European Union Network for the Implementation and Enforcement of Environmental Law

GUIDELINE ON

RIVER DEVELOPMENT PLANNING

(Draft: 17 November 2018)

Introduction to IMPEL

The European Union Network for the Implementation and Enforcement of Environmental Law (IMPEL) is an international non-profit association of the environmental authorities of EU Member States, acceding and candidate countries as well as EEA countries. The association is registered in Belgium and its legal seat is in Brussels, Belgium.

IMPEL was set up in 1992 as an informal network of European regulators and authorities concerned with the implementation and enforcement of environmental law. The Network's objective is to create the necessary impetus in the European Community to make progress on ensuring a more effective application of environmental legislation. IMPEL's core activities concern awareness raising, capacity building and exchange of information and experiences on the implementation, enforcement and international enforcement collaboration on environmental legislation, as well as promoting and supporting the practicability and enforceability of European environmental legislation.

Over the years IMPEL has established itself as a well-known and respected organisation, mentioned in a number of EU legislative and policy documents such as the 6th Environment Action Programme and the Recommendation on Minimum Criteria for Environmental Inspections. The expertise and experience of the participants within IMPEL make the network uniquely qualified to work on both the technical and regulatory aspects of EU environmental legislation.

Information on the IMPEL Network is also available through its website at:
http://www.impel.eu.

Title of the document: Guideline on River Development Planning	**Number report:** Annex to 2018/08
Project manager: Thomas Ormond (Germany)	**Report adopted at IMPEL General Assembly:** December 2018, Austria
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Executive summary:

Many rivers and streams in the EU are far away from the good water status that they should have reached by December 2015 or should reach at the latest by 2027, according to the EU Water Framework Directive. A river development plan – more specific and action-oriented at the catchment scale than the general River Basin Management Plan – is a suitable instrument to organize knowledge-based binding and voluntary measures for the improvement of the situation. This guideline gives recommendations and shows good practice examples from the Member States how to plan and implement such measures in collaboration with stakeholders, NGOs and the general public, and by this reach the objective of good water status for small and medium-sized rivers within a reasonable period of time.

Contents

1. Introduction

Under Article 4(1)(a) of the EU Water Framework Directive (2000/60/EC, short "WFD"), Member States have to implement the necessary measures to prevent deterioration of the status of all bodies of surface water, and to protect, enhance and restore all bodies of surface water with the aim of achieving good surface water status – signifying good ecological as well as chemical status - at the latest 15 years after the date of entry into force of this Directive. The aim of good water status should thus have been reached in December 2015. However, all EU Member States are still far behind schedule, especially those countries in Central and North West Europe that are densely populated and dominated by industry and/or intensive agriculture. Here rivers, streams and lakes suffer from pollution by wastewater, agricultural fertilizers and pesticides, heavy canalization, obstruction by hydro dam barriers, as well as urban sprawl and ground sealing in the catchment areas.

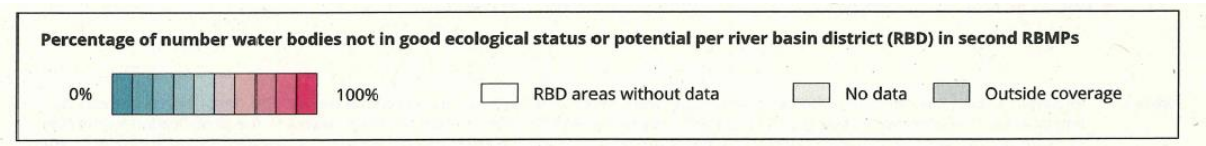
The WFD has established a system of River Basin Management Plans (RBMPs) and Programmes of Measures (PoMs) in all Member States to redress the situation. As part of a "Common Implementation Strategy" (CIS), information platforms and numerous guidelines have been developed by the "Water Directors" of the EU Commission and the governments of the Member States. Notably, CIS Guidance document No. 11 "Planning process" describes the professional elaboration of RBMPs and PoMs, and other documents like No. 2 ("Identification of Water Bodies") or No. 8 ("Public participation in relation to the Water Framework Directive") look at specific aspects of this process.
However, it has become apparent that planning at the level of central government and for whole river basins is often not concrete enough and too far away from administrative implementation to achieve effective improvements in the short or medium term. Some countries like the UK have therefore initiated policies focusing on smaller geographical areas ("catchments") and on a collaborative approach involving stakeholders, environmental NGOs and the general public.

As a European network of administrative practitioners, IMPEL has taken up this idea with a view to exchanging experiences and researching best practices in the member countries, so that practical recommendations can be given on development planning for especially small rivers and their catchment areas, and on the effective implementation of such plans. Based on Terms of Reference of November 2016 (later updated in October 2017), IMPEL's General Assembly agreed on a two-year project for the elaboration of a guidance document on "River Development Planning (RDP). The RDP project - led by Germany, with project team members from the Czech Republic, Denmark, Poland, Romania, Slovenia and the United Kingdom (see page 3), and active participants from altogether 8 IMPEL member countries (project team plus Italy) - started with a survey of existing practices and the needs for guidance. An expert workshop was held in Frankfurt am Main on 27-28 September 2017. The draft of the present guideline was developed and discussed from April to November 2018. The final version was submitted for adoption to the IMPEL General Assembly in December 2018.

The guideline at hand aims to help water authorities with the planning and implementing of development measures for smaller rivers and catchment areas in their jurisdiction which are not in a "good" condition, especially by providing a structure and knowledge-based recommendations and showing best practices and useful tools to achieve this task. It is meant also to assist practitioners in the field and other relevant actors (e.g. municipalities, NGOs, interested stakeholders) in understanding development plans and in improving cooperation between all parties concerned.

2. Background

According to a recent report by the European Environment Agency (EEA)[1], around 40 % of surface waters (rivers, lakes and transitional and coastal waters) in the European Union are in good ecological status or potential, and 38 % are in good chemical status. In other words, the ecological and chemical quality of 60, resp. 62 % of surface waters in the EU is below the objectives that should have been achieved in late 2015 under the Water Framework Directive. Based on the updated River Basin Management Plans (RBMPs) of 2015, the EEA report identified as the main significant pressures on surface water bodies: hydromorphological pressures (i.e. channelization, disconnecting of flood plains, dams, weirs etc.; affecting 40 % of water bodies), diffuse sources (38 %), particularly from agriculture, and atmospheric deposition (38 %), particularly of mercury, followed by point sources (18 %) and water abstraction (7 %). The main impacts on surface water bodies are nutrient enrichment, chemical pollution and altered habitats due to morphological changes.[2]



(Source: EEA, European Waters, 2018, p. 26)

[1] European waters. Assessment of status and pressures 2018. EEA Report 7/2018, p. 6.
[2] *Ibid.*, p. 7.

Especially in the densely populated parts of Europe - like Germany and its neighbouring countries – rivers were straightened and de-naturalized over the last 150 years in order to facilitate agriculture, produce energy and protect towns and villages against flooding. Dams, weirs and bank reinforcements have degraded the hydro-morphology of watercourses, changed the water flow significantly and limited or prevented fish migration. Besides, the building of comprehensive sewage systems with a high connection rate (in Germany about 99 % of the population) led to a situation where many watercourses nowadays derive a major part of their water from the discharges of sewage treatment plants, so that the chemical quality of rivers is largely dependent on the ability of these facilities to retain chemicals, pharmaceuticals, phosphorus and other pollutants. In rural areas, it is particularly the effects of intensive farming - with high emissions of fertilizers and pesticides, together with soil erosion through insufficient buffer strips – which cause pollution and excessive sedimentation of surface waters. In addition, the long history of coal burning has left ubiquitous loads of mercury in the sediments of rivers which prevent these water bodies in Central Europe from attaining good chemical status for probably the next decades.

Insight in these problems has provided a strong motive for EU legislators to draft the Water Framework Directive[3] and lay down the obligations on Member States under Art. 4(1)(a)(i) and (ii) WFD to prevent deterioration of the status of all surface water bodies and to protect, enhance and restore these water bodies with the aim of achieving good surface water status at the latest 15 years after entry into force of the Directive (i.e. in late 2015), subject to the application of extensions and certain exemptions. The requirements of good surface water status are explained in Annex V of the WFD, including the quality elements and normative definitions for status classifications, and the details of the monitoring of ecological and chemical status. Apart from this, the WFD established a set of rules and procedures which are to be followed by EU Member States for the implementation of the Directive. For surface waters this includes in particular:

- Analysis of characteristics of the river basin district, review of the environmental impact of human activity and economic analysis of water use (Art. 5);
- Combined approach for point and diffuse sources of pollution (Art. 10);
- Establishment of a Programme of Measures (PoM) and a River Basin Management Plan (RBMP) for each river basin district, to be reviewed and updated every six years (Art. 11 and 13);
- Public information and consultation in the implementation of the WFD, in particular in the production, review and updating of the RBMPs (Art. 14);
- Regular reporting to the Commission (Art. 15);
- EU Strategies against pollution of water, with the aim of progressive reduction and, for priority hazardous substances, the cessation or phasing-out of discharges, emissions and losses (Art. 16);
- Effective, proportionate and dissuasive penalties for breaches of national implementing laws (Art. 23).

Based on Art. 16 WFD, the EU adopted a Directive on environmental quality standards in the field of water policy (Dir. 2008/105/EC).[4] Although this Directive contains rules on the definition and monitoring of priority hazardous substances, it does in fact not lay down a binding time-table for the reduction and phasing-out of hazardous pollutants.

Besides, there are a number of other EU directives that are important for surface waters and have to be implemented in parallel (cf. Art. 10.2 WFD):

[3] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy, OJ L 327, 22.12.2000, p. 1; for general information see the EU Commission website: http://ec.europa.eu/environment/water/water-framework/index_en.html.

[4] Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council, OJ L 348, 24.12.2008, p. 84.

- the Industrial Emissions Directive 2010/75/EU[5] (substituting the IPPC Directive 96/61/EC mentioned in Art. 10 WFD);
- the Urban Waste Water Treatment Directive 91/271/EEC[6];
- the Nitrates Directive 91/676/EEC[7];
- the Floods Directive 2007/60/EC[8];
- the Habitats Directive 92/43/EEC.[9]

These pieces of legislation have differing objectives and their rules are not completely harmonized, so that conflicts may occur. Taking them into account in river development planning can, however, produce positive synergy effects.

For the implementation of the WFD, the EU Commission and the Member States have established a "Common Implementation Strategy" (CIS) with frequent expert meetings and numerous guidance documents. For surface waters and river development planning the following CIS documents are of particular importance (cf. the list on the Commission website http://ec.europa.eu/environment/water/water-framework/facts_figures/guidance_docs_en.htm):

- N° 2 - Identification of Water Bodies (2003);
- N° 3 - Analysis of Pressures and Impacts (2003);
- N° 4 – Identification and Designation of Heavily Modified and Artificial Water Bodies (2003);
- N° 8 - Public Participation in Relation to the Water Framework Directive (2003);
- N° 10 - Rivers and Lakes - Typology, Reference Conditions and Classification Systems (2003);
- N° 11 - Planning Processes (2003);
- N° 24 - River Basin Management in a changing climate (2009).

The CIS documents are, however, meant to address aspects of river basin management planning on a national or regional scale. Their contents therefore cannot be applied 1:1 to the river development plans, as understood in this IMPEL guideline. In the following chapters, reference will be made to these documents where appropriate.

[5] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control), OJ L 334, 17.12.2010, p. 17.
[6] Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment, OJ L135, 30.5.1991, p. 40.
[7] Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources, OJ L 375, 31.12.1991, p. 1.
[8] Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks, OJ L 288, 6.11.2007, p. 27.
[9] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, OJ L 206, 22.7.1992, p. 7.

3. Objectives and procedure of river development planning

3.1 Necessity of planning ("why?")

In the words of the relevant CIS document[10], the primary purpose of planning is to provide a plan as an instrument for making decisions in order to influence the future. Planning is a systematic, integrative and iterative process that is comprised of a number of steps executed over a specified time schedule. Water planning in particular is a means to improve and support a sound management of water resources; it has to be regarded as a process and not as an objective of the WFD in itself.

According to Articles 3(4), 11(1) and 13(1) of the Water Framework Directive, the purpose of a river basin management plan and a programme of measures under the WFD is basically to coordinate the requirements for the achievement of its environmental objectives for the whole of the river basin district. Because of the potentially large scale of these districts, the plans and programmes will often stay at a rather general level and not go into detail. So the WFD itself provides in Art. 13(5) that river basin management plans may be supplemented by the production of more detailed programmes and management plans for sub-basin, sector, issue, or water type to deal with particular aspects of water management. Experience especially in the larger Member States has shown that planning at sub-basin level (regional or local) is necessary or at least useful to make the RBMP and PoM operational in practice.

3.2 Objectives ("what?")

Any river development planning in the EU has to be based on the objectives of the Water Framework Directive, notably the obligation under Art. 4(1)(a)(ii) WFD to protect, enhance and restore bodies of surface water with the aim of achieving good surface water status. In addition, the purposes of Art. 1 WFD – especially non-deterioriation, improvement of the aquatic environment (*inter alia* through the progressive reduction of discharges) and mitigation of the effects of floods – should be borne in mind. More concrete objectives for a specific water body are usually contained in the applicable River Basin Management Plan (RBMP) or Programme of Measures (PoM). However, the difficulty will often be that the high-level plans provide for various objectives and targets in parallel without clearly prioritizing or setting a realistic time-table (beyond the general target dates of 2021 or 2027). It is thus useful to reflect and discuss, inside the competent authority and with other relevant players, which objectives for a given water body or catchment area might be more urgent than others, which are equally important and practicable, and in which period of time they can be reached.

It is important to understand that the objectives of local river development – beyond the binding elements laid down by the law – should rather not be dictated top-down by the administration but formulated in a discussion process where relevant authorities, affected stakeholders and interested members of the public can provide their opinions and expertise.

[10] CIS Guidance document no. 11 – Planning process, 2003, at p. 9. CIS guidance documents are published at http://ec.europa.eu/environment/water/water-framework/facts_figures/guidance_docs_en.htm;

3.3 Stakeholders and other players to be involved ("who?")

For informed decision-making as well as public acceptance it is crucial that the environmental authority or other organisation in charge of river development planning identifies the relevant stakeholders and involves them in the planning process. This participation of stakeholders and the public is not a luxury but a necessity for decision-making on complex issues such as the improvement of a river and its catchment area. It is important for authorities to realize that the top-down approach works well only for single-cause interventions, and this simple constellation is rare in the context of river development.

Depending on the size and definition of the catchment area (see chapter 4), its urban or rural character as well as land use and ecologic potential, there are different authorities, businesses and NGOs that will be interested in the subject. To begin with, the administration itself will often not be a single authority: The management of a river and its catchment area may fall into the jurisdiction of several water authorities at different levels (to keep things practicable, the size of the planning area should not be too large). Other agencies responsible for town and country planning, nature protection, agriculture and licensing of industrial facilities will usually have a say in the matter. Municipalities and public bodies with responsibilities in the field of sewage disposal, flood protection and water supply (if derived from surface water) are key players for river development and thus have to be involved from the start. On the side of private stakeholders, all those who contribute to pollution of the river via point sources or diffuse emissions – notably industrial and agricultural enterprises – play an important role and so should better be called to participate in the process of planning and implementing improvement measures. The same is true for the operators of hydropower installations whose dams, weirs and turbines often have a heavy impact on water flow and fish migration. On the other hand, environmental NGOs, fishermen and angling societies are vital as pressure groups for maintaining and improving the ecological status of a river. Last not least, the general public needs to be informed and involved as well. Experience shows that public awareness and the "ownership" feeling of the local population towards a river – translating e.g. into reporting of observations or "clean-up" projects by school classes – are a powerful driver towards also political action for improvement.

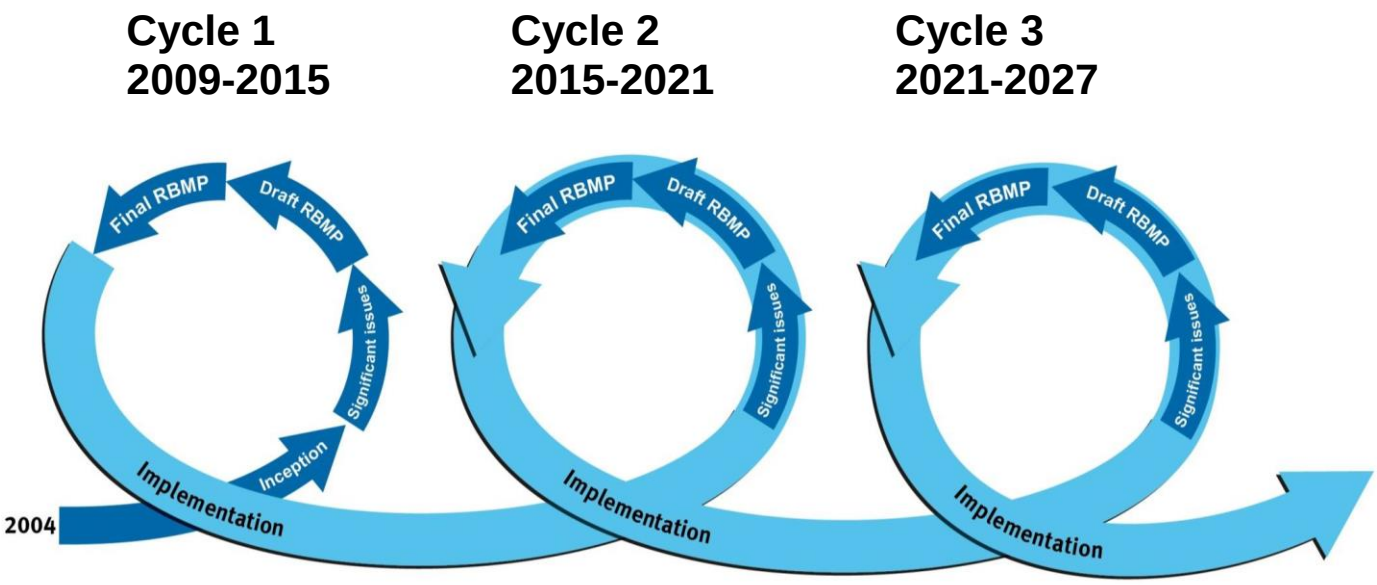
(Source: www.slideplayer.com)

This does not mean that all relevant stakeholders and the public have to be drawn into the process at the same time and in the same way. It may be advisable to follow a flexible approach which allows for a direct consultation of experts and discussion with interest groups as well as for various fora of public participation.

3.4 Planning procedure ("how?", "when?")

Whereas the elaboration of River Basin Management Plans and Programmes of Measures is at least regulated for the whole EU by Articles 11, 13 and 14 plus Annexes VI and VII of the Water Framework Directive, the planning procedure below the level of a river basin is not specified by EU law. However, Art. 2(14) WFD defines – in a very general way - the term of "sub-basin" below the level of river basin, and section A.8 of Annex VII obliges Member States to include in the RBMP a "register of any more detailed programmes and management plans for the river basin district dealing with particular sub-basins, sectors, issues or water types, together with the summary of their contents". CIS Document No. 11 (Planning Processes)[11] acknowledges that the detail required for management decisions will mean that planning will need to be carried out at a lower spatial scale, but does not contain specific advice on this. Therefore, the making of plans at local or catchment level will depend largely on national law, in so far as it is regulated at all.

WFD River Basin Management Planning (Source: Environment Agency, UK)



What may be derived in any case from the WFD and CIS Document No. 11 is the importance of public participation and the understanding of river development planning as an iterative process. This means that a plan is not a final outcome which remains definite and unvaried over a long period of time but rather an intermediate result in a never-ending process of planning, implementation and review which is meant to continually improve the status of a river and maintain it also in the face of new challenges. For that reason, the planning procedure should not be too complicated and time-consuming. On the other hand, it has to be well prepared and conducted in order to lead to informed decisions, gain acceptance among stakeholders and the public, and thus enable an effective implementation. Therefore, compromises will have to be made. The following steps will be necessary, as a rule, to come to a river development plan:

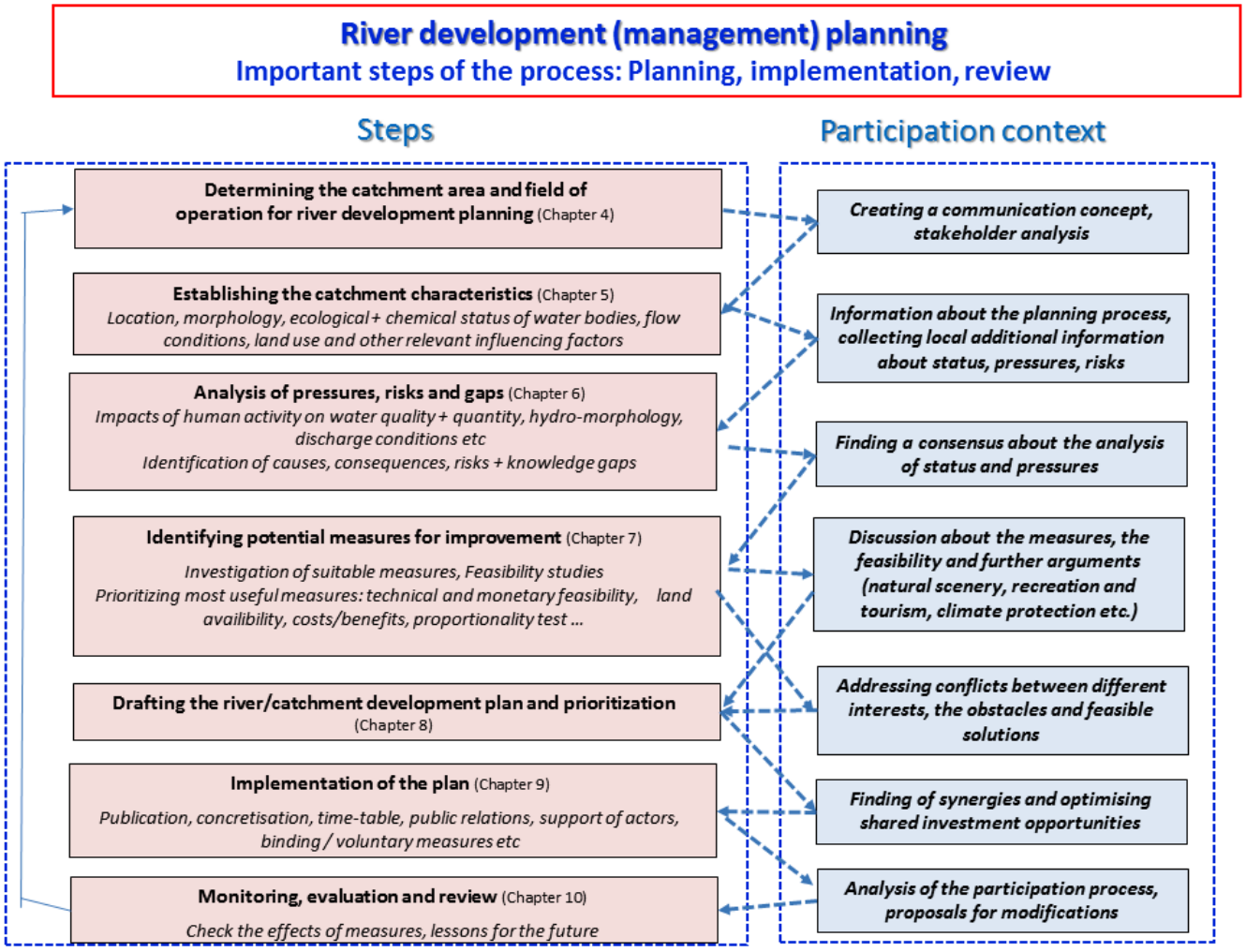
1. Determining the catchment area / field of operation

See especially pp. 44 et seq.

2. Establishing the catchment characteristics (collection of necessary data)
3. Deficit analysis
4. Identifying potential measures for improvement
5. Prioritization of measures
6. Drafting of the plan
7. Final discussion, editing and publication

Discussion with stakeholders and public participation are not a separate step but an integral part of the whole planning process.

This process will be followed by an implementation stage which, however, should also be seen as a multi-step procedure implying various administrative and technical measures, more specific planning for partial aspects and synergies with other policies. Involvement of stakeholders and the public is also vital at this stage. And it is useful for implementation to be monitored and documented. This will provide the basis for an evaluation as to its effectiveness, and to its eventual review and adaptation.



4. Determining the field ofoperation ("where?")

4.1 Water bodies under the Water Framework Directive

According to the WFD, the water body is the basic physical unit for surface water (as for groundwater) to which the Directive's terminology and requirements - characterisation, pressures, impacts, objectives, monitoring and assessments - are related, most importantly the achievement of good water status. It is also the main reporting unit for these components of WFD implementation.[12]

In order to develop a common understanding of this key concept and to provide specific practical suggestions for the identification of water bodies under the WFD, the CIS Guidance Document No 2 "Identification of Water bodies" was developed.

4.2 Catchment areas

Water bodies within river basin districts can be grouped into 'catchment' areas. [13] These are geographic areas where water flows through hydrologically interconnected water bodies (rivers, lakes, groundwater and coastal waters). They vary in size and for instance in urban areas may be limited to a small tributary, to cope with population density. In England, where the "catchment based approach" is a key concept for implementing the Water Framework Directive, there are around 90 catchments defined for an area of 125,000 km².[14]

Many of the problems facing water environments are complex (diffuse pollution, hydromorphological and ecological pressures). A range of stakeholders may need to be involved in finding solutions through catchment-level engagement, planning and delivery.

The emphasis on a catchment-level is to focus on the potential benefits of a more integrated, systems approach. The aim is to balance environmental, economic and social demands across multiple water bodies, by aligning funding and actions at the catchment level.

4.3 The field of operation for development planning

The key issue in implementing effective measures is to realistically define who will do what, how, where and when to achieve the set goals for specific water bodies and catchment areas within a river basin. In this chapter we are focusing on the question "where", i.e. how to scope the field of operation for river development planning.

In relation to water bodies there are three possible situations:

- The measure is designed for the whole water body;
- the measure is designed for an area larger than one water body, possibly also for the whole river basin; or
- the measure is designed for the area smaller than water body.

For instance, measures to decrease the phosphorus level usually address the whole river basin or catchment area that stretches over several water bodies. Similarly, the measures designed for sensitive nature protection or resource protection areas are usually implemented regionally. The same is true for dealing with fine sediment input and missing source populations for colonisation of the river with species which must be considered on a

[12] See CIS Guidance Document No 35 "Reporting Guidance".
[13] In the USA the expression »watershed« is used instead of »catchment«.
[14] See the map of water management catchments in England and Wales at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/296967/LIT_8391_3f3d89.pdf and the "Good practice" box on p. 28 of this Guideline.

larger scale, most likely river basin or sub-basin level, because a purely local scale would limit the effectiveness of measures.

Measures dealing with hydromorphological pressures are usually implemented more locally (e.g. greening of the riparian zone, building fish passes etc.), but can have effect to water bodies upstream or downstream (fish migration).

It is very important that smaller scale projects fit into a big RBMP picture. Water managers therefore must ensure a general coherence between different activities implemented on different scale by different authorities and stakeholders. The holistic approach corresponding to river basins requires a wide perspective, but the management of local catchment issues needs to take place at a smaller scale. The existing water bodies should be kept in mind, also due to the necessary reporting level of good ecological status. It is essential to reach at an early stage an agreement between authorities and stakeholders on a long-term vision for the river basin district and to ensure that local initiatives fit to overall objectives.

For the purpose of local (sub-basin) river development planning and management, it would be appropriate to downsize the area to smaller planning units but without losing the larger scale context. The prevailing local interest will largely determine the size of the field of operation. In many cases the improved water status might be a by-product of other local concerns, such as improved quality of life by the establishment of recreational areas, improving flood protection in particularly by implementing the green measures, but the local interest can actually reflect the desire to improve the aquatic environment. Most of the time the activities on the local scale will try to satisfy more interests at the same time. To avoid conflicts between parallel responsible authorities, the field of operation may either be limited to the jurisdiction of only one authority or framed in such a way that one authority is clearly leading based on cooperation agreement among different authorities. Nevertheless, it may reduce the administrative burden for the coordinating authority if the number of affected municipalities is not too high.

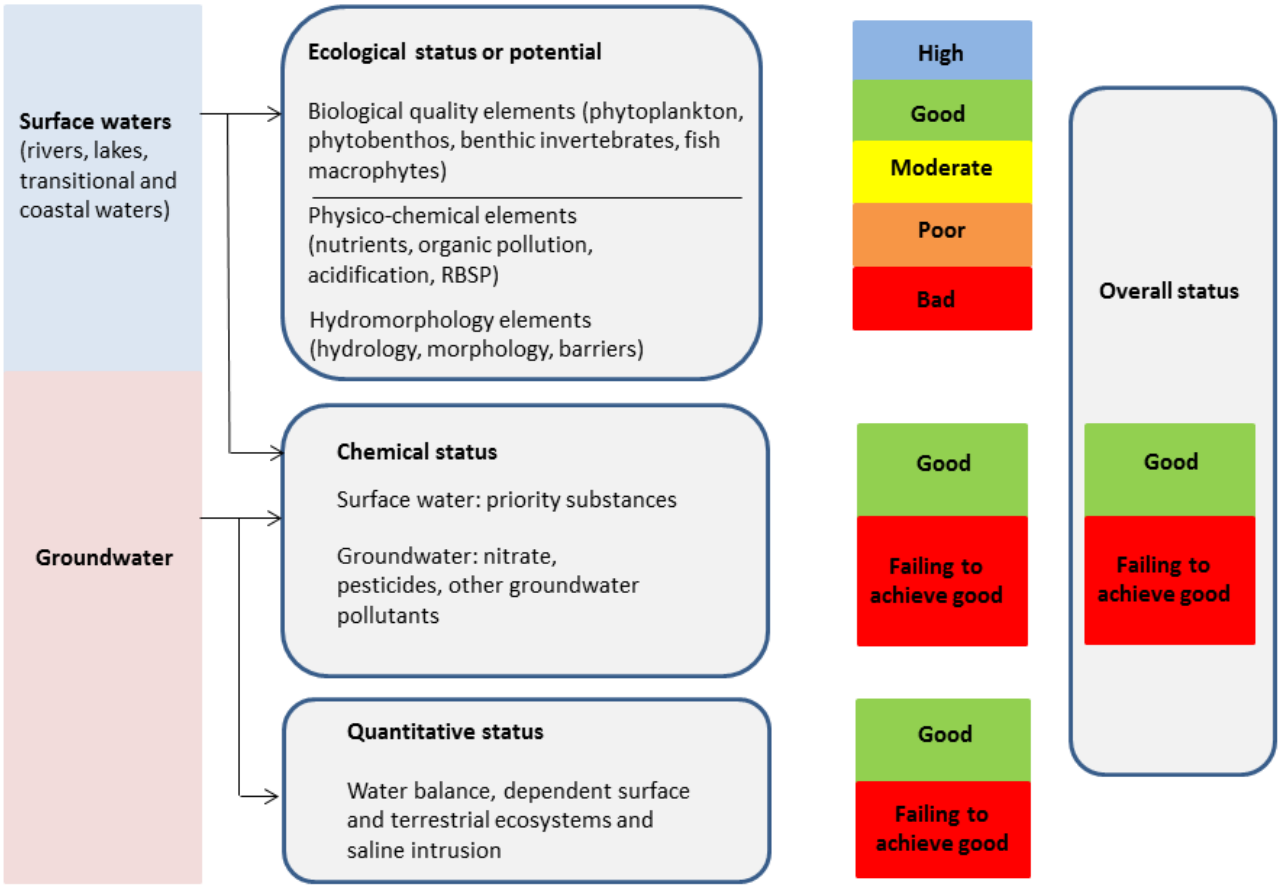
The local situation regarding responsible authorities and administrative borders, geographical, topographical and hydrological conditions, population density, land use, personal and financial resources varies from country to country and region to region. Therefore, the determination of the catchment area and the field of operation must be carried out on a case-by-case basis.

It might be worth mentioning that in principle the local activities are either project or government driven (see Good practice example: “The Catchment Based Approach in England”). Both approaches suggest that some additional resources are needed for the activation of stakeholders at the local level. Both approaches increase the local ownership over water issues, which has a long-term positive effect for water management and water quality.

5. Establishing the catchment characteristics

For most rivers and catchment areas a detailed analysis of water status will have been carried out already in preparation of the river basin management plan. The fact-finding for the RBMP should have followed CIS Guidance Document No. 11 “Planning process” (especially Section 4). However, where a waterbody is not in good condition and the reasons for this are not clear, the survey at the level of the RBMP will not be sufficient. Thus, extra detail investigations are required.

Assessment of status of water bodies under the Water Framework Directive



(Source: EEA, European waters, 2018)

For a start, the geographical or rather geological and ecological situation of the catchment area has to be described, followed by an analysis of the land use (anthropogenic exploitation), before a comprehensive survey of the environmental data can be performed. This survey should serve to determine possible influencing factors by current or past land-use. Typically, waste water discharges from point sources (waste water treatment plants and industry, sewage and rainwater spillways) and input from diffuse sources (agriculture, road drainage) cause the major part of river pollution. Data on these influences are vital for determining the status of the waterbody.

In particular, the following influence factors might be relevant for the waterbody:

- Geographical location (mountainside, valley, lowland; urban/countryside) and climatic influences;
- Climatic conditions;
- Morphology / structure of the waterbody and its floodplain;
- Land use in the catchment area; existence of waste water treatment plants which discharge into the river;

- Pollution by chemicals from point sources and diffuse sources (substances regulated by EU or national law, non-regulated substances - e.g. micropollutants -, concentration and loads of pollutants);
- Nutrient status in conjunction with oxygen content and temperature;
- Water abstraction, e.g. for irrigation purposes or as cooling water for industry;
- Change of flow conditions by rain discharges and the amount of sealing, straightening and flow obstacles;
- Weirs / hydro-electric installations and other obstacles to fish migration;
- Channelisation and other changes of hydromorphology (physical alteration of riverbed and riverbanks), due to that a loss of habitats and fish population;
- Sedimentation caused by erosion and land-use in floodplains;
- Risk of flooding and measures undertaken for flood protection;
- Conditions of the riparian strip – e.g. vegetation, shading - and floodplains as retention areas for aquatic life.

For a comprehensive analysis of pressures, risks and gaps (see Chapter 6) all factors that have an influence on the water ecosystem, in particular the composition of the biocoenosis (i.e. macrozoobenthos, fishes, diatoms) need to be recorded and assessed. The interactions between different factors should be considered in the process. The hydromorphological, biological and physico-chemical quality elements, as regulated by the Water Framework Directive and established in the applicable RBMP, are the main basis of information on the waterbody but may have to be supplemented by additional information.

Apart from the analysis of existing data, a comprehensive on-site inspection of the respective waterbody is crucial. The report on the site inspection (with data on current hydromorphology, specific structural deficits, points of discharge, floodplain areas) will benefit from an accompanying photo documentation and a map of the waterbody.

For the assessment of both pollution and hydraulic load, a modelling is an appropriate instrument to simulate both mixing and dilution effects and degradation processes of the waterbody over the year. The modelling can used as a base to choose measurements as well.

Furthermore, the inventory should also include information on the person or institution responsible for the maintenance of the river, on the users of waterbodies and adjacent land (like operators of hydro power plants, farmers, industry, fishermen), as well as on environmental NGOs and other stakeholder groups that have a material or immaterial interest in river development (like tourist boards, historic monuments authorities, pipeline route operators). This will help to recognize early in the process possible fields of conflicts and increase the acceptance of the river development plan.

If necessary, the survey of catchment characteristics might be updated during the planning process, in order to avoid errors and supplement the information in detail.

Also in this context the public should be involved in the process so that valuable information is taken into account at an early stage. An early participation of the public also provides the possibility for all stakeholders to get a common information basis and is likely to promote a common interest in the improvement of the river and catchment area.

To facilitate the organisation, it is recommended to collect the data of the inventory at a single point, if possible with the coordinating authority or other organisation that is leading the process. After collection of the data, they need to be analysed comprehensively, taking into account the interactions of the various influencing factors. For this purpose, also engineering offices or other consultants could be used. In special cases – e.g. where scientific questions of causation arise - it might be useful to consult universities or other research institutions (see “Good practice” example from Germany on p. 19).

It will increase public acceptance if the results of the survey are published and made available with clear explanations and relevant maps, tables and graphs.

6. Analysis of pressures, risks and gaps

If a surface waterbody does not achieve good ecological and chemical status, the competent authority has to take measures under Art. 4 WFD for improving the situation. A necessary precondition for this is an analysis of the causes for the existing deficits and risks for the achievement of good status. Potential interactions between the different factors need to be taken into account. Last but not least, planners have to be aware of the existing knowledge gaps, before they can define potential measures for improvement.

As in river basin management planning under Art. 5 WFD, the fact-finding process starts with an analysis of the characteristics of the planning area (see Chapter 5) and continues with a review of the impact(s) of human activity on the status of water bodies and catchment area. At the end, the research turns to an economic analysis which includes water use as well as land use in the catchment area. In the course of this analysis, the pressures and the risks for the achievement of WFD objectives have to be addressed. The diverging interests on the way to good water status need to be made transparent.

A general description of the impacts of human activity on the waterbodies of a river basin is usually part of the River Basin Management Plan (RBMP). However, especially in catchment areas that are subject to intensive use by human settlement, industry or agriculture, the various negative influence factors will have overlapping effects which require a more detailed analysis at regional or local level.

For a detailed analysis the data described in Chapter 5 should be available and need to be evaluated. This requires in particular a structural survey of the watercourse, a description of the species composition at relevant measuring points, the hydrographs of the discharge conditions and a record of the polluting substances in the river. The essential steps to evaluate these data would be:

- Evaluation of hydromorphological data;
- Analysis of discharge conditions;
- Evaluation of water quality in relation to data on emissions from point sources and diffuse sources;
- Analysis of the status of biological quality components along the waterbody / waterbodies (i.e. species composition, quantity of fish and macrozoobenthos).

The insights gained with these detailed investigations will help to ascertain whether the insufficient quality is due primarily to hydromorphological changes or the pollution of the waterbody. The data are to be checked e.g. for an answer to the question if the aquatic habitat as a whole is substantially damaged or destroyed, or if the species composition is specifically impaired by obstacles to fish migration. Another effect might be a high sediment run-off which causes damage to the riverbed and its ecological functions. The discharge conditions changed by urban drainage systems can weaken considerably the potential of a river for recolonization with aquatic life. The pollution from point sources (municipal and industrial waste water treatment plants, sewage and rainwater overflows), diffuse sources (run-off from fields and sealed areas, groundwater flow) and atmospheric deposition can lead to a nutrient surplus and toxic contamination of the water. In the course of a research project on the river Nidda near Frankfurt in Germany, for instance (see “good practice” box below), it was shown that a share of more than 12 % (partly-treated) waste water in the total water volume of a river may cause significant damages to the water organisms relevant for ecological water status. This is due to excessive input of organic matter but also to the micropollutants contained in the waste water, such as pharmaceutical residues and household chemicals, which have an ecotoxic impact on aquatic life.

Apart from determining the (main) cause of the quality problem, the degree of deviation from good status will also point to the extent to which improvement measures are necessary. Taking into account the positive potential of more intact river sections in the vicinity and the possibilities for recolonization, a strategy for ecological restoration of the waterbody can be developed.

The aquatic ecosystem is influenced by many different factors and the effects of those may be very diverse. Especially in complex constellations, it will not be possible to establish with certainty the interactions (connectivity) between the various factors.So there is often a knowledge gap which prevents full understanding of the ecological processes and makes it necessary to undertake further research.

The results of the analysis of pressures, risks and gaps should be published and discussed with interested members of the public, in order to get possibly additional information on details and include them in the analysis. The issues need to be raised also in discussions with possible polluters, other responsible parties and institutions who are able to carry out measures for improvement. The main objective would be to find a consensus on the causes for the problems that have been observed. In this process, one or several field visits (“river walks”) can be helpful to establish a common view of these problems and possible solutions. A comprehensive and thorough discussion of causes and effects is a good basis for the planning and implementation of improvement measures.

Good practice example: Collaboration of water authorities with scientists in the deficit analysis for the river Nidda (DE)

As one of 15 projects funded by the German Federal "ReWaM" programme[15], the "NiddaMan" project aimed at combining scientifc research with the organisation of practical measures to improve the quality of the River Nidda near Frankfurt am Main. Between 2015 and 2018, ecologists from Frankfurt University, biologists, chemists, social scientists and engineers from various institutes and regulators from the regional water authority *(Regierungspräsidium Darmstadt)* worked together to investigate key risk factors for chemical water quality and biodiversity of the river, develop a set of tools – e.g. a web-based information and management system – for monitoring and reducing pollution, and involve the public in planning and implementation measures.

The scientific research paid special attention to chemical contaminants, including micropollutants, and their impact on biodiversity in the river. The concentration of pharmaceuticals like Diclofenac in particular was found to correlate with a high mortality of freshwater shrimps and snails (*Gammarus* and hydrobiids). The research could also show that a proportion of more than 12 % conventionally treated waste water in the total water volume constituted a "community change point" altering the biological community with a loss of sensitive species. On the other hand, the closure of a local waste water treatment plant enabled the scientists to demonstrate how quickly the affected ecosystem could recover from the effects of pollution. The research altogether produced valuable insights into the role of micropollutants, sediments and general pollution in preventing a good ecological status of rivers even after their morphological restoration.

In order to involve stakeholders and the public in the planning of improvement measures, the NiddaMan team created a website,an interactive knowledge map ("NiddaLand") and a consulting body of stakeholders and NGO representatives. Altogether five public hearings ("NiddaTalk") and four stakeholder workshops were organised, as well as several "Science Tours", on-site inspections and regular meetings with the water authorities. In addition, the City of Frankfurt was inspired to hold public planning workshops to discuss the removal of two local weirs on the Nidda. As a final product, the project group drafted a 20-page guidance paper for participation processes in river development planning.

Exploring the River Nidda (from the website https://bmbf.nawam-rewam.de/en/projekt/niddaman/

[15] ReWaM = Regional Water Resources Management for Sustainable Protection of Waters in Germany; see https://bmbf.nawam-rewam.de/en/rewam/.

7. Identifying potential measures for improvement

The analysis of pressures and risks according to Chapter 6 will have allocated possible causes or negative influence factors to the existing deviations from good water status. To identify potential improvement measures one can draw today on a rich body of practical experience which may be assembled in a "toolbox". The measures may be of quite different scale and nature, some of them administrative and binding, others taking the form of financial incentives or awareness-raising and relying on voluntary action by stakeholders and the public. The river development plan in itself will, as a rule, not be a legally binding instrument but it can refer to and coordinate measures that have this legal status and others that have not.

The following tables contain some possible measures in connection with the most important influence factors. They are listed in the order of significance suggested by the findings of the EEA report on "European waters" of 2018[16] and take into account the list of supplementary measures under Annex VI Part B WFD.

Hydromorphological pressures	**Potential measures**
Absence of natural river structure	Revitalisation of floodplains; extension of the length and width of watercourses by meanders and additional land to allow natural development; restoration of diversified river structures to vary flow speed; installation of gravel banks, rootstocks, stones and other disturbing elements
Heavily modified discharge conditions	Reduction of the quantity of discharges from urban areas by decentralized rainwater infiltration or percolation, unsealing of land, rooftop greening, sewerage management, retention basins and ground filters etc.
Obstacles to fish migration	Removal of weirs and riverbed steps, replacement by rough ramps, establish fish passes
Insufficient shading	Installation of a buffer strip with trees

Types of pollution	**Potential measures**
Discharges from waste water treatment plants	- Closure of treatment plants discharging into small watercourses and diversion to central treatment facility; - Monitoring and adaptation of discharge permits; - Upgrading of treatment plants concerning nutrient emissions by phosphorus precipitation and recycling, optimisation of secondary sedimentation and denitrification; - Retention of micropollutants[17] by ozonation, activated carbon or filtration; pre-cleaning of discharges from hospitals; change of consumer behaviour by awareness-raising, collection systems for pharmaceutical waste etc.; - Reuse of waste water in industry, agriculture and households.
Pollution from drainage systems (e.g. sewage and rainwater overflows, road gullies)	- More extensive cleaning of run-offs by sedimentation tanks, retention ground filters, filtration systems; - Decentralised rainwater infiltration, unsealing of paved areas, building of green roofs and rainwater cisterns, use of rainwater and grey water in households and gardens.

[16] EEA Report No. 7/2018, European waters. Assessment of status and pressures 2018, at p. 35.
[17] Cf. the "Watch list" under Art. 8b of Directive 2008/105/EC (Environmental Quality Standards Directive).

Diffuse pollution from agriculture	- Designation of sufficiently broad buffer strips / riparian zones free of agricultural use, fertilizers and pesticides and protected from conversion; - Incentives to take other areas out of cultivation; - General system of accounting and control of fertilizer use; - Advice to farmers and awareness-raising campaigns concerning water-friendly land use to reduce emissions of nitrate, phosphorus and pesticides, e.g. by planting of catch crops, flower strips and other buffer zones; advice on environmentally sound cleaning of spray equipment; - Codes of good practice and environmental agreements with farmers; sanctions against major violations; - Fiscal instruments (tax on pesticides and nitrogene surplus).
Sediment run-off through erosion	Advice to farmers concerning land use that avoids erosion, e.g. by appropriate farming methods, catch crops, tramline greening, flower strips and other buffer zones.

Other pressures	**Potential measures**
Over-abstraction of surface water for public water supply	- Intensive monitoring and public awareness-raising concerning effects on the river ecosystem; - Reduction of private water consumption by promoting use of water-saving equipment, awareness-raising, higher water pricing, minimizing water losses by repairing leaks and better maintenance of water pipes; - Reduction of industrial water consumption by promoting-water recycling and reuse, higher water pricing etc.
Over-abstraction for irrigation	- Promotion of water-saving / targeted irrigation techniques; - Advice and incentives to farmers for changing to crops and pastures with low water demand; - Adaptation of permits with reduced limits on quantity; sanctions for non-compliance.
Excessive maintenance of river banks for agricultural purposes	- Designation of buffer strips with ecological maintenance plans; - Awareness-raising among farmers, environmental agreements.
Overuse by touristic and leisure activities (bathing, canoeing, entering sensitive riparian zones etc)	- Raising of public awareness concerning sensitivity of river banks and aquatic life; - Agreements with canoeing or other sports clubs on code of conduct; - Designation of protected areas with off-limit rules; channelling of visitors to less sensitive areas; deployment of rangers and local volunteers; sanctions for non-compliance..

Knowledge gaps	**Potential measures**

Lack of knowledge on causalities and correlations	- Cooperation with universities and research institutes in interdisciplinary research projects; - Incentives and support for “citizen science”; frequent exchange of information between authorities, experts and local citizens; long-lasting structures for communication and mutual learning.

All these measures should be checked in a feasibility study for their potential effects and costs in the specific case, in relation to the available funding and the time horizon.

The envisaged measures of the management plan need to be discussed in a first stage with other relevant authorities responsible in particular for nature protection, fisheries, soil management, agriculture and cultural heritage, in order to take into account non-water interests that might be important for river development. For example, the installation of a retention ground filter near the river might conflict with nature protection, or the removal of a historic weir might raise objections from the point of view of monument conservation.

As a next step, the feasibility of measures need to be discussed with persons and institutions that would be able to carry out the envisaged measures, as well as with interested members of the public. In the course of this discussion, further arguments - e.g. regarding natural scenery, recreation and tourism, climate protection - could come into play and be useful as drivers for improvement. The discussions will also show the conflicts between different interests and the obstacles for the implementation of development measures.

In order to settle such conflicts, various alternatives and options for improvement have to be examined, and it will be necessary to check whether state funding is available to implement certain measures and compensate e.g. financial losses of farmers. Also a reparcelling or exchange of land might be helpful to facilitate renaturation and river restoration. Last but not least financial support can also come from private sources, e.g. charitable trusts, and such options should be explored.

The process of identifying suitable measures for improving water status will often take considerable time and require talks at various levels and in different forms. In some cases it may even be useful to engage in direct, personalized discussions with farmers over a longer period of time, in order to change attitudes and behaviour, as experience in the UK has shown. Generally, it is advisable to make use of a professional moderator/facilitator and a communication strategy.

River restoration in Richmond Park, UK (from website https://www.southeastriverstrust.org/wp-content/uploads/2015/10/RichmondGrid.png)

8. Drafting the plan, participation and prioritization

8.1 Drafting the plan

The Water Framework Directive obliges Member States to produce river basin management plans and programmes of measures, and it requires public participation in the planning process but does not specify which authority (or other organization) should draft plans at river basin level or below. So the details of planning procedure and participation are left to the discretion of the Member States. Whether the water authority assumes the responsibility for planning and organizing the whole process, or involves a consultant, or limits itself to coordinating the actions of municipalities, NGOs or "catchment partnerships" (as in the UK), depends therefore on national law and in this framework possibly on the initiative of administrators and civil society. In any case, however, the linking of the local or sub-basin management plan to the RBMP, as prescribed by the WFD, will have to be done by the competent water authority. The role of the authority will also be more significant in so far as it has funding as its disposal for the implementation of the plan.

Problems in the water environment are complex and defining them differs between individuals and across disciplines, thus necessitating the inclusion of multiple perspectives.

The planning process will need to draw on the principle that a collaborative process is necessary, efficient and productive in situations where there are multiple positions and interests. The planning process also needs to build trust and good working relationships and maximise the input from and collaboration between stakeholders. This will include all the individuals, groups and organisations who are affected by and have an interest in the outcomes of the plan. The purpose of a planning process is to:

- Produce a river development plan (catchment plan) through a collaborative process; meaningfully involving all those who need to contribute to the planning process;
- Address the areas of contention and maximise the potential for common ground and agreement on ways forward;
- Encourage local collaboration and more transparent decision-making when both planning and delivering activities to improve the water environment.

The main steps in a planning process, as described in Chapters 6, 7, 9 and 10, will need to include:

- Definition of the pressures and what needs to be done to address them;
- Implementation of the necessary actions;
- Checking what has been achieved;
- Reviewing whether the interventions were successful.

Consequently, the drafting process will also have several stages, starting with a general outline and becoming, on the basis of research and participation of stakeholders and the public, more and more specific and action-orientated. At the end, the adoption, distribution and publication of the plan will depend on national rules and typically be a matter for the planning authority or other organization which has the necessary information and means for this task.

Essential elements of a good river development plan might be:

- Presentation of results from fact-finding, problems/pressures, assessment, development goals, suggested measures, comments of stakeholders and public; chances and challenges (financial resources, land availability etc.);
- Clear arrangement and description of planned measures/action steps;
- Flexible time-planning;
- Explanation with maps, expert opinion, results from analysis, comments and pictures/ illustrations;

- Coordination with higher level and other managerial units regarding measures and important information;
- Conclusions to be based on consensus as much as possible.

8.2 Participation

Broad participation is a core requirement of the Water Framework Directive. Article 14 WFD asks Member States to encourage the "active involvement of all interested parties" in the implementation of this Directive. The WFD mentions the production, review and updating of river basin management plans in particular but does not limit public participation to this level. Participation of relevant stakeholders and the public is in fact not only prescribed by law but a necessity for the effective implementation of the river development and its measures. It is a sensible element at every stage of the planning, implementation and review process, starting – in unclear cases - from the definition of the field of operation and the establishment of the catchment characteristics, up to the monitoring and evaluation of the plan's effects and the discussion of necessary changes. An early involvement of local expertise can provide valuable information for the planning authority and build a basis of confidence for the whole planning process. Besides, conflicting interests can be identified and possibly resolved or reduced in this way. This explains why it is so important to research carefully and involve local stakeholders at an early stage.

Good practice participation and stakeholder engagement processes include:

- Accommodating cultural differences;
- Commitment and clarity of purpose;
- Enhancing skills and personal involvement;
- Issues of representation;
- Time for group dynamics.

In the context of increasing participation and stakeholder engagement, effective relationships between stakeholders are vital. Characteristics of effective relationships between the public, private and civil society sectors include:

- Adequate support structures;
- Awareness, vision and commitment;
- Cooperative team behaviour;
- Good group/meeting practices, governance and power structures;
- Management ability and management for diversity;
- Sharing resources and outcomes;
- Sound consultation and communication;
- Sound skills base and technical competence.

It is important to be aware of and allocate resources to these elements when establishing engagement opportunities to enable strategic dialogue and deliberation.

From experience it seems useful to draw up, at the beginning of the planning process, a communication concept that covers issues of public relations and participation of public and stakeholders. This concept should systematically look at the actors and potential conflicts in the catchment area and organise the sharing of information and the discussion process in a way that constructive solutions can be achieved. It should help to clarify at what points in time the public or certain stakeholders need to be informed or consulted and which form is most appropriate for this.Four types of relations between planning authority and civil society might be distinguished, according to the degree of participation and interactivity:

a) Information of the public (press statements, info brochures, presentation events, website etc);
b) Public hearing and consultation (invitation to submit comments – also via internet -, bilateral talks, "river walks", oral hearings, workshops etc);
c) Participation in decision-making (round table, planning workshop, local referendum);
d) Cooperative planning and decision-making (partnership).

The communication and participation formats might also be combined or vary in different steps of the process, according to what is appropriate at this stage.

For the elaboration and implementation of the communication concept, at least in complex situations, it will be helpfu to seek advice of a professional consultant.

Good practice example: Stakeholder workshops in the BeWater project for the River Vipava (Slovenia)

The BeWater project, which ran from 2013 to 2017 and involved organisations from 11 European countries and the EU Joint Research Centre, sought to promote dialogue and collaboration between science and society for sustainable water management and adaptation to the impacts of global change in the Mediterranean (see website http://www.bewaterproject.eu/). One of four case studies concerned planning for the river basin of the Vipava river in Slovenia.

This Slovenian part of the project focused specifically on the participation of stakeholders. Relevant stakeholders were thus included from the beginning of the project and contact with them was kept until the very end. Three workshops with stakeholders were organised, one open consultation and several individual interviews were carried out. In the first workshop the stakeholders were asked to highlight key challenges in the Vipava River Basin, their opinion on the desired state of that area and the available management options. On the basis of this input, an expert group prepared all necessary documents. The second workshop aimed at discussing and evaluating water management options through a guided process (with the help of an on-site multicriteria analysis). In the third workshop the stakeholders were asked to find synergies and conflicts between management options and to create bundles of options. This input, together with the documents prepared by the expert group, provided the basis for the Vipava River Basin Adaptation Plan (RBAP).

Results of the project

- The BeWater participative process brought together for the first time stakeholders from different sectors and included them in the development of the River Basin Adaptation Plan from the start. This ensures that the plan contains a high input from stakeholders and is now accepted by them as their plan.
- An intensive publicity campaign in the Vipava River Basin made the brand of the BeWater project well-known among stakeholders, residents of the valley and also representatives of authorities.
- Some water management options were implemented before the BeWater project ended. For instance, a Council for Vipava River was established by the end of 2015, composed of Mayors from municipalities of the area. The Council therefore has political importance and executive power. Its main objective is the integrated planning of water management and spatial development.
- The Life ViVaCCAdapt project started in mid-2016 as a partial follow up of BeWater. The project will establish new shelterbelts for wind protection as one of the water management options.
- Two new projects were confirmed in 2018 in the Vipava River Basin which refer to the results of the BeWater project. VISFRIM is a cross border project with Italy intended to improve flood risk protection. GREVISIN aims at establish green infrastructure along the Vipava River and also extends across the border to Italy.

8.3 Prioritisation

A certain degree of prioritisation, as concerns choice of planning objects (e.g. sections of a river) and types of measures, will be indispensable in most countries as water authorities and other planning organisations have

to allocate limited human and financial resources. Besides, prioritisation is necessary to promote the alignment of planning and delivery processes (e.g. environmental protection, flood and coastal risk management, spatial planning and infrastructure management) and to avoid conflicting and wasteful decisions.

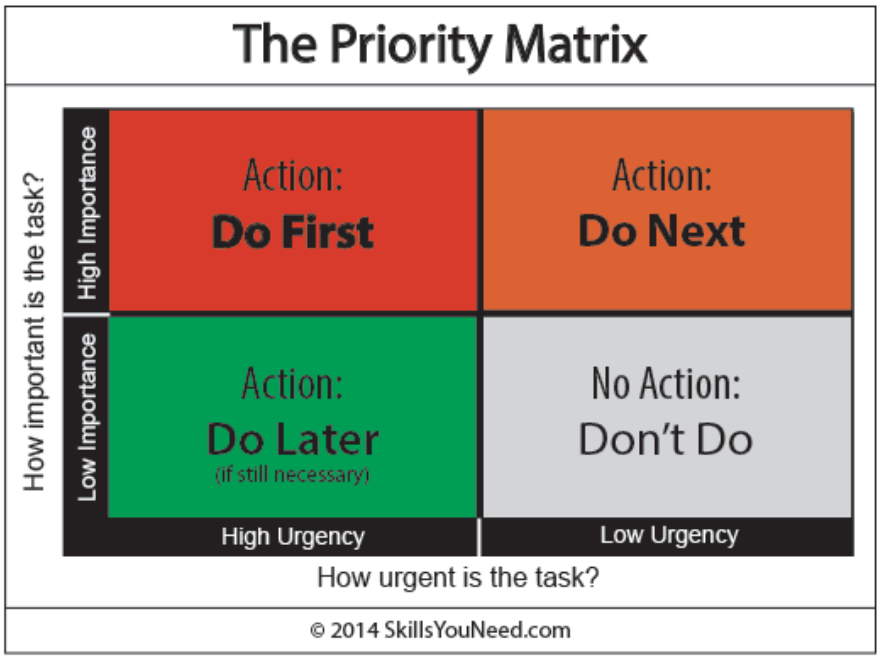
As in the preceding stages of the planning process, the complex nature of river development requires careful and well-informed decisions, and thus a discussion on priorities instead of a top-down approach. Prioritising together in partnership helps to identify synergies and optimise shared investment opportunities.

Essential criteria for prioritisation might be:

- Requirements and priority decisions of RBMP/PoM or other EU law (e.g. EU Eel Regulation);
- Ecologic importance and urgency;
- Existence of source populations for ecological diversity; “stepping stone” principle;
- Feasibility, costs and chances of success, acceptance by stakeholders;
- Available human and financial resources.

In most contexts of river and catchment development it will nevertheless not be possible to propose general rules on which sections of a river and which measures should have priority. It may, for instance, from the point of view of fish migration and the European Eel Regulation (1100/2207), be preferential to remove barriers first in the lower courses of rivers. On the other hand, such measures e.g. on the major rivers in Germany (with many weirs and hydropower plants) are particularly difficult and costly, and for an interim period provisional measures (temporary switch-off of turbines, “catch and carry”) might still be an option, while the removal of weirs in the headwaters of smaller rivers may be particularly effective already in the short term for the ecologic improvement of many waterbodies.

Likewise, it seems sensible to focus on the reduction of ecotoxic pollutants in waste water discharges as a necessary precondition for revitalising a watercourse. But on the other hand, the restoration of natural river banks and the establishment of buffer strips against agricultural erosion are still important for increasing biodiversity along the river and should not be postponed until the very end of the process. It is thus useful, as a rule, to allow for parallel improvement measures and seek for synergies and the necessary amount of coordination.



Source: https://www.skillsyouneed.com/ps/time-management.html

Good practice example: The Catchment Based Approach (England)

In England, increasing attention has been placed on more local, partnership approaches to managing the water environment[18]. This is in recognition of the influence that strong community engagement can have on local policies, plans and actions.

Following a series of 'experimental pilots'[19], a national policy framework was launched in 2013, for a Catchment Based Approach (CaBA). Since then, catchment partnerships have been established across England providing full national coverage. The catchment partnerships include involvement from public, private and civil-society sector organisations. Catchment partnerships play a key role in the development of local catchment community aspirations. They drive greater awareness of water environment issues and catchment based solutions, empowering communities to engage. Results show that catchment-level interventions can be very effective in realising multiple benefits. There are a growing number of examples of catchment partnerships co-delivering interventions with their local catchment communities (www.catchmentbasedapproach.org).

The Environment Agency (the 'competent authority') provides dedicated support to the catchment partnerships through a national network of 'catchment coordinators'. The Environment Agency also hosts the Catchment Data Explorer an online data and information platform portal.

Case Study

Rapid urbanisation in the London Borough of Lewisham has impacted ecology and modified catchment hydrology. Urbanisation has altered rainfall-runoff relationships and contributed to an increase in flooding events in Lewisham.

Building local involvement in 'place-making' can increase the 'ownership' of interventions to improve quality of life outcomes through better integration of natural and social infrastructure. For example, restoration of the River Ravensbourne in Ladywell Fields, Lewisham has been transformed through this approach, which helped drive the integration of sustainable water management into local policies.

Before restoration of the River Ravensbourne in the park, only 44% of local residents felt safe using the park. Now 78% say they feel comfortable visiting the park (reduced anti-social behaviour and vandalism). The number of people using the park has increased by 250%. Local communities have greater ownership through increased involvement and play an important role in the rivers' upkeep.

Restoration of the River Ravensbourne to a more natural state has seen a marked increase in wildlife.

Lessons learned

1. **Effective stakeholder engagement** leads to better coordination of programmes and projects. The establishment of a partnership in each catchment is pivotal to the facilitation of shared outcomes and multiple benefits for land, water and biodiversity.
2. **Capacity and capability building** of catchment partnerships is needed. Appropriate time, space and resources must be allocated and deployed to enable, facilitate and accelerate catchment partnership development.
3. **Data and evidence sharing** between public, private and civil society is essential to promoting collaborative advantage and catchment partnership working. This requires dedicated and coordinated support by the competent authority.

[18] In 2011, a government commitment to encourage and support partnership working was set out in the *Natural Environment White Paper* and the *Water White Paper*.

[19] In 2012, a series of 'catchment pilots' were set up across England to test and understand how they could improve local planning and better integrate local delivery of the Water Framework Directive (WFD). The purpose was to: better engage river catchment stakeholders; establish common ownership of problems and their solutions; build partnerships that balance environmental, economic and social demands; and align funding and actions within river catchments for multiple benefits.

Good practice example: Participation of local water councils in river basin management planning in Denmark

In Denmark, the river basin management plans 2009-2015, including the programme of measures (PoM), were determined solely by the government. However, the then government wanted the measures for the second planning period (2015-2021) to be determined with a greater degree of stakeholder involvement, greater local anchorage and greater local co-ownership. This led to the adoption in 2013 of a new Water Planning Act, which resulted in a process where municipalities, with the participation of local water councils, in 2014 were drafting proposals for the measures for improving the physical conditions of the watercourses in the second planning cycle.

Denmark is, for the purpose of river basin management planning, divided into 23 main catchment areas, and one local water council was set up in each of the 23 main catchment areas. The municipalities in each catchment area simultaneously agreed to which municipality would be responsible for the secretarial service of the water council.

It was stated by the government that each water council could consist of no more than 20 members and that the members should be appointed by, among others, relevant nationwide business organizations, nationwide organizations whose main purpose is the protection of nature and the environment (including recreational interests), and local associations and organizations that are associated with the protection and use of water.

No organization or association could be represented in a water council with more than one member and there should be a balanced representation of organizations and associations representing different interests in relation to water planning (users and protectors).

The framework for the work of the water councils

The task of the water councils was to advise the municipalities in preparing proposals for those watercourses for which physical efforts were to be carried out and the instruments to be used. Specifically, the water councils and municipalities had to propose concrete measures to improve physical conditions, including restoration of watercourses, opening of pipelines and removal of barriers, as well as the control of the ochre in streams, etc.

Prior to the establishment of the water councils the then government had decided to allocate a preliminary budget for watercourse measures in the second plan period of 696 million DKK (about 93,3 million Euro). It was then the opinion of the Ministry of the Environment (MoE) that this limit could finance measures that improved the physical conditions of 1600-2200 km of watercourses by the cost-effective use of instruments contained in a specially crafted catalog. This included both stretch-based tools and the removal of 180-250 barriers and approx. 40 ochre measures.

It was reported to the municipalities and water councils that their task was to propose measures that should at least ensure good ecological status of 1600 km of watercourses. However, it was estimated that the removal of a number of barriers and ochre measures was likely to have a positive effect on more kilometers of streams beyond the approx. 1600 km.

The total financial framework was divided by the 23 main catchment areas. Effort level and financial framework were distributed proportionally between main catchment areas based on total effort needs. The effort requirement was evaluated on the basis of the Water Framework Directive's article 5 analysis' risk assessment. For each main catchment area, the MoE stated that within the allocated budget, proposals should be prepared which would at least ensure good ecological status at a specified number of kilometers of watercourses. The number of barriers that should at least be removed during the second planning period was also specified. The municipalities in the main catchment area should then assess how many kilometers of watercourses that would benefit from the removal of barriers and reach

good ecological status. The MoE emphasized the expectation of a cost-effective approach. The selection of watercourses where action would be proposed and the choice of measures for each watercourse should ensure that the maximum number of kilometers could achieve good ecological status.

The result of the work of the water councils was that almost all project proposals of municipalities and water councils were included in the proposal for the PoM in the River Basin Management Plans 2015-2021. The proposals of the municipalities and water councils were thus the basis for the final PoM proposal prepared by the MoE.

Assessing the government framework with the result of the work of the water councils shows that the economic framework was generally complied with. At the same time, in some catchment areas, there were proposals for measures on more kilometers of watercourses, removal of more barriers, and proposals for the establishment of the same number or more ochre treatment facilities than required in the main government frame.

Evaluation of the work of the water councils

Following the completion of the work of the water councils, an evaluation of the process was carried out. Overall, it was estimated that the work had been successful. For the future use of water councils it was emphasized in particular that their tasks should be clearly defined, that professional management was needed and at the same time the council members must have a real chance to influence the outcome. Besides, participants regarded it as important to have access to good and easy-to-use IT tools.

It follows from the Danish legislation that the municipalities and water councils will be involved again in the preparation of the river basin plans for the third planning period.

9. Implementation of the plan

9.1 Conditions for successful implementation

Once the river development plan (or river management plan) has been adopted, its implementation will pose various challenges: It will need personal and financial resources on the side of the competent authority as well as all those persons and institutions which actually have to carry out the planned measures. It should have the support and, if possible, the active collaboration of the relevant stakeholders and the public. In the process, it will often be necessary to further specify and supplement the plan with more concrete details and sometimes also to modify the objectives and the time schedule of the plan itself.

An important element of the river development plan is the list of priorities for the feasible measures. Prioritization offers the chance to start with a number of important, urgent and significant measures, targeting those deficits or pressures that have found to be most responsible for the deviation from a good water status. A monitoring should accompany the implementation to determine the arising improvements (see Chapter 10). After the implementation of the most urgent priority measures, a new evaluation of water status and deviation from the good status has to be done. It is useful not to forget that biological quality components need a lot of time to adapt to different living conditions. At this stage of the implementation process, the original priority list has to be reviewed and adapted to latest findings. Following this, the next measures can be implemented. Maybe it will be necessary to replay the iterative steps several times.

In contrast to RBMPs and programmes of measures under the Water Framework Directive, this planning and the implementation take place at a local level and is more detailed. This also means that in every individual case the measures can and should be planned more concretely concerning the location, the assessment, the technical design und the operating modes. The concrete planning has to be coordinated with other forms of sectoral planning, for example nature conservation plans and measures of flood protection. The question to be considered is how far synergy effects can be used to get funding opportunities on a larger scale and to promote general acceptance.

The river development or management plan is a basis for the gradual implementation and administrative measures of all competent authorities. For this, the plan has to describe the technical feasibility und the necessary cost framework. By this, it provides a basis for negotiations with municipalities and other – also private – organisations which carry out the measures. The preferable option is to achieve a consensus among all or most relevant players. This means that the measures have to be advertised and the actors have to be convinced. Apart from local government, water companies and land users in the catchment area there are other interests and the public who also play an important role (see above Chapter 8).

As the implementation of measures will cost more or less money, the planning authority needs to consider the possibilities of state funding or other financial support. On one hand there could be a state participation on necessary investment costs (e.g. costs for changing water structures, upgrading sewage plants), and on the other hand there could be a financial state compensation for permanent financial losses (e.g. restrictions on agricultural practices or the use of hydro-power). If it is not possible to find a consensus / compromise concerning the implementation of an urgent necessary measure, administrative orders might be a last option.

In any case, the successful implementation of measures according to the river management plan requires an intensive involvement of stakeholders and the public. The forms of public and stakeholder participation as described in Chapter 8 are also useful at this stage.

It is recommended to develop a communication concept (and update it) also as part of the implementation of the river development plan. For details see Chapter 8 above.

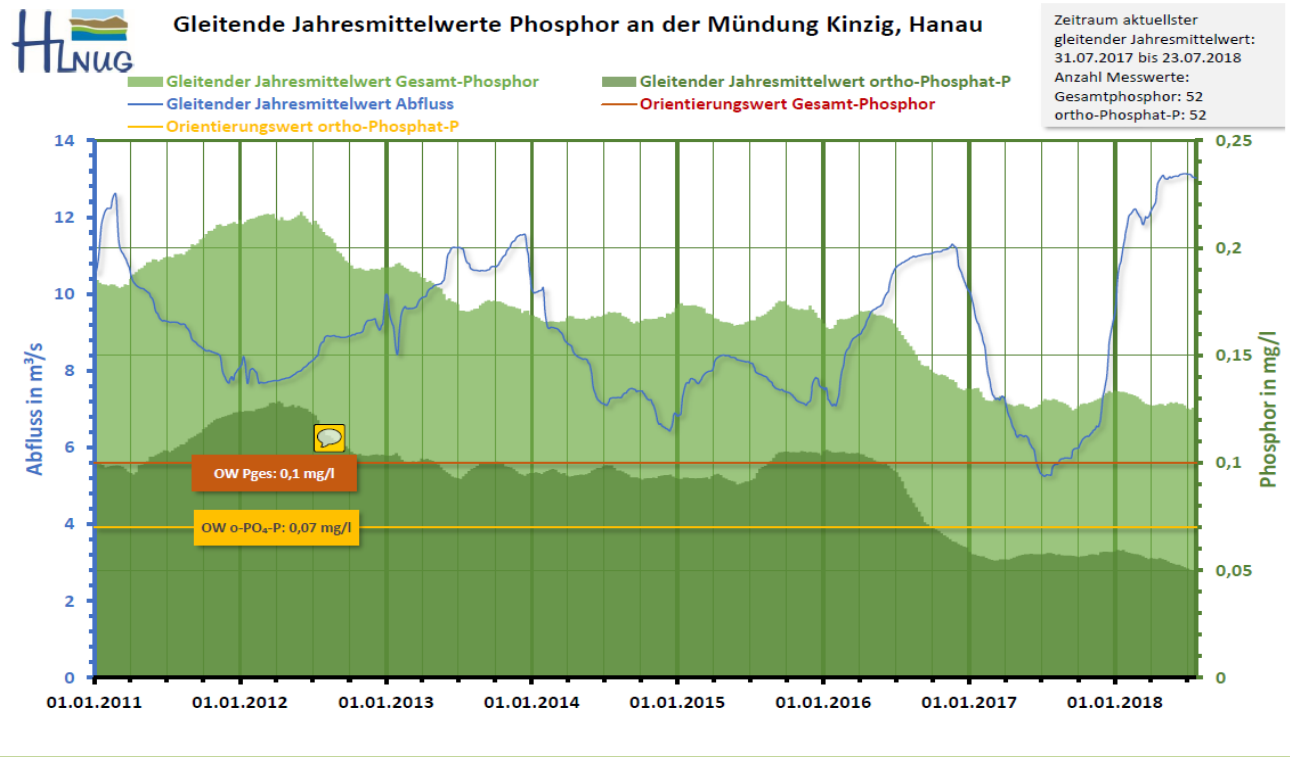
Good practice example: Reducing phosphorus emissions from municipal waste water plants in Hessen (DE)

Implementation of the current River Basin Management Plan (RBMP) and the Programme of Measures (PoM) for the German State of Hessen in the years since 2015 focused on the reduction of phosphorus emissions from municipal waste water treatment plants, which had been found to be the primary source of phosphorus (and thus eutrophication) in small and medium-sized rivers. The PoM 2015-2021 itself laid down a scaled system of target values for emissions of total phosphorus and orthophosphate-P, depending on the size class of the sewage plant. For example, size class 4 installations (10,000–100,000 population equivalents) were obliged to reach a control value of 0.7 mg/l P_{tot}, a monthly average of 0.5 mg/l P_{tot} and a maximum value of 0.2 mg/l o-PO_4-P by the end of the planning cycle.

After intensive discussions in a working group of water authorities and after hearing the associations of municipalities, the Hessian Ministry of the Environment issued a step-by-step implementation concept in May 2016 with a more detailed time-table which took into account the necessary technical measures for each class of sewage plants. Scientific support with river-specific facts and research results was provided by the Hessian Environment Agency. The binding measures were taken in the form of amendments to the discharge permits for each individual plant that are issued by the water authorities. However, the authorities took care to base their measures as far as possible on consensus with the operators. In this, they were aided by the rules of German law which allow operators of sewage treatment facilities to offset their investment costs – if reducing the load of certain pollutants - against the waste water charges they have to pay annually.

For a medium-sized sewage plant, e.g. Niedermittlau, the investment costs for P-reducing measures (building of 3 dosing stations for precipitating agents) amounted to 174,000 € (10 € per inhabitant). From 2015 to 2017, the Niedermittlau plant thus managed to reduce its concentration of total phosphorus from 0.8 to 0.23 mg/l. This and other measures contributed to a lowering of the phosphorus concentration downstream in the River Kinzig (measuring point Hanau) from a medium of 0.17 mg/l P_{tot} and 0.11 mg/l o-PO_4-P in early 2016 to 0.12 and 0.06 mg/l, respectively, in mid-2017 (see graph of Hessian Environment Agency below).

This reduction of the P load will not only benefit the ecological status of the directly affected water body but also – via the rivers Main and Rhine - eventually the North Sea.



Phosporus reduction at the mouth of the River Kinzig (Hessen, Germany), 2011-2018

9.2 Role of inspections

Inspection plays a crucial role for implementing the legally binding requirements of EU water law, thus also representing one of the WFD measures.

To ensure effective "water inspection" the data acquired in water body characterisation and analysis of pressures and impacts should be used for targeting the inspections and setting inspection priorities based on risk assessment.

Different methods of risk based approach for point source pollution are already described in the IMPEL DTRT guidebooks.[20] Such methods still need to be gathered and developed in future for diffuse water pollution, physical modification of watercourses or water abstraction. However, there are already several elements that can be used to target the inspection of diffuse pollution:

- Focus on areas where environmental quality standards are exceeded and status of water is less than good or groundwater pollution still shows negative trend;
- Focus on parts of catchment areas or waterbodies where receiving environment is most vulnerable.
- If appropriate take into account the presence of drinking water protection zones, sensitive areas under the Urban Waste Water Treatment Directive (UWWTD), nitrate vulnerable zones under the Nitrates Directive, bathing areas, Natura 2000 areas etc.
- A pressure or impact within these areas should only be prioritised if it is significant, alone or in combination with others and as such puts the achievement of the environmental objectives at risk.

[20] See various IMPEL DTRT projects (DTRT = Doing the Right Things in Permitting and Inspection), e.g. https://www.impel.eu/inter-active-handbook-for-regulators-responsible-for-industrial-emissions-directive-implementation; Draft final report of the IMPEL 2017 project: Supporting implementation of the Industrial Emission Directive (2010/75/EU) and Doing the Right Things.

- Focus on operators / businesses / farmers / individuals that contribute biggest loads of the emission / landspread / pressure. Sometimes an additional analysis will be needed to identify the relevant individual pressure sources;
- Understand functioning of specific type of operator to select activities, which are most likely to pose greater risk and enforce specifically those requirements. For example whether to focus on nitrate storage capacities,on landspreading or point-source pollution from possible misuse;
- In different types of pressures analyse the potential impact of illegal pressure sources. If these could be significant, develop appropriate intelligence for planned inspection activities.

It is important to recognise that not all cases of non-compliance can be improved by inspection activities. If the reason for non-compliance is delayed or incomplete transposition of EU legislation, lack of financial resources for implementation (which is dependent on political decisions) the increased inspection activity will have no or very limited effect. In addition, inspections are usually only competent to verify levels of compliance with permit conditions, and have no powers to check obligations set out in EU law for the Member States (e.g. UWWTD, drinking water, IPPC/IED, landfills, etc.). The same might be true where EU environmental law establishes quality standards (air, water, etc.) which should be complied with and emissions should be controlled to contribute to such compliance, while the competent authority actually issues permits with conditions which do not deliver such compliance.[21]

[21] Summarised from the 2013 report of IEEP, Bio Intelligence Service and Ecologic Institute: Information collection and impact assessment of possible requirements for environmental inspections in the area of EU legislation on water, nature protection and trade in certain environmentally sensitive goods. Final report for the European Commission, DG Environment. Institute for European Environmental Policy, Brussels and London, July 2013.

Good practice example:
Targeted regulation of agriculture in Denmark

In Denmark, since the 1980s, there has been a focus on reducing emissions of primarily nitrate to the fjords and coastal waters to bring these in good ecological condition. Consequently, a considerable effort was made in the 1980s and 1990s to improve waste water treatment, and at the same time leaching from agriculture was reduced. Following the implementation of the major wastewater efforts, it has been assessed that the major part of the future necessary reduction of nitrate emissions must be achieved by further reducing the emissions from diffuse sources. The loss of nitrate by agriculture therefore has been regulated - most recently based on the requirements in River Basin Management Plans for the 1st and 2nd planning periods.

By 2015, it was politically decided that a fundamental paradigm shift should be implemented in the regulation of agriculture. So far, all farmers had been regulated so that everyone was meeting the same regulation with regards to how much they should reduce nitrate leaching, etc. That was the case regardless of whether their fields bordered on a vulnerable fjord with a risk of oxygen depletion or was located far from the nearest vulnerable coastal area. However, the impact of the environment depends on how robust the soil is, and on the vulnerability of the affected water. It was therefore decided that the general environmental regulation of agriculture should be replaced by a differentiated, targeted regulation.

The differentiation implies that the targeted regulation imposes more stringent requirements on farms in areas were a high level of effort is a necessity, while for farms in areas with less need for reductions, less stringent requirements are imposed.

From the growing season 2018/19, the targeted regulation is phased in by one third a year towards full phasing in the growing season 2020/21. This means, the targeted regulation by the end of 2021 will contribute a reduction of nitrate leaching of 3,500 tonnes to the total of 7,000 tonnes of nitrate, which according to the RBMPs 2015-2021 should be reduced during the second planning period.

The model for targeted regulation consists generally of two rounds:

First round: Voluntary commitments. Farmers declare that they wish to plant catch crops or one of six alternative nitrate-reducing instruments, for example intermediate crops, energy crops or reduced application of nitrates. The farmers who voluntarily establish catch crops will be compensated for their efforts. Those who participate in targeted regulation have the opportunity to enroll more catch crops beyond the average needs set for the area. The effect of nitrate reducing instruments will be differentiated according to a map of the nitrate retention divided into 3.000 catchments.

Second round: Mandatory commitment. If farmers report that sufficient catch crops will be produced in a demarcated catchment area, those farmers that individually do not plant such crops will not be sanctioned. Only if farmers in an area as a whole do not provide sufficient crops or alternatives in the voluntary round, they will receive a mandatory requirement without compensation being paid. Farmers who declared they will establish catch crops during the voluntary round, can offset these against a mandatory order.

The two rounds contribute to both ensuring a cost-effective model and achieving the required nitrate reduction in an area.

A control and sanction scheme is in place to ensure that the necessary nitrate reduction will take place. The targeted regulation co-exists with a national-scale, general regulation of agricultural practices which ensures a common level of environmental protection across Denmark. This scheme includes a national Fertilizer Register, where the vast majority of Danish farms are registered and thereby obliged to produce and submit an annual fertilizer account to the Danish Agricultural Agency. The Agency performs a 100 % administrative check of all fertilizer accounts received, as well as a

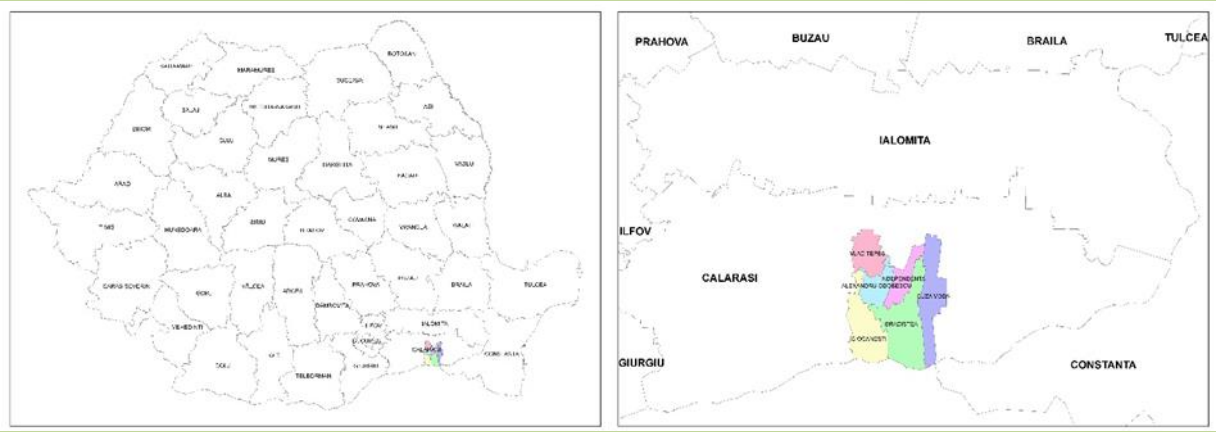
system of regular on-site farm inspections with on the spot checks of fertilizer usage and focused controls of slurry tanks. In each planning period, farms subject to registration in the Fertilizer Register must not apply more nitrogen for fertilizer purposes than the Fertilizer quota calculated for the farm. The farm nitrogen quota and the content of nitrogen in livestock manure is calculated in accordance with stipulated standards. If farmers fertilize in excess of the Fertilizer quota, they will be in breach with the Fertilizer Act and sanctioned accordingly.

It is planned to further develop targeted regulation over time, for example with more instruments and a still more differentiated model, and thus also include the practice in the regulation of agriculture after 2021.

For more information see websites: https://eng.mst.dk/trade/agriculture/ and https://eng.lbst.dk/agriculture/inspections/

Good practice example:
Agricultural pollution control project in Calarasi County, Romania

The overall objective was to increase significantly the use of environment-friendly agricultural practices in the project area and thereby reduce pollution from agricultural sources in Romania to the Danube River and the Black Sea. The project area covered the Calarasi Judet district. Initially, the focus was put primarily on seven communes located around Lake Galatui, where the current manure handling practices had the potentially greatest negative impact, and where the beneficial impact of an improved system could be monitored. There are 21 villages in the seven communes with a total population of about 26,657 in 10,540 households.



Organisation Type	Number	Farming Entities[3] Number	Percentage	Agricultural Land Hectares	Percentage
Commercial Societies	28	2699	24%	9096	13%
State Farms[4]	6	0	-	21,490	31%
Agricultural Associations	25	6093	54%	23,056	34%
Family Associations	29	468	4%	2345	3%
Individuals	-	2075	18%	9294	14%
Land run by comunas	-	0	-	3730	5%
Total	88	11335	100%	69,011	100%

The project supported activities during 5 years as follows:

- the provision of grants on a cost-sharing basis for the installation of improved manure storage facilities and equipment for manure collection and application;
- the testing and demonstration of environment-friendly agricultural practices;
- the promotion of ecologically sustainable land use in the Boianu-Sticleanu Polder, including a conservation management plan for the Iezer Calarasi water body, as well as an intervention in the Calarasi-Raul Polder;
- the strengthening of capacity in Calarasi Judet for monitoring soil and water quality and environmental requirements;
- organized public awareness activities. The main focus was to direct stakeholders of the project (local and county officials, farmers, community groups and NGOs). The objective of the activity was to familiarize the population and help induce the behavioral changes.

Project achievements:

- Visible pollution mitigation;
- Extension to national level compliance with EU Nitrates Directive; favorable EU assessment of Romania's progress towards meeting the EU Nitrates Directive;
- Improved famers capacity to implement sustainable farming practices linked to EU subsidies (cross – compliance);
- Institutional consolidation (ministry, water management authority, environment control bodies, paying agency for subsidies in agriculture, and local level (Calarasi county) institutions and stakeholders etc);
- Significantly lowering the “blue baby syndrome” occurrence.

10. Monitoring, evaluation and review

The frequent monitoring of actual conditions is essential for the development of river catchments and the improvement of the ecological status of water bodies. It enables the authority to compare the status before and after measures have taken place and to assess their success or failure. Especially the field of operation where river restoration or other major works were carried out may need some additional monitoring to generate the data necessary for evaluation. In other cases the additional gathering of information might be needed because the existing data are old or the status has changed for natural reasons or certain conditions have become more important.

The results of the monitoring will provide the basis for the assessment whether the development plan can stay as it is or has to be changed.

Some considerations about the time-table of measures and the time perspective when first successes towards rehabilitation of ecological diversity are expected will be useful. The recolonisation of a river section with invertebrates, for example, can take years. In this way expected changes should be considered carefully so that it becomes clear after what period of time it is sensible to check the success of measures.

How should the effects of the plan be monitored?

To take an example, Polish water monitoring in rivers (including dam reservoirs) includes 4 types of monitoring:[22]

a) diagnostic;
b) operational;
c) research;
d) protected areas.

The scope of the research is derived from the type of monitoring, the type of water body and the requirements related to the function of the measuring and control point. [3]

The aim of diagnostic monitoring is to establish a coherent and comprehensive review of water status in each river basin area, as a result of which it will be possible to classify all surface water bodies by assigning them to one of five classes of ecological status / potential, two classes of chemical status and two status classes. Diagnostic monitoring should be carried out in a sufficient number of uniform surface water bodies to enable the assessment of the general state of surface water within each catchment or sub-basin in the river basin. Diagnostic monitoring also provides information on long-term natural changes and long-term changes resulting from anthropogenic activities conducted on a large scale. [3]

Operational monitoring is used to determine the status of those bodies of water where it was considered that there is a risk that the environmental objectives designated for these waters will not be achieved. It is also used in the assessment of changes in water status resulting from the implementation of action programs. Operational monitoring must be carried out for all water bodies that have been identified as a result of a review of the impact of human activities and / or based on the results of diagnostic monitoring that there is a risk of failure to achieve environmental objectives. This monitoring must also cover all water bodies to which priority substances are discharged. It should also be included in the operational monitoring, in which the diagnostic monitoring showed the exceedance of environmental quality standards or good health boundaries for priority substances and for substances from the group of specific synthetic and non-synthetic pollutants. [3]

The results of research monitoring are used, among others to determine the effects of accidental pollution, supplement information on water status and to meet international obligations when these obligations go beyond the scope of diagnostic and operational monitoring. [3]

[22] Cf. Annex V no. 1.3 WFD.

Monitoring of protected areas is complementary to monitoring the state of a river basin district (diagnostic monitoring, operational monitoring). Currently, monitoring of protected areas in Poland is conducted for:

- intended water abstraction for supplying people with drinking water,
- areas for recreational purposes, including bathing,
- areas for the protection of habitats or species, including aquatic species of economic importance,
- areas sensitive to eutrophication caused by pollution originating from municipal waste water treatment,
- areas exposed to pollution with nitrogen compounds from agricultural sources.[23]

Who should do the monitoring? Are formal structures necessary?

In most EU countries, monitoring of the environment including rivers is done by various institutions for various purposes. Ideally, all the information necessary for the evaluation of the river development plan should be collected by the planning authority or concentrated in a central database to which it has access. In any case, it is important that the environmental and agricultural authorities and other organisations that may be involved have regular communication channels and openly cooperate with each other by exchanging information. Besides, publication of monitoring results (when verified) through websites and the media can be useful to raise awareness and promote further measures of river development.

How can shortcomings of the plan and potentials for improvement be detected? What would be indicators of success?

Again, a combination of scientific expertise plus public and stakeholder participation will be necessary to detect early actual shortcomings of the river development plan and its implementation. Regular on-site inspections and probings of the parameters that have formed the information basis before the plan was drafted will also provide the main body of evidence for its evaluation and further development. In addition, talks to local experts/stakeholders like fishermen, conservationists, water company staff and neighbours can give valuable insights into the actual state of affairs and whether the implemented measures have more or less positive effect. An inter-active website where members of the public can share their observations on the river and express their concerns may also help to inform the planners and alert them to undesirable developments.

The main indicator of success will be the increase of biodiversity in and near the river which ideally would approach its natural potential. The reduction of relevant pollutants and the establishment of river continuity and a varied and type-specific hydromorphology will provide important signs of improvement on this way.

[23] Website of GIOŚ (Chef Inspectorate od Environment): http://www.gios.gov.pl/pl/stan-srodowiska/monitoring-wod

Good practice example: Scientists share knowledge and join forces to improve biodiversity and water quality on the Kwacza River in Poland

Scientists from Kazimierz Wielki University in Bydgoszcz and the University of Warmia and Mazury in Olsztyn worked together on river restoration projects for the Kwacza River, the left tributary of the Słupia River in northern Poland.

This river is a recipient of nutrients from an agriculturally used catchment area. The hydrographic network of the Kwacza River consists of many small watercourses, some of which have been highly transformed by hydrotechnical structures for the needs of agriculture, in particular in its lower course where the Kwacza River meets the Słupia River. The river catchment was nearly entirely “reclaimed”, i.e. cultivated for livestock farming. Wetland areas were drained and converted into grasslands. The flow of the Kwacza River was partially diverted into a by-pass ditch to irrigate meadows and grasslands. Peat was excavated across a large area in the river catchment. The river basin was then used less for agricultural purposes following the economic crisis of the late 1980s. Drainage canals and the irrigation system ceased to operate. Plant succession in peatlands led to the development of meadow plant communities, including sedges, willow scrubs, and riparian forests.

Scientists made a complex analysis before the start of the restoration in 2007 and 6 years after improvements by various hydraulic structures including palisades, groynes and stone islands, by protecting the banks with trunks, exposing a fragment of the river channel and building a by-pass near a defunct culvert. They compared the physicochemical parameters of river water along the 2.5 km restored section between the source and the mouth to the Słupia. The new hydraulic structures had decreased flow velocity, increased water retention time and improved water quality along the restored section of the Kwacza River. The experts analyzed a total of 18 physicochemical parameters at 10 cross-sections along the river. They noticed after the project that the greatest changes were observed in the concentrations of NO_3-N and NH_4+-N, which decreased by 70% and 50%, respectively. The concentration of dissolved oxygen increased by 65%, chloride values by 44%, and chlorophyll-a concentration by 30%. These results showed that river restoration projects can substantially reduce nitrogen pollution and reinstate natural conditions in river ecosystems.

The most important conclusion from this restoration project is that a substantial improvement of river ecology requires a good chemical water quality and the diversity of hydromorphological conditions. To achieve that, water parameters should be monitored before restoration to assess the condition of riparian habitats and propose the most adequate restoration measures. Long-term studies are needed to understand changes in nutrient dynamics and to evaluate the resulting progress as projects evolve over time.

This piece of research was shared through the good offices of Mr. Krystian Obolewski, who is co-author of the article ,,Water Quality as an Indicator of Stream Restoration Effects — A Case Study of the Kwacza River Restoration Project”, N. Mrozińska, K. Glińska-Lewczuk, P. Burandt, Sz. Kobus, W. Gotkiewicz, M. Szymańska, M. Bąkowska and K. Obolewski, in: Water 2018, 10(9), 1249;;https://www.mdpi.com/2073-4441/10/9/1249.

On the basis of the collected monitoring data, a sober and unbiased evaluation of the effects of the existing river development plan needs to be carried out. It can help to involve independent experts in this exercise but the evaluation might also be done by the planners themselves, provided they are open for new insights and ready to learn from mistakes. As the last part in the planning cycle for the “old” plan and at the same time first part for the preparation of the “new” plan, the review should again be a process with public participation which might take the form of local hearings and/or possibly an online consultation. Transparency is one of the preconditions to convince stakeholders and the public that their opinions, experiences and local expertise are taken into account for the continual improvement of the plan, and that their positive contributions are welcome for the plan’s implementation.

11. Annexes

Annex A: Planning schedule for the participation process in river management („NiddaMan" project, Germany)[24]

Phase	Why? (concrete problem)	Who? (actor)	Whereby? (context)	For what? (solution)	How? (format)
1) Start of project	*Make planning (more) transparent*	*Interested members of the public*	*Gaining/sharing information über on the project*	*Raise awareness, gain acceptance, visibility for the project*	*Press statement,, info event*
2) Inventory	*Systematic and comprehensive recording of knowledge, expand knowledge base*	*Experts, possibly locals who know the area („Citizen Science")*	*Establishment of waterbody status*	*Integration of knowledge, supplement official information base; increase visibility of the project*	*„River walks"; report of observations, e.g. via online plattform,*
3) Evaluation of inventory	*Enable multidimensional evaluation*	*Experts*	*Deduct needs for action*	*Make evaluation (more) robust*	*Workshops, bilateral talks*
4) Development of measures	*Negotiation of concrete measures, e.g. to. reduce sediment input in waterbody or regarding use restrictions for certain groups*	*Relevant stakeholders or potential polluters, e.g. farmers or affected users*	*Action plan, e.g. for implementation of nature protection concept*	*Raise acceptance, reach a consensus, e.g. agreement on sustainable sediment management or negotiation of nature conservation agreements*	*„River walks", workshops, bilateral talks, round table*
5) Implementation of measures	*Establish acceptance, ensure support*	*Relevant stakeholders, e.g. river users, neighbours, farmers, landowners*	*(Construction) measures / implementation steps / plan*	*Adequate and swift implementation of decisions / measures*	*Information events, on-site inspections*

[24] For the German original see ISOE - Institut für sozial-ökologische Forschung, Planungshilfe für die Gestaltung von Beteiligungsprozessen im Flussgebietsmanagement, ISOE-Materialien No. 51 (Nov. 2018), p. 11.

Annex B: Template for a "Catchment Management Plan" (UK example, without annexes)[25]

Catchment Management Plan for Catchment X: Template V1

Introduction

Our water environment is important to our quality of life. We need to protect and enhance rivers and groundwater as systems which means thinking about them source to estuary, and all the places in between. In other words, we need to think at a catchments scale. There are lots of great things about our catchment which we want to keep. That takes management, conservation and planning for extreme weather events including flooding and drought. And there are some things we want to make better. That takes change. That's what a CaBA Plan is all about.

1.0 Our Vision for the Catchment

This Plan is about action. Action to improve our rivers, and action to raise awareness and educate people about the importance of rivers. The partnership has identified five themes:

Protected: Protect the people and wildlife that depend on the river from the influences of climate change, both floods and droughts.

Managed: Manage the river from source to sea to maximise the benefits that it brings to our economy, communities and wildlife.

Used and appreciated: If our river is used and appreciated it will bring economic benefits to our catchment by attracting business and jobs.

Enjoyed and valued. Our quality of life depends upon our surroundings, the

Restored. Where we have lost the benefits that river brings we will restore it so that it functions as an effective catalyst for sustainable growth in our local economy.

2.0 Data & Evidence to underpin a weight of evidence approach

This catchment plan is based on a weight of evidence approach. The key sources of evidence which we have used to identify where we will work and what we will do are:

2.1 Nationally consistent evidence base

CaBA data package for our catchment: (Link to the CaBA website, user guide) The 'CaBA Data&GIS User Guide' explains which layers are available, what they mean and how they can be used. There are over 100 data layers available for this catchment which identify the spatial pattern of opportunities; issues, characteristics and the possible sources of the issues. This weight of evidence is being improved by collecting local datasets and working with local organisations in the catchment. This data coupled with 'Local Evidence' and 'Priority Places' below provide the weight of evidence required to deliver projects which will benefit the lives of people and wildlife living in this the catchment.

[25] See website https://catchmentbasedapproach.org/learn/developing-a-catchment-managment-plan/

2.2 Local Evidence

In addition to the national datasets available in the CaBA data package and via government open data initiatives, local data and evidence (including modelling) is important for helping to pinpoint issues, identify solutions and monitor outcomes in our catchment.

Details of key monitoring and modelling resources and tools which are being used in this catchment can be found in Annex 2.2.

2.3 Priority places

A number of key CaBA organisations are prioritising where they will undertake actions to meet their particular aims, and these actions can potentially impact on other aspects of the water environment. We have used the following resources to help the partnership focus delivery where it will bring the greatest benefit:

Catchment Data Explorer (Link): This is central to the CaBA planning process and we have used it to help identify where the issues are and the likely causes.

EA Bathing Water Explorer (Link)**:** We have used this to identify whether runoff from your catchment influences bathing water quality and compliance with the Bathing Water Directive.

Catchment Flood Management Plan (Link)**:** We have used this to check planned actions for reducing flood risk in this catchment in order to identify opportunities to create multi-benefit actions, and to identify opportunities to add flood risk benefits to other planned projects.

Countryside Stewardship Statements of Priorities (Link)**:** We have used this to identify where Natural England has identified water quality or flooding as a priority issue for allocation of countryside stewardship grants.

EA Local evidence reviews and prioritisation tool (Link)**:** We have used these to understand where the Environment Agency has prioritise waterbodies for future Grant In Aid funding, where actions will provide WFD, Flood risk, Biodiversity and other benefits.

Local Authority spatial plan (Link)**:** We have used these to identify where green infrastructure measures could be targeted, and funded from infrastructure levy, to provide flood risk, water quality, biodiversity and recreational benefits.

Water company asset management plan: We have used this to understand where the priorities are for the water company and identify opportunities for partnership working.

There are many organisations looking to prioritise where they spend money and undertake actions to provide the best outcome for their particular objectives. The best way to make use of these different prioritisation tools and plans is to use them in combination to identify areas of the catchment, and possible projects, which will provide benefits to multiple partners, as this will provide a strong business case for future funding bids.

3.0 Delivery or project plan.

3.1 What are we currently doing in the catchment?

Below are a selection of the projects currently being delivered. A full list of projects and partners can be found in the Annex.

Project 1: Water Company. Under AMP 5 we have reduced CSO discharges in town X which has improved the water quality and ecology on stream Y.

Project 2: Natural England. Countryside Stewardship has focused on reducing diffuse pollution from agriculture to protected sites X and Y to return them to good condition so that they can be used and appreciated by the local community.

Project 3: Environment Agency. Flood project to de-culvert stream X and re-naturalise the river has reduced flood risk in X and provided an amenity for the local community to use.

Project 4: NGO. Education project to reduce misconnections in Town X has improved the aesthetic value of stream Y allowing it to become an asset rather than dumping ground for the local community.

3.2 What flagship projects are we planning to do which are supported by the Evidence?

Flagship project 1: Increase the resilience of sub-catchment X to extreme weather by maximising the delivery of upstream natural flood risk management. This project will be made up of many smaller projects:

- Soil improvement, via farm advice in area #.
- River improvement schemes along river reach #.
- Green infrastructure in urban area #.

Benefits: **Protected, Managed and Restored.**

Flagship project 2: Improve the quality of life in urban area # by reconnecting it to the benefits that flow down the river. This project will be made up of many smaller projects:

- River improvement schemes to engage communities in river #
- Point source pollution for sewer overflows and historic sources of pollution
- Urban diffuse pollution from roads and industrial estates.

Benefits: **Managed, Valued and Enjoyed and Restored.**

A full list of flagship projects is included in the Annex**.**

4.0 Monitoring and evaluation.

Catchment Management has to adapt as we improve our understanding because we cannot predict with certainty what the impact of our changing environment and the delivery of projects in this plan will be. The monitoring plan for this catchment is summarised in Annex #.

5.0 Work in progress.

This plan is work in progress and will grow and adapt as we deliver projects to improve the catchment and as new threats, like climate change, emerge. The greater the collaboration between CaBA partners the more sustainable this plan will become and the greater the benefits to the catchment and the people and wildlife that live there.

Component of CaBA Plan	Initial	Growing	Sustainable
1) Vision and ToR			
2) Data & Evidence			
3) Project plan			
4) Monitoring plan			

Annexes for Catchment Management Plan: …

Annex C: Contract (Terms of Reference) for a Catchment Partnership (UK example)[26]

CATCHMENT PARTNERSHIP:

TERMS OF REFERENCE

VERSION CONTROL

V1 – Initial Draft	Shared with working group.	

1. Name

The name of the association is "## Partnership".

2. Area

2.1 The Catchment Partnership will take an interest in the whole catchment of the River ## from the source in the ## to #, including its tributaries of the Rivers ##.

Insert a catchment map here

If you don't already have a map showing your partnership boundary, you can screengrab one from the national CABA partnerships map http://arcg.is/2kwJXwO

Or copy and paste from the Catchment Flood Management Plan,

Or download the ArcGIS map package to create your own: http://www.catchmentbasedapproach.org/discussions/310-catchment-maps-on-the-caba-website-esri-arcgis-map-package-available

Figure 1: # Catchment
(source: e.g. # Catchment Flood Management Plan - Final Report 2008, Environment Agency)

2.2 The Catchment Partnership are cognizant the River ## water flow contains inputs from beyond the catchment geography, e.g. ##, and also forms part of the ## Basin.

3. Vision

To make a healthy water environment a positive aspect of people's daily life.

[26] See https://catchmentbasedapproach.org/learn?s=terms+of+reference

4. Remit

4.1 The aim of the Catchment Partnership is to bring together relevant organisations to conserve and improve the health of the water environment of the ## catchment.

4.2 The Catchment Partnership will provide a forum for discussion of issues and coordination of activity, contributing to the development of a Catchment Partnership monitoring and evaluation process.

4.3 The Catchment Partnership works at the catchment level with key stakeholder organisations to agree the strategic priorities for the catchment and support delivery.

4.4 The Catchment Partnership will support the Environment Agency in developing an appropriate River Basin Management Plan, required under the Water Framework Directive.

4.5 The Catchment Partnership maintains the primary right to recommend and support actions within the ## catchment as per the ## Catchment Partnership strategic priorities.

4.6 The Catchment Partnership will support adjacent catchment partnerships through the sharing of information and activity prioritisation wherever possible.

5. Status

5.1 The Catchment Partnership is a voluntary, non-statutory body which is mandated by the Environment Agency [Mandate: A contract by which one party agrees to perform services for another without payment].

5.2 The Catchment Partnership is unincorporated and not a legal entity.

5.3 The Catchment Partnership does not hold or expend funds itself. Projects and activities recommended or supported by the Catchment Partnership will be led by other organisations best placed to do so.

6. Membership

6.1 Membership of the partnership is conferred to an individual who represents an organisation (public, private, NGO, charity, local community group) which supports the aims of the Catchment Partnership and whose goals are synergistic with the remit set out for the Catchment Partnership.

6.2 Membership shall be conferred by simple majority vote of existing members.

6.3 The Catchment Partnership will review its membership at least every two years.

6.4 Members who are not active, that is, not participating in Catchment Partnership actions and management processes, will be placed on a ‘correspondence only’ list. Members placed on such a list will still be able to contribute to the Partnership, but will have no voting rights.

6.5 A member who does not participate (either by meeting attendance or contribution in any other way) to achieving the aims of the Catchment Partnership within a twelve month period, shall be deemed to have resigned from the partnership and be deleted from all communication media.

6.6 The Catchment Host Officer of the Catchment Partnership shall keep a list of members.

7. Risk

7.1 Liability risk arising from collaborative Catchment Partner activities rest with the relevant member organisation aka ‘partner’.

7.2 Liability risk arising from decisions made at ## Catchment Partnership meetings are shared among partners, unless risk is agreed to rest with a specific partner.

7.3 Personal liability risk may occur as a result of contractual obligations or through carrying out an activity that could create a legal liability in the name of the Catchment Partnership. To avoid such risk:

a) Communications issued in the name of the ## Catchment Partnership should include the following caveat:

Disclaimer

This publication may be of assistance to you, but the ## Catchment Partnership, its members and other contributors do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaim all liability from error, loss or other consequence that may arise from you relying on any information in this publication.

b) The use of the ## Catchment Partnership name or logo should not be used in isolation, but alongside the relevant members' information details and should include the following caveat:

Disclaimer

The ## Catchment Partnership is a voluntary group who work to conserve and improve the health of the water environment of the ## Catchment. Use of ## logo or name does not imply any endorsement by them.

8. Equality

The Association will not discriminate against any member of the Partnership on any grounds.

9. Governance

9.1 It is intended that the Catchment Partnership be given adequate structure without being burdened by formality.

9.2 Each organisation shall have one vote at meetings on matters requiring a vote and, except where otherwise provided in this terms of reference, any decision will be by way of simple majority of those organisations at said meeting. Such decisions made will be considered binding to all members.

9.3 Any person who is not a member of the Catchment Partnership, including representatives of other organisations, shall be entitled to attend and address a meeting by prior arrangement, unless there is an objection from an existing member, but such persons will have no voting rights.

9.4 Decisions are made jointly for any initiative requiring collaborative activity; joint working arrangements are left to the discretion of the collaborating members.

9.5 Issue based 'Task & Finish' advisory groups will be set up by agreement of the members to explore issues, identify solutions and make recommendations to the Catchment Partnership.

9.6 There will be at least four meetings of the Catchment Partnership a year. Meetings should address both governance and management issues and also provide an opportunity for updates on catchment health and environment.

9.7 A quorum of 6 organisations is required for any general meeting, including officers. 8 organisations should be present to make decisions on matters requiring a vote.

9.8 The meetings of the Catchment Partnership will be chaired by the Chair or Vice-Chair(s) of the Catchment Partnership except if they are unavailable, in which case the meeting shall be chaired by another officer.

9.9 The Catchment Host Officer will maintain a record of matters discussed at meetings and any decisions made.

9.10 The Catchment Host Officer will endeavor to give 28 days' notice in writing to all members for meetings, excluding extraordinary meeting requirements.

9.11 The Catchment Partnership shall review its membership, terms of reference, appointment of officers at least on an annual basis.

10. Catchment Partnership Management

10.1 The officers of the Catchment Partnership shall consist of a chair, vice chair(s), secretary and statutory body representative.

10.2 The secretarial role will be fulfilled by the Catchment Host Officer; the statutory body role will be fulfilled by the Environment Agency Catchment Co-ordinator.

10.3 Election of Chair and Vice-chair(s) is to be by way of simple majority vote by organisation. If either officer resigns, retires or is no longer able to continue in office for any reason, then, at the request of the officers at a meeting, the members can appoint a member (including one of the current officers) to act on a temporary basis.

10.4 All Catchment Partners are expected to comply with the Roles and Responsibilities as outlined in separate documentation held by the Catchment Host.

10.5 The selection of Vice-chairs(s) shall enable the partnership to access specific skills, so providing operational support to both the Chair and/or Catchment Host.

11. Catchment Partnership Functional Requirements

11.1 All catchment partners are to contribute to the identification of activities required to enable the partnership to function, excluding those activities which fall wholly within the remit of member organisations. Such activities are to be reviewed at least annually.

11.2 Manpower and other resource required to deliver such activities are to be identified and the Catchment Partnership to consider and agree priorities.

11.3 Functional activities are listed in separate documentation held by the Catchment Host

12. Devolved Authority

The Catchment Host can represent the Catchment Partnership with regard to

a) submission of inputs to statutory consultations,

b) representing ## Catchment Partnership at CaBA conferences,

c) meeting with other organisations which share interests with the ## Catchment Partnership, such as LNPs etc.

Signed: Organisation:

Annex D: Useful links to information on river development planning

International:

- **IMPEL project:** https://www.impel.eu/projects/river-development-planning/

- **UNESCO guidance on "River restoration" (with WWF and GIWP)**: http://unesdoc.unesco.org/images/0024/002456/245644e.pdf

- **European Centre for River Restoration:** http://www.ecrr.org/

- **European Commission information on the status of river basin management planning in the EU:** http://ec.europa.eu/environment/water/participation/map_mc/map.htm

- **"Reform River" project:** http://wiki.reformrivers.eu/index.php/Related_Sites

- **"BeWater" project:** http://www.bewaterproject.eu/images/results/Handbook/BeWater-handbook-final_web.pdf

National:

- **Denmark:**

  http://ec.europa.eu/environment/water/participation/map_mc/countries/denmark_en.htm

  Pilot project Odense: http://discomap.eea.europa.eu/map/Data/Milieu/OUR-COAST_160_DK/OURCOAST_160_DK_Case_RiverBasinManagementPlanningOdense.pdf

- **Germany:**

  http://ec.europa.eu/environment/water/participation/map_mc/countries/germany_en.htm

  River restoration in Germany: https://www.bmu.de/en/publication/den-fluessen-mehr-raum-geben-renaturierung-von-auen-in-deutschland/

  River development planning ("Gewässerentwicklungskonzepte") in Bavaria: https://www.lfu.bayern.de/wasser/gewaesserentwicklung/gewaesserentwicklungskonzepte/index.htm"

  NiddaMan" project: http://www.niddaman.de/

- **Poland:**

  http://ec.europa.eu/environment/water/participation/map_mc/countries/poland_en.htm

  Chief Inspectorate of the Environment: http://www.gios.gov.pl/en/

- **Romania:**

  http://ec.europa.eu/environment/water/participation/map_mc/countries/romania_en.htm

  River basin management plans (in Romanian): http://www.rowater.ro/SCAR/Planul%20de%20management.aspx

Short description in English: http://www.rowater.ro/sites/en/default.aspx

Danube management plan: https://www.icpdr.org/main/activities-projects/river-basin-management-plan-update-2015

Nitrate control project: http://www.inpcp.ro/en/home/

- Slovenia:

http://ec.europa.eu/environment/water/participation/map_mc/countries/slovenia_en.htm

- UK:

http://ec.europa.eu/environment/water/participation/map_mc/countries/united_kingdom_en.htm

Catchment Based Approach: https://catchmentbasedapproach.org/