Appendix: Overview of the implementation of Flood Mapping Practices and development of hazard and risk maps

The following checklist should provide an overview about status of and ideas for the implementation of the EU Floods Directive. It cannot provide a detailed insight but should be a comprehensive overview with reference to relevant documents and internet resources which provide more detailed information and data. Please note for each particular information the source such as Document (quotation), internet (URL), interview, workshop.

Criterion	Bavaria	Saxony	England	Austria	France
Background					
History of flood hazard and risk maps (Is there a longer history of hazard and risk maps, maybe with a strong legal basis?)	Hazard and risk maps: only some experiments on a local basis, not on a legal basis §74 Water Act (WHG) in connection to § 6 EU flood directive require the production of flood hazard and flood risk maps for all areas with a potentially significant flood risk. The maps have to be completed by 22.10.2013. The maps, serving as a basis for the management plan, had to be finished by the end of 2010. RiskCatch, local basis	e) Legally binding flood-prone areas (mostly HQ(100)) have been indicated in zoning plans for a long time. Agencies had also hazard maps for floods with rather high probabilities After the 2002 flood: Set-up of HWSKs (flood protection concepts) for all major rivers (1st Order) including hazard maps for different probabilities, coarse damage potential maps for an extreme flood event, existing and proposed measures, prioritisation of proposed measures, etc. Legally binding flood-prone areas (HQ(100) according to the Saxon Water Act (Sächsisches Wassergesetz – SächsWG): only restricted development is possible Hazard and damage maps on the web (Gefahrenhinweiskarte Sachsen): http://www.umwelt.sachsen.de/umwelt/wasser/2339.htm p) Risk maps will be produced for the EU-floods directive, pilot sites at the Weiße Elster River (project LABEL) and Schwarze Elster River (internal LfULG project) INGE Tool: Interactive hazard maps for emergency response in municipalities DISMA Tool: not flood hazard-specific, used by agencies on the regional level f) UFZ-risk maps from Floodsite project for the Vereinigte (Joint) Mulde River (Meyer et al. 2009)	Over 40 years tradition of flood mapping. Four different types of flood hazard maps are provided on a national basis in England and Wales. (e) Outline flood maps (OFM) (e) National Flood Risk Assessment (NaFRA) – although this information is not provided as a mapped layer but as information accessed from clicking on the outline map. Surface water flood maps Areas at risk from reservoir flooding Flood maps are generally accessed by a web-based map service available on the Environment Agency website.	The national organisation and structure of flood protection in Austria is divided into three parts due to the legal requirements, the diversity in landscapes, and the regionally different responsibilities: (1) Management of water bodies: The Federal Water Engineering Administration is responsible for the management of all waters (except waterways and torrents), in cooperation with provincial authorities and the Federal Ministry of Agriculture, Forestry, Environment and Water Management (Department VII 5 - Water Management and Flood Protection) (2) Torrents: Torrents of which boundaries are defined by ordinance fall into the area of responsibility of the Austrian Torrent and Avalanche Control Service, a branch of the Federal Ministry of Agriculture, Forestry, Environment and Water Management. (3) Maintenance and development of waterways: The rivers Danube, March and Thaya are in responsibility of the Federal Ministry of Transport, Innovation and Technology (BMVIT). Legally, for (1) and (2) flood hazard maps are established with either the 1:100 or the 1:150 event as a design event. Web Resources: eHora (web map service) →determined by state and insurance industry, national level, shows the inundation area based on modelling approaches which partly neglect flood protection.	Risk maps are present in these documents : Submersible Surfaces Plan (Plan des Surfaces Submersible or PSS) since statutory order of 30/10/1935 and decree of application of 20/10/1937. Exhibition at the Risks Plan (Plan d'Exposition aux Risques or PER) since the law of compensation of natural disasters (N 82-600 of 13/07/1982) followed by the decree of aplication of May 3rd, 1984 which are replaced since the law n°95-101 of 02/02/1995 by : PPRi (Flood Risk Prevention Plan or Plan de Prevention des Risques d'Inondation)

Criterion	Bavaria	Saxony	England	Austria	France
Defined Target groups/distinct thematic maps (Will there be specialized hazard and risk maps for defined groups of readers, e.g. citizens, disaster man.)	Water Management Administration Authorities of regional planning Persons responsible for disaster prevention and protection Population Building owners Residents Decision makers from industry and business (p) Flood hazard and flood risk maps as a basis for spatial planning, for local hazard assessment, for emergency planning and for planning technical protection measures (Hagemeier-Klose & Wagner 2009) (f) Maps are essential for awareness building and for communication about the local hazard situation, the extension of the legally designated flood plain and the use of restrictions (see above)	Flood-prone areas (Überschwemmungsgebiete): legal basis for (urban) land-use planning (Bauleitplanung) and other activities Hazard maps for built-up areas (Gefahrenkarten): Public awareness raising, emergency management, urban planning Hazard indication map for Saxony (Gefahrenhinweiskarte Sachsen), consisting of rather coarse hazard and damage potential maps for 1st Order rivers: long-term regional planning, emergency planning, planning of protection measures	(e) Flood hazard maps originally developed as a basis for spatial planning. (e) However, they were made publically available in 2000 to allow the public to find out about their flood risk – awareness raising and communication about flood risk. (e/p) The maps are also used for emergency planning by a whole range of professionals (such as the emergency services, local authorities, water companies etc.)	Flood hazard maps as a basis for any spatial planning, partly for emergency planning and for planning technical protection measures.	Maps of PPRI (Flood Risk Prevention Plan or Plan de Prevention des Risques d'Inondation): legal basis for land-use planning. These maps are available to local actors (mayor, urban manager…). Maps of AZI (Atlas of flood areas or Atlas des zones inondables) : basis for communication according level of hazard and/or highest known flood levels. These maps are available to everyone.
Why are maps produced for different target groups?	The flood hazard maps and flood risk maps have to satisfy all the needs and requirements of the different user groups. Therefore the requirements of the user groups are taken into account for choosing content and design of the maps.		The same flood maps are produced for the different target groups and although they were primarily produced for planning purposes – they are now used for many different purposes. Those developing properties do commission their own modeling in order to challenge the maps and in some cases this information is incorporated at a local level and used to improve the official maps.		
Relevant national laws and acts (Which national laws and regulations have been established?)	Bayerisches Wassergesetz(BayWG**)** 2010 – Bavarian Water Act Bayerisches Landesplanungsgesetz (BayLplG) 2004 – Bavarian Land Use Planning Act Gesetz zur Ordnung des Wasserhaushalts (Wasserhaushaltsgesetz - WHG) 2009 – Federal Water Act Hochwasserschutzgesetz (Gesetz zur Verbesserung des vorbeugenden Hochwasserschutzes) 2005 - The act to improve preventive flood control. Baugesetzbuch (BauGB) 2011 – Code of Building Law Raumordnungsgesetz (ROG) 2008 – (Fererеal) Land Use Planning Act General Regulations in the German Water Act (Wasserhaushaltsgesetz), specific regulations in the Bavarian Water Act from 1994[1] and new modifications in discussion. [2]	National sectoral planning: • Sächsisches Wassergesetz (SächsWG = Saxon Water Act, 2009 → flood protection concepts with "risk areas", legally binding flood-prone areas) within the frame of the Wasserhaushaltsgesetz (German Water Act, 2010), Gesetz zur Verbesserung des vorbeugenden Hochwasserschutzes (Act to Improve Preventive Flood Control, Artikelgesetz = omnibus bill, 2005) • Nationale overall planning • Raumordnungsgesetz (Spatial Planning Act), Landesplanungsgesetz (Saxon Spatial Planning Act → Regional Plans with priority and reserved areas for flood protection; Bauleitplanung (BauGB = Town and Country Planning Code)	Environment Agency (EA) established under the Environment Act (1995) - inherited a range of responsibilities flood defence responsibilities principally from Water Resources Act 1991. These relate to defending against flooding from main rivers and the sea, and related activity including providing flood warnings and flood mapping. The Floods Directive is transposed into law in England and Wales through Statutory Instruments (Environmental Protection – The Flood Risk Regulations 2009 [2009 No. 3042] and Environmental Protection – the Flood Risk (Cross Border Areas) Regulations 2010 [2020 No. 1102]	Forest Act 1975 (Forstgesetz idgF, BGBl. 440/1975) Decree on hazard maps 1976 (Verordnung des Bundesministers für Land- und Forstwirtschaft vom 30. Juli 1976 über die Gefahrenzonenpläne, BGBl. Nr. 436/1976) Water Act	Law dated 22 July 1987, an Act concerning civilian safety, forest fire and major risk prevention (LOI n°87 - 565 du 22 juillet 1987. Relative à l'organisation de la sécurité civile, à la protection de la forêt contre l'incendie et à la prévention des risques majeurs). Law concerning water dated 3 January 1992 (Loi n°92-3 du 3 janvier 1992 sur l'eau). Interministerial Circular dated 3 January 1994 Law dated 2 February 1995 on increased environnemental protection, the so-called „loi Barnier" (Loi n°95-101 du 2 février 1995 relative au renforcement de la protection de l'environnement, dire „Loi Barnier") Law to modernise civilian safety dated 13 August 2004 (Loi n°2004-811 du 13/08/04 de modernisation de la sécurité civile)

1 http://www.verwaltung.bayern.de/Gesamtliste-.115.htm?purl=http://by.juris.de/by/WasG_BY_1994_rahmen.htm

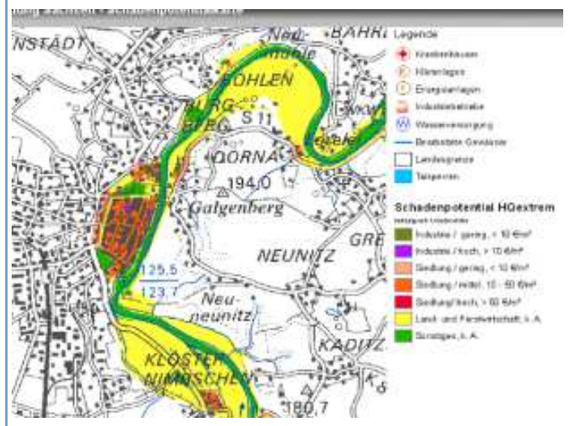
Criterion	Bavaria	Saxony	England	Austria	France
Process and implementation guidelines. **(Which guidelines, handbooks, reports for the implementation of the flood directive and risk mapping are available?)**	LAWA (flood hazard guidelines of the German Working Group of the Federal States on the Water Issues) EXCIMAP (handbook on good practices for flood mapping in Europe) FloodScan	e) LTV, 2003: Erstellung von Hochwasserschutzkonzepten für Fließgewässer. Empfehlungen für die Ermittlung des Gefährdungs- und Schadenpotenzials bei Hochwasserereignissen sowie für die Festlegung von Schutzzielen [Establishment of flood protection concepts for riverine water bodies. Recommendations for the analysis of the hazards and damage potentials in case of flood events as well as for the definition of protection objectives. Unpublished document. Socher M, Sieber H-U, Müller G, Wundrak P (2005): Verfahren zur landesweiten Priorisierung von Hochwasserschutzmaßnahmen in Sachsen [Procedure for the state-wide priorisation of flood protection measures in Saxony]. Unpublished document. Publication planned for 12/2005. LAWA: Guidelines for Forward-Looking Flood Protection (http://www.lawa.de/documents/Leitlinien_2902_629.pdf), Flood hazard map guidelines of the German Working Group of the Federal States on Water Issues (http://www.lawa.de/documents/Flood-Hazard-Map-Guidelines_ea8.pdf) – update coming soon, 3 additional but internal papers by LAWA. f) UFZ approach: **Meyer, V.**, 2007: GIS-based Multicriteria Analysis as Decision Support in Flood Risk Management. UFZ Discussion Papers 6/2007. Leipzig. **Meyer V**, Scheuer S, Haase D (2009) A multicriteria approach for flood risk mapping exemplified at the Mulde River, Germany. Nat Hazards (2009) 48:17–39	Guidance is due to be written for the local lead flood authorities detailing their new obligations to provide maps. Current explanations of the mapping procedure can be found in: Environment Agency (2006) Using our Flood Map: Identifying and understanding Flood Risk in England &Wales Environment Agency Website, (2008) Understanding the flood map Environment Agency (no date, accessed 2008) Understanding flood risk: Our National Flood Risk Assessment (NaFRA) The Environment Agency's Flood and Coastal Risk Management Risk Mapping Strategy (2010) which sets out the changes in flood mapping planned over the next 5 years.	RIWA-T: Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft (2006): Technische Richtlinien für die Bundeswasserbauverwaltung. Wien For torrent hazard maps only internal guidelines, major items described in Forest Act 1975 and Decree on hazard maps 1976. A new guideline on technical implementations is discussed [die.wildbach - Richtlinien für die Gefahrenzonenplanung. BMLFUW-LE.3.3.3/0185-IV/5/2007. Fassung vom 11. Februar 2011 - as of February 2011]	General guide for forseeable natural risk prevention plan (Ministère de l'Environnement, Ministère de l'Equipement, "Plans de prevention des risques naturels prévisibles (PPR) : guide general", La Documentation Française, 1999, 76 p.) The Departmental Report of Major Risk (dossier Départemental des Risques Majeurs or DDRM) describes the risks, their foreseeable consequences, as well as the measures for prevention, protection and safety in the Department, commune by commune. Equipe pluridisciplinaire Plan Loire Grandeur Nature, „Etude de la propagation des crues et des risques d'inondation en Loire moyenne", april 2004.
Data					
Main source of flood data/ methodology (historic events, 1D, 2D models)	Data sets from recent events and existing modelling results Models are based or calibrated using data from the German national weather service and measuring network of the Bavarian Environmental Agency and Offices FloodScan: 2D modeling of flood plains [iv] RiskCatch: 2d modeling of flood plains (Sprachinger, Dorner, Metzka, Serrhini & Fuchs 2008)	e) Data from LfULG/LTV Methodology	Outline flood maps – Uses digital terrain modelling and mapping and is then modelled with 2D models Environment Agency (2006b). Validated with cross-sectional survey and historical flood outlines (Bradbrook et al., 2005). NaFRA – see risk assessment section below.	Historical events, terrain analysis, modelling (different software)	Highest known flood levels or 100-years flood. HYDRA model: the Val de Tours is modelised in 74 boxes. The Loire and Cher rivers are shown in thread form (main and lesser beds) with 35 cross-sections for the Loire and 44 for the Cher.

2http://www.bayern.landtag.de/www/ElanTextAblage_WP16/Drucksachen/Basisdrucksachen/0000001500/0000001848.pdf
iii http://gis.lebensministerium.at/ehora/frames/index.php?&gui_id=eHORA
ivhttp://www.lfu.bayern.de/wasser/fachinformationen/iueg/kartendienst/index.htm
v http://www.umwelt.sachsen.de/umwelt/wasser/72.htm
http://www.lfu.bayern.de/wasser/hw_risiko/index.htm
Communities and Local Government (2010 revision) Planning Policy Statement 25: Development and Flood Risk, Available at:
http://www.communities.gov.uk/planningandbuilding/planning/planningpolicyguidance/planningpolicystatements/planningpolicystatements/pps25/
Environment Agency (2006b) Using our Flood Map: Identifying and understanding Flood Risk in England & Wales.Available online at http://publications.environment-agency.gov.uk/pdf/GEH00306BKIY-e-e.pdf?lang=_e Accessed January 2007.
Environment Agency Website, (2008) Understanding the flood map Available online at http://www.environment-agency.gov.uk/subjects/flood/826674/829803/858477/858535/?lang=_e, Accessed 6th May 2008.
Environment Agency (no date, accessed 2008) Understanding flood risk: Our National Flood Risk Assessment (NaFRA), Available online at http://publications.environment-agency.gov.uk/pdf/GEH00306BKIX-e-e.pdf?lang=_e. Accessed 6th May 2008.
Environment Agency (no date, accessed 2008) Understanding flood risk: Our National Flood Risk Assessment (NaFRA), Available online at http://publications.environment-agency.gov.uk/pdf/GEH00306BKIX-e-e.pdf?lang=_e. Accessed 6th May 2008.
Environment Agency (2006) Using our Flood Map: Identifying and understanding Flood Risk in England & Wales.Available online at http://publications.environment-agency.gov.uk/pdf/GEH00306BKIY-e-e.pdf?lang=_e Accessed January 2007.

Criterion	Bavaria	Saxony	England	Austria	France
Main source of economic data for risk assessment (National statistics, mapping, …)	No economic data is currently used	e) Official damage maps (LfULG) Damage: • Land-use data: ATKIS-Basis-DLM • Asset values: typical asset values per land use category based on other studies, official statistics • Relative Depth/damage functions from other studies (Rhine) f) UFZ-approach: Damage Land-use data: ATKIS-Basis-DLM Asset values: from official statistics, broken down to municipality level, assigned to ATKIS-categories Relative depth/damage functions from 3 different sources (IKSR, Kok et al. and KRIM)	Economic data are currently not used within the Flood Maps of England and Wales. Damage data are available from the Multi-coloured manual (MCM) (Penning-Rowsell et al., 2005)	None, since RISK maps are not yet legally prescribed	IGN, INSEE
Source of social data	No social data is currently used	f) Official statistics	No social data is currently shown on the maps.	None, since RISK maps are not yet legally prescribed	INSEE
Source of infrastructural data	No infrastructural data is currently used	f) ATKIS	The only infrastructural data that is used is on the base map which is produced by the ordinance survey – although damage data for infrastructure is available within the MCM.	None, since RISK maps are not yet legally prescribed	IGN
Is climate change considered at this stage?			Climate change is not currently considered but is considered to be an element to introduce under the Risk Mapping Strategy.	Forest Act 1975, § 11 Abs 9: In case of changes in the fundamentals (process behaviour,…) or the respective assessment the hazard maps have to be updated according to Abs. (3)-(8). Decree on hazard maps 1976, § 8 Abs 2: If general principles change, or underlying conceptions, or the evaluation criteria change, hazard maps have to be revised accordingly by the Austrian Torrent and Avalanche Control Service.	
Flood hazard					
Definition of relevant probabilities (10, 50, 100 500 year flood event?)	Flood hazard maps contain information about the spatial extent of the flood, the water depth and the flow velocity (where appropriate). Following flood scenarios are covered: • Low probability (HQextreme) • Medium probability (HQ100) • High probability (HQ5, HQ10)	e) LfULG: Varying: HQ(5/10/20/25), HQ(50), HQ(100), HQ(200/300) Flood hazard maps are produced for events with return periods of 20 (or 25), 50, 100 and 200 (or 300) years + for so-called “extreme” events (sometimes corresponding to the HQ(200/300) event)	(e) OFM: HQ:100 (rivers), HQ:200(coastal), HQ1000(extreme) (e) NaFRA: HQ:75, HQ:200.	HQ1, HQ5, HQ10, HQ30, HQ50, HQ100[III] HQ150 for torrents[3]	Higher level of water between PHEC and HQ100

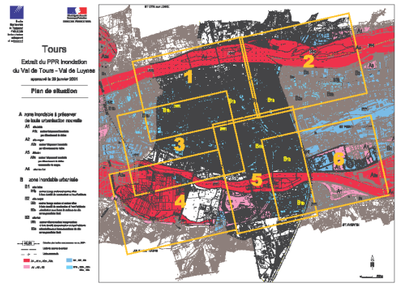
3 A harmonisation at the overlap between the competency of the Austrian Torrent and Avalanche Control Service (HQ150) and the Federal Water Engineering Administration responsible for lower catchments (HQ100) is described in BMLFUW 2011 [die.wildbach - Richtlinien für die Gefahren-zonenplanung. BMLFUW-LE.3.3.3/0185-IV/5/2007. Fassung vom 11. Februar 2011 - as of February 2011], p. 37.

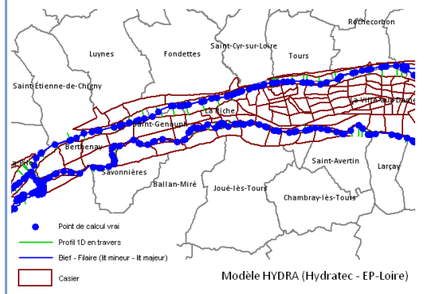
<table>
<tr><th>Criterion</th><th>Bavaria</th><th>Saxony</th><th>England</th><th>Austria</th><th>France</th></tr>
<tr><td></td><td>(f)
HQ10, HQ100, HQ1000 (Sprachinger, Dorner, Metzka, Serrhini & Fuchs 2008)</td><td>f)
UFZ:
• HQ10, 15, 50, 100, 200, 500</td><td></td><td></td><td></td></tr>
<tr><td>Water levels (Have distinct water levels been defined to be presented in the maps, e.g. 0.1)</td><td>Not water levels.</td><td>e)
The general hazard maps are called “intensity maps HQ(100)” displays three intensity levels (high, medium, low), depending on the water depth. In mountainous areas, these levels depend on the discharge/flow velocity (not applicable near Wurzen/Bennewitz). For non-public use there are five intensity levels.
<table>
<tr><th>Intensitäts-stufe</th><th>Grenzen der Intensitätsstufen</th><th>Gefahrenmerkmale</th></tr>
<tr><td>hoch</td><td>$h_w \geq 2{,}0$ m
oder
$q = v \cdot h_w \geq 2{,}0$ m²/s</td><td>Menschen und Tiere auch innerhalb von Gebäuden stark gefährdet, erhebliche Schäden an Gebäuden, plötzliche Gebäudezerstörung</td></tr>
<tr><td>mittel</td><td>$2{,}0 > h_w > 0{,}5$ m
oder
$2{,}0$ m²/s $> q = v \cdot h_w > 0{,}5$ m²/s</td><td>Menschen und Tiere außerhalb von Gebäuden stark, innerhalb von Gebäuden kaum gefährdet, Sachschäden an Gebäuden</td></tr>
<tr><td>niedrig</td><td>$h_w \leq 0{,}5$ m
oder
$q = v \cdot h_w \leq 0{,}5$ m²/s</td><td>Menschen und Tiere außerhalb von Gebäuden kaum gefährdet, Sachschäden an Gebäuden (v. a. Kellerräume)</td></tr>
<tr><td></td><td colspan="2">h_w … Wassertiefe
v … Fließgeschwindigkeit
q … spezifischer Durchfluss (Durchfluss pro Meter Breite)</td></tr>
</table>
The hazard indication map displays water levels/depth only for the HQ(extreme) and in four levels: 0-0.5 , 0.5-2.0, 2.0-4.0 and >4.0 m.</td><td>No water level information is presented on the map or NaFRA layer.</td><td>Torrents: 0.7 m is the distinction between red and yellow hazard zones [new RL]</td><td>Levels of danger shown on the maps of the AZI are a combination between speed (low, medium, high velocity) and height of the flood (<0.5m; 0.5m to 1m; 1m to 2m; >2m)</td></tr>
<tr><td>Intensity criteria (Which additional intensity parameters such as flow velocity, load, etc. are taken into account?)</td><td>If available the IÜG also shows water depths, inundation areas and the wrap-around of observed floods.
Water depth and flow velocity and areas with embankment erosion and sediment deposit (Sprachinger, Dorner, Metzka, Serrhini & Fuchs 2008))</td><td>See above</td><td>No intensity criteria are shown on the map or NaFRA layer.</td><td>Only internal regulations</td><td>Flow velocity (see above)</td></tr>
<tr><td colspan="6">Risk analysis</td></tr>
<tr><td>Definition of risk and methodology for its assessment (nat. statistics, on a building basis, …)</td><td>The Bavarian Environment Agency describes flood risk in the following way: Flood risk is the product of the probability of occurrence and the size / dimension of a flood event plus the exposure of subjects of protection.
Flood risk maps display the possible consequences of the scenarios mentioned above. They highlight the risk for human health, environment, cultural heritage and economy. The information about flooded areas is blended with the information of about land use. The potentially affected land-use classes are highlighted. Following aspects are considered:</td><td>Risk = annual average damage = P*D
e)
Official damage maps (LfULG):
• Land use data: ATKIS-Basis-DLM
• Asset values: typical asset values per land use category based on other studies, official statistics, some critical infrastructures, (no indirect losses)
• Relative depth/damage functions also from other studies (the</td><td>Only hazard information is provided on the outline flood maps.
The NaFRA layer underneath uses the Risk Assessment of flood and coastal defence for Strategic Planning (RASP) methodology – this uses a “risk-based probabilistic approach to factor the location, type, condition and performance of flood defences into the risk assessment” (Environment Agency, no date accessed 2008). This is used to provide more information to users about the distribution of</td><td>None, since RISK maps are not yet legally prescribed</td><td>PPRI : Risk = hazard * vulnerability</td></tr>
</table>

Criterion	Bavaria	Saxony	England	Austria	France
	• Number of affected population • Type of economic activity in the affected area • Installations and facilities listed in den Annex of the EC Flood Directive on prevention of pollution, which could cause widespread pollution in case of a flood • Protected areas • Potential adverse consequences of specific flood scenarios [iv] • Function of the probability of occurrence of a process and the related extent of damage – RiskCatch (Fuchs, Sprachinger, Dorner, Rochmann & Serrhini 2009)	Rhine) f) UFZ-approach: Damage Land use data: ATKIS-Basis-DLM Asset values: from official statistics, broken down to municipality level, assigned to ATKIS-categories Relative depth/damage functions from 3 different sources (IKSR, Kok et al. and KRIM)	the likelihood of flooding to an area.		
Components of risk assessed (economic, social, ecological, aggregated indicators, …)	Social & economic -> legal and financial information for inhabitants and land owners [iv] Social, economic and ecologic (Sprachinger, Dorner, Mezka, Serrhini & Fuchs 2008)	e) Hazard indication map (Gefahrenhinweiskarte Sachsen):  Prioritisation of protection measures: Apart from damages also special vulnerabilities are included: • Human lives • Essential infrastructure facilities (e.g. water plants, hospitals, power plants), • Important infrastructure facilities (e.g. railways, national traffic ways, train stations, …), • Extraordinary cultural heritage or monuments • Also: hazardous substances! f) UFZ risk maps: • Economic: annual average damage	Only hazard information is presented on the outline maps. The RASP method which is used to produce NaFRA is able to take into account both social and damage data – however only the conditions of defences are taken into account on the version of the maps that is provided via the web-based maps and no socio-economic information	None, since RISK maps are not yet legally prescribed	The social (housing), economic (offices) and environmental (rural area) dimension are fully integrated since risk maps are legally prescribed in PPRi.

Criterion	Bavaria	Saxony	England	Austria	France
		• Social: people affected & social hotspots • Ecologic: vulnerable biotopes, accumulation areas of polluted material			
If relevant the method of aggregation	none	e) Prioritisation of measures – 100-point assessment scheme: 1a. Cumulative expected damages (25) 1b. Benefit-cost ratio (25) 1c. Effects on Water Management (25) Retention capacity (10) Discharge conditions (10) Water ecology (5) 1d. „Vulnerability“ (25) Special vulnerability (people, infrastructure, heritage sites) 10 Potential secondary losses (e.g. hazardous substances) 10 Special protection needs (lacking possibility of defence) 5 f) Multicriteria risk mapping by UFZ: additive weighting procedure of risk maps – standardising, weighting and addition of risk maps disjunctive approach: definition of threshold values for each risk criteria. Threshold exceeded in at least one criterion = high risk area	The different probabilities of inundation are aggregated in order to provide the NaFRA product. But this is only in relation to the hazard.	None, since RISK maps are not yet legally prescribed	None
Public participation					
Past activities for public participation	No past activities for public participation on a legal basis RiskCatch (Sprachinger, Dorner, Metzka, Serrhini & Fuchs 2008)		(f) ESRC-funded project *Understanding environmental knowledge controversies* used what they called competency groups to try to incorporate different types of knowledge into flood risk science – but few available outputs so far from this project which has now finished.	Forest Act 1975, § 11 Abs 4: Everybody with legitimate interest is allowed to comment on the draft within the period of four weeks...	See below.
How were hazard and risk maps used in public participation processes?	RiskCatch: maps were presented to various user group using the method of eye tracking supplemented by experimental graphic semiology (Fuchs, Sprachinger, Dorner, Rochmann & Serrhini 2009)		Waiting to see the outputs of the above project The flood maps are often used as contextual information when engaging the public about many flood issues	Forest Act 1975, § 11 Abs 4: Everybody with legitimate interest is allowed to comment on the draft within the period of four weeks...: Local meetings with stakeholder groups	One step of the elaboration of each PPRi is composed of a public consultation and/or a public survey.
Planned activities			None that are known of to date specifically tackling flood risk mapping – outside of this project.		

Criterion	Bavaria	Saxony	England	Austria	France
How is public participation integrated or recognized in national law?			The Environment Agency has a general approach to public participation and communicating and engaging with communities but no activities in relation to flood mapping have been undertaken.	See above	See above
Definition of target groups			Usually targeted at 'At risk' populations – which is often defined as being within the 1 in 1000 year flood extent.	Mainly citizens inhabiting endangered areas or having land development plans therein.	
Further information (websites, brochures, …)	Flood hazard maps, flood risk maps and other flood-related information maps have to be presented and published in print form and in an interactive online map service.	Information platform flood protection (operated by the Saxon Flood Centre at LfULG, Informationsplattform Hochwasserschutz): http://www.umwelt.sachsen.de/umwelt/wasser/2318.htm Flood warning system: http://www.umwelt.sachsen.de/de/wu/umwelt/lfug/lfug-internet/wasser_13482.html Flood education trail Dresden: http://www.hochwasserlehrpfad-dresden.de/hw/index.html	*Environment Agency (no date) Working with others: Building Trust in Comminites. A guide for staff http://publications.environment-agency.gov.uk/pdf/GEHO1106BLOJ-e-e.pdf*	Occasional brochures distributed via webpage of the Federal Ministry	Central platform about risks : http://www.prim.net/# website monitoring flood: http://www.vigicrues.ecologie.gouv.fr/ website presenting technologic and natural risks : http://cartorisque.prim.net/ Communal Report of information about major risks (Dossier d'Information Communal sur les RIsques Majeurs or DICRIM)
Design of maps					
Scale of maps	From the scale of 1:400 and higher, only the land register maps are shown in the background. Usually, flood plains are determined on a scale of 1:2.500. IÜG provides a representation of flood plains to 1:1.000. But the system states that the possibility of zooming does not increase the accuracy of the map content of a scale of 1:2.500. Properties can be seen while using the land register maps. Therefore the concernment on individual properties through floods can be read. Drawing inaccuracies in the area of +/-10m are possible. Extreme events are only shown on smaller scales. These areas can only be determined due to uncertainties in the input data with a precision of 1:25.000	e) Legally binding flood-prone areas (Überschwemmungsgebiete): 1:25.000 Gefahrenkarten (hazard maps): 1:10.000 (partly 1:25.000 and 1:50.000 along the Elbe River), 1:5.000/1:10.000 for hazard maps in settlements (restricted to public authorities?) Hazard indication maps and damage potential maps: 1:100.000 Risk maps under development: 1:5000 and other	Maps provided via the web are provided at the following scales OFM 1: 650 000; 1:100 000; 1: 20 000.	1:50000 [iv] 1:5000 or below for torrents	study of phenomena: 1/25,000 or 1/10,000 identification of majors stakes: 1/25,000 or 1/10,000 legal document: 1/25,000 to 1/5,000
Background (topographic maps, cataster map, …)	IÜG Bayern: • 1:1.000 – 1:4.000 Digital land register maps (without plot number) • 1:8.000 – 1:30.000 Topographic map 1:25.000 • 1:60.000 Topographic map 1:50.000 • 1:120.000 Topographic (Survey) map 1:200.000 • 1:240.000 – 1:500.000 Topographic (Survey) map1:500.000 DTM [iv] (e)	e) Legally binding flood-prone areas (Überschwemmungsgebiete): Topographic maps and vegetation maps 1:100.000 Hazard maps/intensity maps (Gefahrenkarten, Intensitätskarten): Topographic maps and vegetation maps 1:100.000/1:50.000, for hazard maps in settlements topographic maps and vegetation maps 1:50.000 Hazard indication maps and damage potential maps: Topographic maps 1:100.000	A coloured raster base map produced by the Ordnance Survey This includes road and rail network, built up areas including individual streets, contour information, field boundaries, buildings etc.	DTM [iii] Land register plan Orthophoto map	Topographic map (1/25,000 or enlarged to 1/10,000) Cadastral background (1/5,000)

Criterion	Bavaria	Saxony	England	Austria	France
	Standard for the design of hazard maps (Länderarbeitsgemeinschaft Wasser 2006)				
Color scheme for water level, risk, extent, …)	(f) Blue for water levels/depth (Hagemeier-Klose & Wagner 2009)	e) Hazard maps/intensity maps: Different blues/purple for intensity of inundation (see above) Hazard indication maps: Different greens for floods ≤ HQ(100), different blues/purple for the HQ(extreme) Colours for intensity of damage (4 different land use classes, 1-3 intensities, see above), reds/orange for settlements, brown/purple for industrial areas, yellow for agricultural areas, green for other land uses	OFM – Two different shade of blue are used a dark blue for the areas at higher risk than HQ100 (rivers) and HQ200 (sea) and a lighter blue for the area between this flood risk and HQ1000.	Blue -> HQ100 Light pink -> HQ1 Hazard zones: yellow, red[iii] For torrents: According to Decree on hazard maps 1976: § 6. In a hazard map the following areas have to be depicted based on a design event (probability of occurrence ~ 150 yrs., "design event"): a) Red hazard zones indicate those areas endangered by avalanches and torrents where the permanent utilisation for settlement and traffic purposes is not possible or only possible with extraordinary efforts for mitigation measures; b) Yellow hazard zones indicate those areas where a permanent utilisation for settlement and traffic purposes is impaired by hazard processes; Furthermore, specific other areas have to be displayed in the hazard maps: 1) Blue colours mark areas to be provided for future mitigation measures, 2) brown colours indicate areas affected by land slides and rock fall and 3) (3) purple colours indicate areas that can be used as protection due to their natural properties, such as protection forests or natural retention basins.	PPRi :  AZI:  With actually : Low velocity / Medium velocity / High velocity Height < 0,50m: Low risk / Medium risk / Medium risk 0.50m < height < 1m: Low risk / Medium risk / Medium risk 1m < height < 2m: Medium risk / High risk / High risk 2m < height: High risk / Very high risk / Very high risk But soon: Low velocity / Medium velocity / High velocity Height < 0,50m: Low risk / Medium risk / High risk 0.50m < height < 1m: Medium risk / Medium risk / High risk 1m < height < 2m: High risk / High risk / Very high risk 2m < height: High risk / High risk / Very high risk

Criterion	Bavaria	Saxony	England	Austria	France
Level of detail and additional data in the map (hot spots, …)	If available also water depths, inundation areas and the wrap-around of observed floods can be shown (f) location of gauging stations (Hagemeier-Klose & Wagner 2009)	e) infrastructure (power plants and other energy assets, waste water treatment plants, hospitals)	Flood defences are shown on the map in purple and black hatching indicates those areas that are protected by the defences. Clicking on the map – provides access to the *Learn more* option whereby information related to the NaFRA assessment is provided.		
Extras					
Information management (centralized or decentralized handling of data, integration with INSPIRE, …)	The Bavarian Environment Agency (Landesamt für Umwelt - LFU) is head of the Bavarian flood information & alert service. The flood information centre at LFU forms a central information platform There in-depth information and data of the water management agencies, the German Weather Service (Deutscher Wetterdienst – DWD), the neighbouring countries and the Waterways and Shipping Administration are collected, analysed and distributed to relevant agencies. Detailed flood situation reports can be provided through the media, via Internet and phone messages.	e) The flood information & alert service in the Free State of Saxony is headed by the Saxon Flood Centre based in the Saxon State Agency for Environment and Geology (LfULG). The Saxon Flood Centre is responsible for flood information and early warning for all main rivers in Saxony. It provides relevant flood information directly to each authority with flood defence responsibilities as well as to any third parties (private persons) with particular risk of flooding. The following information products are automatically delivered to the recipients when defined alarm stages (flood level thresholds) are reached: • Flood levels, • Flood warnings / all-clear messages and • Flood flash messages via SMS. The following input data are being received regularly: • Up-to-date readings of more than 100 flood level gauges • Precipitation and thaw forecasts of the German Meteorological Service (DWD) • Flows and water levels of reservoirs provided by the State Dam Monitoring Centre • Relevant hydrological and meteorological data for the river Obere Elbe and its tributaries in the Czech Republic are provided by the Czech Hydro-Meteorological Institute. The whole flood information system contains: • An automatic flood level and precipitation data recall unit • An information management system (database) • Forecasting models for the rivers Obere Elbe, Schwarze Elster, Mulde, Weiße Elster, Spree and Lausitzer Neiße • A public internet platform • An automatic information distributor	The flood maps are held and updated centrally within the Environment Agency – however local teams have mapping and data specialists who provide data and input into the development of the maps.	Organised regionally (Regional branches of respective authorities).	The legal flood maps are held and updated centrally within the Regional Direction (DREAL or Direction Régionale de l'Environnement, de l'Aménagement et du Logement) Actually based on historical flood but based on HYDRA model soon.  Study about the impact of the break of dike : Arnaud BOULAY, DREAL-Centre, "Les études de dangers des digues de la Loire : méthodologie, calendrier, avancement", Meeting EP-Loire, November 24th 2010, Orléans (45).

Criterion	Bavaria	Saxony	England	Austria	France
					
Form of presentation (print, handouts, webGIS, …)	Print maps are not publicly available; therefore public available web mapping service [iv] Online maps run on a online platform, called IÜG Bayern (Informationsdienst Überschwemmungsgefährdete Gebiete – Information service on flood endangered areas), provided by the Bavarian Environment Agency. The IÜG is an interactive map service. The service gives the opportunity to gain an overview of the status of the investigation and determination of flood areas in Bavaria.	e) The Saxon Flood Centre also operates an "information platform flood protection", providing major contents of the flood protection concepts (…) online. The coverage is already rather comprehensive and will be complete soon. webGIS (http://www.umwelt.sachsen.de/umwelt/wasser/2339.htm http://www.umwelt.sachsen.de/de/wu/umwelt/lfug/lfug-internet/wasser_13888.html) Furthermore, the hazard indication map (Gefahrenhinweiskarte Sachsen) is also available for free on CD-ROM (at selected agencies or upon request) Printed maps are available for inspection at relevant agencies (Format DIN A3)	Publically available web mapping service[1] Can be accessed through request to the Environment Agency. The information is held within a GIS and so in theory it is possible to access it via this with permission from the EA.	web gis [iii]	Public available web mapping service: http://www.prim.net/# http://www.vigicrues.ecologie.gouv.fr/ http://cartorisque.prim.net/ printed PPRi and AZI maps available in the prefecture
Is there a formal obligation to make maps publicly available?	Paragraph 76 WHG defines the duty to supply information to the public. Flood hazard maps, flood risk maps and other flood-related information maps have to be presented and published in print form and in an interactive online map service. FloodScan: public web map (guarantee a provision of information on flood plains and flood hazard areas)		There is a formal responsibility on the EA to raise awareness of the public about flooding - but not specifically with regard to the map. The map is required under spatial planning guidance and therefore should be publicly available for purposes of flood risk assessments for new developments - Communities and Local Government (2010 revision)	Yes, see above	There is a formal responsibility on the state (government, prefect, mayor…) to raise awareness of the public about flood risk
Test basins (are there test basins where processes, strategies and ideas have been or are tested)	In Bavaria, flood risk management plans are created in coordination with surrounding states and provinces of the catchment areas of the river Danube and Elbe. Flood hazard maps and flood risk maps are tested mainly with the river Danube and Main. RiskCatch: Test basin Vils and Rott for the development of hazard maps (Dorner u. a. 2006) RiskMap: Rott (Ruhstorf, Pocking and Schwaibach)	p) Official test sites for establishing flood risk management plans according to the EU Floods Directive, including risk maps: Schwarze Elster River (LfULG) Weiße Elster River (within the context of the LABEL project, under participation of LfULG f) Risk Maps from UFZ: Vereinigte Mulde River [Joint Mulde], City of Grimma area	Already produced at a national level.	national level [iii]	Local actors realize simulations in response to a flood event to prepare emergency (government actors, fire brigade, police, technical services…)

1 http://www.verwaltung.bayern.de/Gesamtliste-.115.htm?purl=http://by.juris.de/by/WasG_BY_1994_rahmen.htm
1 http://www.bayern.landtag.de/www/ElanTextAblage_WP16/Drucksachen/Basisdrucksachen/0000001500/0000001848.pdf
iii http://gis.lebensministerium.at/ehora/frames/index.php?&gui_id=eHORA

ivhttp://www.lfu.bayern.de/wasser/fachinformationen/iueg/kartendienst/index.htm
v http://www.umwelt.sachsen.de/umwelt/wasser/72.htm
http://www.lfu.bayern.de/wasser/hw_risiko/index.htm
Communities and Local Government (2010 revision) Planning Policy Statement 25: Development and Flood Risk, Available at: http://www.communities.gov.uk/planningandbuilding/planning/planningpolicyguidance/planningpolicystatements/planningpolicystatements/pps25/
Environment Agency (2006b) Using our Flood Map: Identifying and understanding Flood Risk in England & Wales.Available online at http://publications.environment-agency.gov.uk/pdf/GEH00306BKIY-e-e.pdf?lang=_e Accessed January 2007.
Environment Agency Website, (2008) Understanding the flood map Available online at http://www.environment-agency.gov.uk/subjects/flood/826674/829803/858477/858535/?lang=_e, Accessed 6th May 2008.
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