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Fallstudien zu erheblich veränderten Gewässern in Deutschland - Case Studies on Heavily Modified Waters in Germany

von

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Zusammenfassung/Summary

Zusammenfassung

In einem zweijährigen Forschungsvorhaben wurde die von der EG-Wasserrahmenrichtlinie (2000/60/EG) (WRRL) unter bestimmten Bedingungen vorgesehene Ausweisung von „erheblich veränderten Gewässern“ anhand exemplarischer Fallstudien in vier Flussgebieten Deutschlands (Elbe, Lahn, Seefelder Aach und Dhünn) erprobt und Beiträge zur Konkretisierung der Bestimmungen der WRRL erarbeitet.

Diese Studien dienten dazu, die CIS-Arbeitsgruppe 2.2 „Erheblich veränderte Wasserkörper“ bei der Erstellung der EG-Leitlinie zur Identifizierung und Ausweisung von erheblich veränderten und künstlichen Wasserkörpern aktiv zu unterstützen, was unter anderem durch die Mitarbeit in den internationalen Unterarbeitsgruppen „Schifffahrt“ und „Wasserkraftnutzung“ sowie die Teilnahme an Workshops geschah.

Schwerpunkte der Studie waren die Entwicklung und Erprobung von Kriterien für die Ermittlung signifikanter nutzungsbedingter Eingriffe in die Hydromorphologie, die Entwicklung von Maßnahmenszenarien zum Erreichen des guten ökologischen Zustandes und deren Bewertung in einer ökonomischen Analyse sowie die Ermittlung des Zielzustandes erheblich veränderter Wasserkörper unter Festlegung von Kriterien für deren ökologischen Zustand und deren ökologisches Potenzial.

Weitere Ergebnisse beziehen sich auf die Wahl optimierter Betrachtungsmaßstäbe, die Erprobung von Kriterien und Verfahren für die Bewertung des ökologischen Zustandes bzw. Potenzials und die Verknüpfung der Leitlinien der CIS-Arbeitsgruppen IMPRESS und HMWB.

Summary

The implementation of the Water Framework Directive (WFD) requires for all surface waters the achievement of "good ecological and chemical status" by 2015. Some water bodies may not achieve these objectives according to irreversible alterations of hydro-morphological characteristics. Under certain conditions the WFD permits Member States to identify and designate artificial water bodies (AWB) and heavily modified water bodies (HMWB) according to Article 4(3). Methodology and criteria for the identification as HMWB were defined in the process of developing the Common Implementation Strategy (CIS) and a phased procedure separating eleven steps was recommended (Fig. 1).

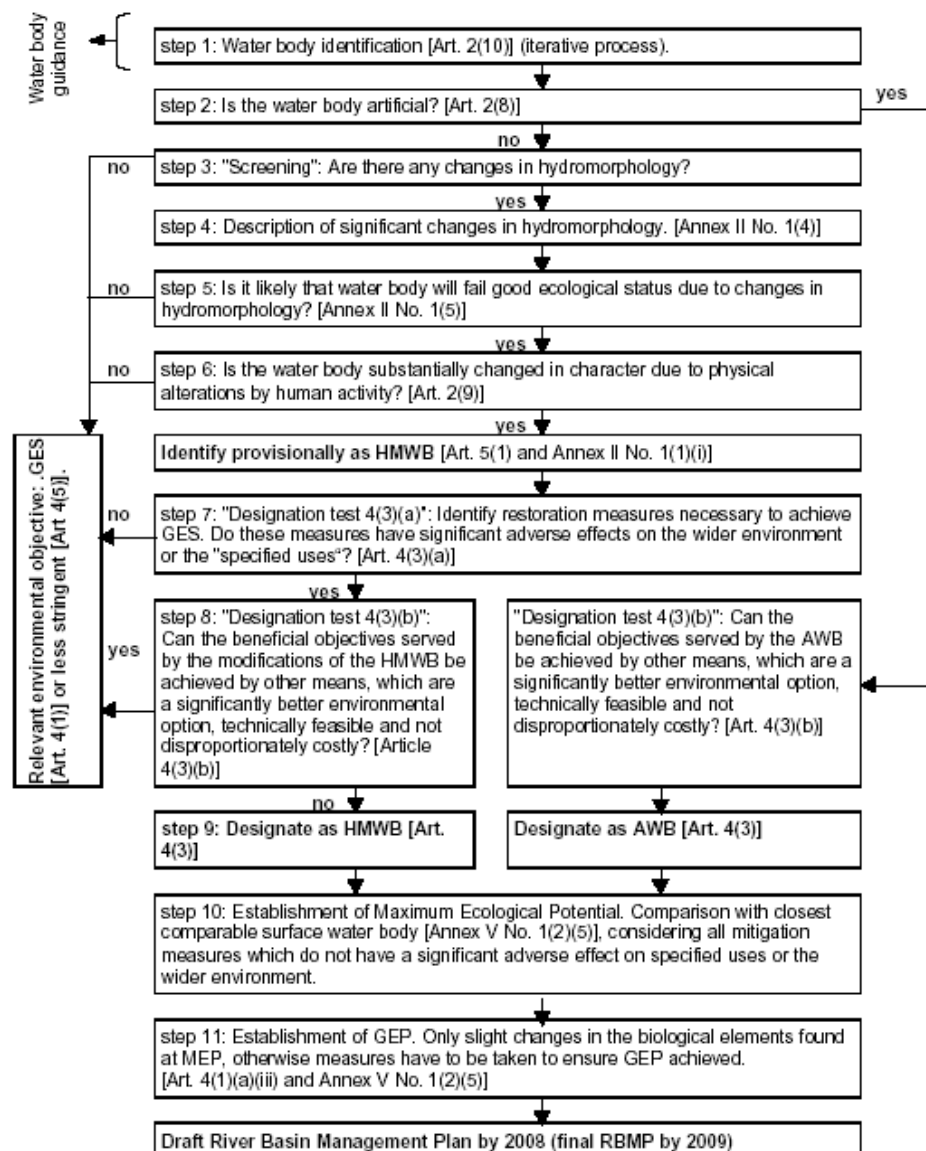
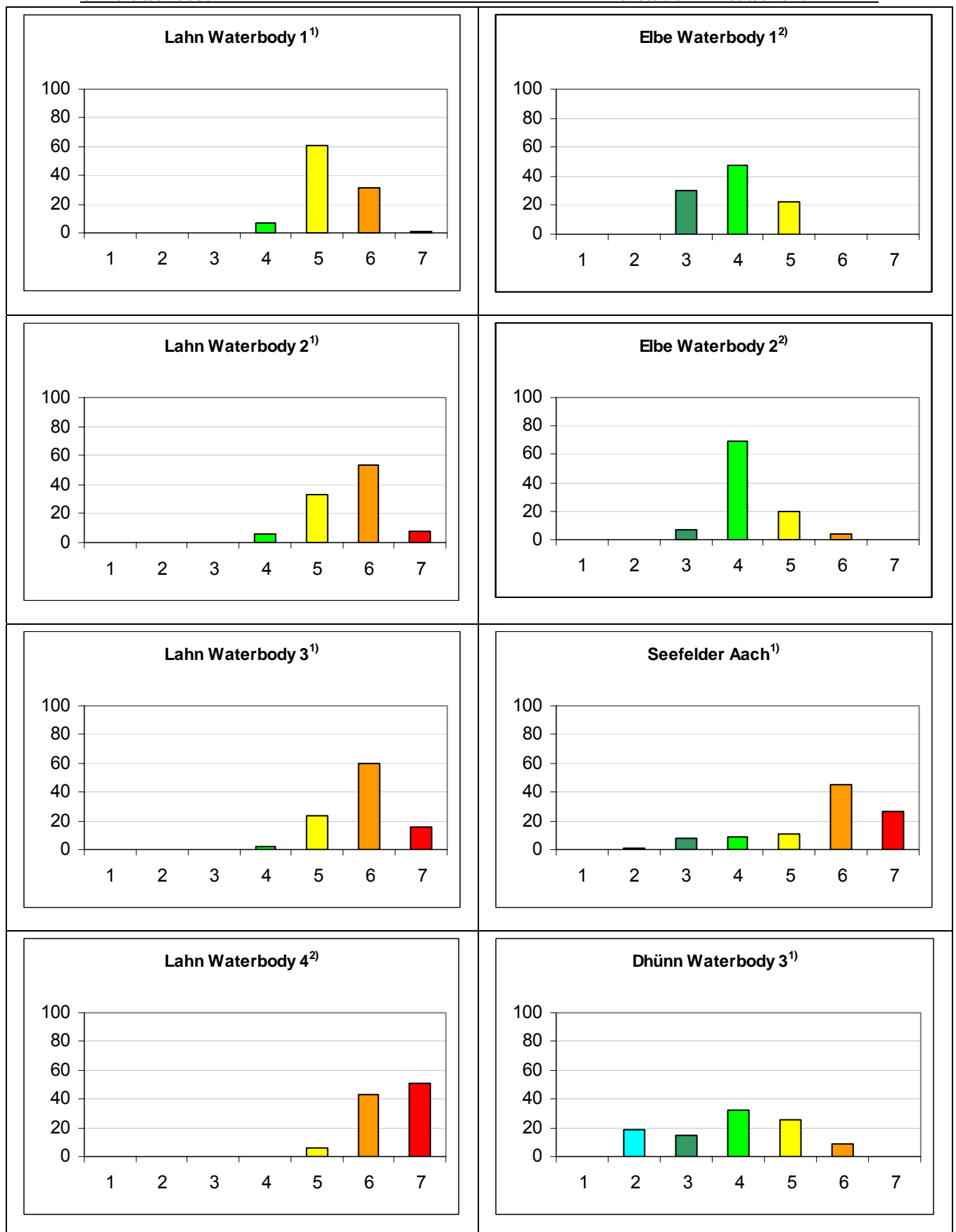


Fig. 1: CIS- strategy and steps of the HMWB and AWB designation

A purpose of this study was to actively support the CIS working group “Heavily Modified Water Bodies” in the preparation of the European guidance document concerning the identification and designation of heavily and artificial water bodies. A further topic has been the cooperation in the international subgroups “Navigation” and “Hydro Power Generation” and the participation at a series of workshops. Efforts focused on the development and testing of criteria used for the identification of significant physical alterations, the development of scenarios of measures to reach the good ecological status and their evaluation within an economic analysis. Furthermore, the identification of target states by establishing specific criteria for heavily modified water bodies with special emphasis on maximum and good ecological potential has been elaborated. Additional results refer to the selection of meaningful scales, testing of criteria and processes to evaluate ecological status or potential and linking the guidance documents produced by the CIS working groups IMPRESS and HMWB.

This designation procedure has been examined for exemplary case studies in selected river basin districts across Germany. These were the Rivers Elbe, Lahn, Seefelder Aach and Dhünn elaborated in a 2-years project funded by the Federal Environmental Agency (Umweltbundesamt) and the Rivers Mulde and Ruhr from a research project funded by the Federal Ministry of Education and Research (Bundesministerium für Bildung und Forschung). These case studies reflect a wide range of catchment sizes, river and stream types and different gradients of anthropogenic pressures and impacts. In particular, the hydromorphological status varied significantly between water bodies within and between case studies (Fig. 2). In general, it can be seen that the hydromorphological status of all case studies is characterized by a wide variety of quality classes given the hydromorphological mapping on small scales (100m – 1km in length). River sections with good hydromorphological quality were almost missing, while poor and bad conditions were dominating. Therefore, the significant change of hydromorphological properties had to be determined for all case studies. From the variety conditions and their biological relevance it could be concluded that potentially HMWB may not be designated on the scale of single hydromorphological units rather than for larger scales and significant water bodies. In particular, these were chosen on scales between 8 km for the smallest water body and 485 km for the largest, according to the typology and significant pressures and impacts upon hydromorphology.

The risk assessment for failing the “good status” was related to existing biological data and encompassed the macroinvertebrates and fish communities as relevant indicators. In particular, functional properties indicated for feeding types, rheotypes, reproduction and migration were included in the analyses. In general, the biological data did not



¹⁾ detailed method (for little and medium sized waters), ²⁾ overview method

Fig. 2: Hydromorphological quality for selected HMWB case studies. Bars show the percentage frequency distribution of river sections across seven quality classes and related to water bodies.

reflect the morphological degradation in a linear way and showed comparable high levels of ecological functionality even under degraded hydromorphological conditions.

Therefore, the biological relevance of morphological degradations has to be evaluated carefully. The ecological relevance of particular pressures has been studied in further detail. These were the impact of inland navigation, hydropower generation and the impact of impoundments and reservoirs on downstream river sections.

The ecological impact of inland navigation and hydropower generation on rivers has been investigated for two case studies (Rivers Elbe and Lahn). Both rivers have been subject to long term changes of hydromorphological properties in order to ensure a wide range of anthropogenic uses including inland navigation and hydropower generation. However, the current situation of both rivers appears to be significantly different. The River Elbe lost the majority of riparian ecosystems, but impoundments are restricted to upstream sections and one downstream barrier separating the river from a transition zone with tidal flow variations and the estuary with salinity gradients. Channel corrections and in-stream maintenance for navigation have been only moderate when compared to the other rivers under consideration. Currently, the River Elbe is recovering from excessive pollution prevailing over the last decades. In contrast, the River Lahn can be characterised as being a gradient from free flowing sections upstream towards a sequence of impoundments with significant hydro-morphological changes and large scale flow regulations downstream. These include channelisation and impoundment with intense in-stream measures aiming for depth enhancement and channel maintenance. However, with the exception of the downstream water body of the River Lahn there was no evidence for the designation of heavily modified bodies for these two rivers.

In contrast, the River Ruhr has been identified as HMWB according to numerous and large scale impoundments. The closest natural type for characterising the ecological potential was identified to be a eutrophic lowland lake while for the River Lahn there was no shift of water body categories.

The relevance of reservoirs on ecological conditions of downstream rivers has been studied for the River Dhünn which is separated by a large reservoir in its middle section. There has been a surprisingly low impact of this reservoir on downstream ecological conditions both hydromorphologically and biologically with no evidence of designation as HMWB.

Given these results, the designation of HMWB appears to be dependent on individual

catchment characteristics including their historical dimension. There have been no general cut-off criteria for the designation procedure rather than individual positive and negative lists concerning pressures and impacts which have to be interpreted in an objective way according to the provisions of the WFD and the CIS- guidance documents.

Finally, the River Elbe has been subject of an economical analysis investigating the relationships between navigation, alternative uses and their ecological implications within the framework of WFD and the HMWB designation process. This analysis provided relevant information and a methodological approach for the assessment of costs, alternative options and cost benefit analyses considering positive and negative environmental effects.