

New Ways to Water Protection

From monitoring to development strategy – Twelve positions from the BMBF funding measure ReWaM for a more efficient water management



WATER PROTECTION – A SHARED RESPONSIBILITY. Water bodies fulfil roles which are vital for humankind. They are a drinking water resource and transport route, are used for water disposal or as recreational areas. However, only intact water bodies can guarantee all these services for society over the long term. That is why water protection is an ongoing remit of national and European policy makers. Tools such as the EU Water Framework Directive (WFD) and other water-related directives, as well as associated action programmes are continually being refined and substantiated by current research results. In this field of tension between water use and water protection, the 15 projects of the funding measure 'Regional Water Resources Management for Sustainable Protection of Waters in Germany' (ReWaM) have been conducting research since 2015.

The key insights are summarised in twelve positions for policy makers and water managers. The goal is to promote widespread use of the results obtained in the respective pilot regions and of the recommendations for more efficient water management derived from them. These insights are especially significant in view of the Europe-wide review process of the WFD which is currently being implemented.

Twelve positions for policy and practice

Action strategies

1. WATER – A SHARED RESPONSIBILITY. The obligation to educate and involve the public in management planning can be fulfilled in various ways. An information and communication management system tested by ReWaM supports transparent procedures and heightens the appreciation for water bodies. A software created for water body development and maintenance enables plans for measures to be easily updated with the involvement of all stakeholders. This approach ensures that information is topical and accessible, and it customises the data for the bodies responsible for maintenance charges, specialised authorities, and citizens. Over the long term, however, more far-reaching approaches must be pursued to protect water bodies, so that the imparted issue awareness is also reflected in (consumer) behaviour. A first step could be a nationwide obligation to notify the authorities when using pesticides, in order to assess risks and minimise avoidable entries.

2. WATER NEEDS SPACE. The availability of land limits a natural development of water bodies in many areas. ReWaM has also highlighted that lacking or contradictory land consolidation regulations substantially delay or prevent renaturation and flood protection measures, even when financial assistance is available. In some cases, however, subsidies were used as a temporary solution to compensate landowners for the loss of income until the land was permanently secured. But to realise successful water body development and flood risk reduction, the provision of land across all jurisdictions needs to be improved and harmonised. This could be achieved by designating priority areas for water development using regional planning procedures and pre-purchase rights.

3. UNITED FOR WATER. Measures taken at water bodies often fall into different jurisdictions. But interdisciplinary collaboration in particular has an intrinsic added value which is substantial. This became evident in ReWaM in a project focussing on an urban area as well as a project dealing with catchment-wide substance transport, including coastal water and ocean. The consolidation and provision of data and models supports the development of the joint process- and problem understanding of all the stakeholders. In ReWaM, for example, joint use of a standardised (geo) data management system has been successfully established as the basis for interdisciplinary concepts in urban planning.

4. START AT THE SOURCE. Trace substances such as pharmaceuticals, pesticides, and biocides are increasingly being detected in the entire water cycle. However, the impact of these substances on aquatic ecosystems is only poorly understood. ReWaM has shown that selected pesticides form transformation products which can be as toxic as the parent compound but are less biodegradable and more mobile in the environment. Downstream measures in the water body, such as dry detention ponds and wetlands, can only retain a limited

amount of substances. A more effective approach is to start directly at the source and minimise the use of pharmaceuticals and pesticides. It will be important to monitor and adapt the type and place of use, while taking into account their environmental relevance.

Planning instruments and management strategies

5. ECOLOGICAL ENHANCEMENT OF FLOOD RETENTION AREAS. Areas for retaining floodwater around cities are scarce. The concept developed in ReWaM for the automated control of flood retention basins combines the aspect of flood protection with an environmental benefit for the retention areas. However, bench scale tests were unable to substantiate this synergy effect for flood channels or artificial tributaries. It also became evident that wetlands in flood retention basins play a valuable role in retaining harmful trace substances. In addition, flood protection measures in combination with ecological enhancement are becoming more widely accepted.

6. NEAR-NATURAL RAIN WATER MANAGEMENT. Housing developments have a negative impact on the water balance and runoff behaviour of water bodies. A natural water balance is, however, a WFD goal which urban water management is aiming to achieve. In ReWaM, simulation models for decentralised rainwater management were improved. Methods were created for calculating evaporation and the water balance in residential areas. Rainwater infiltration systems which have long been in operation proved to be hydraulically robust and efficient. But precipitation runoff from settlements may contain substances hazardous to water, e. g. biocides from facade coatings, which can lead to the pollution of surface waters or the groundwater. Even infiltration systems are not able to reliably retain these substances. Regulations on the use of substances contained in building materials which are hazardous to water, more eco-friendly construction methods or the appropriate pre-treatment of contaminated rainwater runoff are measures which are necessary to protect water bodies.

7. PUT WATER FIRST. Renaturation measures often do not achieve the desired success in terms of a good ecological status according to the WFD. This can also be attributed to anthropogenic substance discharges, e.g. from sewage treatment plants and sewer overflows. Within ReWaM it was verified that the elimination of residually polluted wastewater associated with the closure of a wastewater treatment plant very quickly led to an improvement of the water status in a small stream. By looking at the whole water system – including the headwaters, estuaries, and coastal waters – relevant stressors could be factored in at an early stage. Here, impact-based methods, which can also evaluate the effects of measures in a timely manner, will help monitor pollution in the future. As stipulated by the WFD, reducing substance inputs even further is vital for the positive development of aquatic ecosystems. This includes abatement at the source or more advanced wastewater treatment if necessary.

8. RECOGNISING AND MANAGING RISKS. Health-endangering pollutants in water bodies pose problems both for the drinking water supply and for the recreational use of water bodies. The sources of pollution often cannot be removed, so we need to establish a responsible way of handling the risks. For example, in ReWaM a concept for monitoring the mass development of cyanobacteria has been further developed. Substance transport models for predicting compromised water quality when extracting drinking water from lakes have proven effective, as have models for assessing microbiological pollution in bathing waters. With the help of these methods, management strategies can be modified for civil protection and risk management systems can be established.

Data collection, digitisation, and status assessment

9. EXPLORING WATER. Water bodies are often only mapped locally (above and below the water level) and within the context of existing activities. Boat-based monitoring systems developed in ReWaM offer the opportunity of recording the river's surroundings, the riverbed topography, and other variables continually and in high resolution. Among other things, continuous terrain models for watercourses and lakes are created, which enable selected sections of a water body to be printed (3D model) as well as virtual reality to be used. These approaches can underpin planning, decision-making and communication processes, e. g. through a before-after comparison.

10. CLOSING DATA GAPS. Water body monitoring which is as comprehensive as possible and includes the entire catchment is time-consuming and costly. Improved strategies and mobile monitoring techniques offer opportunities for consolidating

measurements, as do automations in the field of metre network administration and data management. Based on (remote) data transmission, subsequent steps, i.e. reviewing, correcting, and evaluating the data, can be automated to save monitoring time and costs. This also enables rapid access to results and direct integration into models.

11. EVALUATING WATER. Standardised methods for evaluating the ecological status of small urban water bodies and groundwater have not existed up till now. A method developed in ReWaM determines the ecological potential of small urban water bodies using bioindicators. It enables valuable habitats in small, multi-functional water bodies to be mapped and better be factored into urban planning. A groundwater guideline was developed in a similar manner. Its recommendations extend from integrative sampling to microbiological and faunistic monitoring criteria. The additional inclusion and monitoring of the ecological viability of groundwater ecosystems, such as the natural purification capacity, help ensure the quality of the groundwater.

12. HIGHLIGHT THE BENEFITS OF WATER. Water bodies fulfil a variety of functions for society. This often leads to competing usage claims. Water managers often formulate the need for a transparent method which factors the functions of water bodies into management planning. An ecosystem performance index developed in ReWaM and tested in five catchment areas enables the consistent, data-based assessment of different measures. With the ongoing evaluation of water bodies, the manifold usage claims can be taken into consideration during the planning process through this approach, and decisions can be made plausible.

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EU Water Framework Directive - improving the knowledge base, maintaining high standards

The EU Water Framework Directive (WFD) is an effective tool for water protection. But many processes which impact the status of a specific water body are still insufficiently understood. These knowledge gaps must be closed further. Using new technologies and strategies, the relationships can be analysed more accurately. Many of the results generated in ReWaM are valuable steps in this direction.

In the projects of the funding measure it has become clear that sustainable water protection is more than just a water management task. In fact, further social and political stakeholders, such as the agricultural and industrial sector, cities and municipalities, but also tourism and nature conservation need to support

this goal. To successfully implement the WFD it is vital to continue promoting interdisciplinary collaboration. In this context, tools which foster collaborative action and transparent planning processes are especially useful for water management.

The ReWaM results show that it is not expedient to respond to the currently low level of fulfilment of the WFD requirements by setting less stringent goals. Extending the deadline beyond 2027 seems advisable due to the insufficiently understood interdependencies and lengthy revitalisation processes of water bodies. Harmonising the WFD with other water-related directives by aligning deadlines and adapting content offers the opportunity to enhance its benefit and manageability.

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For more information: www.bmbf.nawam-rewam.de/en

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