

Mitigating hydro-meteorological hazard impacts through improved transboundary river management in the Ciliwung River Basin

TRANSBOUNDARY RIVER GOVERNANCE AND FLOOD MANAGEMENT ARRANGEMENTS IN EUROPE

February 2020



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About the Project

The project Mitigating Hydrometeorological Hazard Impacts Through Improved Transboundary River Management in the Ciliwung River Basin will examine how the current transboundary river management arrangements in the Ciliwung River Basin, Indonesia influence flood hazard impacts. The interdisciplinary project will bring together expertise in flood modelling, disaster risk reduction, urban planning, public policy, and behavioural science with the objective of identifying the environmental, socio-economic, political and organisational landscape associated with flood risk in the Ciliwung River Basin. The results will be used to inform improved transboundary river management arrangements for the Ciliwung Basin and provide a model for urban and peri-urban river basins elsewhere.

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1. Introduction

This work was conducted as part of the project Mitigating hydrometeorological hazard impacts through improved transboundary river management in the Ciliwung River Basin. This UK-Indonesia collaborative project, funded by NERC and Ristekdikti, aims to inform plans for improved transboundary river management to tackle flooding in the Ciliwung Basin, Indonesia. In developing recommendations for future river governance plans, the project has drawn on the practices of other countries also affected by flooding around the world.

The aim of this document is to highlight the ways transboundary rivers and floods are managed in Europe. Europe was chosen because it has a long history of transboundary water sharing. The region has the largest number of internationally shared river basins globally. Approximately 60% of Europe is covered by international river basins (Baranyai, 2019b). It is also home to the 'most international' basin in the world, the Danube River Basin, which crosses 19 countries. Due to the large number of international river basins, significant interdependencies exist between European countries (UNECE, 2009; Reichert, 2016; Baranyai, 2019b). Over time different methods have become established for the management of transboundary waters. In this document, Europe's management arrangements are described to understand how they operate and then examined in terms of their successes and failures.

2. Methods

European river governance and flood management arrangements were explored through a literature review. The review included documents from the academic literature, grey literature and EU documents and websites. The literature sources were retrieved through online searches using Google, Google Scholar and the University of Huddersfield's online portal 'Summon'. Key word searches included: flood*; 'river basin'; water; management; Europe; transboundary. Although the focus of the study was on flood management in transboundary basins, the review included literature from the broader field of water management. This is because there are several important water management procedures (such as the Water Framework Directive), that although do not pertain directly to flooding, have had substantial influence on the way river basins are managed across boundaries, therefore they are likely to be insightful for this study.

Due to the breadth of the topic, this document aims to give a general overview, but presents several examples throughout to provide depth. In order to ensure coherence with the wider project, this study follows the structure set out in the project's conceptual framework (Clegg *et al.*, 2019b). It draws upon the three pillars of effective water governance proposed by Savenije and van der Zaag (2000), political, institutional and operational. Throughout this document key concepts that were identified in the conceptual framework are discussed for the European context. The study presents key issues at the international level, but also gives some examples of what remains the mandate of individual states.

The document is structured as follows: Firstly, a background to flooding in Europe is provided, including an introduction to the role of the European Union (EU). The river governance and flood management arrangements are then discussed in terms of the three pillars of effective transboundary water governance: Political, institutional and operational.

3. Background context

3.1. The flood hazard in Europe

Flooding presents a significant disaster risk in Europe. Between 1980 and 2010, 3,563 distinct flood events were identified across 37 European countries (European Environment Agency, 2016). Flooding is widespread, but its nature varies across the region. River flooding is dominant in central and western parts of Europe, while flash flooding is most common in the south. Flooding from snow melt is most common in the north (Paprotny *et al.*, 2018). Flooding has significant impacts, including on human health, the environment, cultural heritage and economic activities (European Environment Agency, 2016). To provide an example, the major Central European floods in 2013, which affected large part of Germany, Austria and the Czech Republic, incurred estimated losses of between 11.9 and 16 billion Euros. There were 25 deaths and over 52,500 people had to leave their homes (Zurich, 2014). Over time, there has been a reduction in the number of fatalities resulting from flooding, however, there has been an increase in the number of people affected (Paprotny *et al.*, 2018).

Trends show that the frequency of flood events is changing. Between 1960 and 2010 incidences of river flooding increased in north-western and central Europe, but decreased in southern and north-eastern Europe (Alfieri *et al.*, 2015). This trend is consistent with increasing precipitation amounts in the north and decreasing amounts in southern areas. All coastal regions in Europe have experienced increases in absolute sea level, however the degree varies regionally (European Environment Agency, 2019). These trends suggest that increased flooding from both fluvial and coastal sources is likely to be one of the most significant impacts of climate change in Europe.



Figure 1. Flooding in the old city area of Passau, Germany during the 2013 central European flood event. The city is located at the confluence of the Danube, Inn and Ilz rivers (blickwinkel/Alamy Stock Photo).

3.2. The European Union

The European Economic Community (EEC) was established in 1958. Its aim was to increase economic cooperation between Belgium, Germany, France, Italy, Luxembourg and the Netherlands after the Second World War. The EEC was originally focused on economic partnership, but expanded overtime to become an economic and political union. An autonomous supranational legal system was introduced (Baranyai, 2019b) and its name changed to the European Union (EU) in 1993 (Europa, 2019). There are currently 27 Member States.

List of EU member countries

Austria
Belgium
Bulgaria
Croatia
Cyprus
Czechia
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Latvia
Lithuania
Luxembourg
Malta
Netherlands
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden

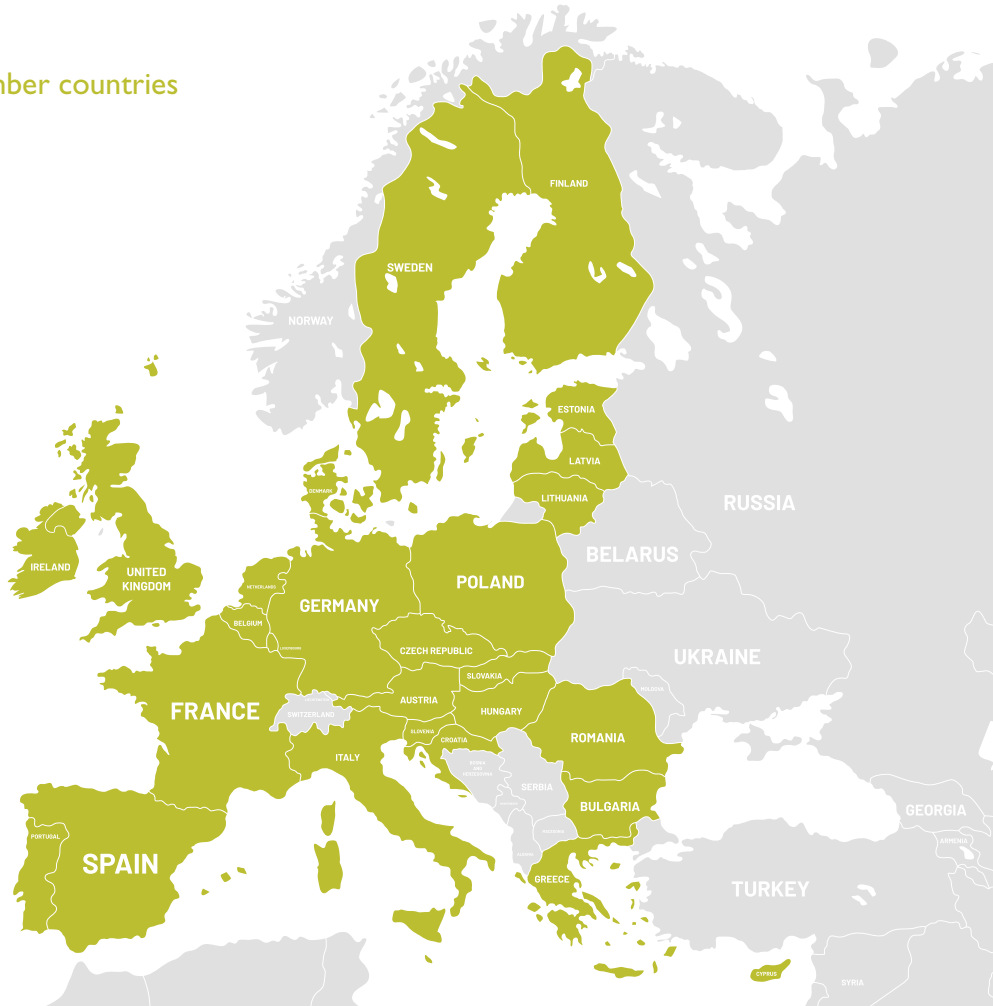


Figure 2. List of European Union member countries and their geographical locations (VectorStock).

4. Transboundary Governance and River Management

4.1. Political Pillar

4.1.1. Leadership and Political will

The purpose of the EU, in part, is to enhance cohesion and solidarity between European countries. Thus, a great deal of effort has gone into fostering cooperation. However, this is often in contention with national level political will. A study of EU countries (Denmark, France, Italy, Germany, Switzerland and the United Kingdom) found that a lack of political will and motivation were hindrances to implementing transboundary policies on crisis management. This lack of political will was linked to a sense of 'isolated national thinking' and countries believing they should be self-reliant, which led to the view that they did not need to cooperate across boundaries. This view could have potentially negative impacts on the amount of transboundary coordination that takes place (Amaratunga *et al.*, 2017a).

National political will can also impact how much funding is available for flood measures, as flood risk management (FRM) in European countries is often reliant on public spending (Mees *et al.*, 2016). In addition, flooding is often not the only concern of national governments. Therefore, political attention given to flooding can be variable overtime. Similarly, in a transboundary setting, coordination is required on a range of issues spanning the border such as resource use, amenity and economic concerns. This creates a complex arena where environmental and economic considerations compete (Amaratunga *et al.*, 2017a). Levels of political will to tackle these issues between countries may not always be aligned.

4.1.2. Capacity

Although the EU presents a unifying body for European countries, there is still great diversity between the countries themselves. Even when political will for greater integration exists, the differing capacities of institutions, actors and communities can present a barrier to cooperation (Del Moral and Do O, 2014). In a study of the Dutch-German border, Renner *et al.* (2018) describe how differences in resource availability between the two countries limits the ability to move beyond joint policy making towards collaborative implementation (with Germany having less human and financial resources for water management compared to the Dutch).

4.1.3. Sectoral fragmentation

For successful integrated water management, different sectors need to align their plans and actions throughout the river basin. European water management has increasingly been reorganised around the river basin to achieve this. This is owing to the implementation of the Water Framework Directive that stipulates planning must be undertaken at the River Basin District (RBD) level (see Section 4.2.1). Although this has tackled fragmentation in the water sector, there are concerns over the gap between water and other sectors. New mismatches may occur between the water sector and the management structures of other sectors (agriculture, nature conservation, spatial planning etc.) that are not oriented around the river basin (Moss, 2012). Indeed, a lack of coherence between water policies and other sectoral policies, such as agriculture and spatial planning, has been identified across Europe. This gap can impede the integrated management of floodplain areas (Tsakiris, 2015; European Environment Agency, 2016).

4.2. Legal/Institutional Pillar

4.2.1. Legal Frameworks

Transboundary water governance in the EU is regulated by four layers of supranational law. These are: EU primary law (i.e. the EU founding treaties), international water treaties ratified by the EU, EU secondary law (i.e. Directives) and bilateral, regional or basin treaties (Baranyai, 2019b). This section discusses some of the key laws relevant to transboundary river and flood management.

4.2.1.1. International law: UNECE Water Convention

The United Nations Economic Commission for Europe (UNECE) is one of the five regional commissions of the United Nations. The UNECE Convention on the Protection and Use of Transboundary Water Courses and International Lakes ('Water Convention') was established in 1996. There are currently a total of 43 Parties to the Convention (42 European States plus the EU) (United Nations Treaty Collection, 2019).

Although the Water Convention does not address floods directly, it has a significant influence on the management of transboundary waters (UNECE, 2009). Parties to the Convention are required to prevent, control and reduce transboundary impact, to use transboundary waters in a reasonable and equitable way, and to ensure their sustainable management. It also requires parties to cooperate on research and development and exchange information on water quantity and quality (UNECE, 2019a). Overtime the obligations of the Water Convention have been expanded via a number of guidelines. The Guidelines on Sustainable Flood Prevention were adopted in 2000. They include the basic principles, policies and strategies for transboundary flood management, including the tasks of joint bodies, the provision of information, mutual assistance and education and training (UNECE, 2009). The Guidelines stipulate that flood prevention strategies should cover the whole basin, even in transboundary cases. They further suggest that joint bodies are established for cooperation who should incorporate flooding into their work programme (United Nations Economic and Social Council, 2000).

4.2.1.2. International law: Espoo Convention

The Convention on Environmental Impact Assessment in a Transboundary Context (1997) (the 'Espoo Convention') aims to reduce the potential for negative environmental impacts across international borders. There are currently 45 Parties to the Convention including the EU (UNECE, 2019b). Although the Convention does not deal with flooding or river management directly, it requires states to consult one another on major developments taking place along water courses. The Convention is transposed into EU Law in the Environmental Impact Assessment (EIA) Directive. Under the Directive, EU Member States are required to assess environmental impacts of planned activities and obliges them to consult with other states on any plans that may have a transboundary environmental impact (Koyano, 2008). Planned activities may include the development of hydropower stations or the building of bridges across rivers, but also covers non-water related activities e.g. the development of nuclear power stations (UNECE, 2019b). During the process, environment authorities and the public in the potentially affected states are consulted (Marsden, 2012). An assigned 'competent authority' makes a decision based upon the results of the consultation. The public are able to challenge the decision through the courts (European Commission, 2020a). However, Marsden (2012) notes that it is the individual states that decides at what stage decisions may be challenged and whether the challengers have 'sufficient interest'. This potentially limits the potential for successful challenges to be made.

4.2.1.3. EU secondary law: Directives

EU Directives are legislative acts of the EU. The directives set out goals for EU countries, but do not prescribe how they should be achieved (European Union, 2019). There are two significant EU Directives relating to transboundary river governance and flood management, the Water Framework Directive and the Floods Directive.

Water Framework Directive

The Water Framework Directive (2000/60/EC) (WFD) sets out goals to achieve the improved environmental status of river basins in Europe. Although the WFD does not address flooding directly, it has had a significant impact on the way river basins are managed across Europe, and is considered a highly influential aspect of European water management (Maia, 2017). In particular, the WFD focuses on management at the river basin scale. It requires that EU Member States define River Basin Districts (RBDs) (an area covering one or more catchments) and develop River Basin Management Plans (RBMPs). There are a total of 128 RBDs in Europe, with 49 of these crossing international borders (Jager *et al.*, 2016).

EU Directives do not prescribe how goals should be achieved. Therefore, countries are able to decide on the method of implementation. In many EU countries, implementation of the WFD has been built upon previously existing institutional structures. Some countries already had fairly well-established national river basin management arrangements and integrated management structures (e.g. the Netherlands) (Priest *et al.*, 2016). These countries found implementation of the WFD much easier. However, other countries had to undergo significant institutional change (e.g. Sweden) (Jager *et al.*, 2016).

Due to the implementation of the WFD manifesting differently across borders, there are concerns over institutional gaps between neighbouring states. This presents a particular challenge for international RBDs (European Environment Agency, 2016). In some cases it has been found that national laws, norms and standards restrict policy freedom and hinder the ability to harmonise measures across a border (Renner *et al.*, 2018). Furthermore, in cases where the WFD spurred institutional change, power was not always redistributed to new river basin bodies or the public (Jager *et al.*, 2016).

International RBDs do not fall within EU territory only. Several international basins are shared with non-EU states. Nonetheless, the WFD encourages coordination between EU states and non-EU states in these circumstances. The fifth WFD implementation report published in 2019 indicated that most international RBDs shared with non-Member States have some form of cooperation agreement in place. However, in many cases a joint body or shared international RBMP remains lacking (European Commission, 2019b). There are several potential barriers that hinder cooperation in international RBDs. EU Member States are required to meet EU WFD regulations, while non-EU states have their own national legislative requirements that may not necessarily be aligned. Furthermore, the capacities of neighbouring countries may differ. EU Member States benefit from EU financial support mechanisms to improve water infrastructure and management. However, non-EU states do not benefit from this. This can further increase disparities across a border and make sustaining joint action problematic. To tackle these issues, the need to ensure transboundary arrangements are compatible with socio-economic conditions either side of the border has been highlighted (Krengel *et al.*, 2018).

Floods Directive

The goal of the Floods Directive (2007/60/EC) (FD) is to achieve a consistent approach to flood management across Europe. The Directive requires Member States to conduct flood risk assessments, identify Flood Risk Areas (FRAs) and produce flood risk management plans (FRMPs) for these zones (European Commission, 2019a). The FD is implemented on the same River Basin District level as the WFD.

The FD is based on two primary principles, the subsidiarity principle and the solidarity principle. Subsidiarity means responsibility should be given to the least centralised authority capable of addressing the problem.

Solidarity means that FRM should be carried out so that it does not significantly increase flood risk elsewhere in the basin (Bakker *et al.*, 2013). Both these principles have relevancy for transboundary management, by distributing responsibility and taking into consideration upstream-downstream linkages. However, the notion of solidarity is a principle, and not a hard law. van Eerd *et al.* (2015) note that although the principle has increased awareness of the need for cross-border cooperation in FRM, it does not always translate successfully into practical action (based on a case study of the Dutch North Rhine-Westphalian region). The requirements of the FD mean that states can meet their obligations through planning and assessment, therefore actual improvements in FRM practically are not necessarily legally enforced. In addition, a review of draft FRMPs suggested that governance related issues require further work. International coordination in particular was highlighted as an area that has lagged behind others (WRc, 2015). Priest *et al.* (2016) recommend that the FD could be improved through more stringent cross border cooperation requirements.



Figure 3. Flooding near Bratislava during the summer 2013 flood event (REUTERS / Alamy Stock Photo).

Enforcement and compliance of the WFD and the FD

There are legal mechanisms in place for ensuring the compliance of individual Member States with the WFD and the FD. The Commission is responsible for ensuring compliance with its own law (including directives). The EC conducts assessments of the application of its laws and if non-compliance is detected it investigates the case. In some cases, the Commission may report the issue to the European Court of Justice (EU's highest court of law) (European Commission, 2020c).

In the case of a dispute between Member States, a Member State may take its complaint to the European Court of Justice, national authorities may institute legal proceedings, or compensation may be claimed via private law (Keessen *et al.*, 2008). Alternatively, affected states can report the problem to the European Commission (EC). However, the EC is required to 'respond' only. It has been identified that it is exceedingly rare for Member States to take legal action against one another. This is because it can lead to poor cross-border relations and political issues. Thus, it is more common for states to rely on the Commission to identify non-compliance issues (Keessen *et al.*, 2008; Baranyai, 2019a).

Although there are legal requirements to both the WFD and the FD, this is not the case for transboundary cooperation. As previously mentioned, requirements of the FD are primarily in the planning stages, and practical cooperation is not enforced. Similarly, the actual cooperation in a transboundary RBD is not legally enforced. This means that if two states fail to develop joint RBMPs or FRMPs, there are no legal consequences (Baranyai, 2019a). Baranyai (2019a) suggests that many of the legal requirements are focused on pollution and ecology, and that transboundary water quantity management are not sufficiently addressed in the current legal framework.

4.2.1.4. Bilateral/multilateral/basin treaties

Treaties are commonly used within Europe between two (bilateral) or more (multilateral) countries sharing a watercourse to aid transboundary governance. There are over 100 bilateral or multilateral treaties for shared rivers, lakes and aquifers in Europe (Reichert, 2016). In many cases, treaties have been in place for many years, predating the WFD. As there is a vast number of treaties, this section presents two examples, one of a bilateral treaty between Spain and Portugal and one of a multilateral treaty for the Rhine River Basin. The two agreements are discussed widely in the literature and are considered particularly influential and successful.

BILATERAL LEGAL FRAMEWORK: ALBUFEIRA CONVENTION BETWEEN SPAIN AND PORTUGAL

There are five river basins shared between Spain and Portugal (the Minho, Lima, Douro, Tagus and Guadiana). There is a long history of bilateral water agreements between the two countries, the first dating back to the 19th Century. Others dating back to 1927 and 1964 were implemented for the regulation of hydroelectric power generation. The Albufeira Convention which came into force in 2000 (also known as the Convention on Cooperation for the Protection and Sustainable Use of Portuguese-Spanish River Basins) is considered a particularly influential water management agreement for the Iberian Peninsula (da Silva Costa, 2018). It seeks to maintain friendship between the two Nations and to balance environmental protection with sustainable use of water resources (UNDESA, 2013). The Convention came into action alongside the WFD, and acts as a cross-border implementation mechanism. It was also a result of political tensions over water availability and demand between Portugal and Spain.

The Convention led to the creation of two transboundary institutions. The first is the Conference of the Parties, at which environmental ministers meet. The second is the Commission

for the Application and Development of the Convention (CADC), which is concerned with the implementation of the Convention and the WFD. The CADC is composed of delegations appointed by the Governments of the two states. Decisions are made by the CADC and these are agreed upon by the delegation. The Convention does not require shared hydrological planning, only coordination of activities. This is primarily achieved through sharing information via the CADC. Implementation is then carried out by the two states, in line with national procedures and legal structures (Bukowski, 2011).

Criticism of the Convention is that it exists primarily at the national level. This is in contention with Spain's multi-level water management arrangements where powers are shared between river basin organizations and autonomous regions rather than being wholly centralised (Sereno (2011) in Del Moral and Do O (2014)). This has meant that cooperation between Spain and Portugal is primarily governmental and has not necessarily empowered the river basin level (thought to be important for river management) (Del Moral and Do O, 2014).

MULTILATERAL TREATY: THE RHINE CONVENTION

The Rhine Convention is a multilateral treaty established in 1999 between Germany, France, Luxembourg, the Netherlands Switzerland and the European Community. The Rhine Convention is often regarded as an example of successful transboundary cooperation as it partly informed the development of the WFD.

The Convention is implemented through the International Commission for the Protection of the Rhine (ICPR). The organisation was initially set up in 1950s as a result of concerns over industrial pollution. Several major events such as the Sandoz pollution incident in 1986 and major floods in the 1990s increased pressure and expanded the work of the ICPR. The new goals of the ICPR were incorporated into the new Rhine Convention in 1999 (ICPR, 2020a). The objectives of the Convention are now to achieve sustainable development of the Rhine ecosystem, ensure drinking water production, improve quality of Rhine sediments and provide holistic flood protection and prevention (ICPR, 2020b).

The Rhine treaty draws upon the principles of the UNECE Water Convention. There are also several founding principles that support relations between the parties, including the polluter-pays principle, the principle of not increasing damage and the principle of not transferring environmental pollution (ICPR, 1999).

The ICPR has also made efforts to coordinate with non-EU states. Although Switzerland is not an EU Member State, it supports the ICPR on the basis of its national laws. Furthermore, the Coordinating Committee Rhine was established within the ICPR which aims to integrate non-contracting parties (Liechtenstein, Austria and Wallonia, Belgium) into the ICPRs work. Despite this, some issues have been noted. It is suggested that after the implementation of the WFD, states began to focus on the substantial requirements of the WFD, rather than tackling the range of transboundary issues via the ICPR (Keessen et al., 2008).



Figure 4. View of the Rhine River in Germany (robertharding/Alamy Stock Photo).

4.2.2. Horizontal and Vertical Integration

4.2.2.1. Horizontal integration

As set out by the legal instruments described in the previous section, actors are required to coordinate their actions across river basins and state borders. This can prove challenging as cooperation can be hindered by differences between neighbouring countries. Even in cases where countries are thought to be similar, issues can still be found (Wiering *et al.*, 2010). The ability to cooperate across international borders can be strongly influenced by the institutional arrangements in which it is embedded (Renner *et al.*, 2018). This section provides details of how horizontal and vertical integration in river basins is achieved via several examples.

HORIZONTAL INTEGRATION ACROSS THE DUTCH-GERMAN BORDER IN THE DELTARHINE

In a study of cooperation across the Dutch-German border in the Deltarhine region, Renner *et al.* (2018) identified four modes of cooperation. These were, regional level initiatives such as the Dutch-German water sub-commissions and the WFD Working and Steering Group; cross-border river development projects for individual basins; transboundary hydrological modelling projects, and shared initiatives, for example the Dutch-German Action on Flood Protection. This example demonstrates the existence of multiple and diverse coordination mechanisms at both regional and local level within a single basin. These forms of cooperation were seen as particularly valuable for communication, mutual understanding and knowledge exchanges, and as a result, there has been a proliferation of masterplans, reports and visions. However, a lack of joint policy

making and implementation has been noted. The two countries still tend to develop policies and implement actions independently. Several reasons for this have been suggested, such as the difference in institutional structure between the two countries (Wiering *et al.*, 2010), differing availability of resources, and restrictions of the national legal frameworks (Renner *et al.*, 2018). Despite the countries' similar politico-cultural background, the institutional structures are a largely limiting factor (Wiering *et al.*, 2010). In addition, although these modes of cooperation were mainly implemented by government authorities, they are found to be reliant on the leadership of key individuals for their success. Loss of these key individuals can significantly impact their effectiveness and sustainability (Renner *et al.*, 2018).

4.2.2.2. Vertical integration

Many European countries exhibit multilevel governance systems. Often local actors are the implementors, but policy is commonly made at higher levels (Fournier *et al.*, 2016). Thus, the different governance levels need to be able to coordinate. Dieperink *et al.* (2018) conducted a study to identify common ways FRM is coordinated across multiple levels of governance in six European countries (the Netherlands, United Kingdom, Belgium, Sweden, Poland and France). The authors identified several mechanisms through which vertical coordination takes place, including the use of policy entrepreneurs, bridging concepts, clear rules, formal hierarchies and the development of specific coordination bodies. Policy entrepreneurs were found to provide vision and leadership and were useful for initiating coordination processes. The role is usually played by a public actor, such as local government, or an NGO. Bridging concepts were identified as abstract terms that facilitate communication across disciplinary border, providing common ground for communication. Clear rules and formal hierarchies help actors to clarify their roles and understand who is responsible for what. In addition, although local levels are the implementors, a comprehensive overview of flood mitigation measures in existence at higher institutional levels is suggested to help to support multi-level decision making (Fournier *et al.*, 2016).

Despite the existence of these coordination mechanisms, international coordination can still prove difficult. Different countries have different models of vertical governance organisation. Some countries have

centralised systems, some decentralised and some federal. This means that decision making responsibilities may be held at different governance levels between countries. This can make coordination across the border difficult when actors located at different governance levels have to work together. It may also be challenging for the different actors to understand the working structures of neighbouring countries, making it unclear who they should coordinate with (Amaratunga *et al.*, 2017a).

HORIZONTAL AND VERTICAL COORDINATION IN RIVER BASINS WITHIN COUNTRIES: EXAMPLES FROM FRANCE AND GERMANY

Although much of the literature on transboundary river basin management in Europe concerns international basins, examples of implementing river basin management within countries can also be found. The Wupper Sub-basin in Germany and the Thau Catchment in France demonstrate two different ways coordination has been established for implementation of the WFD.

The Wupper sub-basin of the Rhine, Germany

Moss (2012) describes the approach taken to horizontal coordination in the Wupper basin, Germany. The Wupper is a sub-basin of the Rhine, wholly located in the state of North Rhine-Westphalia, but which cuts across three administrations and five counties. Since 2007, district authorities have been responsible for planning and implementing the WFD in the basin. However, there are three district authorities in the Wupper sub-basin which has led to issues of fit between these administrative units and the basin level implementation of the WFD. To overcome this problem, the State allocated responsibility for coordinating the WFD to a single district authority (Dusseldorf). The District Authority, along with the

Environment Ministry and the water board, organise roundtables and workshops, arranged around the river basin units. The plans developed by these units are then fed into the wider RBMP. Although it is the district authorities that are responsible for planning, they are reliant on other actors for the implementation. In particular the sub-basin waterboards have taken on this role as traditionally basin-oriented organisations. However, there are concerns that the legally bound district authorities are reliant on non-legally bound organisations for implementation. Although at the moment, the arrangement works well as the waterboards are keen to demonstrate their worth.

The Thau Catchment, France

The Thau catchment, located in France, encompasses 14 municipalities that are divided into two intermunicipal planning authorities. In contrast to the Wupper sub-basin, the Thau Catchment relies on a water basin authority to implement the WFD in the form of the SMBT (Syndicat mixte du bassin de Thau). Aubin *et al.* (2019) conducted social network analysis to understand whether the local water basin authority (SMBT) was in fact at the centre of water management in the basin. It was found

that water managers deemed the SMBT an important actor, but not the most influential. In fact, it was found that the authority lacks direct power. Power is instead shared between the local water assembly (CLE), the Government and the European Commission as decision makers. However, the SMBT are still important as they act instead as a broker between different actors. In this way they have an influence over the way people think and the evolution of norms and values.

4.2.3. Coordinating Institutions

International River Basin Organisations

Schmeier *et al.* (2016) proposed the definition of a river basin organisation (RBO) to be “institutionalised forms of cooperation that are based on binding international agreements covering the geographically defined area of international river or lake basins characterised by principles, norms, rules and governance mechanisms”. The authors identified 26 RBOs across Europe meeting these criteria. RBOs provide a platform for coordination. They can facilitate effective multi-actor networks (Fournier *et al.*, 2016) and communication between actors by providing a communication hub (Amaratunga *et al.*, 2017b). There are several successful examples where they have proven to be useful for joint river basin management planning (UNECE, 2009). But RBOs vary in their role, mandate and therefore impact. Some basins have multiple RBOs while others have none (Bakker, 2009). There are also concerns that there is limited empirical evidence available of their effectiveness (Jager *et al.*, 2016). The following section presents an example of the RBO for the Danube Basin – one of the most well established and well-known basin organisations.

INTERNATIONAL COMMISSION FOR THE PROTECTION OF THE DANUBE RIVER (ICPDR)

The Danube River Basin is the ‘most international’ river basin in Europe and in the world, encompassing (or partially encompassing) 19 states. The river covers a distance of 2,826 km and drains an area of 801,093 km² (Sommerwerk *et al.*, 2009).

In terms of transboundary cooperation, the Danube is well established, with a formal international agreement, an international coordinating body (ICPDR) and an international WFD RBMP (European Commission, 2019b). The main multilateral agreement is the Convention on Cooperation for the Protection and Sustainable Use of the Danube River which has been in force since 1998. It was enacted to ensure waters in the basin were managed and used sustainably and equitably. The Convention is implemented by the International Commission for the Protection of the Danube River (ICPDR). The Commission is composed of delegations from Contracting Parties. It has an Ordinary Meeting Group that takes political decisions, a Standing Meeting Group that provides political guidance, and several expert and task groups. For horizontal coordination, the ICPDR meet twice a year. The meetings are chaired by the ICPDR

president and comprised of delegations from the contracting parties and observing organisations. The ICPDR presidency is passed from one country to another in alphabetical order each year for fairness (ICPDR, 2019). All contracting parties to the Danube Convention agreed to produce a joint international RBMP, which included additional cooperation with the non-EU Member States.

Three levels of coordination are used to coordinate management vertically within the basin. ‘Part A’ is international, basin-wide coordination which is facilitated by the ICPDR. ‘Part B’ is national coordination, or internationally coordinated sub-basin, while ‘Part C’ is sub-unit coordination which refers to management units within the national territory. To link international and national levels (A and B), national plans should refer to the basin-wide RBMP and link issues identified in the RBMP with activities taking place at the national level (ICPDR, 2019). The ICPDR has also produced several supplementary documents, that provide further guidance on how actions can be harmonised throughout the basin. These documents are not legally binding however (European Commission, 2019b).



Figure 5. Flooding of the Danube River in Budapest, Hungary during the summer 2013 floods (Boscorelli/ Alamy Stock Photo)

Coordination groups

To aid the implementation of the WFD and the FD, many countries have implemented multi-agency and multi-actor groups. These initiatives provide a platform for interactions between different actors and stakeholders (Pellegrini *et al.*, 2019). They are similar in function to RBOs but are not necessarily legally bound and can exist alongside RBOs, often located at the sub-basin level. They are commonly engaged in a range of tasks including the transfer of WFD and the FD into the local planning and emergency processes, coordination of local response services and provision of information and advice for the population (Cassel and Hinsberger, 2017). The position of these initiatives at the sub-basin level is considered to be beneficial in finding a balance between top-down and bottom-up governance. RBDs are suitable for river basin planning, but too large for meaningful participation of lower levels, therefore these multi-actor groups provide a bridge, increasing the possibilities for bottom-up participation (Cassel and Hinsberger, 2017; Pellegrini *et al.*, 2019). However, it is suggested that there is a need for clearer protocols on how the actions of these groups are linked with other governance levels and aggregated to the RBD level for the RBMPs and FRMPs (Pellegrini *et al.*, 2019). Coordinating groups are common in the United Kingdom (UK) and further examples can be found in the UK project report (Clegg *et al.*, 2019a).

4.2.4. Participation

There has been growing attention for participation of stakeholders and communities in river basin management in Europe since it is a requirement of the WFD (Begg, 2018). Similar to other aspects of the WFD, flexibility is given to Member States on how participation should be implemented. This approach provides the freedom to tailor participation to local needs. However, the actual participation requirements stipulated by the WFD have been suggested to be too minimal (Euler and Heldt, 2018) and too ambiguous as to who, how and at what stage people should be involved (Wright and Fritsch, 2011; Jager *et al.*, 2016).

As a result of the WFD being non-prescriptive, countries have developed different approaches (Euler and Heldt, 2018), and the resulting variation in the characteristics and extent of participation can be seen across Europe (Fournier *et al.*, 2016; Mees *et al.*, 2016; Euler and Heldt, 2018). Some countries exhibit more developed forms of participation. For example, England, Belgium and France have encouraged citizens to participate in both the decision making and delivery of FRM services alongside the authorities (a process termed 'coproduction'). This has been driven by the desire to create more fair and efficient FRM and more resilient communities (Mees *et al.*, 2016). On the other hand, the transferal of responsibility to the public has been criticised, with the suggestion that the responsibility has been transferred at the expense of power, generating concerns over justice and accountability (Begg, 2018).

In countries where public participation is limited, there are some common barriers. These include lack of flood experience, awareness, misconceptions and lack of financial resources (Fournier *et al.*, 2016). Perceptions of the public also play a role. For example, in some European countries (e.g. England, Germany and the Netherlands) the public believe it is the responsibility of the state to manage flooding, therefore they are reluctant to participate or take on responsibility (Begg, 2018). Overall it is suggested that more work needs to be done to develop improve modes of participation that are legitimate and fair.



Figure 6. Volunteers respond to flooding of the River Elbe during the August 2002 event. Dresden, Germany. (dpa picture alliance/Alamy Stock Photo).

4.3. Operational Pillar

4.3.1. Technical cooperation

Data and information are crucial for effective integrated water resource and flood risk management. However, sharing information across international borders can be challenging. European countries have different official languages which can prevent clear communication. Further varying data management standards that can lead to incompatibility of data sources (Amaratunga *et al.*, 2017a). The following sections present some examples of how international technical cooperation has occurred, focusing on early warning and joint research.

Early Warning Mechanisms

European Flood Awareness System (EFAS)

Severe flooding of the Danube and the Elbe rivers in 2002 highlighted issues with incoherent and poor-quality flood information. As a result, the European Flood Awareness System (EFAS) was developed (ECMWF, 2019). EFAS provides pan-European medium range flood forecasts and information to hydrological and civil protection services, of which there are currently 48 partners in the network. EFAS is operated by the European Centre for Medium Range Weather Forecasts (ECMWF) who generate the forecasts. The forecasts are then assessed and distributed by several expert authorities to the rest of the network. This is to ensure competencies of the distributors and trust in the information. EFAS information is only distributed to designated authorities, who are then responsible for disseminating it, this is to ensure the principle of 'one voice' (Smith *et al.*, 2016). EFAS has a particular focus on providing information to international transboundary river basins (ECMWF, 2019). To do this, it focuses on large scale forecasting. It does not deal with forecasts on the local scale below (2,000 km²). Therefore the system works in addition to national forecasting services (Smith *et al.*, 2016).

FLOODS OF 2002 VS. 2013 – EVIDENCE OF INCREASED TECHNICAL CAPACITY

Many countries in Central Europe and the Danube catchment were devastated by major floods in 2002 when heavy rainfall brought severe flooding. In 2013 a similar severe flood even occurred, but this time the overall economic losses were lower. This has been attributed to advances in technical capabilities and improved data and information sharing.

Thieken *et al.* (2016) present a review of the changes that took place between 2002 and 2013 floods from a German perspective. Of particular note here were the increases in the effectiveness of flood warnings. This was due to improvements in forecasting ability, but also cross-departmental and transnational collaboration. The establishment of an internet portal allowed for

country and basinwide assessment of the flood situation. This aided countries in understanding the complete picture across the basin. In terms of response, collaboration among disaster response organisations was improved due to coordination provided by the Joint Reporting and Situation Centre of the Federal Government and Federal States (GMLZ). The GMLZ acts as a central contact point for warnings and conducts situation management (Federal Office of Civil Protection and Disaster Assistance, 2019). Despite these improvements, Thieken *et al.* (2016) recommend that transboundary and cross-sectoral cooperation still could be improved, including coordination between various stakeholders and administrative units.

Joint research projects

INTERREG is a research and implementation initiative that provides funding to enable regional and local governments across Europe to develop and deliver better policy (INTERREG, 2019). It supports programmes that enhance cross-border cooperation. It is funded by the European Regional Development Fund. The initiative spans a wide range of policy areas and has supported several projects that are focused on transboundary waters. For example, the FLOW M-S project (Flood and Drought Management in the transnational Model and Saar Watershed) that focused on the implementation of the FD in Germany, France and Luxembourg (Cassel and Hinsberger, 2017).

Horizon 2020 is another programme providing funding for research and innovation in Europe over the period 2014-2020. Its purpose is to allow researchers, and the public and private sectors to coordinate more easily across Europe with less 'red tape' (European Commission, 2020b). The programme has a strand on climate action, which has a focus on water including integrated water and climate action, and on strengthening research and innovation on water internationally.

4.3.2. Climate change adaptation

The EU adopted a Strategy on Climate Change Adaptation (CCA) in 2013. The strategy aims to enhance to preparedness and capacity of all governance levels to respond to the impacts of climate change. The strategy has been successful in increasing the number of EU States with national adaptation plans (from 15 to 23 over the period 2013-2018) (European Commission, 2018). Furthermore, it has been suggested that the Strategy has helped progress in developing adaptation strategies for EU macro-regions. There are four macro-regional strategies (Ionian, Alpine, Baltic and Danube) and these strategies all have a climate change element.

However, a lack of attention for CCA as a transboundary issue in policy has been identified, particularly in the EU Directives (Amaratunga *et al.*, 2017a). The WFD, although significant for transboundary management, does not explicitly make reference to climate change (Maia, 2017). Furthermore, in a review of draft FD FRMPs, it was found that climate change considerations have not been fully included in most documents. Of the 32 plans screened in the review, only 14 were found to include climate change in the mapping of flood hazards and risk scenarios (WRc, 2015). Overall, more effort is needed to incorporate climate change and socio-economic changes in EU water policies (Tsakiris, 2015).

CLIMATE CHANGE ADAPTATION PLANNING IN THE RHINE RIVER BASIN

Only in recent years has attention been given to the development of river basin level CCA plans. One such basin that has made this shift is the Rhine River Basin. The Rhine River flows from Switzerland through Germany, France and the Netherlands, covering an area of 185,000 km² (van Pelt and Swart, 2011).

The international RBO for the Rhine, the International Commission for the Protection of the Rhine (ICPR) has developed its CCA strategy over the past decade. In 2007, the Conference of Rhine Ministers requested the ICPR carry out a study of discharge scenarios in 2007 and the international expert working group KLIMA were commissioned to produce a report on the state of climate change knowledge in the basin. In 2013, the ICPR held a workshop on impacts of climate change in the Rhine basin, during which impacts were presented and possible solutions were discussed. ICPR Expert Working Groups on ecology, water quality and water quantity

all produced climate change reports for their thematic area. The ICPR conducted a synthesis and developed the basinwide CCA strategy based on these results, (first published in 2015) (UN and INBO, 2015). The development of the CCA plan was facilitated through the ICPR RBO and developed based on several rounds of scientific evidencing and expert discussion.

Despite the efforts of the ICPR in developing the CCA strategy, the organisation does not hold any legally binding power on the matter. Climate change decisions are still made nationally. Although each state in the basin has a national CCA plan, those of Germany and the Netherlands for example, do not feature transboundary cooperation as a priority (van Pelt and Swart, 2011). This could potentially hinder the implementation of the CCA strategy for the basin. As the basinwide strategy is relatively new, it is unclear whether it has been considered by the nation states or has had any significant impact.

5. Discussion

This report has presented transboundary river basin and flood management procedures in Europe within the framework of effective transboundary water sharing. The aim was to understand how transboundary river and flood management are conducted in the region and to highlight any particular successes or issues.

The review indicated that transboundary river and flood management in Europe are guided by a strong legal framework. This includes multiple layers of international, European, bi-lateral/multilateral and national laws. These laws provide overarching principles for Member States to follow and their legally binding nature helps to foster action. Markedly, the European Directives, the WFD and the FD, have had significant impacts on the way river basins are managed and have been driving forces for integration and cooperation (Wiering *et al.*, 2010). The frameworks have resulted in more developed forms of cooperation in the planning stages especially, as well as greater communication and information exchange (Renner *et al.*, 2018). Despite more integrated planning, implementation is still primarily the responsibility of individual states. The WFD has to be written into national law and how it is operationalised varies between countries. This can be viewed as a way to balance between the need for integration and respect for sovereignty. In addition, European countries are not homogenous and the flexibility allows countries to meet their individual needs. However, there is also the potential for this to reinforce institutional gaps between countries and impede cooperation across international borders. It also means that the successful application of plans is reliant on national approaches (Bakker *et al.*, 2013), thus is also subject to political will. There are concerns that although there are legal mechanisms for ensuring compliance with legal frameworks, these are not always applicable to the transboundary cooperation aspects, and legal proceedings for transboundary disputes are not necessarily sufficient for flood related problems (Baranyai, 2019a).

RBOs and groups, whether previously existing or having emerged as a result of the WFD, are common in both international basins and within national/sub-basins. In cases such as the Danube, the RBO has been driving force for coordinated planning and action. Although often concerned with flooding, these organisations commonly have a broader remit and are concerned with a wide range of water related issues (Bakker, 2009). The more well-established organisations would seem to have significant power. However, this is not always the case. Their work is not always legally binding and can be hindered by national decision making.

There are several areas where work is still required. Notably participation and CCA. Although a few countries in Europe exhibited participation in river basin management and FRM prior to the WFD, the concept of participation is relatively new to most, and the degree to which participation takes place varies greatly. It has been suggested that more developed, fair and legitimate forms of participation are needed. Although growing attention for CCA in Europe can be seen, again, some countries and river basins have progressed more than others. The variation may be due to the fact that CCA does not have the same legally binding status as other areas. More effort is needed to incorporate CCA into river basin planning. Furthermore, it should be factored that reorganising management around the river basin may solve coordination challenges within the water sector, but does not necessarily make coordination with other relevant sectors easy.

In many of the most successful examples of river basin management, cooperation is not new. Often there had been existing arrangements pre-dating the WFD and the FD. Cooperation has taken significant time and effort to develop.

Due to the successes of European river basin and flood management procedures, there has been discussion on the ability to transfer these methods to other areas of the world (Shah *et al.*, 2001; Heldt *et al.*, 2017; Khalid *et al.*, 2018). It is noted that countries with well-developed water institutions have normally developed industrially. In Europe, rivers such as the Rhine and the Danube initiated cooperation on the basis of industrial pollution and hydropower production. These routes to cooperation may not

be available to developing countries. Likewise, issues faced in developed countries may not apply to developing ones and developing countries may present new management challenges. Heldt *et al.* (2017) notes that in European approaches, there is little consideration for issues such as poverty, gender and capacity development, more pertinent to a developing setting. They further identify that the success of integrated basin management in Europe has been based on strong legal and governmental structures with reasonable data monitoring and management mechanisms. Therefore, transfer to other locations is likely to be smoothest in countries with these features.

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