered in Greece.

Greece shares six international river basins with Albania, Former Yugoslav Republic of Macedonia, Bulgaria and Turkey. The assessment of flood risk in these international basins is coordinated between a trilateral agreement between Albania, Former Yugoslav Republic of Macedonia and Greece, a written cooperation between Greece, Albania, Former Yugoslav Republic of Macedonia, Kosovo and Montenegro and a separate coordination between Greece and Bulgaria. Bilateral cooperation has also been established with Turkey.

The following areas of potential significant flood risk were identified for Greece:

<b>Region</b>	<b>Number of areas</b>			
	<b>Rivers</b>	<b>Surface water flooding from heavy rainfall</b>	<b>Other sources of flooding</b>	<b>No data on source of flooding</b>
Greece	103	14	1	9

- **Flood Hazard and Flood Risk maps**

Greece has not yet published these maps.

- **Links to reports on assessment of flood risk in Greece**

Title	Source
Ministry of Environment, Energy and Climate Change Floods homepage	<a href="http://www.ypeka.gr/Default.aspx?tabid=252&amp;language=el-GR">http://www.ypeka.gr/Default.aspx?tabid=252&amp;language=el-GR</a>
Flood Risk Management Special Secretariat for Water	<a href="http://floods.opengov.gr/">http://floods.opengov.gr/</a>
Preliminary Flood Risk Assessment in Greece (PFRA-Report, December 2012)	<a href="http://www.ypeka.gr/LinkClick.aspx?fileticket=T4DDG1hqQMY%3d&amp;tabid=252&amp;language=el-GR">http://www.ypeka.gr/LinkClick.aspx?fileticket=T4DDG1hqQMY%3d&amp;tabid=252&amp;language=el-GR</a>
Flood Hazard and Risk Maps	<a href="http://www.ypeka.gr/Default.aspx?tabid=252&amp;language=el-GR">http://www.ypeka.gr/Default.aspx?tabid=252&amp;language=el-GR</a> <a href="http://floods.opengov.gr/">http://floods.opengov.gr/</a>

## ES-Spain

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- **Types of flooding**

Spain undertook a preliminary assessment of the risk of flooding from all relevant sources which included rivers, coastal waters, surface water flooding from heavy rainfall, dams and reservoirs and groundwater. Flooding from sewerage systems has also been considered in the historical flood and future flood risk analysis.

- **History of flooding**

6441 historical flood events have been identified and 95.7% of them have reported significant consequences. Records of flooding from rivers are the most common in Spain, going back to before 1800, with some 1282 (in 2011) flood events being recorded since 2000. There are fewer records on floods from sea water, surface water flooding and from reservoirs (e.g. dam failures). Three groundwater flood records exist, all originating from 1995 to 2010.

- **Areas at risk of flooding now and in the future**

In Spain, the location and risk of future floods were largely predicted using flood simulations or more simplified modelling if no relevant studies were available. Future adverse consequences and impacts were evaluated by assessing whether significant land-use changes have happened in comparison to historical flood events; and if the development of infrastructural measures has changed significantly the flood risk in comparison.

Climate change can potentially significantly affect the risk of flooding. In Spain climate change is not considered in the statistics of flood flows due to uncertainties in the impact climate change will have in the future.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development have been considered in Spain.

Spain shares six international river basins with France and Portugal. The assessment of flood risk in these international basins has been coordinated between the respective national authorities through commissions and working groups.

The following areas of potential significant flood risk were identified for Spain:

<b>Region</b>	<b>Number of areas</b>				
	<b>Rivers</b>	<b>Surface water flooding from heavy rainfall</b>	<b>Coastal</b>	<b>Groundwater</b>	<b>Other source</b>
Spain	850	30	386	1	2

- **Links to reports on assessment of flood risk and maps in Spain**

Title	Source
Flood Hazard and Risk Maps	<a href="http://www.magrama.gob.es/es/agua/temas/gestion-de-los-riesgos-de-inundacion/mapa-peligrosidad-riesgo-inundacion/">http://www.magrama.gob.es/es/agua/temas/gestion-de-los-riesgos-de-inundacion/mapa-peligrosidad-riesgo-inundacion/</a>
National Mapping System Viewer	<a href="http://sig.magrama.es/snczi/">http://sig.magrama.es/snczi/</a>

## **FI-Finland**

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- **Types of flooding**

Finland undertook a preliminary assessment of the risk of flooding from all relevant sources which included rivers and lakes, coastal waters, surface water flooding from heavy rainfall and dams and reservoirs. Groundwater flooding is not considered as relevant as it is very rare in Finland and has never caused significant damage and is not expected to do in the future. In the Aland Islands only surface water flooding from heavy rainfall is considered as flooding from lakes and groundwater is rare and not likely to cause significant impact in the future.

- **History of flooding**

Records of flooding from rivers are the most common in Finland with five flood events being recorded since 1975 (as at 2005). There are fewer records on floods from coastal water and surface water flooding and no records for any type of flooding are included in the assessment prior to 1975.

- **Areas at risk of flooding now and in the future**

In Finland the location and risk of future floods were largely predicted using computer models. Initial flood hazard mapping was also undertaken for the coastal area where sea water levels equivalent to a once in every 200 years event were used. In terms of potential river flooding an estimated likelihood of at least once in a hundred years was considered and for floods from dam failures, the events considered were those with a likelihood of once in a thousand years. There are also dam failure flood hazard maps. The potential flooding from ice blockages at bridges was considered when identifying areas at risk of flooding, but this particular type of flood has not been mapped.

Climate change can potentially significantly affect the risk of flooding. In Finland the temperature is expected to rise by 3-7 ° C and precipitation increase by 13-26 % by the end of the 21<sup>st</sup> century with an increase in heavy rainfall events, particularly in summer. The impact of climate change on river flooding has been estimated using models. No significant flood risk has been identified in the Aland Islands.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development have also been considered in Finland.

Finland shares two international river basins with Sweden and Norway. The assessment of flood risk in these international basins has been coordinated between the respective national authorities through commissions and transboundary agreements.

The following areas of potential significant flood risk were identified for Finland:

<b>Region</b>	<b>Number of areas</b>		
	<b>Rivers</b>	<b>Coastal</b>	<b>Dams and reservoirs</b>
Finland	17	6	1

- **Links to reports on assessment of flood risk and maps in Finland**

Title	Source
Tulvariskien alustava arvointi – Uusimaa (national Finnish web page on flooding)	Available at: <a href="http://www.ymparisto.fi/fi-FI/Vesi_ja_meri/Tulviin_varautuminen/Tulvariskien_hallinta/Tulvariskien_hallinnan_suunnittelu/Tulvariskien_alustava_arvointi_vesisto_ja_meritulvat/Tulvariskien_alustava_arvointi_Uusimaa(14390)">http://www.ymparisto.fi/fi-FI/Vesi_ja_meri/Tulviin_varautuminen/Tulvariskien_hallinta/Tulvariskien_hallinnan_suunnittelu/Tulvariskien_alustava_arvointi_vesisto_ja_meritulvat/Tulvariskien_alustava_arvointi_Uusimaa(14390)</a>
Paikkatietomenetelmä tulvariskien alustavaan arvointiin (GIS-Method for Preliminary Flood Risk Assessment) Mikko Sane (3.6.2010)	Downloaded from the Finnish Environment Network: <a href="http://www.ymparisto.fi">http://www.ymparisto.fi</a>
Merkittävän tulvariskialueen kriteerit ja rajaaminen (22.12.2010) (Criteria for the definition of Significant flood risk areas)	Downloaded from the Finnish Environment Network: <a href="http://www.ymparisto.fi">http://www.ymparisto.fi</a>
Merkittävät tulvariskialueet sekä merkittävyyden perusteenä olevat vahingolliset seuraukset (Significant flood risk areas) (20.12.2011)	Downloaded from the Finnish Environment Network: <a href="http://www.ymparisto.fi">http://www.ymparisto.fi</a>
Flood Hazard and Risk Maps	<a href="http://www.ymparisto.fi/tulvakartat">http://www.ymparisto.fi/tulvakartat</a>

## **FR-France**

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- **Types of flooding**

France undertook a preliminary assessment of the risk of flooding from all relevant sources which included rivers, coastal waters, surface water flooding from heavy rainfall, dams and reservoirs and groundwater.

- **History of flooding**

Historic flood events were considered for all types of floods. River flooding was the most common although surface water, sea water and other floods have occurred multiple times. Four events have been registered for reservoir and dam flooding since 1959.

- **Areas at risk of flooding now and in the future**

For future flood events, all types of floods have been considered except dam failures, groundwater floods outside floodplains and surface water floods on slopes. For these floods, it is not considered possible to have information available or readily deliverable.

Climate change can potentially significantly affect the risk of flooding. In France the potential impacts of climate change by 2100 have been incorporated, assuming 1 metre of sea level rise which corresponds to a worst-case, extreme scenario.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development have also been considered in France.

France shares six international river basins with Belgium, Luxembourg, Germany, Switzerland, Italy and Spain. The assessment of flood risk in these international basins has been coordinated between the respective national authorities through informal arrangements, two-way environment management agreements and a commission.

The following areas of potential significant flood risk were identified for France:

<b>Region</b>	<b>Number of areas</b>		
	<b>Rivers</b>	<b>Surface water flooding from heavy rainfall</b>	<b>Coastal</b>
France	133	21	39

- **Links to reports on assessment of flood risk and maps in France**

Title	Source
Ministry of Ecology, Sustainable Development and Energy: Management of flood risks	<p><a href="http://www.developpement-durable.gouv.fr/-La-gestion-des-risques-d,4726-.html">http://www.developpement-durable.gouv.fr/-La-gestion-des-risques-d,4726-.html</a></p> <p><a href="http://www.developpement-durable.gouv.fr/Publication-du-bilan-des-actions.html">http://www.developpement-durable.gouv.fr/Publication-du-bilan-des-actions.html</a></p>
Flood Hazard and Risk Maps	<p><a href="http://www.developpement-durable.gouv.fr/-La-gestion-des-risques-d,4726-.html">http://www.developpement-durable.gouv.fr/-La-gestion-des-risques-d,4726-.html</a></p>

- **Types of flooding**

Croatia undertook a preliminary assessment of the risk of flooding from all relevant sources which included rivers, coastal waters, surface water flooding from heavy rainfall and dams and reservoirs. Groundwater flooding was not included in the preliminary assessment as insufficient data were available.

- **History of flooding**

Historical flood records for Croatia go back to the 1950's, with two coastal water floods also reported between 1900 and 1949. Surface water and river flood events are the most common in Croatia, with 152 surface water floods and 52 river floods recorded since 2000, as at 2010. There are fewer records on floods from coastal water with 12 events since 2000, again at 2010, and no historical records of flooding from reservoirs (e.g. dam failures), or groundwater.

- **Areas at risk of flooding now and in the future**

In Croatia, computer modelling was used to classify settlements as having a high, moderate, low or insignificant flood risk based on past events. The approach used for the preliminary flood risk assessment included the collection and interpretation of relevant information; estimation of the danger of flooding; analysis of an area's susceptibility to flooding and estimation of flood risk.

Climate change can potentially significantly affect the risk of flooding, but the impact of climate change was not taken into consideration in Croatia.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development have not been considered in Croatia.

Croatia shares one international river basin (the Danube) with Slovenia and Hungary. The assessment of flood risk in this international basin has been coordinated between the respective national authorities. Flood risk management plans will also be coordinated across these countries.

The following areas of potential significant flood risk were identified for Croatia:

<b>Region</b>	<b>Number of areas</b>			
	<b>Rivers</b>	<b>Coastal</b>	<b>Dams and reservoirs</b>	<b>No data on source of flood</b>
Croatia	2876	296	192	75

- **Flood Hazard and Flood Risk maps**

Croatia has not yet published these maps.

- **Links to reports on assessment of flood risk in Croatia**

Title	Source
Preliminary Flood Risk Assessment for the Sava River Basin	<a href="http://www.savacommission.org/dms/docs/dokumenti/documents_publications/publications/other_publications/pfra/preliminary_flood_risk_assessment_in_the_sava_river_basin_20140701.pdf">http://www.savacommission.org/dms/docs/dokumenti/documents_publications/publications/other_publications/pfra/preliminary_flood_risk_assessment_in_the_sava_river_basin_20140701.pdf</a>
Flood hazard maps and flood risk maps	<a href="http://korp.voda.hr/">http://korp.voda.hr/</a>
Water Act (Zakon o vodama) ("O.G.", No. 153/09, 63/11, 130/11, 56/13 and 14/14)	<a href="http://www.zakon.hr/z/124/Zakon-o-vodama">http://www.zakon.hr/z/124/Zakon-o-vodama</a> (available only in Croatian), accessed on 25 June 2014
ICPDR's 2012 Preliminary Flood Risk Assessment in the Danube River Basin	<a href="http://www.google.be/url?sa=t&amp;rct=j&amp;q=&amp;esrc=s&amp;source=web&amp;cd=1&amp;ved=0CB4QFjAA&amp;url=http%3A%2F%2Fwww.icpdr.org%2Fmain%2Fsites%2Fdefault%2Ffiles%2F PFRA%2520REPORT%2520DRBD%2520v%2520March%25202012.pdf&amp;ei=aU70U6XWMMaWO_uPgdgB&amp;usg=AFQjCNGkNLNBcjuA3r8FdM1gwc-gm6kGgw">http://www.google.be/url?sa=t&amp;rct=j&amp;q=&amp;esrc=s&amp;source=web&amp;cd=1&amp;ved=0CB4QFjAA&amp;url=http%3A%2F%2Fwww.icpdr.org%2Fmain%2Fsites%2Fdefault%2Ffiles%2F PFRA%2520REPORT%2520DRBD%2520v%2520March%25202012.pdf&amp;ei=aU70U6XWMMaWO_uPgdgB&amp;usg=AFQjCNGkNLNBcjuA3r8FdM1gwc-gm6kGgw</a> , accessed on 25 June 2014
Plan for preparation of PFRA	<a href="http://www.voda.hr/001-492">http://www.voda.hr/001-492</a> , accessed on 25 June 2014
Protocol on Flood Protection to the Framework Agreement on the Sava River Basin	<a href="file:///C:/Users/DP/Downloads/PFRA%20REPORT%20DRBD%20v%20March%202012.pdf">file:///C:/Users/DP/Downloads/PFRA%20REPORT%20DRBD%20v%20March%202012.pdf</a> , accessed 1 July 2014
River basin Management Plan ("O.G.", No. 82/13)	<a href="http://www.voda.hr/puvp/">http://www.voda.hr/puvp/</a> (available only in Croatia), accessed on 1 July 2014
Preliminary Flood Risk Assessment	<a href="http://korp.voda.hr/pdf/Prethodna%20procjena%20rizika%20od%20poplava/PRETHODNA%20PROCJENA%20RIZIKA%20OD%20POPLAVA%20-%20TEKST.pdf">http://korp.voda.hr/pdf/Prethodna%20procjena%20rizika%20od%20poplava/PRETHODNA%20PROCJENA%20RIZIKA%20OD%20POPLAVA%20-%20TEKST.pdf</a>

## **HU-Hungary**

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- **Types of flooding**

Hungary undertook a preliminary assessment of the risk of flooding from all relevant sources which included rivers, surface water flooding from heavy rainfall and groundwater.

- **History of flooding**

Hungary has experienced a large number of major floods in the last 50 years, including 92 floods from rivers while floods from other sources are less common. Ten events from 1965 to 2011 were evaluated in greater detail during Hungary's assessment of flood risk as these were considered to be particularly significant flood events with national importance.

- **Areas at risk of flooding now and in the future**

In Hungary, risks of flooding from rivers and groundwater were considered significant for large areas and surface water floods after heavy rainfall were considered significant in populated areas. Past floods were included in the flood risk assessment if they were considered to be significant according to their impact on people, the environment and the economy.

Climate change can potentially significantly affect the risk of flooding. Hungary's National Climate Change Strategy has defined a number of scenarios that will be analysed in the future.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development have been considered to a limited extent in Hungary.

All of Hungary is in the international Danube river basin, with borders shared with Slovakia, Austria, Slovenia, Romania, Croatia, Serbia and Ukraine. The assessment of flood risk in this international basin is coordinated by a commission involving respective national authorities.

The following areas of potential significant flood risk were identified for Hungary:

<b>Region</b>	<b>Number of areas</b>		
	<b>Rivers</b>	<b>Surface water flooding from heavy rainfall</b>	<b>Dams and reservoirs</b>
Hungary	2	1	1

- **Links to reports on assessment of flood risk and maps in Hungary**

Title	Source
Official national website of the implementation of the WFD and other water related EU directives	<a href="http://www.vizeink.hu">www.vizeink.hu</a>
Preliminary Flood Risk Assessment report	<a href="http://www.vizugy.hu/index.php?module=content&amp;programelemid=1&amp;id=826">http://www.vizugy.hu/index.php?module=content&amp;programelemid=1&amp;id=826</a>
Flood Hazard and Risk Maps	<a href="http://www.vizugy.hu/index.php?module=content&amp;programelemid=62">http://www.vizugy.hu/index.php?module=content&amp;programelemid=62</a>

- **Types of flooding**

Ireland undertook a preliminary assessment of the risk of flooding from all relevant sources which included rivers and natural lakes, coastal waters, surface water flooding from heavy rainfall, dams and reservoirs, groundwater and other types of flooding such as tsunamis.

- **History of flooding**

Records of flooding from rivers are the most common in Ireland, going back to before 1800, with some 41 (in 2011) significant flood events being recorded since 2000. There are fewer records on floods from sea water and surface water flooding. A national flood hazard mapping website, launched in 2006, displays the locations and extents of flood events in the past and provides information such as photographs, reports and newspaper articles, related to those past events.

- **Areas at risk of flooding now and in the future**

In Ireland, a simplified predictive assessment of future floods was conducted rather than detailed modelling, which will be undertaken in follow up studies, as there was a lack of available information on past flood extents. In terms of identifying potential future impacts of flooding, consequences were categorised using one of five vulnerability categories: Critical; Extreme; High; Moderate and Low for all flood maps available.

Climate change can potentially significantly affect the risk of flooding. In Ireland the information to analyse the potential flood risk impacts of climate change was not available at the time of flood mapping. A predictive analysis is under development and will be reported in a 2018 review.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development have not been considered in Ireland.

Ireland shares two international river basins with the UK (Northern Ireland). The assessment of flood risk in these two international basins has been coordinated between the respective national authorities, and it is the intention that one joint flood risk management plan will be produced for each basin.

The following areas of potential significant flood risk were identified for Ireland:

<b>Region</b>	<b>Number of areas</b>			
	<b>Rivers</b>	<b>Groundwater</b>	<b>Coastal</b>	<b>Surface water flooding from heavy rainfall</b>
Ireland	280	1	93	1

- **Links to reports on assessment of flood risk and maps in Ireland**

<b>Title</b>	<b>Source</b>
The National Preliminary Flood Risk Assessment (PFRA): Overview Report, March 2012	Available from the National Catchment Flood Risk Assessment and Management Programme website: <a href="http://www.cfram.ie/pfra/">http://www.cfram.ie/pfra/</a>
Flood Hazard and Risk Maps	<a href="http://maps.opw.ie/fhrm/viewer/">http://maps.opw.ie/fhrm/viewer/</a>

- **Types of flooding**

The authorities in Italy were able to make use of existing flood risk assessments and maps from the last two decades for most types of floods (main rivers; particularly in periods of exceptional snow melt, surface water and coastal waters). Groundwater flooding is not believed to be a major concern but could possibly arise, for example, in northern Italy. Flooding from reservoirs has not been included in Italy's present assessment but might also be expected.

- **History of flooding**

Certain areas in Italy such as the Northern Apennines and the Eastern Alps note major flood events in the past and the more recent ones have been used to determine flood hazards and risks. However, the criteria for what constitutes a 'significant' historic flood under the Floods Directive are not identified as Italy applied transitional measures.

- **Areas at risk of flooding now and in the future**

In Italy computer modelling was used to determine flood risks in certain river basin districts but it is likely that different methods and criteria have been used across Italy. Some areas of Italy have carried out analysis of extreme rainfall events to assess areas subject to flash flood risks.

Climate change can potentially significantly affect the risk of flooding. In Italy climate change is mentioned in relation to the development of preliminary flood risk assessments and identification of areas of potential significant flood risk. Useful hydrogeological data for climate change scenarios are not currently available to identify potential future adverse consequences of flooding and the authorities have been advised to evaluate the issue and consider possible further work in this field.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development have not been considered in Italy.

Italy shares international river basins with Austria, Switzerland, Slovenia and France. No information is reported by Italy on how the assessment of flood risk is coordinated with the other national authorities, however commissions based on international agreements for international river basins exist.

Italy did not identify areas of potential significant flood risk under the Floods Directive as flood risk areas had already been identified and mapped.

- **Links to reports on assessment of flood risk and maps in Italy**

Title	Source
Documento conclusivo del tavolo tecnico stato-regioni, Indirizzi operativi per l'attuazione della Direttiva 2007/60/CE (Concluding document from the state-regions technical group: Operational Guide for the implementation of Directive 2007/60/EC), January 2013	Ministero dell'ambiente, della tutela e del territorio (Ministry of Environment, Land and Sea): <a href="http://www.minambiente.it/sites/default/files/archivio/allegati/vari/documento_definitivo_indirizzi_operativi_direttiva_alluvioni_ge">http://www.minambiente.it/sites/default/files/archivio/allegati/vari/documento_definitivo_indirizzi_operativi_direttiva_alluvioni_ge</a>

	<a href="#">n_13.pdf</a>
Martina Bussettin, Giuseppina Monacelli, Fabio Trezzini (ISPRA and MATTM): Introduzione alla Direttiva Alluvioni (Introduction to the Floods Directive), PowerPoint presentation, June 2011	ISPRA (Institute for Environmental Protection and Research): <a href="http://www.isprambiente.gov.it/files/doc-pericolosita-idraulica/bussettin.pdf">http://www.isprambiente.gov.it/files/doc-pericolosita-idraulica/bussettin.pdf</a>
Decreto Legislativo n. 49 of 23.02.2010 (transposing Directive 2007/60/EC)	Available at: <a href="http://www.camera.it/parlam/leggi/deleghe/10049dl.htm">http://www.camera.it/parlam/leggi/deleghe/10049dl.htm</a>
Decreto Legislativo n. 219 of 10.12.2010	ISPRA: <a href="http://www.isprambiente.gov.it/files/sostanze-pericolose/decreto-legislativo-219-2010.pdf">http://www.isprambiente.gov.it/files/sostanze-pericolose/decreto-legislativo-219-2010.pdf</a>
DPCM 29.09.1998: Atto di indirizzo e coordinamento per l'individuazione dei criteri relativi agli adempimenti di cui all'art. 1, commi 1 e 2, del decreto-legge 11 giugno 1998, n. 180 (Act of direction and coordination for the identification of criteria for the fulfilment of Art. 1 (1 and 2) of DL 180/1998)	
Distretto Appennino Settentrionale, Mappe della pericolosità e del rischio di alluvioni: Relazione, June 2013	Available at the ITC web site: <a href="http://www.appenninosettentrionale.it/rep/distretto/relazione_PGAlluvioni_Completa_18062013.pdf">http://www.appenninosettentrionale.it/rep/distretto/relazione_PGAlluvioni_Completa_18062013.pdf</a>
Distretto di Bacino Alpi Orientali, Piano di Gestione del Rischio di Alluvioni 2015-2021: Valutazione Globale Provvisoria dei Problemi di Gestione delle Acque e Obiettivi di Piano (Flood Risk Management 2015-2021: Provisional overview evaluation of water management problems and plan objectives), October 2013	Available on the ITA web site: <a href="http://www.alpiorientali.it/new/dati/partecipazione/VGP_OP_6.pdf">http://www.alpiorientali.it/new/dati/partecipazione/VGP_OP_6.pdf</a>
Autorità di Bacino Pilota del Fiume Serchio, Distretto del Fiume Serchio: Mappe della pericolosità e del rischio di Alluvioni – relazione, (Serchio River District: Flood Hazard and Risk Maps – report), June 2013	Available on the ITD web site: <a href="http://www.autorita.bacinoserchio.it/files/pianodigestioneri/documenti/FHRM_relazione_Giugno_2013.pdf">http://www.autorita.bacinoserchio.it/files/pianodigestioneri/documenti/FHRM_relazione_Giugno_2013.pdf</a>
Flood Hazard and Risk Maps	<a href="http://webgis.alpiorientali.it:6080/arcgis/res">http://webgis.alpiorientali.it:6080/arcgis/res</a>

[t/services/Dir200760](#)

[http://www.alpiorientali.it/new/index.php/di-rettiva-2007-60/consultazione-mappe/servizio-mappe-fhrm](#)

[http://www.alpiorientali.it/new/flexviewers/ITR051/](#)

[http://www.alpiorientali.it/new/flexviewers/ITN003/](#)

## LI-Lithuania

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- **Types of flooding**

Lithuania undertook a preliminary assessment of the risk of flooding from all relevant sources, which included rivers, coastal waters, dams and reservoirs.

- **History of flooding**

Records of flooding from rivers are the most common in Lithuania, with records going back to 1829 and 42 river flood events recorded between 2000 and 2010. There are also records of floods from coastal waters and reservoirs (e.g. dam failures) since the 1950s but these are significantly fewer in number.

- **Areas at risk of flooding now and in the future**

In Lithuania, the location and risk of future floods were largely identified as areas which had previously experienced significant floods and by using computer modelling to identify areas with physical characteristics that could result in adverse consequences from floods. These consequences were based on the economic analysis of past floods.

Climate change can potentially significantly affect the risk of flooding. In Lithuania the vulnerability of river catchments and coastal waters to climate change was assessed by using computer climate models to consider 40 scenarios for greenhouse gas emissions and estimate the impact of the occurrence of potential significant future floods. Analysis of historical data showed a significantly decreasing trend in river flow during spring, summer and autumn and significantly increasing trends during winter. The frequency of heavy rainfall is also predicted to increase – this is responsible for 15% of the historical floods analysed. Finally, the average winter water level in the Baltic Sea may increase up to 100 centimetres by 2100.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development have not been considered in Lithuania.

All four river basins in Lithuania are international and shared with Latvia; additionally, one is also shared with Belarus and the largest is also shared with Belarus, Poland (a relatively small part) and Russia. The assessment of flood risk in these four international basins has been coordinated between the respective national authorities.

The following areas of potential significant flood risk were identified for Lithuania:

<b>Region</b>	<b>Number of areas</b>	
	<b>Rivers</b>	<b>Coastal</b>
Lithuania	127	2

- **Links to reports on assessment of flood risk in Lithuania**

<b>Title</b>	<b>Source</b>
Preliminary Flood Risk Assessment (PFRA) Report	Downloaded from the Lithuanian Environmental Protection Agency web site: <a href="http://vanduo.gamta.lt/cms/index?rubricId=eec72856-096d-4cb3-ad8b-2d519a755bc8">http://vanduo.gamta.lt/cms/index?rubricId=eec72856-096d-4cb3-ad8b-2d519a755bc8</a>

- **Types of flooding**

Luxembourg undertook a preliminary assessment of the risk of flooding from all relevant sources which included rivers, groundwater and surface water flooding from heavy rainfall.

- **History of flooding**

The only source of flooding found in records from the last 30 years is floods from surface water after heavy rainfall, which has occurred four times.

- **Areas at risk of flooding now and in the future**

In Luxembourg, the location and risk of future floods was limited to surface water floods after heavy rainfall, as the risk from rivers or groundwater floods is considered low. These future floods were largely predicted in relation to their potential effect on people, the environment and the economy as well as data on physical characteristics of the areas in question. No flood risk areas were found in the smaller of Luxembourg's two river basins.

Climate change can potentially significantly affect the risk of flooding. Luxembourg has not yet taken the effects of climate change into account when considering flood risk as there was not enough available information, but it intends to include the results of recent and on-going studies into the next revision of its flood hazard and flood risk maps.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development have not been considered in Luxembourg.

97.3% of Luxembourg is part of the international Rhine river basin, which is shared with Belgium, Switzerland, Germany, France and the Netherlands. The rest of Luxembourg is part of the international Meuse river basin which is shared with Belgium, Germany, France and the Netherlands. The assessment of flood risk in these two international basins has been coordinated between the respective national authorities.

The following areas of potential significant flood risk were identified for Luxembourg:

<b>Region</b>	<b>Number of areas</b>
	<b>Surface water flooding from heavy rainfall</b>
Luxembourg	15

- **Links to reports on assessment of flood risk and maps in Luxembourg**

Title	Source
L'évaluation préliminaire des risques d'inondation 2011, Bassin Rhin ( <i>Preliminary flood risk evaluation 2011, Rhine River Basin - in French</i> )	<p><a href="http://www.lorraine.developpement-durable.gouv.fr/IMG/pdf/EPRI_Rhin_maquettage_final2_cle2fc92b.pdf">http://www.lorraine.developpement-durable.gouv.fr/IMG/pdf/EPRI_Rhin_maquettage_final2_cle2fc92b.pdf</a></p> <p>downloaded from  <a href="http://www.developpement-durable.gouv.fr">www.developpement-durable.gouv.fr</a></p>
L'évaluation préliminaire des risques d'inondation 2011, Bassin Meuse ( <i>Preliminary flood risk evaluation 2011, Meuse River Basin - in French</i> )	<p><a href="http://www.lorraine.developpement-durable.gouv.fr/IMG/pdf/EPRI_Meuse_maquettage_final_cle262217.pdf">http://www.lorraine.developpement-durable.gouv.fr/IMG/pdf/EPRI_Meuse_maquettage_final_cle262217.pdf</a></p> <p>downloaded from  <a href="http://www.developpement-durable.gouv.fr">www.developpement-durable.gouv.fr</a></p>
Directive inondation : Rapport sur l'Evaluation préliminaire des risques d'inondation (EPRI) dans le district hydrographique international "Meuse",  Minond/12-2def (Floods Directive: Report on the <i>preliminary flood risk evaluation in the Meuse International River Basin District - in French</i> )	<p><a href="http://www.cipm-icbm.be/files/files/DRI/rapp_art_4_5_fr.pdf">http://www.cipm-icbm.be/files/files/DRI/rapp_art_4_5_fr.pdf</a></p>
Cartes des zones inondables et cartes des risques d'inondation; mise en oeuvre de la directive Inondation au Luxembourg, Christine Hilbert-Bastian, Beckerich, 22 Nov 2010 ( <i>Maps of flood risk zones and flood risks; implementation of the Floods Directive in Luxembourg – presentation in French</i> )	<p><a href="http://www.aquafil.net/upload/6/biblio_pict ure/file/Cartesrisques_2.pdf">http://www.aquafil.net/upload/6/biblio_pict ure/file/Cartesrisques_2.pdf</a></p>
Le projet Interreg TIMIS Flood ( <i>Interreg Project TIMIS – in French</i> )	<p><a href="http://www.eau.public.lu/publications/broch ures/hochwasser/hochwasser.pdf">http://www.eau.public.lu/publications/broch ures/hochwasser/hochwasser.pdf</a></p>
LU official website – general information and Water level database	<p><a href="http://www.eau.public.lu/cours_eau/crues/index.html">http://www.eau.public.lu/cours_eau/crues/index.html</a></p> <p><a href="http://213.139.159.80/timis/gauge/lux/">http://213.139.159.80/timis/gauge/lux/</a></p>

	<a href="http://www.inondations.lu"><u>www.inondations.lu</u></a> <a href="http://eau.geoportail.lu/"><u>http://eau.geoportail.lu/</u></a>
LU official website – general information and Water level database	<a href="http://www.eau.public.lu/cours_eau/crues/index.html"><u>http://www.eau.public.lu/cours_eau/crues/index.html</u></a> <a href="http://213.139.159.80/timis/gauge/lux/"><u>http://213.139.159.80/timis/gauge/lux/</u></a> <a href="http://www.inondations.lu"><u>www.inondations.lu</u></a> <a href="http://eau.geoportail.lu/"><u>http://eau.geoportail.lu/</u></a>

- **Types of flooding**

Latvia undertook a preliminary assessment of the risk of flooding from all relevant sources which included rivers, coastal waters, and dams and reservoirs. The authorities in Latvia were able to make use of existing flood risk assessments for significant types of floods (rivers, coastal waters and reservoirs).

- **History of flooding**

Records of flooding from coastal waters are the most common in Latvia, with five significant flood events being assessed compared with one historical river flood event.

- **Areas at risk of flooding now and in the future**

In Latvia, the location and risk of future floods is largely predicted by assessing all the available information about historical floods, such as their size, the extent of damage to people, the environment and the economy and the number of people evacuated in each flood zone.

Climate change can potentially significantly affect the risk of flooding. In Latvia the vulnerability of river catchments and coastal waters to climate change was assessed, but significant changes in flood events are not expected in the foreseeable future. There may be more frequent storms in the Baltic Sea and possibly a rise in sea level during storms. There are no significant changes expected to rivers.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development have also been considered in Latvia.

Latvia shares four international river basins with other countries. Two are shared only with Lithuania; one with Lithuania, Belarus and Russia, and the other with Estonia. The assessment of flood risk in these international basins has been coordinated between the respective national authorities.

The following areas of potential significant flood risk were identified for Latvia:

<b>Region</b>	<b>Number of areas</b>	
	<b>Rivers</b>	<b>Coastal</b>
Latvia	23	11

- **Links to reports on assessment of flood risk and maps in Latvia**

Title	Source
The national program “Flood risk assessment and management of 2008 to 2015”	<a href="http://polsis.mk.gov.lv/LoadAtt/file39976.doc">http://polsis.mk.gov.lv/LoadAtt/file39976.doc</a> (Relevant Governmental Order).
National research programme “Climate change impact on water environment in Latvia” (KALME)	<a href="http://kalme.daba.lv/en/">http://kalme.daba.lv/en/</a>
Flood Hazard and Risk Maps	<a href="http://212.70.174.131/FLORIS/sistema.html">http://212.70.174.131/FLORIS/sistema.html</a>

- **Types of flooding**

Malta undertook a preliminary assessment of the risk of flooding from all relevant sources which included rivers, coastal waters, surface water flooding from heavy rainfall, dams and reservoirs, and groundwater. However, only seasonal flooding after heavy rainfalls is of significance in Malta and only surface water and coastal flooding were assessed, although assessment was only to a limited extent for coastal flooding.

- **History of flooding**

There is no formal database of flooding records to draw upon in Malta; instead past flooding events have been collected through newspaper records. Historical flooding from the sea was not considered as significant because of its shallow depth and short duration. Flooding from the failure of reservoirs was not considered significant because of the low volume of water involved.

- **Areas at risk of flooding now and in the future**

In Malta, no computer modelling of current or future flood scenarios was carried out as this had already been done as part of the compilation of other projects. Due to the non-relevance of flood events other than through rain and (to a limited extent) coastal water in Malta, other types of flooding were not assessed with regard to possible future events.

Climate change can potentially significantly affect the risk of flooding. In Malta there is no information on climate change predictions, no mentioning of methods, and no mentioning of any consequences of climate change for future flooding events and their consequences.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development have not been considered in Malta.

Malta does not share any river basins with other countries.

Malta has reported no areas of potential significant flood risk as of December 2014.

- **Flood Hazard and Flood Risk maps**

Malta has not published these maps.

- **Links to reports on assessment of flood risk in Malta**

Title	Source
Maltese PFRA	downloaded from the homepage of the Malta Resources Authority: <a href="http://mra.org.mt/wp-content/uploads/2013/06/Preliminary-Flood-Risk-Assessment.pdf">http://mra.org.mt/wp-content/uploads/2013/06/Preliminary-Flood-Risk-Assessment.pdf</a>

## NL-Netherlands

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- **Types of flooding**

The Netherlands were able to make use of existing flood risk assessments for the risk of flooding from all relevant sources which included rivers, coastal waters, surface water flooding from heavy rainfall, dams and reservoirs, and groundwater.

- **History of flooding**

The Netherlands did not identify historical floods under the Floods Directive as the decision to prepare flood hazard maps and flood risk maps and to establish flood risk management plans had already been taken (application of transitional measures).

- **Areas at risk of flooding now and in the future**

The Netherlands did not identify potential future floods under the Floods Directive as the decision to prepare flood hazard maps and flood risk maps and to establish flood risk management plans had already been taken.

Climate change can potentially significantly affect the risk of flooding. However, the Netherlands did not identify at this stage how climate change might impact future flood risk.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development were also not identified by the Netherlands.

The Netherlands shares four international river basins with Belgium, France, Luxembourg and Germany. The assessment of flood risk in these international basins has been coordinated between the respective national authorities through a number of agreements and working groups.

The Netherlands did not identify areas of potential significant flood risk under the Floods Directive as it made use of existing flood risk assessments.

- **Links to reports on assessment of flood risk and maps in the Netherlands**

Title	Source
Preliminary Flood Risk Assessment	<a href="http://www.helpdeskwater.nl/onderwerpen/wetgeving-beleid/eu-richtlijn/kalender-ror/">http://www.helpdeskwater.nl/onderwerpen/wetgeving-beleid/eu-richtlijn/kalender-ror/</a>
Other references	<a href="http://www.helpdeskwater.nl">http://www.helpdeskwater.nl</a>
	<a href="http://deltaproof.stowa.nl">http://deltaproof.stowa.nl</a>
	Overstromingsrisico's op de kaart – spoorboekje voor te maken kaarten in het kader van de nationale implementatie van de EU Richtlijn Overstromingsrisico's (2010) (can be downloaded at <a href="http://www.helpdeskwater.nl/onderwerpen/wetgeving-beleid/eu-">http://www.helpdeskwater.nl/onderwerpen/wetgeving-beleid/eu-</a>

	<a href="#">richtlijn/overstromingsgevaar</a> )
Flood risk maps with flood depth for different return periods	<a href="http://nederland.risicokaart.nl">http://nederland.risicokaart.nl</a> .

## **PL-Poland**

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- **Types of flooding**

Poland undertook a preliminary assessment of the risk of flooding from rivers and coastal waters. Surface water and groundwater floods along with flooding from dams and reservoirs were considered, but their significance is only in relation to river flooding. In addition, data availability tended to be poor for these flood sources so they were not assessed individually but included within the river flooding category.

- **History of flooding**

Records of flooding from rivers are the most common in Poland, going back to 1570, with some 2746 significant flood events being recorded since 2000, as of 2011. There are fewer records on floods from sea water, a total of 51 from 1558 to 2010.

- **Areas at risk of flooding now and in the future**

Areas at risk of flooding were assessed based on studies of flood protection, historical data, surveys carried out by municipalities, analysis of the impact of man-made flood defences on flood protection and analysis of climate change on the occurrence of floods from the sea.

Climate change can potentially significantly affect the risk of flooding. In Poland the impact of climate change on the occurrence of river floods was not considered at this stage due to lack of data. The impact of climate change on the occurrence of floods from coastal waters was included.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development have only been included as a starting point for analysis in Poland.

Poland shares eight international river basins with Russia, Lithuania, Belarus, Ukraine, Slovakia, Czech Republic and Germany. The assessment of flood risk in these international basins is coordinated through a mix of two-way negotiations, management agreements and two commissions.

The following areas of potential significant flood risk were identified for Poland:

<b>Region</b>	<b>Number of areas</b>	
	<b>Rivers</b>	<b>Coastal</b>
Poland	256	48

- **Links to reports on assessment of flood risk and maps in Poland**

Title	Source
PFRA report	Available at: <a href="http://www.kzgw.gov.pl/pl/Wstepna-ocena-ryzyka-powodziowego.html">http://www.kzgw.gov.pl/pl/Wstepna-ocena-ryzyka-powodziowego.html</a>
	<a href="http://legnica.naszmiasto.pl/artykul/galeria/1909652,legnica-podtopiona-strazacy-ratowali-kobiety-z-zalanego,id,t.html">http://legnica.naszmiasto.pl/artykul/galeria/1909652,legnica-podtopiona-strazacy-ratowali-kobiety-z-zalanego,id,t.html</a>
	<a href="http://www.tvn24.pl/raporty/polska-pod-woda,290">http://www.tvn24.pl/raporty/polska-pod-woda,290</a>
	<a href="http://www.miastokolobrzeg.pl/gmu-stronie-morskie/6607-poranna-powod-w-ustroniu-morskim.html">http://www.miastokolobrzeg.pl/gmu-stronie-morskie/6607-poranna-powod-w-ustroniu-morskim.html</a>
	<a href="http://www.panoramio.com/photo/59138129">http://www.panoramio.com/photo/59138129</a>
Flood Hazard and Risk Maps	Available at: <a href="http://mapy.isok.gov.pl/imap/">http://mapy.isok.gov.pl/imap/</a>
Maps of significant historical flood	Available at: <a href="http://www.kzgw.gov.pl/pl/Wstepna-ocena-ryzyka-powodziowego.html">http://www.kzgw.gov.pl/pl/Wstepna-ocena-ryzyka-powodziowego.html</a>
Coast Protection Strategy	Referred to in PFRA report:  Zawadzka E., 2000, Instytut Morski w Gdańsku- (PL title: Strategia ochrony brzegów morskich)

## **PT-Portugal**

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- **Types of flooding**

Portugal applied transitional measures and decided, before December 2010, to prepare flood hazard maps and flood risk maps and to establish flood risk management plans. Therefore, Portugal decided that a preliminary assessment of flood risk under the Floods Directive was not required. The types of flood to be taken into account for mapping flood hazard and risk were not fixed at the time of reporting.

- **History of flooding**

Portugal did not identify historical floods as the decision to prepare flood hazard maps and flood risk maps and to establish flood risk management plans had already been taken.

- **Areas at risk of flooding now and in the future**

Portugal did not identify potential future floods and areas of potential significant flood risk as the decision to prepare flood hazard maps and flood risk maps and to establish flood risk management plans had already been taken. Risk zones were identified based on historic data, but no detailed methodology was reported.

Climate change can potentially significantly affect the risk of flooding. Portugal did not identify how climate change might impact future flood risk.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development were also not identified by Portugal.

Portugal shares a total of four international river basins with Spain. No information was reported on coordination of the assessment of flood risk in these basins.

- **Flood Hazard and Flood Risk maps**

Portugal has not yet published these maps.

- **Links to reports on assessment of flood risk in Portugal**

Title	Source
Other relevant websites	
Portuguese Environmental Agency website – section on water	<a href="http://www.apambiente.pt/index.php?ref=16&amp;subref=7">http://www.apambiente.pt/index.php?ref=16&amp;subref=7</a>
National Water Resources Information system	<a href="http://snirh.pt/index.php?idMain=-2&amp;palavra=cheias">http://snirh.pt/index.php?idMain=-2&amp;palavra=cheias</a>
Azores Regional Water Resources Information System	<a href="http://sig.sram.azores.gov.pt/SRAM/site/SRIA/">http://sig.sram.azores.gov.pt/SRAM/site/SRIA/</a>
Madeira Direction of Environment and Spatial Management	<a href="http://drota.gov-madeira.pt/berilio/berwpag0.desenvctt?pCt=2129">http://drota.gov-madeira.pt/berilio/berwpag0.desenvctt?pCt=2129</a>

## **RO-Romania**

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- **Types of flooding**

Romania undertook a preliminary assessment of the risk of flooding from all relevant sources which included rivers, coastal waters, surface water flooding from heavy rainfall, dams and reservoirs and groundwater.

- **History of flooding**

Records of flooding from rivers are the most common in Romania, going back to 1970, with 155 significant river flood events being recorded since 2000, as at 2010. There are fewer records on floods from coastal water, surface water flooding, groundwater and from reservoirs (e.g. dam failures). Only larger floods (those with a probability of occurrence of less than 10%) were included.

- **Areas at risk of flooding now and in the future**

In Romania, the location and risk of future floods were largely predicted using information from past floods and a set of criteria around the effects on people, the environment and the economy.

Climate change can potentially significantly affect the risk of flooding. In Romania the vulnerability of river catchments and coastal waters to climate change was not assessed as the impact of climate change on the occurrence and size of floods in Romania are not clear.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development were also not considered in Romania.

Almost all of Romania is within the international Danube river basin, which is shared with Bulgaria, Hungary, Moldova, Serbia and Ukraine. The assessment of flood risk in these international basins is coordinated between the respective national authorities by a commission.

The following areas of potential significant flood risk were identified for Romania:

<b>Region</b>	<b>Number of areas</b>				
	<b>Rivers</b>	<b>Surface water flooding from heavy rainfall</b>	<b>Coastal</b>	<b>Groundwater</b>	<b>Dams and reservoirs</b>
Romania	375	220	3	12	87

- **Links to reports on assessment of flood risk and maps in Romania**

Title	Source
“Romanian Waters” National Administration portal	<a href="http://www.rowater.ro">www.rowater.ro</a>
Preliminary Risk Assessment Country Report (PRFA) for the 11 subunits and the information available on the webpage of the national water management authority ( RO language)	<a href="http://www.rowater.ro/EPRI/EPRI.aspx">http://www.rowater.ro/EPRI/EPRI.aspx</a>
Flood Hazard and Risk Maps	<a href="http://gis2.rowater.ro:8989/flood/">http://gis2.rowater.ro:8989/flood/</a> <a href="http://maps.danube-floodrisk.eu/">http://maps.danube-floodrisk.eu/</a>

## SE-Sweden

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- **Types of flooding**

Sweden undertook a preliminary assessment of the risk of flooding from rivers and lakes only as the majority of historical floods are of this type. Other flood types are not included in the preliminary assessment due to a lack of data or methods to predict future floods.

- **History of flooding**

A significant historical flood is identified in Sweden as a crisis situation affecting many people, large parts of the community or basic values and functions. Based on those criteria, 190 significant historical floods were identified.

- **Areas at risk of flooding now and in the future**

The criteria used to identify potentially significant future floods are limited to fluvial floods affecting urban areas. Computer models were used to assess the extent of areas flooded for a 1 in 100 years flood and a 1 in 10,000 years flood. The consequences of flooding of these areas were not quantified, but the impacts on the four focus areas (health, environment, economy and cultural heritage) were qualitatively assessed.

Climate change can potentially significantly affect the risk of flooding. In Sweden climate change has not been fully considered in determining future risk but is included in flood hazard maps which show the areas affected by a 1 in 100 years flood.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development have not been considered in Sweden.

Sweden shares eight international river basins with Finland and Norway. The assessment of flood risk in these international basins has been coordinated between the respective national authorities through informal discussions and two-way cooperation projects and agreements.

The following areas of potential significant flood risk were identified for Sweden:

<b>Region</b>	<b>Number of areas</b>	
	<b>Rivers</b>	<b>Groundwater</b>
Sweden	18	1

- **Links to reports on assessment of flood risk in Sweden**

Title	Source
Preliminary Flood Risk Assessment	<a href="https://www.msb.se/Upload/Nyheter_press/Pressmeddelanden/Slutrapport_PFRA_MS_B.pdf">https://www.msb.se/Upload/Nyheter_press/Pressmeddelanden/Slutrapport_PFRA_MS_B.pdf</a>
Flood Hazard and Risk Maps	<a href="https://www.msb.se/sv/Forebyggande/Naturolyckor/Oversvamning/Oversvanningsdirektivet/Steg-2-Hot--och-riskkartor/">https://www.msb.se/sv/Forebyggande/Naturolyckor/Oversvamning/Oversvanningsdirektivet/Steg-2-Hot--och-riskkartor/</a>
Report on 18 areas of potential significant flood risk	<a href="https://www.msb.se/sv/Forebyggande/Naturolyckor/Oversvamning/Oversvanningsdirektivet/Steg-1-Omraden-med-betydande-oversvanningsrisk/18-identifierade-omraden/">https://www.msb.se/sv/Forebyggande/Naturolyckor/Oversvamning/Oversvanningsdirektivet/Steg-1-Omraden-med-betydande-oversvanningsrisk/18-identifierade-omraden/</a>
Historic flooding in Sweden 1901-2010	<a href="https://www.msb.se/sv/Forebyggande/Naturolyckor/Oversvamning/Oversvanningsdirektivet/Steg-1-Omraden-med-betydande-oversvanningsrisk/Historiska-oversvamningar/">https://www.msb.se/sv/Forebyggande/Naturolyckor/Oversvamning/Oversvanningsdirektivet/Steg-1-Omraden-med-betydande-oversvanningsrisk/Historiska-oversvamningar/</a>  <a href="https://www.msb.se/RibData/Filer/pdf/26098.pdf">https://www.msb.se/RibData/Filer/pdf/26098.pdf</a>

- **Types of flooding**

Slovenia undertook a preliminary assessment of the risk of flooding from all relevant sources which included rivers, groundwater and coastal waters (only the Adriatic area). The authority was able to make use of existing flood risk assessments. Warning maps of floods (last updated in 2006) were used for defining areas of potential significant flood risk. All types of flooding were included. There is no distinction of the types of flooding presented on flood risk maps.

- **History of flooding**

Records of flooding from rivers are the most common in Slovenia, going back to the 1550's, with some 42 significant flood events being recorded in the time period 2000 to 2010. There are fewer records on floods from coastal waters (nine) and groundwater (one) in the same 2000 to 2010 period. Five recorded floods are snow melt floods and one is recorded as debris flow.

- **Areas at risk of flooding now and in the future**

In Slovenia, the areas at risk of future flooding are modelled and calculated from the best available data which includes; details of the landscape, groundwater and land cover of the land around flood sources, water flow, level of the water and surface water data.

Future floods are presented in two forms: firstly, the probability of extreme events occurring and secondly, the classes of flood hazard present water depth, flow and the extent of floods. Flood risk is predicted in terms of flood extent, pathways and depths in relation to people, property, economic activity, cultural heritage, physical environment and sensitive buildings such as hospitals and schools.

Climate change can potentially significantly affect the risk of flooding. The impacts of climate change on the occurrence of floods were not considered, because there is insufficient evidence about the influence of climate change on floods in Slovenia. More recent studies on the impact of climate change will be taken into account in the 2018 review.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development have not been considered in Slovenia, because protective measures are being carried out with the help of a Decree on conditions and limitations for constructions and activities on flood risk areas, which ensures that potential damage human activity does not increase by re-directing new developments outside of flooding areas. In the case of foreseen enlargements of existing infrastructure in the areas already endangered by floods, mitigation measures have to be implemented to reduce existent endangerment.

Slovenia shares two international river basins with Italy, Austria, Hungary and Croatia. The assessment of flood risk has been coordinated among the respective national authorities in the context of already existing commissions, appointed on the basis of cooperation agreements with neighbouring countries.

The following areas of potential significant flood risk were identified for Slovenia:

Region	Number of areas	
	Rivers	Coastal
Slovenia	60	3

- **Links to reports on assessment of flood risk and maps in Slovenia**

Title	Source
PFRA- Report	
Durović, B.: Določitev in razvrstitev poplavno ogroženih območij v Sloveniji, povzetek metode dela in rezultatov, IzVRS, Ljubljana (Designation and classification flood risk areas in Slovenia, summary of methodology and results), July 2012	<a href="http://www.mko.gov.si/fileadmin/mko.gov.si/pageuploads/podrocja/voda/metodologija_dolocanja_obmocij.pdf">http://www.mko.gov.si/fileadmin/mko.gov.si/pageuploads/podrocja/voda/metodologija_dolocanja_obmocij.pdf</a>
Predhodna ocena poplavne ogroženosti Republike Slovenije (The preliminary flood threats to the Republic of Slovenia), December 2011	<a href="http://www.mko.gov.si/fileadmin/mko.gov.si/pageuploads/podrocja/voda/predhodna_ocena_poplavne_ogrozenosti.pdf">http://www.mko.gov.si/fileadmin/mko.gov.si/pageuploads/podrocja/voda/predhodna_ocena_poplavne_ogrozenosti.pdf</a>
Flood Hazard and Risk Maps	<a href="http://www.mko.gov.si/fileadmin/mko.gov.si/pageuploads/podrocja/voda/opvp/OPOP_O.xls">http://www.mko.gov.si/fileadmin/mko.gov.si/pageuploads/podrocja/voda/opvp/OPOP_O.xls</a>  <a href="http://www.mko.gov.si/si/delovna_podrocja/voda/poplavna_direktiva/">http://www.mko.gov.si/si/delovna_podrocja/voda/poplavna_direktiva/</a>

- **Types of flooding**

Slovakia undertook a preliminary assessment of the risk of flooding from all relevant sources which included rivers, surface water flooding from heavy rainfall, dams and reservoirs, and groundwater. The authorities in Slovakia were able to make use of existing flood risk assessments for most types of floods (main rivers and large raised reservoirs).

- **History of flooding**

Records of flooding from surface water (heavy rainfall, dams and reservoirs) are the most common in Slovakia, going back to 1997, with some 317 significant flood events being recorded. There are fewer records on floods from groundwater and river flooding.

- **Areas at risk of flooding now and in the future**

In Slovakia, the location and risk of future floods were largely assessed using expert judgement and computer modelling with information on historic floods being used to validate the predictions. The focus of groundwater flooding was on the seepage of water through flood protection dikes.

Climate change can potentially significantly affect the risk of flooding. In the Slovak Republic the vulnerability of river catchments and coastal waters to climate change was assessed.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development have also been considered in Slovak Republic.

Slovakia shares two international river basins with adjacent countries: the Danube River basin and the Vistula River basin. The Vistula River Basin District is shared with Poland, Czech Republic, Belarus and Ukraine. The assessment of flood risk in these two international basins has been coordinated between the respective national authorities, and it is the intention that one joint flood risk management plan will be produced for each basin.

The following areas of potential significant flood risk were identified for Slovakia. Note that Slovakia did not identify areas of potential significant flood risk for all rivers in the country due to applying transitional measures: these areas are not included in the table below.

<b>Region</b>	<b>Number of areas</b>		
	<b>Rivers</b>	<b>Surface water flooding from heavy rainfall</b>	<b>Coastal</b>
Slovakia	360	383	9

- **Links to reports on assessment of flood risk and maps in Slovakia**

Title	Source
Slovak PFRA report	<a href="http://www.minzp.sk/sekcie/temy-oblasti/voda/ochrana-pred-povodnami/manazment-povodnovych-rizik/">http://www.minzp.sk/sekcie/temy-oblasti/voda/ochrana-pred-povodnami/manazment-povodnovych-rizik/</a>
MoE SR Resolution 313/2010 Coll., which sets details on the preliminary flood risk assessment, its revision and updating	<a href="http://www.zbierka.sk/zz/predpisy/default.aspx?CiastkaID=26234">http://www.zbierka.sk/zz/predpisy/default.aspx?CiastkaID=26234</a>
Slovak RBM Plan	<a href="http://www.vuvh.sk/rsv2/">http://www.vuvh.sk/rsv2/</a>
Flood Hazard and Risk Maps	<a href="http://www.minzp.sk/sekcie/temy-oblasti/voda/ochrana-pred-povodnami/manazment-povodnovych-rizik/povodnove-mapy.html">http://www.minzp.sk/sekcie/temy-oblasti/voda/ochrana-pred-povodnami/manazment-povodnovych-rizik/povodnove-mapy.html</a>  <a href="http://mpomprsr.svp.sk/Default.aspx">http://mpomprsr.svp.sk/Default.aspx</a>

## **UK-United Kingdom**

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- **Types of flooding**

Scotland, Northern Ireland and Gibraltar undertook a preliminary assessment of the risk of flooding from all relevant sources which included rivers (not in Gibraltar), coastal waters, surface water flooding from heavy rainfall, dams and reservoirs (Northern Ireland) and groundwater. The authorities in England and Wales were able to make use of existing flood risk assessments for most types of floods (main rivers, coastal waters and large raised reservoirs) except for small rivers, surface water and groundwater flooding for which a separate assessment was required.

- **History of flooding**

Records of flooding from rivers are the most common in the UK, going back to the 1900's, with some 19 (in 2010) significant flood events being recorded since 2000. There are fewer records on floods from sea water, surface water flooding and from reservoirs (e.g. dam failures).

- **Areas at risk of flooding now and in the future**

In Scotland, the location and risk of future floods were largely predicted using geographic computer models with information on historic floods being used to validate the predictions. The focus was on river, surface water and coastal water flooding rather than on groundwater flooding which was considered to be a contributory source to other types of flood rather than as primary source requiring a specific assessment. Floods with a medium probability of occurrence were used for assessing future risk.

Computer models were also used in England and Wales for predicting the risk of future surface water and groundwater flooding, and also for small rivers and ditches for which there was no existing assessments of flood risk. For surface water, future floods events that were considered to be of a medium probability of occurring were modelled.

In Northern Ireland, a computer model, which included details of the topography of the land around flood sources, was used to predict future floods in terms of pathways and depths in relation to people and property. Using this approach the effects of future floods from rivers, surface water and coastal waters were predicted for low, medium and high probability events.

In Gibraltar, no modelling of future flooding was undertaken and the assessment of future risk was based on largely anecdotal evidence of historic floods. Only surface water and coastal flooding were considered to be significant future sources of flood risk.

Climate change can potentially significantly affect the risk of flooding. In Scotland the vulnerability of river catchments and coastal waters to climate change was assessed; in Northern Ireland models were used to estimate the potential increase in flood risk from river and coastal flooding because of climate changes; the predicted effects of climate changes on flood risk has also been assessed in national studies England and Wales; and in Gibraltar the effects of climate change on sea levels was assessed particular in relation to existing and planned future sea defences.

The potential effects on flood risk of spatial planning policies such as those on land use and infrastructure development have also been considered in England and Wales, Northern Ireland and Scotland.

The UK (Northern Ireland) shares two international river basins with the Republic of Ireland. The assessment of flood risk in these two international basins has been coordinated between the respective national authorities, and it is the intention that one joint flood risk management plan will be produced for each basin.

The following areas of potential significant flood risk were identified for the UK. Note that England and Wales, by applying transitional measures, did not identify areas of potential significant flood risk for rivers and coastal waters as flood risk areas had already been identified and mapped: these areas are not included in the Table below.

Region	Number of areas		
	Rivers	Surface water flooding from heavy rainfall	Coastal
Scotland	238	243	160
England and Wales	Not available	18	Not available
Northern Ireland	20	20	6
Gibraltar	Not applicable	0	0

- Links to reports on assessment of flood risk and maps in the UK**

Title	Source
The National Flood Risk Assessment, December 2011(of Scotland)	<a href="http://www.sepa.org.uk/flooding.aspx">http://www.sepa.org.uk/flooding.aspx</a>
Environment Agency (England). Preliminary Flood Risk Assessment (PFRA), Annexes to the final guidance Report – GEHO1210BTHF-E-E, 2 March 2011	<a href="http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/geho1210bthf-e-e.pdf">http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/geho1210bthf-e-e.pdf</a>
Flooding in England: A National Assessment of Flood Risk (2009)	<a href="http://www.environment-agency.gov.uk/research/library/publications/108660.aspx">http://www.environment-agency.gov.uk/research/library/publications/108660.aspx</a>
Flood Risk Management Plans: Guidance for Risk Management Authorities in England and Wales	<a href="http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/LIT_8649_4e4b09.pdf">http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/LIT_8649_4e4b09.pdf</a>
Preliminary Flood Risk Assessment and Methodology for the Identification of Significant Flood risk Areas December 2011, Rivers Agency of Northern Ireland	<a href="http://www.dardni.gov.uk/final-pfra-report.pdf">http://www.dardni.gov.uk/final-pfra-report.pdf</a>
Government of Gibraltar, Preliminary Flood	<a href="https://www.gibraltar.gov.gi/new/sites/defa">https://www.gibraltar.gov.gi/new/sites/defa</a>

Risk Assessment, Final Report, January 2011	<a href="http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=floodmap&amp;x=234034&amp;y=276407&amp;scale=3">ult/files/docs/Preliminary%20Flood%20Risk%20Assessment%20Report.pdf</a>
Flood Hazard and Risk Maps	<a href="http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=floodmap&amp;x=234034&amp;y=276407&amp;scale=3">http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=floodmap&amp;x=234034&amp;y=276407&amp;scale=3</a> <a href="http://map.sepa.org.uk/floodmap/map.htm">http://map.sepa.org.uk/floodmap/map.htm</a> <a href="https://mapping.dardni.gov.uk/FloodMapsNI/index.aspx">https://mapping.dardni.gov.uk/FloodMapsNI/index.aspx</a>