



The Belo Monte dam on the Rio Xingu in Brasil
Foto: Christian Russau

No simple solution

Hydropower, climate change and the sustainable development goals



Humanity is faced with great challenges. On the one hand, the emission of greenhouse gases must be massively reduced in order to keep the rise of the world climate under 1.5° centigrade and thus to prevent irreversible damage to ecosystems.¹ At the same time, the world population is growing. The Food and Agriculture Organization (FAO) estimates an increase of 34 percent to 9.1 billion people by the year 2050, all of whom have a right to a decent standard of living. Currently, one out of every ten people live under the poverty line. In order to feed the growing population, food production must increase by 70 percent.²

The UN sustainability goals

In order to meet these challenges, the United Nations have agreed upon 17 *Sustainable Development Goals* (below SDG). Their overarching goal is to guarantee a better life for all people and at the same time to maintain the natural bases for human life on the planet.³

Electricity for sustainable development...

The lack of electricity is an essential obstacle to fighting poverty around the world. Currently, 1.2 billion people have no access to electricity, the overwhelming majority of them in the countries of the Global South. In order to reach the SDGs, more electrical energy will have to be produced in many countries. According to information from the United Nations, investments in sustainable energy sources must be tripled by 2030 in order to meet this demand without destroying the natural resources of the planet: from \$400 billion per year to \$1.25 trillion.⁴

The United Nations demand for investments in sustainable energy production, by nature, attracts the interest of many actors. For some years now, representatives of the hydropower industry, the International Hydropower Association (IHA), have been trying to present their technology in the

context of the SDGs and the Paris Climate Agreement as the best solution to the energy supply problem for the world.

The IHA argues that hydropower is a simple solution to the challenge of producing climate-friendly energy for all, thus offering an excellent alternative to coal-fired generation. At first glance, this seems logical: hydropower is an old and tested technology that does not burn any oil, gas or coal, nor does it produce any radioactive waste. At the same time, enormous amounts of energy can be produced with hydroelectric plants: of the ten largest power plants in the world, nine are dams.⁵

...but where should it come from?

The hydropower industry sees great potential for further expansion: according to Uwe Wehnardt, the CEO of the German firm Voith Hydro, which is among the ten largest manufacturers of turbines and other equipment used in hydroelectric plants, all existing hydroelectric plants worldwide have an installed total capacity of about 1,300 gigawatts – there is potential for a further 4,000 gigawatts.⁶

The advocates of hydropower contend that it is the best instrument to produce clean and cheap energy (*SDG 7: Affordable and clean energy*) and to fight climate change (*SDG 13: Climate Action*), but also to reach other SDGs: economic growth and jobs are generated (*SDG 8: Decent Work and Economic Growth*), and with the infrastructure created, other industries can be established (*SDG 9: Industry, innovation, and infrastructure*). Ultimately, progress is made in the *fight against poverty (SDG 1)*.⁷

The dark side of hydropower

So, does this present the solution to the problem of a climate and environmentally friendly energy supply? Do we simply have to construct more hydroelectric power plants



Dried fish from lake Turkana (Kenia) is an important staple food in Eastern Africa. The hydroelectric dams on the Omo-River in Ethiopia threaten to dry out the lake, thus threatening the food security of millions of people.

photo: International Rivers
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because there is potential for three times more than currently exist? This perspective, presented by the IHA and the industry, is short-sighted and neglects the many negative sides of hydroelectric power production.

Between 40 and 80 million people have been resettled for dams. In numerous cases, the resettled individuals were poorer than before their resettlement.⁸ Here, poverty is not being fought (SDG 1), but worsened.

What is more, hydroelectric plants only produce short-term jobs during the construction phase. Let's look at the example of one of the largest hydroelectric plants in the world, Belo Monte in Brazil: During construction work, approximately 15,680 people moved to the nearby city of Altamira to work on the dam. Now, the construction work is mostly finished and most of the workers have lost their jobs. But the migrant workers have remained in the region: unemployment and social tensions have increased, and the crime rate in Altamira has increased substantially.⁹ The local population has hardly gained any benefit from the plant at all. Via high-voltage lines, the electricity produced by the dam is transported to faraway population and industrial centers.¹⁰ This is by no means a resilient form of industrialization (SDG 9); the economic growth created was not sustainable, nor were any long-term, fair jobs created (SDG 8). Even villages located directly next to the dam have received no better access to electricity (SDG 7).

Moreover, countries often incur massive debt for the construction of power plants. For one study, scholars at Oxford University looked at 245 dams that have been built since 1934. On average, these dams have cost 90 percent more than planned, in 10 percent of the cases the additional expenses exceeded 300 percent. Developing countries in particular run the risk of running up massive debt due to large hydroelectric projects. The construction costs are systematically underestimated, state the authors of the study.¹¹ The fact that, despite these negative experiences, hydroelectric plants continue to be built, is due in no small part to rampant global corruption: political decisionmakers are not seldom bribed in order to achieve the construction of the power plants.¹² Furthermore, protests against dams




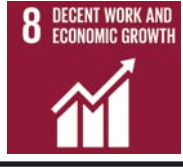





are often violently suppressed.¹³ What is more, hydroelectric power plants often fuel interstate conflicts because countries located downstream fear that they will receive less water due to the damming of the rivers.¹⁴ All of this stands in stark contrast to **SDG 16 Peace, justice and strong institutions**.

The numerous effects of dams contradict several SDGs: due to the construction of the Belo Monte power plant, forests were flooded, the river ecology was destroyed, and fish died at an alarming rate.¹⁵ This clearly repudiates **SDG 14 and 15: Protect life on land and below water**. Many people – indigenous in particular – lost their livelihood due to this as they could no longer fish, thus plunging them into poverty (SDG 1). Based on the dam boom on the Mekong in Southeast Asia, experts fear a famine because the fish might no longer be able to reach their spawning grounds.¹⁵ What is more, dams retain sediments that fertilize farmland and stabilize coastal areas. A large amount of fertile farmland is flooded by dams as well.¹⁷ Scientists therefore see dams as a threat for food security for millions of people (SDG 2: **Zero hunger**).¹⁸ Reservoirs could cause mosquitos and other disease carriers to proliferate in tropical regions, in turn promoting the spread of diseases such as dengue, malaria and Zika (SDG 3: **Good health and well-being for people**).¹⁹

No climate for damming rivers

But is something at least being done for the climate with hydroelectric power plants (SDG 13)? Even this is questionable. On the one hand, dams also emit climate-damaging gases: in the reservoirs of the plants, in particular in tropical countries, much plant material is left to decay. In the process, biogases such as nitrous oxide and methane are produced. These gases are significant greenhouse gases: methane has an effect 25 times stronger than CO₂.²⁰ Moreover, hydroelectric plants are themselves effected by climate change: droughts can impair their efficiency, heavy rainfall endanger their safety.

Yet it is not only the direct effects of hydropower that harm the environment: their indirect effects hurt the environ-

SDG		adverse effects of hydroelectric dams
	No poverty	Many must be resettled or lose their livelihood due to dams. Compensations are usually insufficient; the affected are in most cases worse off than before the construction of the power plant. Population suffering from downstream effects are almost never compensated.
	Zero hunger	Dams flood important farmland. In reservoirs, sediments are retained so that they can't be used as fertilizer further downstream. Fish migration is disrupted, threatening numerous fish species with extinction, which can have fatal consequences for the food security of millions of people.
	Good health and well-being for people	Pathogens can proliferate in the reservoirs of dams, contributing to the spread of illnesses such as dengue, malaria and Zika. Worsening water quality and humidification of local climate also has a negative impact on the health of the local population.
	Clean water and sanitation	Due to hydroelectric power plans, the water quality of a river frequently decreases as processes of decomposition take place in the standing water. Desiccation and disruption of water supply systems in downstream areas has major impact on local communities.
	Affordable and clean energy	Hydroelectric power plants are mainly created for population and industrial centers; frequently villages near the dams are not even connected to the power grid. Often, electricity prices increase after the construction of hydroelectric power plants to cover their cost of construction.
	Decent work and economic growth	The jobs that are created by the construction of dams are only temporary, and the working conditions are often deplorable. Agribusiness and resource extraction profit from dams but are not labor-intensive. Local economy would employ more with decentralized energy sources.
	Reducing inequalities	The negative impacts of dams on the affected, such as resettlement and the destruction of livelihoods, often exacerbate inequality.
	Responsible consumption and production	Hydropower is particularly beneficial to economic sectors such as large agribusiness and resource extraction – intensifying activities which are not sustainable.
	Climate action	Hydroelectric power plants emit greenhouse gases such as methane and nitrous oxide. What is more, they are themselves affected by climate change: droughts can impair their efficiency, and heavy rainfall endanger their safety.
	Life below water	Dams destroy many fresh-water ecosystems, leading to great loss of aquatic biodiversity. By disrupting the drainage of sediment, sand deposits are prevented in coastal regions, accelerating their erosion. The flora and fauna of the oceans need the nutrients of sediments as well.
	Life on land	Hydropower exacerbates destruction of terrestrial habitats, including forest and destroys river ecosystems; biodiversity is reduced. This has also a negative impact on the global climate (see SDG 12).
	Peace, justice and strong institutions	Hydroelectric power plants are often implemented without adequate participation of the population, violating national regulations, and/or include corruption. Protests are often quelled by means of violence. Dams in border regions can worsen interstate tensions as well.

ment, too. In order to stop climate change, the maintenance of forests is essential, as 40 scientists recently declared in an official statement. By maintaining existing forests and reforestation, they can contribute up to 18 percent of the necessary emissions reductions needed by 2030 in order to remain under the global warming temperature of 1.5° centigrade. "The future climate of our planet is inseparable from the future of our forests", contend the scientists.²¹ The Amazon rainforest is the largest forest on our planet and is being directly destroyed by hydroelectric power plants. Hydroelectric power plants alter – among other things – the exchange of high and low water in rivers, damaging the Amazon rainforest; even now, the above mentioned sediment blockade is negatively affecting the world's largest forest (*SDG 15: Life on Land*).²² The interruption of sediment transport is even having repercussions on the flora and fauna in the oceans, whose nutrients are also being withheld, as recent studies have shown (*SDG 14: Life below water*).²³ On top of this, hydroelectric power plants are often connected to other economic activities that are harmful for the environment and the climate, including energy-intensive mining projects. Studies show that mining is responsible for 10 percent of all destruction in the Amazon rainforest.²⁴ Hydroelectric dams are important infrastructure for energy-intensive mining projects and thus attract them to isolated areas in the Amazon.²⁵ The agriculture industry also profits from the expansion of hydropower in the region: in

addition to the planned dams on the Tapajós river, the expansion of a waterway and train lines for the export of ores and agrarian goods.²⁶ Consequently, the expansion of the agriculture and mining industries is fostered, counteracting *SDG 12 (Responsible consumption and production)*.

Such consequences are almost never taken into consideration in environmental impact assessments. Yet in order to correctly evaluate the effect of hydropower on the SDGs and the climate, they also must be taken into account.

CONCLUSION

The idea that climate change can be fought and many of the UN sustainability goals can be achieved by simply building more hydroelectric power plants is short-sighted. On the contrary, hydroelectric power plants frequently foster poverty, harm health and destroy ecosystems. They promote inequality and unsustainable economic practices. Furthermore, they produce climate-damaging greenhouse gases. What is really needed to achieve the SDGs and implement the Paris Climate Agreement is a fundamental paradigm shift toward energy planning that is anchored in the needs of local populations and which comprehensively takes into account a project's effects on all SDGs, biodiversity and the climate, as well as primarily considers decency and energy efficiency. Its aim must be the protection of free-flowing rivers, which are crucial for the preservation of livelihoods and resilience to climate change.

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GegenStrömung / CounterCurrent
www.gegenstroemung.org
gegenstroemung@gegenstroemung.org



c/o
 Institut für Ökologie und Aktions-Ethnologie e.V. (INFOE)
 Melchiorstr. 3 // D-50670 Köln // www.infoe.de // infoe@infoe.de

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