Protecting Biodiversity From Harmful Financing:

No Go Areas For The International Banking Sector

Briefing Paper 05

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RIVERS WITHOUT BOUNDARIES

Friends of the Earth United States

Free Flowing Rivers

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Cover image caption: Large free flowing rivers are some of the rarest and most endangered ecosystems in the world, as well as the lifeblood of the communities who depend on them. Yet, they are disappearing three times faster than forests.

About the Banks and Biodiversity Briefing Paper Series

The Banks and Biodiversity Initiative advocates that banks and financiers strengthen their biodiversity policies and practices. In order to halt and reverse biodiversity loss, the Initiative calls on banks and financiers to adopt eight proposed No Go areas as an important step towards improving their biodiversity policies and practices. This briefing paper series aims to explain the importance of why banks and financiers must exclude harmful direct and indirect financing to industrial, unsustainable, and extractive activities which may negatively impact these critical areas. **This briefing paper discusses No Go area 5 on free flowing rivers, which is Paper 05 of the series.**

Proposed Banks and Biodiversity No Go Areas[1]:

In order to safeguard the rights of Indigenous and local communities in formally, informally, or traditionally held conserved areas – such as Indigenous and community conserved areas (ICCA), Indigenous Territories (TIs) or public lands not yet demarcated – as well as to better address and reflect the current crises of climate change, biodiversity loss, and emergence of zoonotic diseases, the Banks and Biodiversity campaign calls on banks and financial institutions to adopt a No Go policy which prohibits any direct or indirect financing related to unsustainable, extractive, industrial, environmentally, and/or socially harmful activities in or which may potentially impact the following areas:

AREA 1: Areas recognized by international conventions and agreements including but not limited to the Bonn Convention, Ramsar Convention, World Heritage Convention and Convention on Biological Diversity, or other international bodies such as UNESCO (Biosphere Reserves, UNESCO Global Geoparks, etc) or Food and Agricultural Organization (vulnerable marine ecosystems), International Maritime Organization (particularly sensitive areas), IUCN Designated Areas (Categories IA – VI)

AREA 2: Nature, wilderness, archaeological, paleontological and other protected areas that are nationally or sub-nationally recognized and protected by law or other regulations/policies; this includes sites which may be located in or overlap with formally, informally, or traditionally held conserved areas such as Indigenous and community conserved areas (ICCA), Indigenous Territories (ITs) or public lands not yet demarcated

AREA 3: Habitats with endemic or threatened species, including key biodiversity areas

AREA 4: Intact primary forests and vulnerable, secondary forest ecosystems, including but not limited to boreal, temperate, and tropical forest landscapes

AREA 5: Free flowing rivers, defined as bodies of water whose flow and connectivity remain largely unaffected by human activities

AREA 6: Protected or at-risk marine or coastland ecosystems, including mangrove forests, wetlands, reef systems, and those located in formally, informally, or traditionally held areas, Indigenous Territories (ITs), or public lands not yet demarcated, or Indigenous and community conserved areas (ICCA)

AREA 7: Any Indigenous Peoples and Community Conserved Territories and Areas (ICCAs), community-based conservation areas, formally, informally, traditionally, customarily held resources or areas, Indigenous Territories, sacred sites and/or land with ancestral significance to local and Indigenous communities' areas **where the free, prior, informed consent (FPIC) of Indigenous and Local Communities have not been obtained**

AREA 8: Iconic Ecosystems, defined as ecosystems with unique, superlative natural, biodiversity, and/or cultural value which may sprawl across state boundaries, and thus may not be wholly or officially recognized or protected by host countries or international bodies. Examples include but are not limited to the Amazon, the Arctic, among other at-risk ecosystems

Other international bodies have already recognized the value of developing No Go Areas, such as the World Heritage Committee and the UN Environment's Principles for Sustainable Insurance Initiative (PSI). The Banks and Biodiversity No Go Policy also aligns with banks and financial institutions' current practice of following institutional Exclusion Lists for sensitive industries or areas, as well as global goals of preventing further biodiversity loss. Projects that do not fall within Exclusion Lists should still be subject to rigorous environmental and social due diligence, assessment, screening, planning, and mitigation policies and procedures.

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Free Flowing Rivers

Briefing Paper 05

Introduction

Long free flowing rivers are some of the rarest and most endangered ecosystems in the world. Today, damming of rivers has become so pervasive that across the world only 21 rivers longer than 1,000 kilometres remain undammed in retaining their connection to the sea[1]. Of these, 40 percent are concentrated in the Amazon and Asian Russia. Globally, there are 58,519 large dams and countless thousand smaller dams situated on 65 percent of the world's rivers, including the eight most biogeographically diverse basins[2]. Fifty percent of the world's available freshwater and 25 percent of the global sediment load is trapped behind dam walls[3].

While these rivers have spectacular scenic and recreational value, they are also the lifeblood of the communities who depend on them in myriad ways: they provide and support fish, farms, prayers, and songs. At the same time, their unmatched role in safeguarding biodiversity, protecting deltas from erosion, mitigating the impacts of climate change, and providing unsurpassed educational opportunities for future generations to learn about aquatic biodiversity, the importance of sediments, among others, gives each free flowing river a global significance and importance too. Several countries have passed some form of legislation to protect free flowing rivers, but such protection is often missing in the places where it is needed the most. Moreover, global information, coordination, and frameworks are lacking, and there is no commonly accepted methodology to identify free flowing rivers. In spite of this, more and more communities and organisations across the world are coming together organically to protect their free flowing rivers, valuing them for their local and global importance.

Defining Free Flowing Rivers

Although the concept of a free flowing river is an intuitive one to grasp, the vast scope of free flowing river ecosystems makes for a complex definition. One of the reasons for this is the intricate interconnectivity of river systems – the way they encompass living and non-living entities, water, sediment, and crossing regional and international borders. River ecosystems also include secure headwater regions, connected riparian areas and floodplains, intact features like ripples, pools and meanders, swamps, bayous, marshes, mangroves, among others. At the same time, free flowing rivers are not necessarily completely untouched and devoid of human presence. Nor do they exist as natural museums with restricted access. Most healthy, connected rivers have been used by local communities and Indigenous groups for millennia, and provide unsurpassable cultural and livelihood value to those communities.

Within the context of the Banks and Biodiversity Initiative, we base the definition of free flowing rivers on criteria developed by the World Wildlife Fund for Nature (WWF). The WWF definition proposes that: **"Free flowing rivers are any rivers that flow undisturbed from their source to mouth, at either the coast, an inland sea or at the confluence with a larger river, without encountering any dams, weirs or barrages and without being hemmed in by dykes or levees[4]"**.

Furthermore, this definition asserts that in order to be considered free flowing, rivers must be evaluated based on key considerations. First, a **"free flowing river or stretch of river occurs where natural aquatic and riparian ecosystem functions and services are largely unaffected by anthropogenic changes to fluvial connectivity, allowing an unobstructed exchange of material, species and energy within the river system and beyond[5]"**.

Fluvial connectivity is determined based on "longitudinal (river channel), lateral (floodplains), vertical (groundwater and atmosphere) and temporal (intermittency) components" which in turn "can be compromised by infrastructure or impoundments in the river channel, along shorelines, or in adjacent floodplains[6]".

In addition, water abstraction (which means taking water from rivers, such as for irrigation or water supply) and regulation can negatively impact the free flow of a river, while changes in water chemistry due to pollution or to water temperature can constitute an ecological barrier, impeding river connectivity.

The Salween River, which flows from Tibet to Myanmar, is one of the only large, free flowing rivers left in a highly populated area. Just 37% of the world's largest rivers remain free flowing in their entire length, and only 23% flow uninterrupted to the ocean.

Lastly, rivers are typically classified by length. Unfortunately, **most of the world's largest rivers, which are considered as those longer than 1000 km, are no longer free flowing. Currently, it is estimated that just 37% of the world's largest rivers remain free flowing in their entire length, and only 23% flow uninterrupted to the ocean**[7]. The Salween and Irrawaddy Rivers are the only large, free flowing rivers left in highly populated areas, with the rest mostly located in remote areas in the Arctic, Amazon, and Congo basins[8]. Fortunately, most of the world's smaller rivers are still free flowing[9], and should be protected so they remain so.

The Banks and Biodiversity Initiative encourages banks and financiers to draw upon this definition of free flowing rivers in developing and guiding institutional policies related to water issues, as it offers a practical definition for free flowing rivers rooted in scientific research. At the same time, however, it is important to note that legislation around the world which aims to protect free flowing rivers or riverine stretches defines them differently, depending on the scope of the legislation.

For example, New South Wales, a state in Australia, defines wild rivers as: "rivers that are in near-pristine condition in terms of animal and plant life and water flow, and are free of the unnatural rates of siltation or bank erosion that affect many of Australia's waterways[10]". On the other hand, the Wild and Scenic Rivers Act of the USA classifies river areas into wild, scenic, and recreational areas. In Canada, the Canadian Heritage Rivers Act aims to protect rivers of remarkable social value, some of which may be dammed, while Sweden and Norway have endeavored to protect rivers representing each ecoregion of the country. **In identifying rivers which may be negatively impacted by bank financed activities, it is thus important for banks to base their policies and guidance on the most inclusive definition of a free flowing river, even if host country legislation may not yet acknowledge them as such, and may still define them in more narrow terms**.

Key Pressure Indicators for Measuring the Flow and Connectivity of Rivers

Human-induced degradation of river ecosystems often leads to habitat fragmentation and loss of river connectivity. Considering this, banks and financial institutions must require and ensure that clients conduct baseline studies, prior to the construction of a project, assessing river connectivity based on the following pressure indicators[II]:

Degree of fragmentation: This pressure indicator assesses how dams affect river connectivity longitudinally, and can help calculate how potential barriers may divide rivers into fragmented stretches which in turn block the migration of organisms, transport of nutrients, and other natural flows.

Degree of regulation: This pressure indicator assesses the extent of how a particular dam may affect the natural downstream flow of a river as related to lateral, longitudinal, vertical, and temporal connectivity. This indicator reveals potential change in key ecological processes, such as the periodic filling of floodplains, which would impact the many aquatic species whose reproduction depends on this process.

Degree of sediment trapping: This pressure indicator identifies the amount of solid material, such as sand and gravel, that is trapped behind dams instead of moving downstream. The natural flow of sediments is critically important for sustaining key elements of the river ecosystem, such as fish spawning beds or coastal deltas. Sediments may also be trapped as a result of riparian deforestation increasing the flow of sediments above the undisturbed rate.

II The pressure indicators of degree fragmentation, regulation, sediment trapping, water abstraction, and infrastructure development are drawn from the study by Grill, G.; Lehner, B.; Thieme, M. et.al, "Mapping the world's free-flowing rivers". https://www.nature.com/articles/s41586-019-1111-9

The three indicators described above are used in the majority of studies on free flowing rivers. Through these indicators, most of the potential impacts related to connectivity loss would be captured. However, depending on geographic locations, there are additional indicators which may be equally important to apply in specific basins. These include:

Degree of water abstraction[III]: This may be a critical parameter in arid and semi-arid regions (e.g. Middle East, Central Asia), as well as in highly irrigated regions of East, South and South-East Asia. In measuring the amount of natural flow loss caused by a dam, it is important to measure not only the actual productive consumption, but also to consider that evaporation from reservoir surface may occur, which would be in addition to the actual consumption. For instance, the larger the surface area of an artificial reservoir, the more evaporation may occur.

Degree of infrastructure development: For densely urbanized areas (e.g. in Western Europe or Eastern China), it is important to assess the amount of infrastructure development, such as roads, urbanization and levees, in riparian areas and floodplains. This proxy indicator is intended to capture loss of "lateral connectivity", or in other words, losses between the main river proper and its floodplain. For instance, levees (dikes) or filling a river valley destroys natural floodplains and disrupts lateral connectivity; as a result, this arrests the river's ability to absorb and sustain natural flooding and associated biological processes (e.g. fish spawning, groundwater infiltration, wetland replenishment, among others).

Degree of aquatic habitat conversion: Some studies also assess how the creation and development of reservoirs may lead to a drastic increase in lentic habitat (artificial lakes and wetlands), while significantly reducing the length and surface area of lotic habitats (flowing rivers of larger classes)[11]. The transformation of lotic habitats into lentic habitats can be dramatic and disruptive for aquatic and water-dependent species. This change of habitats can also potentially facilitate the introduction of non-native species to a habitat.

Assessing River Connectivity in Project Finance Activities

For project finance activities, banks and financiers should use freshwater connectivity assessments during the project identification and planning stages:

Project Identification Stage: Assigning a conservation value or establishing "No Go" areas is critical *before* planning any infrastructure project. This should be done when assessing rivers as a part of basin-wide Strategic Environmental Assessment (SEA). Conducting a connectivity assessment in this way would be a positive, preemptive measure to preserve the ecosystem integrity of a river basin. In short, projects or activities which negatively impact free flowing rivers should be prohibited.

Project Planning Stage: It is important to determine whether a project may surpass certain ecological thresholds as based on the extent to which it adversely affects the connectivity status of a river. In this way, a connectivity assessment would be an important part of Environmental Impact Assessments (EIA) and project alternative analysis, aimed at minimizing a project's negative impacts on river ecosystem connectivity.

III Water abstraction is the process of removing or extracting water from a natural water source, such as river, lake, stream, etc.

Applying Pressure Indicators in Relevant Assessments

In requiring clients to assess impacts on rivers, banks and financiers can draw from an existing body of research which apply the above mentioned pressure indicators in identifying free flowing rivers and their status. For instance, in 2005, a seminal assessment of global river fragmentation caused by dams was published and inspired many conservation scientists to undertake more detailed regional studies on status of regional rivers[12]. Such assessments have also been conducted for large river basins, including the Mekong, Brahmaputra, Amur, Mississippi, Yangtze, as well as at the national level for Vietnam, Nepal and several European countries[13].

In addition, in 2019, a global study established the Connectivity Status Index (CSI), which assessed 308,015 river reaches[14], that form a single-threaded, contiguous flow path from the headwater source to the river outlet[15]. As a global baseline study, most of the aforementioned pressure indicators were applied in determining the rivers' connectivity status. Rivers with high levels of connectivity (CSI level equal or greater than 95%) throughout their entire length were considered "free flowing rivers".

The study found that **only one third of very long river reaches (greater than 1000 km) and 69% of all rivers longer than 100 km still retain a connectivity level greater than 95%**. Shorter river reaches were found to have a greater proportion of preserved free flowing rivers. Ultimately, the study showed that while shorter river reaches were still more commonly free flowing there is the highest degree of transformation among longer rivers, which are often characterised by the greatest diversity of fish and other aquatic organisms not found in smaller streams. **These findings demonstrate that when conducting basin-specific studies, the thresholds for identifying a free flowing river may be different than what was used in a global assessment. In basins with greater degree of fragmentation, it is thus advisable to use somewhat lower CSI thresholds for assessment of longer rivers to identify best preserved river ecosystems and prevent their further fragmentation**. For example, in the assessment of the Amur River Basin, a lower CSI threshold of 90% was used for all pressure indicators.

While the global CSI study is the most comprehensive standard to date and is a useful reference, banks should not solely rely on its results for determining which rivers are free flowing and thus, "No Go" areas. Each river ecosystem is unique, and so assessments should be undertaken at river-basin or regional levels in order to examine and anticipate how a proposed project may impact a river system, as based on the proposed pressure indicators. Furthermore, in addition to these pressure indicators, all risks and impacts associated with a proposed dam or related infrastructure must be thoroughly assessed for local and trans-basin impacts. This should take into account cumulative and transboundary impacts. **Notably, these pressure indicators do not account for cultural, social, recreational, or other similar values**.

The Irrawaddy River, which is one of the only large, free flowing rivers left in highly populated areas, is home to the Irrawaddy Dolphin, classified as Critically Endangered by the IUCN Red List.

Protecting Freshwater Biodiversity

Since the 1970s, there has been an 83% decline in freshwater species and a loss of 30% of earth's freshwater ecosystems. Like many freshwater species, the Mary River Turtle is classified as an Endangered Species by the IUCN Red List.

Rivers are critical sites of freshwater biodiversity and ecosystems. Freshwater ecosystems sustain biological and human life on Earth by regulating and maintaining ecosystem functions, transporting, and purifying water, enabling the migration and reproduction of fish, nutrients, and sediments,[16] as well as mitigating natural disasters like flooding[17]. In fact, **freshwater ecosystems hold more species than salt water ecosystems**[18]. While freshwaters cover less than 1% of the Earth's surface, they are vital to the survival of a remarkable amount of species[19]. However, freshwater ecosystems are often overlooked despite their rich biodiversity values. For instance, rivers are necessary for maintaining wetlands, which provide habitat or breeding grounds for 40% of the world's species[20].

Global human population growth is driving a rise in demand for water, yet human-driven degradation of freshwater ecosystems, such as that caused by harmful infrastructure, is threatening the sustainability of freshwater sources. Not only are freshwater river ecosystems often overlooked, but they are declining three times faster than even forests[21].

Since the 1970s, there has been an 83% decline in freshwater species and a loss of 30% of earth's freshwater ecosystems[22]. Over this same time period, migratory freshwater fish populations have declined by roughly 76 percent[23], and freshwater mega-fishes (fish which may grow heavier than 30kg) have declined by 94 percent[24]. Today, 27% of freshwater species are threatened with extinction[25], and the majority of the world's large rivers are no longer free flowing due to dams and other river alterations[26, 27].

Furthermore, freshwater ecosystems are vital to millions of people's livelihoods. Freshwater ecosystems provide food and economic livelihoods to countless populations around the world. In 2015, freshwater fisheries produced enough fish to provide the full dietary animal protein of 158 million people[28]. Globally, freshwater fisheries provide jobs for over 60 million people, the majority of whom are women[29].

In comparison to marine sources, freshwater fisheries are disproportionately relied upon by poor and undernourished populations, which makes them critical for alleviating hunger and poverty[30]. In the aftermath of COVID, during which economies deteriorated and unemployment surged, "access to river resources has provided a critical safety net for many local communities as a source of food, livelihoods, income, and well-being, and as a central pillar of recovery"[31].

Finally, freshwater ecosystems are central to the cultural identity and way of life for many Indigenous Peoples and other local communities for centuries. The cultural values, along with the ecological, nutritional, and economic values of freshwater ecosystems are sadly underappreciated, as more free flowing rivers, including those which pass through World Heritage Sites[32], are increasingly dammed, dredged, and polluted.

The Sete Quedas rapids, located on the Teles Pires River in the Brazilian Amazon, was a sacred site for the Munduruku, Kayabi and Apiaka tribes. For the region's Indigenous People, Sete Quedas was considered to be the center of their cosmology where spirits inhabited after death, comparable to a Christian "Heaven"[33]. However, the site, along with its centuries-old cultural significance, was destroyed by the construction of Teles Pires dam in 2013 and São Manoel dam in 2018, both of which occurred without receiving the free, prior, and informed consent of Indigenous communities[34].

Unfortunately, a major driver of biodiversity and habitat loss in freshwater ecosystems is river fragmentation caused by dam building. According to International Rivers, "Large dams cause profound impacts on freshwater ecosystems, disrupting the natural flow of water and sediments, degrading water quality, impeding fish migrations and destroying critical habitat and biodiversity"[35]

Protecting Rivers, Protecting Communities

Today, 60 million people live in the Lower Mekong Basin in South East Asia, and 80 percent of those people rely directly on the river system for their food and livelihoods.

Free flowing, healthy, connected rivers which follow their natural rhythm of flow provide a range of ecosystem functions free of cost to the community. If these functions are compared with the costs of restoring impaired rivers, the incomparable importance of healthy, free flowing rivers can be fully understood. Rivers are critical for providing food security, supplying freshwater, supporting human health, and serving as important source of cultural, spiritual and religious customs.

According to the Millennium Ecosystem Assessment, freshwater ecosystems are the backbone of global food production based on artisanal and commercial fisheries, aquaculture, floodplain recession agriculture and animal husbandry[36]. The fibres and biochemicals derived from riparian and wetland plants are critically important to human welfare and livelihoods in many parts of the world, as are other regulating and cultural services. Today, 60 million people live in the Lower Mekong Basin in Southeast Asia, and 80 percent of those people rely directly on the river system for their food and livelihoods[37]. These people and their livelihoods are now at the mercy of the Mekong dams.

In the Senegal River Basin of West Africa, when it floods from July to October, four hundred thousand hectares of floodplains are inundated, and the enriched floodwaters support 10,000 fisherfolk, who catch 30,000 tonnes of fish per year, a major source of protein for the local communities[38]. Later, as the floods recede, the same land is used to grow sorghum and millets and then as the land dries up, livestock is grazed there[39].

One of the most important ecosystem functions affected by damming rivers is riverine fisheries. Across the world, Indigenous and marginalised communities have depended on riverine capture fisheries. Moreover, this cannot be compared to the fisheries in dam reservoirs which include contracts, seeding, species composition change, among others.

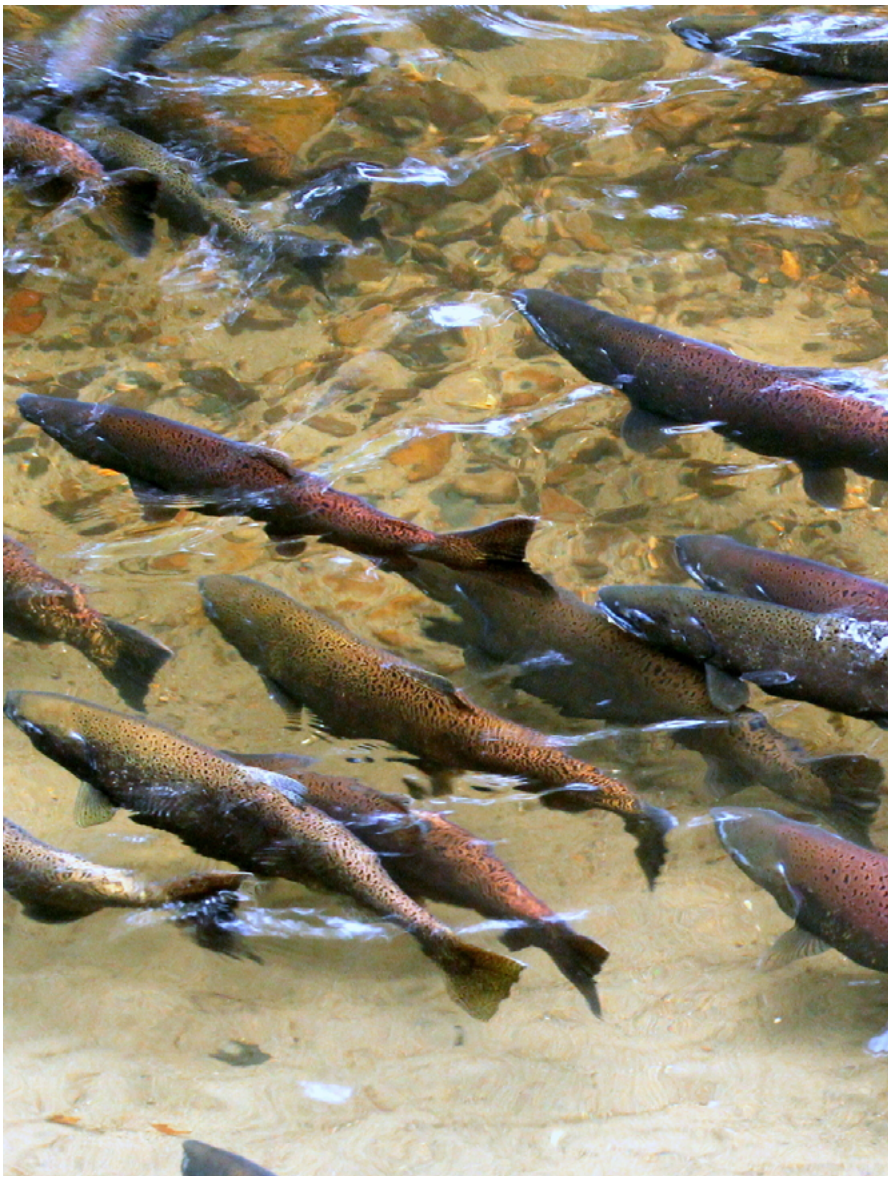
For example, in India, it is estimated that approximately 10 million fisherfolk or more depend on riverine capture fisheries, and this sector is severely impacted by damming, resulting in change in species composition, near extinction of local species, drastic fall in migrating species, among others.

The negative impacts of dams on fisheries and fish diversity have been the driving factor behind several dam decommissioning efforts in countries like the USA. One of the biggest sanctioned dam removal projects in the USA is the series of four hydropower projects on the Klamath River, which will free more than 640 kilometres of the river for people and fish. This is important not only for the Chinook and Steelhead Salmon, but also for the local Klamath Indian tribes.

In India, a study comparing the Aghanashini, a free flowing river, and its dammed counterpart, the Sharavathi, both in Karnataka, revealed that the "Aghanashini Estuary supports 20 fishing villages, while there are only 10 fishing villages in Sharavathi Estuary. Fisherfolk in Aghanashini are more than 6,000, while Sharavathi estuary supports only 283 fisherfolk. Gathering of edible bivalves, a major economic activity in Aghanashini estuary has gone extinct in Sharavathi"[40].

In Japan, the local fishing community came together to advocate for the removal of the Arase Dam in Kumamoto Prefecture, as it directly affected the fishing of a migrating fish called Ayu, as well as eels and shrimps. In the Mekong region, the damming of the mainstem Mekong and its tributaries is directly linked to the fisheries-related livelihoods of over 60 million people. In the Amazon, dams on tributaries are already negatively affecting fish and livelihoods[41]. These hydropower dams are creating a "food security crisis"[42].

A healthy undisturbed river with its range of biodiversity ensures good water quality. For example, freshwater mussels and other bivalves, which are excellent natural filters, are affected directly by infrastructure. A single mussel thriving in a healthy creek or estuary can filter three litres of water in an hour. Bivalves function as natural filter banks of rivers. Natural riparian areas connected to rivers are extremely efficient at trapping sediments. Some studies estimate that natural riparian areas capture 84-90 percent of sediments from cultivated fields[43]. They are also efficient filters of nutrients like nitrates, phosphates, sulfur, and others, which drive eutrophication[IV] of rivers and lakes and



IV Per the United States National Ocean Service, eutrophication "occurs when the environment becomes enriched with nutrients, increasing the amount of plant and algae growth to estuaries and coastal waters". For more information, please see: https://tinyurl.com/mrxkar3t

directly affect water quality and availability. The flow of a river or stream is directly linked to the amount of dissolved oxygen in water, which is one of the important indicators of water quality. Low flow and stagnancy in an artificial reservoir results in low dissolved oxygen. Riparian forests also play a role in maintaining water temperature, as they affect oxygen concentration. Lower temperatures support more oxygen in water and are conducive to species like trout and salmon. Intact sandy riverbanks act as natural water filters, maintaining good water quality.

Flowing rivers also embody tremendous irreplaceable cultural, spiritual values for communities around the world. Rivers have inspired numerous folktales, parables, and songs, inspiring and sustaining cultures and civilisations across the world. This contribution of flowing healthy rivers is extremely important, although often overlooked. In neighbouring Pakistan, for instance, the Indus Delta is desiccating due to upstream dams and diversions by both India and Pakistan. The Indus Delta is not only a remarkably rich biodiversity site, but also the home of deities like Jhulelal, who is believed to be the God of the Indus. Muslims, Hindus, and Sikhs all worship at the shrine of Jhulelal on the banks of the Indus, disregarding international borders, disputes and religious prejudices[44]. The flowing river is thus a symbol of unity and peace.

In another example, in South America, the free flowing Magdalena is the cultural heart of Colombia, being woven into its history and culture. Ranging from sculptures and murals to literature and films, the Magdalena River inspires art, life and culture in Colombia. The upper Magdalena is home to the largest group of religious monuments and megalithic sculptures in South America, nestled in the valleys of Huila. Gabriel García Márquez, one of Colombia's best-known writers, wrote about the Magdalena in many of his works.

In Chile, for the Mapuche and other Indigenous Peoples, rivers hold a special meaning. The Mapuche world view "presents a duality of one great earthly river and one spiritual river coexisting to create a balance between the earthly and spiritual dimensions. As this duality indicates, Mapuche culture is built around a profound understanding of and interdependence with rivers. Mapuche view rivers, lakes, and wetlands as sacred places inhabited by a great diversity of not just flora and fauna, but also spirits, which the Mapuche call ngen[45]."

Rivers are often vital sources of cultural and religious customs for Indigenous and local communities. This is exemplified by the Indus Delta, which is where Muslims, Hindus and Sikhs worship Jhulelal, who is believed to be the God of the Indus.

Dam Modernization or Removal?

Dam removal is critical in order to restore a river's natural flow, and is increasingly supported by governments globally. However, it is often unclear whether, or which dams, should be removed or modernized instead[46]. At the same time, **any investment in modernization should not extend the life of ill-conceived dams or perpetuate substantial environmental and social impacts of dams or other infrastructure. Instead, modernization must lead to improved social and environmental performance. Modernization should also not result in any expansion of negative impacts from the facility.**

Determining whether to remove or modernize a dam requires identifying the dams which have persistent negative impacts on biodiversity and the well-being of Indigenous and local communities, in comparison to dams that have led to newer ecological and social functions which nature and communities may have become reliant upon[47]. At the same time, dam modernization should be considered when removal is impractical, or if its removal could cause greater environmental and social harm.

When considering dam removal or modernization proposals, banks should consider:

1. Analysis of alternatives including dam decommissioning scenario;
2. Facilitation of fish migration, as many existing dams prevent native fishes from reaching spawning grounds, which results in decrease in fisheries and extinction of fish populations;
3. Environmental flow requirements and release capacity, as ill-designed dams disrupt natural flow pulse in downstream areas, resulting in diminishing aquatic biota and potential negative impacts on impacted communities;
4. Environmental and social aspects of sediment management, since dams usually capture most sediments carried by the stream, which otherwise would sustain aquatic and floodplain habitats in downstream river stretches and deltas; in contrast, a sediment-deficient river often may increase bank erosion below the dam;
5. Ecological requirements to water temperature regime, as large reservoirs usually release downstream water which is significantly colder or warmer than in the natural river, which disrupts breeding and foraging conditions for local biota, and may cause negative impacts on impacted communities and recreational users;
6. Legacy of unmitigated impacts and unanswered grievances of local stakeholders (including communities downstream), as old dams often are associated with major injustices caused by their construction and may remain unresolved (e.g. involuntary resettlement and forced eviction of Indigenous people from ancestral lands)
7. Basin-wide ecological optimization water management schemes, as impacts from a dam and its modernization should be assessed across the river-basin in order to account for cumulative impacts of other related water infrastructure;
8. Public consultations on full-spectrum of dam impacts;
9. Synergy with energy system and enabling of intermittent renewable generation (e.g. wind and sun), which is now often claimed without proof, while it is crucial to make sure that specific hydropower project is modernized to serve expansion of less destructive means of energy generation;
10. Downstream mitigation measures and adjusted operation regimes to prevent social and environmental harm, such as from peaking stations, as unnatural flow fluctuations to cover peaking demand causes major disruptions in downstream ecosystems and may pose serious threats to downstream communities or recreational visitors;
11. Modernization often envisions repurposing of hydro (e.g. for hydrogen exports) and such repurposing should not deprive local communities from using locally produced energy for their own pressing sustainable development objectives.

Importantly, these issues should be assessed and shared based on the full engagement and free, prior and informed consent of impacted Indigenous and local communities. In addition to environmental impacts of dam removal, there may also be social impacts. This is why affected people must be fully informed of possible consequences of both removal and modernization options prior to making their own decisions.

Modernization should also not result in any physical enlargement of the facility at the expense of natural habitats or local communities. An example of this would be raising dam height, which causes additional inundation. The only exception to this would be in cases where clear, tangible conservation results may be achieved by such expansion. For instance, if a dam can be raised without significant additional negative impact and in the course of the same project several other dams are removed, these collective changes may improve connectivity in a given river basin.

Further, because smaller dams can be feasibly removed, it is generally not advisable to invest in their modernization or refurbishment, except in cases where local communities rely on benefits from the dam, which could not be substituted after removal. A potential example would be if the dam serves as the community's only reliable water supply[48].

The need for a moratorium on new dams: The harm of over-regulating rivers

Healthy rivers play a central role in several ecosystem processes. Scientists have proven time and again that the natural flow regime of a river is the "master variable" driving the diversity and vitality of river and floodplain ecosystems[49]. At the same time, the natural flow regime is the feature of rivers which is subject to most interference today.

Land-use change, river impoundment, surface and groundwater abstraction and basin transfers all profoundly alter natural flow regimes[50]. Not surprisingly, all of the accepted five major categories of threat to fresh waters – overexploitation, water pollution, fragmentation, destruction or degradation of habitat and invasion by non-native species - are directly linked to the modification of river flows[51].

This is why banks and financiers should establish a moratorium on new dams, and why the development of new hydropower dams on rivers is seen as a false solution to climate change. Supporting a moratorium on new dams is already being increasingly embraced around the world. For instance, in 2020 nearly 400 civil society organizations endorsed Rivers for Recovery, a global call to protect rivers, establish moratorium on new dams, upgrade the efficiency of existing dams in lieu of building new dams, and increasing investment in non-hydropower renewable energies and storage[52].

However, damming has become pervasive even in the most biodiversity rich and remote corners of the world. When a free flowing river is lost, a range of ecosystem functions, benefits, and values of such rivers are also lost. These include contributions to food security, water quality, flood regulation, climate regulation, biodiversity protection, human health, recreational and educational possibilities, as well as intangible but important cultural and spiritual values.

Not only is the natural flow regime important for ecosystems and biodiversity, it is the very foundation of a robust, adaptable river in the era

of climate change. **The natural adjustments of a healthy river, such as lateral migration of channels, interactions between the streambed, floodplain, and riparian zone allow rivers to absorb disturbances and buffer surrounding areas from the impacts of floods and anthropogenic effects. This makes free flowing rivers more capable of adapting to and mitigating the effects of climate change, as opposed to dammed rivers**[53].

Inefficiencies, time delays, and cost overruns of major infrastructure projects like dams have been extensively documented. Moreover, efforts across the world have clearly demonstrated that restoring damaged ecosystems as a means of climate adaptation is more cost effective than engineering solutions, and so protecting healthy ecosystems such as free flowing rivers is one of the most efficient initiatives in times of climate change. These lessons are in turn fueling national efforts to establish more protections for rivers in order to prevent the over-regulation of rivers.

For instance, reconnecting rivers to their floodplains, bringing down dykes and embankments, and dechannelising rivers is being seen as a cost effective and efficient mode of flood control, moving away from infrastructure-heavy flood control measures. The Netherlands, a country which sits below sea level, and thus is extremely vulnerable to sea level rise and floods, is emerging as the global leader in the concept of giving "Room for Rivers"[54]. The same country was a leader in building dykes and embankments in a previous era.

One of the most promising developments in "guarding the freedom to flow" has been the movement for the "Rights of Rivers", which seeks to protect the intrinsic rights of rivers: to flow, to remain pure, to retain connections and to nurture the natural non-human world too. Several unique legal instruments are being devised in countries and socio-ecological settings as diverse as New Zealand, Ethiopia, Serbia, Colombia, India, Bolivia, Ecuador, Venezuela, Mexico and the USA, to name a few.

Growing Community Resistance to Harmful Dams

In addition to the negative environmental and biodiversity impacts of dams, there are also well established negative social impacts associated with and caused by harmful dam building. Dam construction often requires the involuntary resettlement of impacted peoples and loss of traditional livelihoods. This in itself is an extremely controversial and complex process. Compounding these risks, however, is the loss of land through the creation of reservoirs which often destroy irreplaceable cultural and ancestral sites.

There is a longstanding history of strong community resistance against harmful dams. In fact, some of the first bank environmental and social safeguards were born out of crisis, as in the case of the World Bank financed Narmada Dam in India, an extremely controversial dam which displaced an estimated 140,000 people and remains controversial to this day[55].

In another example, in the Northeastern corner of India of Arunachal Pradesh, a transboundary river called the Nyamjang Chhu is revered by the local communities and Buddhists. However, the area is now threatened by the 780 MW Nyamjang Chhu Hydropower project[56]. The Indigenous Lepcha Peoples in Sikkim and Darjeeling, India, have passed on stories for generations about the rivers that flow through their ancestral territories. The Lepchas Peoples have animist roots, maintaining a firm conviction that land is a blessing from their ancestors. However, when hydropower dams affecting their ancestral territories were proposed, local youth went on a hunger strike for more than two years, claiming: "we will die but not allow dams on our sacred land"[57].

Recently, the Erdeneburen Dam in Mongolia, which is to be financed by China Export Import Bank (China Exim), drew community and international opposition due to its negative environmental, social, and biodiversity impacts[58]. The Asian Development Bank also is involved in supporting an associated facility to the dam via a power transmission project[59]. The location of the Erdeneburen Dam was particularly controversial, as it was to be located on the free flowing Khovd River in the Tsambagarav Uul National Park, which is upstream to the Khar Us Lake National Park, a designated Ramsar site[60]. The impacts have been deemed to be so adverse that even the local governor spoke out against the project, saying, "Regardless of what actions [the Mongolian government] may take, we will fight against this dam to the end"[61].

Dam building has long been associated with high environmental, social, political, and reputational risks, with unfortunately dangerous consequences for impacted communities. Recent research finds that communities which oppose harmful dam construction in their territories are often faced with harassment, violence, and death for speaking out[62]. This unfortunate dynamic underscores the longstanding need for banks and financiers to require free, prior, informed consent of impacted communities as a risk management tool in identifying, and thus avoiding, ill-conceived dam projects.

The Black-necked Crane, a threatened species whose winter nest is located on the shores of the Nyamjang Chu River in India, is now further at-risk due to the proposed 780 MW Nyamjang Chhu Hydropower project.

Conclusion

Free flowing rivers are critical for safeguarding biodiversity, maintaining water supply, mitigating climate change, and supporting local and Indigenous communities. However, free flowing rivers are threatened by harmful dams and water infrastructure activities. Free flowing rivers are critical freshwater ecosystems, and are disappearing three times faster than of forests.

Banks and financiers should prohibit direct and indirect financing to harmful activities which negatively impact or alter free flowing rivers. Banks and financiers should also establish a moratorium on new dams. In cases where dams are proposed to be decommissioned or modernized, banks and financiers should assess and prioritize upgrades to increase efficiency instead of building new dams.

Around the world, more and more countries are re-assessing long term dam impacts, and increasingly moving towards restoring rivers and formalizing river protections. With few large free flowing rivers left in the world, and medium and short free flowing rivers at risk from harmful dams and river fragmentation, it is critical that banks and financiers establish strong water and exclusionary policies to protect free flowing rivers and the people who depend on them.

KEY TAKEAWAYS:

- The Banks and Biodiversity Initiative defines free flowing rivers as rivers that flow undisturbed from their source to mouth, at either the coast, an inland sea or at the confluence with a larger river, without encountering any dams, weirs or barrages and without being hemmed in by dykes or levees
- Fluvial connectivity and hydrological alterations are key aspects when assessing the free flow of a river
- Banks and financiers should prohibit financing which negatively impact the connectivity and flow of free flowing rivers, in order to preserve the livelihoods, biodiversity, and multiple other benefits of the world's remaining free flowing rivers
- Freshwater river ecosystems are disappearing three times faster than forests
- A major driver of biodiversity and habitat loss in freshwater ecosystems is river fragmentation caused by dam building
- Harmful water and dam projects financed by banks are historically associated with high risks of negative reputational, environmental, social, and biodiversity impacts
- Banks and financiers should require free, prior, informed consent of impacted local and Indigenous communities across all transactions as a means to reduce the high risks associated with harmful water and dam projects

- Banks and financiers should support a moratorium on new dams in the economic recovery as a key step in reassessing energy options and plans, including all pipeline projects, and reducing the probability of increasing debt burdens from high-cost, high-risk/low reward projects.
- Banks and financiers can facilitate opportunities to protect threatened biodiversity and freshwater ecosystems (and the communities and economies that rely on them) by moving energy production away from rivers.
- Banks and financiers should prioritize upgrades to existing hydropower projects to increase efficiency instead of building new dams. This can include retrofitting turbines, improved pumped storage, protecting upstream forests and watersheds to reduce siltation, and grid-integration with wind, solar, and other energy innovations.
- Banks and financiers should require clients to assess potential impacts of water related infrastructure and to conduct robust, thorough basin wide assessments which incorporate river pressure indicators and other criteria discussed in the Banks and Biodiversity Briefing Paper Series, "Protecting Biodiversity from Harmful Financing: No Go Areas for the International Banking Sector".
- Protecting rivers protects communities, and communities protect rivers

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