Free-Flowing Rivers

Sustaining Livelihoods, Cultures and Ecosystems

INTERNATIONAL RIVERS
people • water • life

About International Rivers

International Rivers protects rivers and defends the rights of communities that depend on them.

We seek a world where healthy rivers and the rights of local river communities are valued and protected. We envision a world where water and energy needs are met without degrading nature or increasing poverty, and where people have the right to participate in decisions that affect their lives.

We are a global organization with regional offices in Asia, Africa and Latin America. We work with river-dependent and dam-affected communities to ensure their voices are heard and their rights are respected. We help to build well-resourced, active networks of civil society groups to demonstrate our collective power and create the change we seek. We undertake independent, investigative research, generating robust data and evidence to inform policies and campaigns. We remain independent and fearless in campaigning to expose and resist destructive projects, while also engaging with all relevant stakeholders to develop a vision that protects rivers and the communities that depend upon them.

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INTRODUCTION

Free-flowing rivers are some of the rarest and most endangered ecosystems in the world. These unrestrained, wild rivers evoke a sense of awe. They are a precious endangered part of the environment, like the Javan Rhinoceros in the wild. Today, damming of rivers has become so pervasive that across the world only 21 rivers longer than 1,000 kilometres remain undammed, retaining their connection to the sea.[1] Of these, 40 percent are concentrated in the Amazon and far east Russian river systems.

Historically, the idea of a river not meeting the sea permanently, or for major parts of the year, was perceived as a tragedy by many cultures across the world. However in current times there is sadly little concern about such developments.

The sacred Rongyoung River in Sikkim, India
Photo: Gyatso Lepcha

1. https://www.worldwildlife.org/pages/free-flowing-rivers

Globally, there are 58,519 large and countless thousand smaller dams situated on 65 percent of the world's rivers, including the eight most biogeographically diverse basins.[2] 50 percent of the world's available freshwater and 25 percent of the global sediment load is trapped behind dam walls.[3]

"Identify and conserve a global network of free-flowing rivers:

Dams and dry reaches of rivers prevent fish migration and sediment transport, physically limiting the benefits of environmental flows. Protecting high-value river systems from development ensures that environmental flows and hydrological connectivity are maintained from river headwaters to mouths. It is far less costly and more effective to protect ecosystems from degradation than to restore them."

— Brisbane Declaration, 2007

Today, in spite of this, it is being proposed to dam most of the final remaining free-flowing rivers of the world: in a cascade of dams in many cases. This would include tributaries of the Brahmaputra in China, Bhutan and India, tributaries of the Ganges in India and Nepal, the Irrawaddy in Burma, tributaries of the Amazon in South America, the Vjosa in Albania in addition to several dams in the Balkan peninsula in Eastern Europe, and the Luangwa in Zambia, to name just a few.

While these rivers have spectacular scenic and recreational value, they are also the lifeblood of

2. Nilsson et al., 2005, *Fragmentation and Flow Regulation of the World's Large River Systems,* Science.
3. Danielle Perry, 2017, *The uneven geography of river conservation in the U.S: Insights from the application of Wild and Scenic Rivers Act.*

The Vjosa River in Albania Photo: © Gregor Subic

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, etc, 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 sadly such protection is often missing in the places where it is needed the most. Moreover global information, coordination and frameworks are also lacking. There is no global inventory of free-flowing rivers, nor a commonly accepted methodology to identify them. Neither is there a platform to share information and analysis regarding the diverse benefits of free-flowing rivers, novel ways to protect them, lessons learned and to rally for their protection. 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 uniquely local and global importance.

The era of large dams is over, with overwhelming evidence showing their excessive costs to communities, and the planet's life support systems. Inefficiencies, time delays and cost overruns of major infrastructure projects like dams have been extensively documented. In the era of climate change, protecting the last remaining free-flowing rivers makes ecological, economic, social and cultural sense. Moreover, efforts across the world have clearly demonstrated that restoring damaged ecosystems is more 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.

The time is thus ripe to devise strategies, campaigns and energy to protect and conserve free-flowing rivers.

DEFINING A FREE-FLOWING RIVER

Although the concept of a free-flowing river is an intuitive one to grasp, yet the vast scope of a free-flowing river 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 and sediment, crossing regional and international borders and transcending cultures and eco-regions. This natural fact emphasises the necessity to ensure the freedom of a river to flow at all scales: lateral (channel to floodplains), longitudinal (headwaters to the ocean/bigger river/lake/plains), vertical (surface to groundwater) and temporal (flow variability across a timescale). It also includes secure headwater regions, connected riparian areas and floodplains, intact features like ripples, pools and meanders, swamps, bayous, marshes, mangroves, etc.

Free-flowing rivers are synonymous with a healthy, connected, living river ecosystem.

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. Many healthy, connected rivers have been used by local communities and indigenous groups for millennia, and provide unsurpassable cultural and livelihood value to those communities. Free-flowing rivers are the "freshwater equivalent of wilderness areas" and yet they also support rich livelihoods for communities.

Definitions of free-flowing rivers

Two definitions of free-flowing rivers, developed by the WWF, are useful to deepen our understanding.

- "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]
- "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. Fluvial connectivity encompasses longitudinal (river channel), lateral (floodplains), vertical (groundwater and atmosphere) and temporal (intermittency) components and can be compromised by infrastructure or impoundments in the river channel, along shorelines, or in adjacent floodplains; hydrological alterations of river flow due to water abstractions or regulation; and changes to water chemistry that lead to ecological barrier effects caused by pollution or alterations in water temperature."[5]

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 thus: "wild rivers are 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."[6]

The Wild and Scenic Rivers Act of the USA classifies river areas into wild, scenic and recreational areas. The Canadian Heritage Rivers Act aims to protect

4. http://wwf.panda.org/wwf_news/?63020/Free-flowing-rivers-Economic-luxury-or-ecological-necessity
5. https://c402277.ssl.cf1.rackcdn.com/publications/935/files/original/WWF_Free_Flowing_Rivers_Fact_Sheet.pdf?1472650714
6. http://www.environment.nsw.gov.au/parktypes/wildrivers.htm

rivers of remarkable social value, some of which may be dammed, while Sweden and Norway have endeavoured to protect rivers representing each ecoregion of the country.

Freedom to flow

In a more fundamental paradigm shift, several countries across the world are attempting to acknowledge and safeguard the "rights" of rivers themselves, and a central right is the "Right to Flow". This movement is developing and growing organically in different corners of the world, from developed and developing countries alike, fueled by governments, indigenous groups and civil society, and often manifested in and through constitutional provisions. Countries such as New Zealand, Bolivia, Colombia, Ecuador, Mexico, India, Serbia and Ethiopia are experimenting with different forms of intervention to protect not only anthropocentric "ecosystem goods and services" of rivers, but also their intrinsic values.

The Amazon Mainstem in Peru. Photo: Parineeta Dandekar

METHODOLOGY TO IDENTIFY FREE-FLOWING RIVERS USING GLOBAL DATASETS

Despite their critical importance, there is no global inventory of free-flowing rivers. However, several organisations and universities have come together in a bid to develop such an inventory, as well as a methodology to identify free-flowing rivers through a global dataset.[7] This methodology is based on identifying "Pressure Indicators" which affect a river's connectivity at any scale.

"While a global academic methodology can identify large free-flowing rivers, ideally communities would come together to identify smaller free-flowing rivers in their regions. The methodology to identify free-flowing rivers is as yet hazy and thus the role of communities in bringing more such rivers into the spotlight is crucial."

Pressure Indicators identified in this effort are:

Degree of fragmentation: This indicator maps how large dams affect river connectivity longitudinally. This includes only large dams currently and is based on the global large dam database, developed by experts in the area.

Degree of regulation: This calculates how much a particular dam affects annual average downstream flow, which relates to lateral, longitudinal, vertical and temporal connectivity. This is also based on the global dam database.

Road density: This indicator looks at how roads affect lateral connectivity when developed over floodplains or when a river passes through culverts. This is measured through a database of the world's roads called GRIP.

Urban areas: This examines how lateral connectivity can be affected by cities and other infrastructure developed in floodplains. This indicator is measured using satellite imagery of nightlight intensity.

Consumptive water use: This is measured by water abstraction and consumption data available through WaterGAP[8], and represents how lateral, vertical and temporal connectivity can be disrupted through extracting too much water by changing groundwater aquifers.

It is clear that even when fully developed, these indicators will mostly be applicable for bigger rivers with large, documented infrastructure.

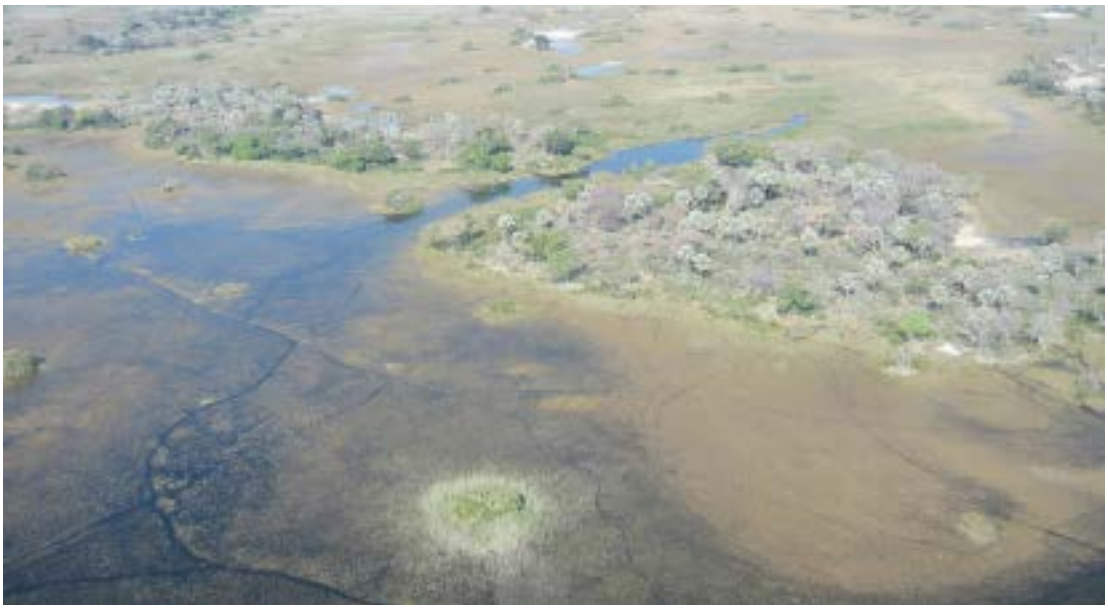
Thus there is a need for local community-based organisations and researchers to come together to identify, document and protect smaller free-flowing rivers in their area, which are facing challenges like embankments, dams, hydropower projects with diurnal water fluctuations etc.

Certain questions also need to be addressed, for example: How should a river with small, community-owned water harvesting structures across it be classified? How to classify micro hydel projects and small community-made diversions? How should rivers which have dams only in the headwaters or only near the delta be classified? What should be the length of a river to be considered free-flowing? All of these questions require further collective discussions and work by community groups, academics and researchers.

7. http://www.free-flowing-rivers.org/methodology

8. Water GAP is a global water database calculating flows and storages.

THE IMPERATIVE TO PROTECT FREE-FLOWING RIVERS



The Okavango Delta in Botswana Photo: Teo Gomez Wikimedia Commons

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.[9] 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 profoundly alter natural flow regimes.[10]

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.[11]

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, etc, 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.[12]

9. Poff et al, 2009, *Ecological responses to altered flow regimes: a literature review to inform the science and management of environmental flows*, Freshwater Biology. https://www.researchgate.net/publication/227644884_Ecological_Responses_to_Altered_Flow_Regimes_A_Literature_Review_to_Inform_the_Science_and_Management_of_Environmental_Flows_; Power et al., 1995; Walker, Sheldon & Puckridge, 1995.
10. Arthington et al., 2009, *Preserving the biodiversity and ecological services of rivers: new challenges and research opportunities*, Freshwater Biology https://www.researchgate.net/publication/48380733_Preserving_the_biodiversity_and_ecological_services_of_rivers_New_challenges_and_research_opportunities2007
11. ibid; Malmqvist & Rundle, 2002; Dudgeon et al., 2006.
12. https://www.researchgate.net/publication/258181492_Climate_change_and_the_world's_river_basins_Anticipating_management_options

Free-flowing, healthy, connected rivers which follow their natural rhythm of flow provide a range of services free of cost to the community. If these services are compared with the costs of restoring impaired rivers, the incomparable intergenerational importance of healthy, free-flowing rivers can be fully understood.

Services provided by free-flowing rivers

Some important services provided by healthy, flowing rivers are outlined below.

Food security

The Millennium Ecosystem Assessment (MEA)[13] was initiated in 2001 to assess the consequences of ecosystem change for human well-being, the scientific basis for action needed to enhance the conservation and sustainable use of those systems and their contribution to human well-being. In 2005 it highlighted the crucial importance of freshwater ecosystems, as well as the threats they face. According to the MEA, freshwater ecosystems are the backbone of global food production based on artisanal and commercial fisheries, aquaculture, floodplain recession agriculture and animal husbandry. 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 South East Asia, and 80 percent of those people rely directly on the river system for their food and livelihoods.[14] Sadly 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. 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.[15]

Fisheries

One of the most important ecosystem services 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, etc.

Fishing in the River Senegal, West Africa Photo: livelihoods.eu

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, etc.[16]

"To me, it's an environmental injustice. Many people have benefited from the development and changes at the expense of the resource and the tribes. It's only right to restore the fishery back to us."

— Klamath Tribes Chairperson Don Gentry, speaking about the Klamath dams

13. Millenium Ecosystem Assessment, https://www.millenniumassessment.org/en/index.html
14. Orr et al 2012, *Dams on the Mekong River: Lost fish protein and the implications for land and water resources*, Global Environmental Change.
15. Parviz Koohafkan, *Forgotten Agricultural Heritage: Reconnecting food systems and sustainable development*, Routledge, 2017.
16. https://www.internationalrivers.org/resources/india%E2%80%99s-dammed-rivers-suffer-fisheries-collapse-7758

Fishing at Khone Falls, Mekong region, Laos Photo: National Geographic

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."[17]

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. This will be the first dam to be decommissioned in Japan.[18]

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. These hydropower dams are creating a "food security crisis".[19] In the Amazon, dams on tributaries are already negatively affecting fish and livelihoods.[20]

Floods

In many ancient cultures, from India to Egypt, floods were heralded and celebrated as the harbingers of fertility, soil moisture and rejuvenation. A healthy river connected with its floodplains deposits silt and delivers a push of nutrients. As the floods recede, floodplains are used for recession agriculture in many parts of the world. For example, in the free-flowing Okavango River Delta in Botswana, floodplain recession farming, known as Molapo, results in much higher yields of maize despite low inputs of fertilisers, due to fertile silt

17. https://sandrp.in/2013/09/03/ecological-value-of-free-flowing-aghanashini-for-estuarine-communities-and-beyond/

18. https://apjjf.org/-Hoyano-Hatsuko/2074/article.html
19. Stone, 2016, *Dam-building threatens Mekong fisheries*, Science.
20. http://www.sciencemag.org/news/2018/01/dam-building-binge-amazon-will-shred-ecosystems-scientists-warn

The Okavango Delta in Botswana Photo: botswanatourism.co.bw

and soil moisture. About 25 percent of agriculture in the Okavango Delta depends on riverine flood pulses and exposed floodplains.[21]

Ancient Egyptians celebrated the floodings of the Nile and even worshipped a Nile Flood God, to celebrate life-giving silt and waters. After the completion of the Aswan Dam and later developments, the Nile Delta suffered immensely due to drastic reduction of freshwater and silt, as did estuarine and marine fisheries.

At the same time, a floodplain regulates the river. An undeveloped, vegetated floodplain reduces the force, height and volume of floodwaters by allowing them to spread out horizontally and relatively harmlessly across the floodplain. Water that floods into vegetated floodplains is soaked up by the "sponge" of floodplain wetland soils and streamside forest leaf litter, which then re-enters the main channel slowly. Healthy riparian areas provide numerous barriers against moving water, which slows it down so water does not flow downstream as quickly. The root systems of riparian forest and aquatic vegetation keep the pores of the soil open, so that two to three times more water can infiltrate the soil compared to lands used for cultivation or grazing.[22]

In several countries, 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

"In the Mekong Delta, Tonle Bassac River and its floodplains in Angkor Borei, Cambodia, allow floods to spread and silt to settle over vast areas. This has resulted in a flood recession rice farming so rich that it is believed that this system, depending on the "exceeding fertility of the silt brought by natural river floods", played a significant role in the early history and culture of the Mekong Delta."

— Fox and Ledgerwood 1999[23]

21. Molapo Farming in the Okavango Delta, http://www.the-eis.com/data/literature/Malapo%20farming%20in%20the%20Okavango%20Delta.pdf
22. https://www.nys-soilandwater.org/crep/forms/FactSheet2.pdf
23. https://www.jstor.org/stable/42928445?se- q=1#page_scan_tab_contents

Saving the biodiversity rich Karnali River in Nepal Photo: Waterkeeper Alliance

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".[24] The same country was a leader in building dykes and embankments in a previous era.

Biodiversity

Free-flowing rivers are the true safety vaults of biodiversity, much of which is still being discovered and documented.

Freshwater ecosystems, including free-flowing rivers, harbour the highest diversity and have the highest proportion of species threatened with extinction, as compared to other ecosystems studied under the MEA.

Freshwater habitats support a disproportionate richness of plants and animals. Over 10,000 fish species live in fresh water, making up approximately 40 percent of global fish diversity and one quarter of global vertebrate diversity. When amphibians, aquatic reptiles (crocodiles, turtles) and mammals (otters, river dolphins, platypus) are added to this freshwater-fish total, then as much as one-third of all vertebrate species in the world are found in freshwater. Yet surface freshwater habitats contain only around 0.01 percent of the world's water and cover only about 0.8 percent of the earth's surface. Almost 10 percent of the globally described species call freshwater ecosystems their home. An additional 50,000–100,000 species alone may live in ground water.[25]

Impoverished biodiversity means decreased food production and food security, loss of resources for indigenous medicine, diminished supplies of raw

"The Vjosa represents one of the last intact large river systems in Europe, hosting all different types of ecosystems: from the narrow gorges in the upper part to the wide braided river sections in the middle part to the near natural delta at the Adriatic Sea. The Vjosa is a European treasure. Its greatest value lies in its uncompromised intactness. The dams would destroy this unique ecosystem and its high potential for sustainable nature tourism in the future."

— www.balkanrivers.net

24. https://www.ruimtevoorderivier.nl/english/

25. D Dudgeon et al., 2006, *Freshwater biodiversity: importance, threats, status and conservation challenges*, Cambridge Philosophical Society.

materials for new pharmaceuticals and biotechnology and degraded water quality.[26]

Free-flowing rivers like the Karnali in Nepal, the Irrawaddy in Burma, the Mura in Europe, the Pascagoula in the USA and the Luangwa in Zambia support an amazing diversity of plant and animal species, and play a central role in their protection.

"Flow alterations have resulted in a pandemic breakdown of ecosystem integrity, thereby affecting the risk of acquiring infectious diseases, through their impact on the biodiversity of infectious agents, reservoirs and vectors. The net result is that human well-being - whether from disease or a state of health - is increasingly compromised."

— Naiman and Dudgeon 2010[27]

Fresh water and water quality

A healthy undisturbed river with its range of biodiversity ensures good water quality too. For example, freshwater mussels and bivalves, which are excellent natural filters, are affected directly by infrastructure. A single oyster thriving in a healthy creek or estuary can filter three litres of water in an hour.[28] Oyster reefs 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. They are also efficient filters of nutrients like nitrates, phosphates, sulfur, etc which drive eutrophication of rivers and lakes and directly affect water availability.[29]

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 result in low dissolved oxygen. Riparian forests also play a role in maintaining water temperature, which in turn affects oxygen concentration. Lower temperatures support more oxygen in water and are conducive to species like trout and salmon. Intact sandy river banks act as natural water filters, maintaining good water quality.

Human health

Flow alterations of rivers significantly reduce freshwater biodiversity, modify disease spreading vector abundance and pathways of disease transmission by impacting habitat, temperature and biotic factors. Reservoirs and stabilised flow regimes lead to an increase in disease vectors like blackflies, snails and mosquitoes.

The simplification of the natural flow regime, creation of habitats such as canals, ditches, ponds, and reservoirs, and the simplification of natural species assemblages allows mass proliferation of dipteran and snail vectors for parasites and modification of bacterial and viral communities. In contrast, healthy, restored rivers are associated with a range of social benefits, including physical and mental wellbeing.[30]

Cultural, spiritual and religious contribution

Flowing rivers have inspired and informed numerous folktales, parables and songs throughout history. They nourish the soul of several cultures and civilisations across the world. This contribution of flowing healthy rivers is extremely important. Flowing rivers bring people together across borders and uplift the depths of the human spirit.

In the Northeastern corner of India, a transboundary river called the Nyamjang Chhu is revered by the local Monpa Buddhists. Not only is its water holy to the community, with shrines and gompas (religious buildings) dotting the river course, but the Black-necked Crane, a threatened migrating species that makes its winter home here, is believed to be the embodiment of the sixth Dalai Lama. Its arrival is heralded and celebrated throughout the tiny valley. The cranes nest in the

26. https://islandpress.org/books/biodiversity-and-human-health
27. http://www.gwsp.org/fileadmin/downloads/Publications/Naiman__2011_-_Global_Alteration_of_Freshwaters_Influences_on_Human_and_Environmental_Well-Being..pdf
28. https://www.riverprojectnyc.org/oyster-restoration/
29. https://pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/420/420-151/420-151_pdf.pdf
30. http://www.ecrr.org/RiverRestoration/Socialbenefitsofriverrestoration/tabid/2612/Default.aspx

Celebrating and worshipping the Indus Delta, Pakistan Photo: Pakistan Fisherfolk Forum

riparian areas and sandy shores of the Nyamjang Chhu, now threatened by the 780 MW Nyamjang Chhu Hydropower project. In Sikkim, the indigenous Lepcha community tell numerous beautiful tales about the rivers that flow through their holy land. Some tales are of wise men, some are poignant love stories of rivers about to meet at a confluence. The Lepchas are nature-worshippers. They believe their land is a blessing from their ancestors. When hydropower dams affecting their beloved Dzongu land were promoted, Dzongu youth went on a hunger strike for more than two years, claiming: "we will die but not allow dams on our sacred land."[31]

In neighbouring Pakistan, 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 syncretic 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.[32] The flowing river is thus a symbol of unity and peace.

In South America, the free-flowing Magdalena is the cultural heart of Colombia, 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.[33] The upper Magdalena is home to the largest group of religious monuments and megalithic sculptures in South America, nestled in the valleys of Huila. The Magdalena's compelling presence is reflected in contemporary art, including movies, paintings and literature. Gabriel García Márquez, one of Colombia's best-known writers, wrote about the Magdalena in many of his works.

In Chile, for indigenous tribes like the Mapuche, 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."[34]

31. http://weepingsikkim.blogspot.com
32. https://sandrp.in/2016/01/01/jhulelal-or-zindapir-river-saints-fish-and-flows-of-the-indus/
33. https://www.internationalrivers.org/blogs/436-1
34. https://e360.yale.edu/features/should-rivers-have-rights-a-growing-movement-says-its-about-time

Recreation and eco tourism

Free-flowing healthy rivers spread joy and adventure and act as magnets for tourism and recreation. White water rafting, catch and release angling, river rafting, swimming, canoeing, kayaking, fly fishing, camping etc, are popular activities in developed countries. In 2016, more than 550,000 people rafted down the Colorado River in just one state of the USA.[35] In developing countries these activities, which bring people closer to rivers, are also gaining momentum and generating employment.

In 2015, the Costa Rican President rafted down the Pacuare river and later signed an order not to dam it for 25 years Photo: http://www.ticotimes.net

"River Guides of Panbang started out as a small river adventure company owned by ten young men from the Khengpa community of Bhutan. They run the two big rivers that flow through their region: the Mangde and Drangme Chhu. They take tourists and locals on multi-day river expeditions and day trips and are excellent local guides who are knowledgeable about the biodiversity and culture of a region that is located next to the famous Royal Manas National Park, Bhutan's first protected area and home to tigers, elephants, hornbills and the endemic long-tailed primate, the golden langur. Bhutan's Royal family are patrons of River Guides and these thrilled guides show how a free-flowing river can benefit the community."

— National Geographic[36]

In India, rafting groups of local youth around the Siang and Teesta Rivers are coming together to protect their free-flowing rivers and livelihoods. In the Karnali, one of the last free-flowing rivers of Nepal, rafting opportunities provide employment to the local youth, who in turn are some of the staunchest campaigners against mega hydropower projects in the area.[37]

The Luangwa Valley, also known as the Valley of the Leopard, is home to the longest free-flowing river in Zambia. The Luangwa Valley provides habitat to creatures like elephants, hippos, lions, giraffes, etc, and creates conservation and employment opportunities for locals.[38] The case is similar with the Okavango in Botswana and tributaries of the Amazon, amongst others.

Rivers are also places of religious pilgrimage, like in India where Hindus undertake pilgrimages to the confluence of rivers like the Ganga and the Yamuna, or the origin of rivers like the Chardham Yatra.

Education

Free-flowing rivers have become so rare that many scientists fear that if they are not protected it may become difficult to understand the value and contributions of a large river flowing into the sea. Several groups are currently studying and documenting the remaining free-flowing rivers to understand their importance, impact and contribution better.[39] In the Vjosa River, one of Europe's last free-flowing rivers, about thirty scientists from four countries and various experts participated in a week long research project in April 2017, to examine the previously almost unexplored river in Albania – in the area of the planned Poçem dam. The experts were amazed by the complexity and sheer size of the river system and each one found

35. https://www.coloradopress.net/outdoors/2016-rafting-season-was-record-breaking/
36. https://blog.nationalgeographic.org/2017/04/16/the-value-of-bhutans-rivers/
37. https://www.thethirdpole.net/en/2017/01/31/can-paddles-save-nepals-karnali-river/
38. http://www.free-flowing-rivers.org/stories
39. http://www.free-flowing-rivers.org/about

something at the Vjosa – species, habitat types, dynamic river processes – that had long been lost in the regulated rivers in central Europe.[40]

Scientists for the Vjosa River Photo: Balkanriversnetwork

As the WWF has written, "the importance of the connections between a river's source and the sea over long distances is not yet fully understood. However, with so few rivers left that travel for more than 1,000 kilometres inland and many of these facing the threat of dams, it is unlikely that we will ever have a chance to fully understand the relationships between the sea and the large rivers."[41]

Sediment transport and the link to deltas

Deltas are some of the most prosperous and populated areas of the world. However, deltas are literally sinking, shrinking and in grave peril, and some may not survive in the coming years. This will impact millions of people, crucial food-producing regions as well as valuable ecosystems. The major reason behind this is sediment trapping by the dams built on upstream rivers, which are starving deltas of sediment, resulting in oceans eroding and literally devouring precious deltas.

Due to rampant dam building, the deltas of rivers like the Chao Phraya, Colorado, Nile, Po, Rhone, Pearl, Yangtze and the Yellow River show virtually no more addition of sediments. In South Asia, during the past century, Indus Delta sediments have reduced by more than 94 percent, Ganga-Brahmaputra Delta sediments by more than 30 percent, and Narmada Delta sediments by 95 percent.[42]

40. https://www.balkanrivers.net/en/key-areas/vjosa-river#anchor2
41. http://wwf.panda.org/wwf_news/?63020/Free-flowing-rivers-Economic-luxury-or-ecological-necessity
42. https://sandrp.in/2014/05/07/sinking-and-shrinking-deltas-major-role-of-dams-in-abetting-delta-subsidence-and-effective-sea-level-rise/

It is thus imperative to restore dammed rivers and protect free-flowing rivers which bring life-giving pulses of sediment and water to the delta.

Climate change, climate resilience

Free-flowing rivers have tremendous capacity to adjust to changes in discharge and sediment inputs, both of which are expected to change in many areas under future climate scenarios. However they need room and space to do this. When a channel changes shape or migrates across the landscape, this generally happens because the river is adjusting to a new flow or sediment regime. When it is locked in its place or cut off, its supply of sediment (due to dams) and the ability of the stream to adjust and reach a new equilibrium is lost.

Fishing markets on the banks of the free-flowing Lohit River in India Photo: Parineeta Dandekar

Rivers need to be "free" so they can move across the landscape and have some degree of buffering capacity which intact riparian corridors and wetlands (and floodplains) provide.[43] Free-flowing rivers are more capable of mitigating and adapting to the effects of climate change than dammed rivers.

Rivers need to be free to be able to adjust to changes brought about by climate change and to reach to a new equilibrium. Free-flowing rivers are more capable of mitigating and adapting to the effects of climate change than dammed rivers.

43. https://www.internationalrivers.org/node/1701

IN CONCLUSION: THE WAY FORWARD

As time goes by, free-flowing rivers, big or small, which retain their connection with their origins, floodplains, bigger tributaries, basins and/or the sea are becoming so rare that scientists worry that if something is not done soon then there may not be any left to study and understand their positive contribution to the environment.

Damming has become pervasive even in the most biodiversity rich and remote corners of the world. When society and the earth loses a free-flowing river, a range of services and intrinsic values of such rivers, which nourish the human and non-human realms, 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, to name a few.

The last remaining free-flowing rivers in the world are the bastions of species and services which are mostly lost to the world due to the endless damming of rivers. As freshwater ecosystems are facing species loss at unprecedentedly high levels, protecting these rivers must be an urgent matter of priority today. However despite this, there is a remarkable gap in global understanding, documentation, institutional set-up and responses in protecting these rivers.

The bright lights and positive examples in this scenario are community efforts to conserve and protect these rivers against destructive dams and interventions. Dam decommissioning efforts are gaining momentum across the world, and a growing movement is working to protect at least stretches of free-flowing rivers through legal interventions.

Legal efforts are innovative and still evolving. Several countries have passed legislation, constitutional amendments or tailored regional laws to protect river flows and characters in unique ways.[44] The common thread across these inspiring examples has been strong and consistent advocacy and ground-level action by community and conservation organisations. None of the protection mechanisms have sprung up spontaneously; they are a culmination of long and hard efforts by communities, activists and academics.

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. The "Rights of Rivers" is a complicated, evolving legal narrative for now. However, the movement is evolving in a very promising direction, carefully addressing the key issues when it comes to guarding free-flowing rivers for posterity.

More work, effort and intent will be needed to save our last remaining free-flowing rivers, which are as rare as those species which are facing extinction.

This report is an effort and contribution in the same direction. Guarding the freedom to flow.

44. https://www.internationalrivers.org/campaigns/the-global-river-protection-movement

Worshipping the sacred flow in Bhutan Photo: Parineeta Dandekar

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