

Freshwater ecosystems and its biodiversity provide services to billions of people. However, the current rate of wetland loss is three times that of forest loss, and populations of freshwater vertebrate species have declined at more than twice the rate of that of land or ocean vertebrates. Freshwater ecosystems are crucial for food security, drinking water supply, urban water management, agricultural water management and disaster risk reduction (DRR) and hence is a major contributor to achieving Agenda 2030 and especially goals 6, 14 and 15. Emerging threats to freshwater biodiversity have increased the last years but there are ways to reverse the rapid worldwide decline in freshwater biodiversity and the linked threats to poverty alleviation. To further strengthen and deepen Sida's work on freshwater biodiversity, issues to consider include: better governance of water and freshwater ecosystem services with a strengthened focus on environmental flows; nature-based solutions; informed investments in hydropower, climate change and resilience and improved water quality.

THE SITUATION

Rivers, lakes, streams and inland wetlands are home to an extraordinary diversity of life. Covering less than one percent of Earth's surface, these ecosystems host approximately 33 percent of vertebrate species and 10 percent of all other species¹ including an estimated 17 800 fish species². Water is a vital resource providing a range of ecosystem services. Well-functioning ecosystems – forests, grasslands, soils, rivers, lakes, streams, wetlands, aquifers, estuaries and coastal waters – provide additional services that influence the availability of water and its quality. These services are also vital in order to meet water management goals such as water storage and flow regulation, filtering and flood and drought protection, among others.

Freshwater ecosystems also provide services to billions of people, including impoverished and vulnerable communities³. However, the management of freshwater ecosystems worldwide has frequently prioritized a narrow range of services for macroeconomic benefits at the expense of healthy habitats, flora and fauna, and the diverse benefits they provide to communities. Consequently, the current rate of wetland loss is three times that of forest loss, and populations of freshwater vertebrate species have declined at more than twice the rate of that of land or ocean vertebrates⁴. Freshwater ecosystem services are renewable resources, if protected and sustained. The difficulty from a sustainability and poverty alleviation perspective is in ensuring

that water itself is where we need it, when we need it and of an acceptable quality. This requires efficient and equitable regimes for using the water that is available, in other words, good governance and management. Freshwater ecosystems are crucial for food security⁵, drinking water supply, urban water management, agricultural water management and disaster risk reduction (DRR)⁶ and hence is a major contributor to achieving the Agenda 2030 targets, especially SDG 6, 14 and 15 (Figure 1). At the same time, IPBES warns that depletion of biodiversity and ecosystems directly undermines the possibility to achieve 35 of the 44 SDG targets⁷.

In the *Swedish Policy for global development in the implementation of the 2030 Agenda*⁸ sustainable management and secure access to water and sanitation are prioritized areas and it is further highlighted that it is imperative to work integrated with climate change. Further, the policy, describes that water is a prerequisite for all life on earth and also for fair and sustainable global development and for achieving most of the goals set out in the 2030 Agenda. Also, knowledge needs to increase regarding integrated water resource management, as well as the understanding of the Source-to-Sea approach and the link between goals 6 and goal 14. Access to, and a fair sharing of, benefits and gains from biodiversity, as well as consideration for the knowledge, roles and rights of local and indigenous peoples, are a

1 Strayer 2010

2 Fricke et al. 2019

3 Lynch et al. 2016

4 Gardner and Finlayson 2018

5 Lymer 2020

6 CBD 2015

7 IPBES 2019

8 Swedish Government Communication 2017

key factor. As a starting point it is important to integrate biodiversity and ecosystem services in ongoing programmes and projects in development cooperation, for example through integration in development cooperation strategies at country- and regional levels.

THREATS – WATER IS A MIRROR OF THE LANDSCAPE

Emerging threats to freshwater biodiversity that have increased the last years (specific relevance to tropical ecosystems and emerging markets in bold) are⁹: (i) **changing climates**; (ii) introduction of invasive species; (iii) **infectious diseases**; (iv) **harmful algal blooms**; (v) **expanding hydropower**; (vi) emerging contaminants; (vii) engineered nanomaterials; (viii) micro plastic pollution; (ix) light and noise; (x) **freshwater salinisation**; (xi) **declining calcium**; and (xii) **cumulative stressors**. Natural habitats play a major role in sustaining water ecosystems and strengthening resilience to the above-mentioned threats and management choices about land-based resources have great impact on water and aquatic ecosystems. For example, deforestation in many areas of the world is still increasing, and habitats of all types, including grasslands, wetlands and river systems – which support the water cycle – continue to be fragmented and degraded. Unsustainable practices in agriculture, aquaculture and forestry, as they relate to water, still cause substantial environmental change, degradation and biodiversity loss. Wetlands continue to decline globally, both in area and in quality. Depending on the region, 30–90 percent of the world’s wetlands have already been destroyed or strongly modified in many countries¹⁰. Mostly due to drainage, conversion to farmland or other forms of development like urbanizations. Eutrophication due to insufficient sewage treatment and increased use of mineral fertilizers is projected to increase in many regions, and remains a significant threat to aquatic and terrestrial biodiversity. The extension of the impacts of pollution from untreated urban wastewater on freshwater ecoregions show that pollution threatens many essential ecosystems across a large area of the planet¹¹. Large areas of freshwater ecosystems overlap with sewage pollution and these ecosystems are often close to other key ecosystems including mangroves, oyster reefs, sea-grasses, and freshwater wetlands, and that sewage pollution is a highly dispersive stressor, it is likely that adjacent ecosystems also reach similarly high levels of contamination globally. Adding to this is an increase of other forms of pollution such as chemicals, pesticides and plastics¹².

Freshwater ecosystems are also highly threatened by dam construction – to provide hydropower, irrigation and sometimes flood control – that disrupt the

FIGURE 1: MOST RELEVANT SDGs AND TARGETS



SDG 6.3 – Improve water quality
SDG 6.4 – Sustainable water withdrawals (*environment flows*)
SDG 6.5 – Water management, IWRM and transboundary
SDG 6.6 – Protect and restore water related ecosystems



SDG 14.4 – End overfishing (*also inland waters*)



SDG 15.1 – Protect and restore inland freshwater ecosystems

connectivity of rivers and may impede fish movements to feeding and spawning grounds. The completion of near-future plans for almost 4 000 large hydropower dams will greatly increase habitat fragmentation in (sub) tropical river basins, where many livelihoods depend on inland fisheries¹³.

Finally, climate change is an increasingly important “stressor” to the health of freshwater ecosystems. Within the next few decades, climate change will have considerable ecological impacts on most of the freshwater ecosystems according to the IPCC¹⁴. Climate change is likely to be one of the main influencing factors on biodiversity in the future¹⁵ and the effect can be expected to be particularly large in combination with other impacts, such as habitat degradation, overexploitation and invasive species¹⁶. Adapting to climate change hence represents a major challenge for the management of watersheds and aquifers. The hydrological cycle is expected to accelerate and change as rising temperatures increase the rate of evaporation from land and sea. One of the most important and major impact to be caused by climate change will be on freshwater flow regime – i.e. flows will become more unpredictable due to sudden droughts or heavy rainfall – and thus access to water for local communities for irrigation and inland fisheries might be affected. Even in the absence of increased precipitation, the glacier fed rivers in tropical and temperate regions¹⁷ may experience increased flows due to glacial melting.

9 Reid et al 2019

10 Mamo et al. 2020

11 Wear et al 2021.

12 CBD 2015

13 Barbarossa et al. 2020

14 Jiménez Cisneros, B.E. et al. 2014

15 IPBES 2019

16 Brook m. fl. 2008

17 E.g. Ganges and the Mekong rivers

ADDRESSING THE CHALLENGES

Addressing the challenges to sustaining freshwater biodiversity, to reverse the rapid worldwide decline in freshwater biodiversity and the linked threats to poverty alleviation the following six elements are needed¹⁸: 1. Accelerate implementation of environmental flows¹⁹; 2. Improve water quality to sustain aquatic life; 3. Protect and restore critical habitats; 4. Manage exploitation of freshwater species and riverine aggregates; 5. Prevent and control non-native species invasions in freshwater habitats; 6. Safeguard and restore freshwater connectivity.

It is important to also address the complex relationship and linkages between different ecosystems, land, water, delta, estuary, coast, nearshore and ocean ecosystems, and apply a holistic management approach, e.g. Source-to-sea approach²⁰ and also address and increase awareness of competing interest for water use. Human activities can alter the key flows and cause impacts upstream and/or downstream of the activities that are altering the flows and can have social, economic and/or environmental consequences at local, regional or global scales.

When attempting to sustain freshwater biodiversity, while at the same time implementing poverty alleviation policies, one of the most contentious clash of objectives is found in the field related to the construction of water infrastructure – mostly dams – to provide energy security, food security and flood control. To safeguard that trade-offs are not “selling local communities short” governance systems such as Integrated Water Resource Management, IWRM²¹, must be robust and transparent with representation and inputs from all groups of people tentatively affected. Application of IWRM is a constructive way to address and balance the legitimate needs of various stakeholders on utilizing finite water resources. Where IWRM is not used in decision-making processes on freshwater management there is a risk that the aspects of less powerful stakeholders like local fishing communities are not adhered to and, implicitly, to the detriment of biodiversity.

STRENGTHEN AND DEEPEN SIDAS WORK ON FRESHWATER BIODIVERSITY

To address the threats to and challenges for sustaining freshwater biodiversity, issues to consider, that are also aligned with the Rio biodiversity marker (Box 1),

¹⁸ Tickner et al. 2020

¹⁹ An environmental flow is the water provided within a river to maintain ecosystems and their benefits where there are competing water uses and where flows are regulated e.g. by dam construction

²⁰ <https://www.siwi.org/wp-content/uploads/2019/07/Source-to-sea-guide-webb.pdf>

²¹ Sida partner Global Water Partnership Organisation's definition of IWRM is widely accepted and it states that: "IWRM is a process which promotes the co-ordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems." <https://www.gwp.org/en/GWP-CEE/about/why/what-is-iwrml/>

BOX 1. OECD DAC RIO MARKER ON BIODIVERSITY AND FRESHWATER ECOSYSTEMS

The marker explicitly mentions water and sanitation, agriculture, forestry and fisheries as sectors where typical activities take place that should be classified as biodiversity. This should be done through integration of biological diversity concerns into sectoral policy, planning and programmes. Examples include: 1) Water resources protection and rehabilitation; integrated watershed, catchment and river basin protection and management; 2) Sustainable agricultural and farming practices; 3) Promotion of sustainable marine, coastal and inland fishing;

include the following:

- 1. Improving governance** – Better governance of water ecosystems is a prerequisite to restore and sustain freshwater ecosystem services for the benefit of poverty alleviation and at the same time addressing the main threats to their biodiversity. Better governance also includes increased biodiversity focus, with a special focus on promoting environmental flows, in water management as an integral part of water use where the other two being industrial and domestic use.
- 2. Support investments in Nature-Based Solutions over “Grey” Infrastructure** – Sustainable land-use planning is crucial and Nature-Based Solutions (NBS) can promote poverty alleviation efforts in various sectors while minimizing negative impacts on ecosystems. The IUCN global standard on NBS should be applied, as it ensures that biodiversity and human well-being is taken into account.²²
- 3. Promote informed decision-making in energy investments** – An environmental sustainability informed decision-making process regarding investments in energy security to benefit poverty alleviation in order to avoid negative effects on freshwater biodiversity and thus local livelihoods while providing carbon-neutral electricity.
- 4. Highlight that healthy freshwater ecosystems benefit resilience to climate change impacts** – Healthy freshwater ecosystems – i.e. with sufficient environmental flows and sustained biodiversity both when it comes to flora and fauna – are an important asset for helping especially vulnerable and poor local communities adapt to the impacts of climate change
- 5. Strengthened efforts to improve water quality** – fresh and clean water is imperative for both ecosystems and successful poverty reduction and continued efforts to improve sewage and water treatment have additional benefits for human health. Addressing the impacts from agriculture and forestry sector as well as pharmaceutical sector on water quality is also imperative.

²² IUCN 2020

EXAMPLES ON HOW HEALTHY FRESHWATER ECOSYSTEMS CONTRIBUTES TO SIDAS FIVE PERSPECTIVES

Where freshwater ecosystems are healthy, inland fisheries are a significant contributor to **poverty alleviation** whether they are a primary livelihood, a secondary livelihood, or even as a subsistence source of nutrition. Healthy ecosystems are a fundamental prerequisite for making the realisation of the **human right** to water possible²³. Careful **gender** considerations in protection and sustainable management of ecosystems can strengthen equalities between men and women in the access to, and control over, resources. As freshwater biodiversity is a fundamental resource for livelihoods across many ecological and societal sectors and competition for water resources and food could give rise to conflicts – between and within sectors and between nations, there are opportunities to contribute to **conflict** prevention. Strengthen protection, restoration and sustainable management and use of freshwater ecosystems and biodiversity is an integral part of an **environmental and climate** perspective.

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²³ On 28 July 2010, through Resolution 64/292, the United Nations General Assembly explicitly recognized the human right to water and sanitation and acknowledged that clean drinking water and sanitation are essential to the realisation of all human rights. https://www.un.org/waterforlifedecade/human_right_to_water.shtml