Ecosystem-based Adaptation Measure and Activity Catalog – Water bodies

Water bodies are embedded in other ecosystems and are thus, in a sense, part of them. Many measures aimed at the functional efficiency of the still and flowing waters must be implemented on the surrounding land or have a significant influence on it. Climate change-related variability in precipitation and the increase of extreme events can lead to longer periods of droughts and floods. The rehabilitation and restoration of rivers, floodplains, and lakes help mitigate erosion, reduce flooding, revitalize local habitats, and reduce local water pollution, retaining and slowly releasing water while groundwater recharge is facilitated and water quality improved. Naturally developing water bodies, riparian zones, and floodplains help create natural land features that act as storm buffers, thus protecting people and property from flood damages. This contributes to improving the hydrological regime and coping with climate change effects. The presented measures and activities also support seasonal aquatic habitats, the creation of corridors of native riparian forests, and the development of shaded riverine and terrestrial habitats.

Relevant measures that primarily contribute to water retention, reduction of surface runoff, and cooling of water bodies are often beyond the design of the water bodies themselves and target vegetated riparian fringes, a wider riverbed, and the creation of retention areas elsewhere. Water bodies also benefit from adaptations in the use of other ecosystems, especially forest and open land.

EbA Measures and Activities in Water Ecosystems
1 Conservation of existing, functional ecological structures and (self-) regulating capacity
1.1 Conservation and protection of existing bodies of water
1.1.1 Abstain from and prohibit changes of the natural form and flow of rivers and lakes (e.g. digging channels or straightening rivers for transport or other uses)
1.1.2 Place springs and spring areas under protection (also refers to 4.1, 4.2)
1.1.3 Minimize and restrict the construction of infrastructure in riparian areas and on the floodplain
1.1.4 Protection of water from pollution (prevent and sanction disposal of waste and industrial disposals;
1.1.5 Separate and avoid combined stormwater and sewage systems (to prevent overspill and contamination)
1.1.6 Minimize and restrict adding significant amounts of impermeable surfaces (e.g. asphalt, concrete, and steel)
1.2 Conservation of (near-) natural water- and green structures
1.2.1 Protection and promotion of native flora and fauna in riparian and floodplain areas
1.2.2 Conservation and control of beaver populations to support ecosystems of small rivers
1.2.3 Prevention of introduction of invasive fish species
1.2.4 Phytomelioration in water catchments - cultivation or maintenance of natural vegetative communities
1.3 Securing and maintenance of existing riparian strips/buffer zones
1.3.1 Conservation of water-protecting vegetation
1.3.2 Prohibition and control of continuous logging (clear cuts) in riparian zones and on banks
1.3.3 Prohibition and control of land plowing in water buffer zones (riverbanks, lakesides, etc.)
1.3.4 Maintenance action only to secure and promote natural development (native species, structures, processes)
1.4 Conservation of natural retention areas
1.4.1 Protection of floodplain grasslands by regular control and punishment of infringement to environmental law
1.4.2 Preventing a change in use purpose of grasslands and pastures in floodplains (prohibit plowing, construction, overgrazing)
1.4.3 Declare and enforce riparian forests as protection zones in floodplains and flood zones
1.4.4 Establish protected emergency retention areas that are located along major rivers and lakes to receive large quantities of water in extreme conditions
1.4.5 Use already existing canal systems to retain water in events of heavy precipitation and flooding and redistribution – do not build new, artificial canals
2 Reduction of direct anthropogenic ecological stress drivers limiting (self-) regulating capacity
2.1 Dismantling or modification of longitudinal shoring (at watercourses and waterbodies)
2.1.1 Deconstruction of channelizing building structures (e.g. hard shorelines) that prevent natural flow and meandering
2.1.2 Elimination of riverbank protection (e.g. removal of rock lining)
2.1.3 Deconstruction of structures along shorelines of lakes impeding natural development of riparian zones and disturbing water-protective buffer areas
2.1.4 Deconstruction of levees and embankments
2.2 Dismantling or modification of transverse structures and other water engineering structures
2.2.1 Removal of weirs, dams, barriers, and other structures that interfere with the natural flow of water
2.2.2 Removal of bridges and roads crossing and altering river flow or lake form
2.2.3 Dike relocation (setting back embankments), removal or lowering of dikes
2.2.4 In the given case, the use of water retaining structures to raise water levels in highly hydrologically altered landscapes as an interim solution
2.2.5 Deconstruction of existing artificial drainage and hydrological structures
2.2.6 Re-planning of existing drainage systems, not for water drainage, but its retention

2.2.7 Dismantling of water pipelines that take water from natural water bodies
2.3 Unsealing and dismantling of building structures in the riparian strips/buffer zones/floodplains
2.3.1 If necessary, expropriation, demolition, and re-building elsewhere of infrastructure and economic activities
2.4 Reduction of biomass extraction
2.4.1 Reduction of sediment dredging (sapropel etc.)
2.4.2 Control and punish overfishing
2.4.3 Reduce removal of woody biomass in riparian and floodplain zones
2.5 Reduction of use intensity
2.5.1 Provide legislation to fix the responsibility of economic structures for the maintenance of the water protection zone, when obtaining the right to use floodplain lands
2.5.2 Control and reduce farm runoff containing fertilizers, herbicides, and pesticides contaminating water with toxins and excess nutrients, causing algal blooms and dead zones
2.5.3 Detection and termination of plowing and overgrazing in river floodplains
2.5.4 Remove wet and damp bank locations from grazing through targeted Pasture management, while maintaining a buffer area at least 10 m wide
2.5.5 Keeping cattle away from humid and wet vegetation worthy of protection
2.5.6 Prohibition of summer cattle camps
2.5.7 Increase responsibility for washing vehicles
Target: Decrease damaging and harmful waste
2.5.8 Liquidation of existing, informal landfills (waste dumping sites)
2.5.9 Increase responsibility for the establishment of official waste dumping sites
2.5.10 Control of discharges, wastes, and pollution
Target: Impacts by tourism and recreational activities
2.5.11 Arrangement of focus areas and places for swimming and access to riverbanks and lakesides - maintaining free but controlled access also for bathers
2.5.12 Control of recreational activities
2.5.13 Avoid active promotion of bathing to reduce damage to riparian vegetation and shore areas
3 Restoration and targeted development of (self-) regulating capacity
3.1 Restoration, renaturation, and (near-) natural development of watercourses and waterbodies
3.1.1 Prefer passive river restoration, i.e. abandoning river maintenance – this may lead to, comparable positive environmental effects (less expensive, easier to apply to longer stretches of the river) on the catchment area as expensive active restoration techniques
3.1.2 Restoration of natural meanders and creation of new meandering course: Formation of a natural riverbed by liquidation of the main channel existing today and, if necessary, promote the development of meanders
3.1.3 Improve bank stabilization by use of natural elements like plants, tree stumps, coir fiber logs, and even stone and similar paving materials
3.1.4 Reconnecting of cut-off meanders
3.1.5 Reconnection of oxbow lakes - removing terrestrial lands between both water bodies and cleaning the river section of the present oxbow lakes
3.1.6 Riverbed restoration/renaturation - removing concrete or obsolete constructions in the riverbed and on riverbanks and replacing them with vegetation and natural substrate (see 2.1, 2.2, 3.1, 3.2)
3.1.7 Restoration of the natural morphology of river streams and valleys (see 2.1, 2.2, 2.3)
3.1.8 Raising the water level by constructing flooding gates on the canals connecting the lakes
3.1.9 Reintroduction and diversification of native species of plants and animals
3.1.10 (Re-)Populating of water bodies with diverse, native fish species only with the strict adherence of the present legislation and after the scientific substantiation

3.1.11 Cleaning riverbeds, ponds, canals, lakes, springs from unwanted species and pollution
3.1.12 Cleaning of riverbeds (from domestic sewage and garbage)
3.1.13 Aeration: Saturation of water with oxygen in the winter by cutting holes in the ice and installing sheaves (bunches) of reeds
3.2 Creation, development, and maintenance of riparian strips with complex, near-natural vegetation structure
3.2.1 Give space and time to natural or supported (actively replant) forested riparian buffers with native and diverse species composition
3.2.2 Add to the existing riparian zone with native vegetation and trees
3.2.3 Creation of native-species, diverse forests (e.g. willow, poplar, alder, ash) in riparian and buffer zones
3.2.4 Give space and time to the natural development or actively create buffer strips and hedges along rivers and lakes
3.2.5 Maintenance or re-establishment of natural vegetation cover (grass, bushes, or trees)
3.2.6 Reforestation of banks along open water bodies (for lowering evaporation)
3.2.7 Afforestation of all non-cultivated lands in river basins, by the natural or artificial way, and their inclusion to the protected areas
3.3 Creation of retention areas and natural intermediate water storage (e.g. small bodies of water)
3.3.1 Create near-natural water reservoirs in high-risk areas to capture excess rainfall water or flood water (use appropriate materials for construction, natural and native species composition)
3.3.2 Create near-natural dry and wet detention basins for the temporary or permanent retention of floodwaters during rain or flood events
3.3.3 Creation and maintenance of ponds in schoolyards with thematic integration into curricula
3.4 Enabling and support of near-natural structural elements
3.4.1 Support structurally rich meadows and pastures alongside flowing and still waters
3.4.2 Allow and support the accumulation of coarse woody debris in channels - Consists of installing logjams (woody debris) using local timber materials
3.4.3 Recover the nature-like structure and composition of the bed load
3.4.4 Support equilibrium between coarse and fine sediment in restoration efforts

4 Development of enabling factors facilitating lines of action I-III
4.1 Development of the legal and policy framework and status of water ecosystems to more naturalness and wildness
4.1.1 Prohibition of logging and plowing on self-forested lands in riparian and floodplain areas
4.1.2 Adapt legislation to increase the minimum width of water- protection belts/strips and buffer areas
4.1.3 Increase the responsibility and state control for violating the regime of riparian protection zones
4.1.4 Regulate the extraction of sapropel and other sediments
4.1.5 Water use restriction act limiting certain uses of water (e.g. irrigation of lawns, car washing, filling swimming pools, or hosing down pavement areas)
4.1.6 Creation of a statute on near-natural rainwater management, in which the charges for private households are based on the degree of surface sealing
4.2 Institutional development (law enforcement, internal and external organizational management & administration, alliances, financing)
4.2.1 Apply ecosystem-based and integrated water management. Restoration measures compete with many other uses of the river-floodplain and lake-riparian systems, and a more holistic analysis could support the balancing of management priorities
4.2.2 Optimization of socio-economic targets in a combination of implementing specific restoration measures to improve the overall delivery of related ecosystem services
4.2.3 Make use of cross-compliance as a mechanism that links direct payments to farmers' compliance with basic environmental and water standards
4.2.4 Creation of a funding program to subsidize conservation measures of small water bodies for private households with earmarking (20-30 years)
4.2.5 Secure the enforcement of compliance with "water" law and regulations (staff, financing, equipment)
4.2.6 Inter-municipal cooperation in water body protection and restoration efforts
4.3 Area designation and planning (land acquisition, resource rights, water use zoning, site infrastructure, etc.)
4.3.1 Transfer of water bodies to municipal/communal owner
4.3.2 Consider property buyouts to reduce the impacts of flooding by removing vulnerable infrastructure and people from areas that are likely to flood (oblast, rayon, or communal funding sources)
4.3.3 Small catchment planning
4.3.4 Creation of water basin councils
4.3.5 Cooperation between local administrations, protected area administration, and land users
4.3.6 Initiate and conduct an active stakeholder process and dialog
4.3.7 Optimize (reduce) the area of arable land and forest lands (increase) in river basins
4.3.8 Develop management plans for flooding risks
4.3.9 Mapping of threats of flooding and inundation of territories
4.3.10 Extension/Enlarging of protected areas
4.3.11 Inclusion of riparian territories to the protected areas of rivers
4.3.12 Incentivize sustainable fishing quantities
4.4 Development of research and monitoring
4.4.1 Control and monitoring of climatic, hydro, and chemical state of water ecosystems (also refers to 4.4)
4.4.2 Waterbody cadaster and monitoring - mapping and recording of the condition and water retention potential
4.4.3 Establish a hydrometeorological post
4.4.4 Hydrochemical analysis of water (Measurement of the content of chemical elements and oxygen in water)
4.4.5 Control and monitoring of eutrophication processes
4.4.6 Regular monitoring of water levels

4.4.7 Identification of sources of surface water pollution
4.4.8 Organizing and conducting joint research and monitoring of rivers with international partners
4.5 Development and promotion of awareness, education, and training (formal education; capacity building)
4.5.1 Training farmers and other landowners on water-saving crops and methods, protection of riparian and buffer vegetation, and alternatives to chemical fertilizers and pesticides
4.5.2 Experience exchange, training (with international partners)
4.5.3 Coverage of water bodies issues in the media
4.5.4 Capacity building also necessary in the private construction sector
Target: Awareness raising
4.5.5 Involve the public in the problem of shallowing of rivers
4.5.6 Raise awareness among schoolchildren, local dwellers, and students about the importance to protect the climate-regulating role of rivers
Target: Environmental/Ecological education of locals (scientific and private)
4.5.7 Permanent formal and informal ecological education
4.5.8 Carrying out of ecological actions, lessons, seminars, round tables
4.5.9 Create and establish “informational corners” explaining the role of water bodies in climate change

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