
Death by a thousand cuts
Black catalogue of small hydropower plants
RiverWatch EURONATUR

The Trojan horse of true renewable energy

They used to be here, the fish. Ivan Mishev remembers the time well. Ivan is the president of the Balkanka 2009 Fishing Association, and he recalls the happier days before the concrete came, when he regularly pulled in 60 centimetre long trout from the lower sections of the Blagoevgradska Bistritsa here in the mountains of south west Bulgaria. That time is history now. A series of small hydropower plants have ruined the river. Ivan and the 100 members of his fishing association now have to fish elsewhere. But they now know what they didn't know back then when the investors turned up and promised the wonders of small hydropower. They now know that small hydropower is not benign. They know it makes no sense. They know it destroys rivers. And they are determined to not let it happen again.

Small hydropower is the Trojan horse of genuine renewable energy. Promised as a low impact, environmentally friendly, renewable source of electricity production, the propaganda of small hydropower has convinced many people that it is good for them, good for the climate and good for nature. However, like the deception of Troy where the small garrison of soldiers crept out of the horse under the cover of darkness and opened the gates to the army that then sacked the city, small hydropower is an artifice that does nothing but wanton damage. But unlike the mythological story of Troy, small hydropower's treachery is real. Once let loose on our rivers, creeks and streams, it wreaks real havoc on natural ecosystems and the communities that depend on them to survive.

Cutting, drying and dissecting rivers and streams, small hydropower dams and diversions have clear negative impacts on freshwater systems. Especially when developed as a sequence of installations, these impacts can be even larger than bigger dams, whose negative consequences are well known. At capacities less than 10 MW (15 MW in Austria), small hydropower plants are often built without assessing any environmental impacts. They are inefficient, producing tiny amounts of electricity, yet they are destroying the last living rivers and streams we have. They are independently economically unviable and survive only with the assistance of vast subsidies and tariffs — all paid by consumers through their electricity bills who remain largely unaware of the damage inflicted on rivers and streams — and where the environmental costs are borne by nature and the broader community. They are vulnerable to climate change and, unlike solar and wind, their technology is outdated and stagnant.

The very definition of the word "renewable" necessitates that something is restored or replenished over time. The simple fact that small hydropower development degrades river systems and kills the plants and species that inhabit them means it cannot — and should not — be considered a source of renewable energy.

Small hydropower is to renewable energy what asbestos is to building materials of the future. It's a misleading and mistaken promise that hides a terrible reality. A free-flowing river, turned into an electricity factory — cut, diverted and sucked dry — is no longer a river. At a time when actions to solve the interconnected climate and biodiversity crises go hand in hand, future energy supply can no longer come at the expense of nature. This can no longer be negotiable.

Presenting only a tiny, but representative number of the tens of thousands of plants that dissect rivers and streams across the European continent, this report lifts the veil on the false promise of small hydropower, revealing its great deception.

Left: Where the river stops. Small hydropower dam on the Ugar River in Bosnia and Herzegovina. Here, the globally endangered Danube salmon, or huchen, *(Hucho hucho)* has lost its spawning habitat.
Photo: Amel Emric

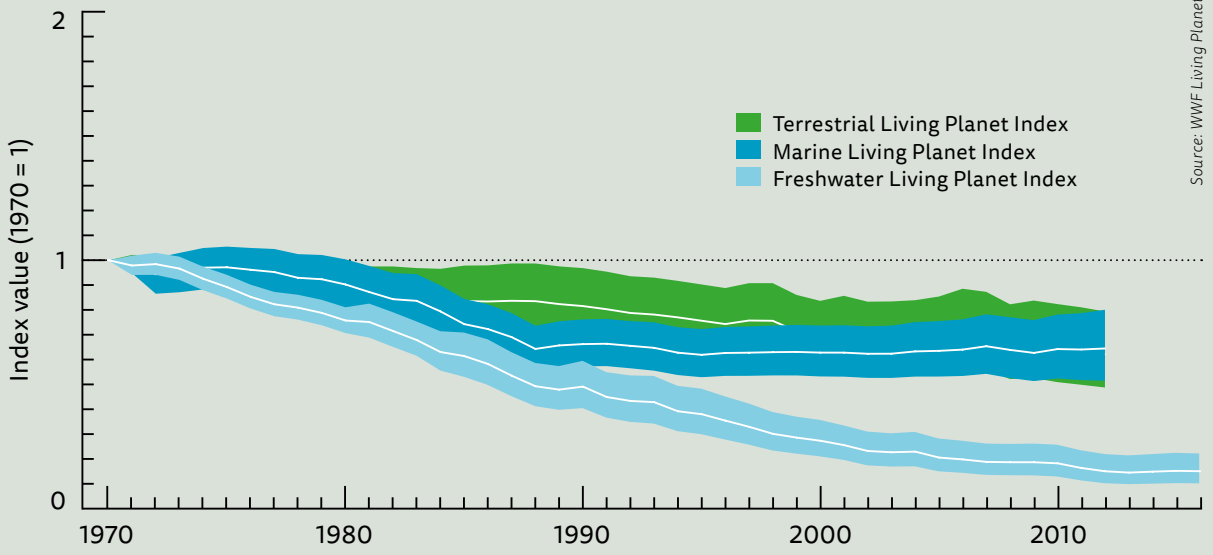
Small hydropower's big deception

Rivers are the beating lifeblood of our land. They replenish and rejuvenate, they pulse and flow, they are the source upon which life thrives. Beyond their value to humans, which is without limit in terms of food production and water supply, an incalculable number of plants and animals would simply not exist without rivers and the estuaries and wetlands they feed. Rivers are extremely rich in biodiversity. From glacial mountain tops to estuaries and salt-water river mouths, free-flowing rivers are critical sanctuaries teeming with so much life that science is still discovering new plant, insect and animal species that call them home.

So why have we treated them which such disregard?

- On a global scale, freshwater ecosystem populations are the most threatened on the planet. In only five brief decades, freshwater populations the world over have declined by a catastrophic 84 % (WWF 2020)(Figure 1).
- This dire situation is mirrored in Europe where freshwater systems have suffered immeasurably from human intervention. The conservation status of freshwater species and habitats is poor, with only 17 % of species and 16 % of habitats reporting a favourable conservation status (European Environment Agency 2015).
- 60 % of rivers within the European Union do not have a good ecological status. Furthermore, little progress has been made on improving this status since the previous assessment in 2009 (European Environment Agency 2018).
- Over one third (37 %) of freshwater fish and almost half (44 %) of freshwater molluscs are threatened according to IUCN criteria (Freyhof and Brooks 2011).
- Fish and mollusc species make up the two most threatened taxonomic groups in Europe (Freyhof 2012).
- Migratory fish populations in the EU have declined by 93 % between 1970 and 2016 (World Fish Migration Foundation 2020).

The contribution to this decline in freshwater values from small hydropower dams and diversions cannot be underestimated. Whilst the damage from large hydropower dams — the fragmentation and impoundment of rivers, significant alteration of sediment and hydrological regimes, dissection of fish migration, loss of freshwater species, incursions into natural areas, displacement of countless communities and cultures, loss of food sources — is widely known (Liermann et al. 2012), it is generally less recognised that small hydropower plants also have substantial negative impacts on river systems:



- A 2017 review of over 3,600 studies and policy documents related to small hydropower found a glaring neglect for important governance considerations including social, environmental and cumulative impacts because of the "unwarranted assumption

Figure 1: Decline in Living Planet Index (LPI) — the state of global biodiversity — of freshwater, marine, and terrestrial systems. Freshwater systems have suffered the greatest decline (84 % since 1970) in species population abundance.

Figure 2: At least 11 small hydropower plants are planned to be built in a series of 'cascades' on a tiny 15 kilometre stretch of the pristine Ljuta River in Bosnia and Herzegovina. The negative impacts of these 'cascades' are cumulative and are often never assessed.

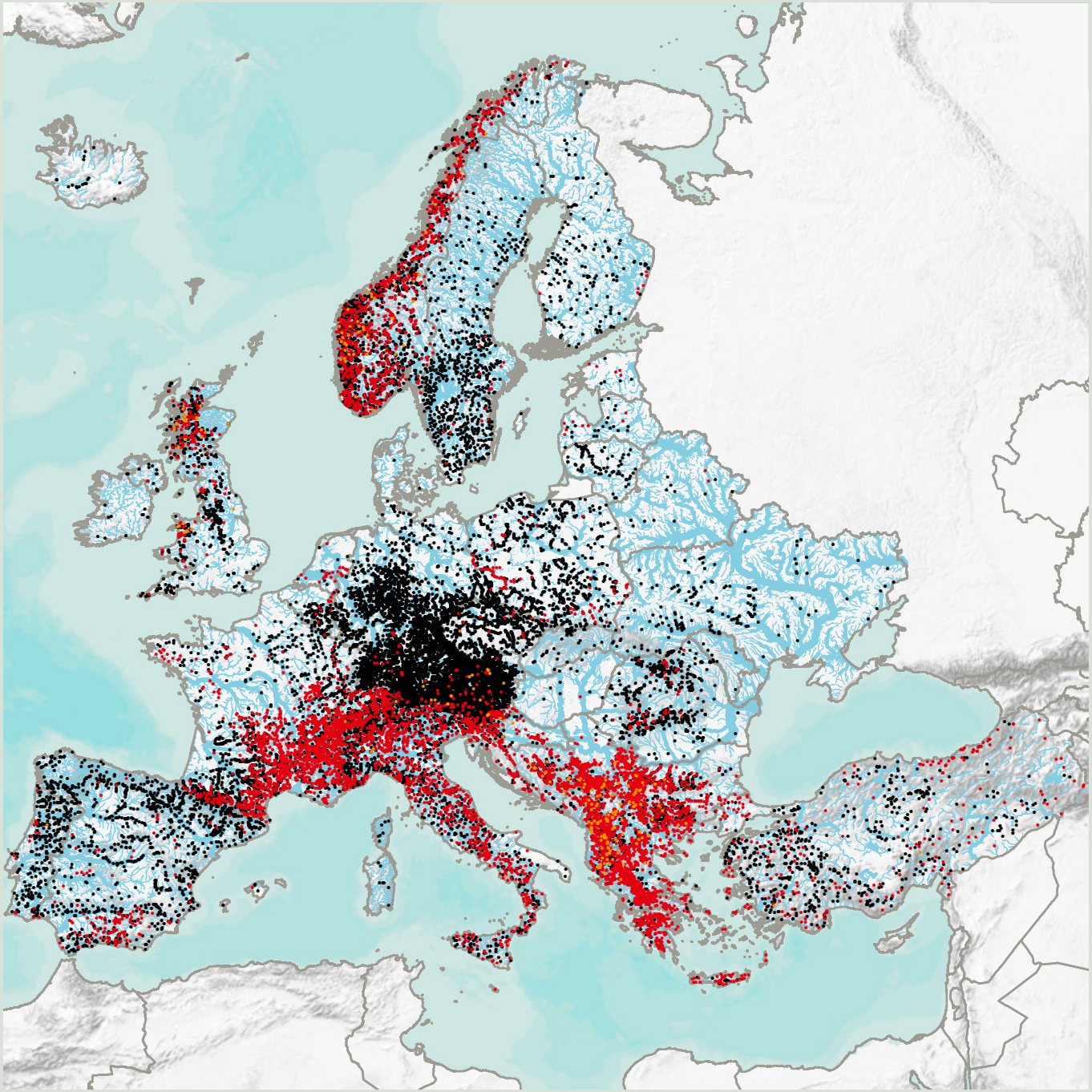
that SHP is a lower impact or innocuous technology" (Kelly et al. 2017).

- The impacts of small hydropower plants on fragile natural river systems — particularly in the smaller upper stream catchments where unique and endemic species have adapted to highly specific habitats — can be equivalent to, or even greater than, large dams (Kibler and Tullos 2013).
- As small hydropower plants produce tiny amounts of electricity, they are often built in a series of cascades along river stretches (Figure 2). Turning free-flowing rivers into series of impoundments and dried river beds, the disruptive impacts of these cascades on river ecology, particularly on migratory species that need to move up and down rivers are cumulative. With many small hydropower projects not being subjected to environmental assessment processes, this cumulative impact is often not even measured in the first place (Nelson 2015).
- Small hydropower alters water temperature, flow and sediment regimes, channel hydromorphology (how physically "intact" a water course is) and river connectivity, which all impact freshwater biodiversity (Couto and Olden 2018).
- In the Mediterranean Basin, which includes European countries from Portugal to Turkey, planned small hydropower plants will negatively impact 161 of the region's 251 threatened freshwater fish (Freyhof et al. 2020).
- Particularly in remote areas, the impact of small hydropower is felt well beyond the river system where forests are lost and natural areas fragmented as roads, pipelines and electricity pylons are built to construct and service the plant.
- Most small hydropower plants divert water away from the river to run through a turbine that is often located away from the river. In many countries as much as 95 % of the flow can be legally diverted from the river. Drought and climate conditions mean that this can be even worse and scientists rightly state that this cannot be considered "ecological" (Weiss et al. 2018).
- On the Balkan peninsular about 870,000 people would be affected by the 3,000 hydropower plants that are either planned or under construction. About 91 % of the dam projects are small scale (CALTUS 2020).

Due to the sheer number of small hydropower plants that exist on rivers across Europe, these cumulative impacts are almost immeasurable. **At least 19,300 small hydropower plants currently degrade European rivers, around 240 are under construction and almost 8,000 more are planned (Figure 3). Small hydropower plants make up 91 % of all hydropower plants in Europe.** Incredibly, most were built without environmental assessments so the exact impacts are not known.

In its recent Biodiversity Strategy, the European Commission reiterated the importance of restoring freshwater ecosystems, acknowledging that implementation of the current legal framework is lagging (EU communication 2020). A key plank of this strategy is the restoration of 25,000 kilometres of rivers to a free flowing state by 2030. Building more small hydropower plants, and using EU funds to finance them, is clearly not aligned with this strategy.

The slow deaths of European rivers have come by thousands and thousands of cuts. If the European Union is serious about reversing river degradation, the cuts of small hydropower, which make the problem worse, must first be stopped and river barriers including small hydropower plants must increasingly be removed.



- Existing
- Under construction
- Planned

Figure 3: Distribution of recorded small hydropower plants (0.1 – < 10 MW) in Europe. 19,344 small plants exist (black), 239 are currently under construction (orange) and 7,921 are planned (red).
Sources: Esri, USGS, NOAA, FLUVIUS.
Map: FLUVIUS, Vienna 2020

A picture tells a story

With over 28,000 small hydropower plants existing, under construction or planned across Europe, only a handful can be shown here in a small selection of countries. These pictures unveil small hydropower's cruel deception.

1 Valbona River. Small hydropower dam under construction in the middle of the Valbona National Park in northern Albania.
Several more are planned and local opposition to these plans in one of Albania's most precious national parks has been steadfast for many years. *Photo: Mirjan Aliaj*

Existing 161 Under construction 52 Planned 418 **Albania**

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2 Rapuni River. Built with finance from the Albanian Orthodox Church, the Rapuni 3 dam has bled this once great river dry. **3 Black Lake (Liqeni e Zi).** Scarring the landscape well beyond the water body, road and water pipe construction for the Ternove plant in eastern Albania leave a terrible mark on the near natural mountain side. Built with a 6 million Euro loan from the European Bank for Reconstruction and Development, water is taken from this "protected" National Monument, a glacial lake that sits over 1,300 metres above sea level. **4 Langarica River.** Built in the Fir of Hotovë-Dangelli National Park at the head of the spectacular Langarica Canyon, a major tributary of the mighty Vjosa River, this dam diverts most of the river's water from the canyon, which was designated a National Monument in the 1970s. *Photos: Amel Emric*

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1 Erlauf River. Construction of "small" hydropower plant on this tributary of the Danube River. The plant, which is replacing an old weir, is within a Natura 2000 site (whose listing includes a number of rare fish and invertebrate species) and a natural monument protected area, one of the highest protected area categories in Austria. *Photo: Gerda Petkov* **2 Vomperbach.** Built at a time when the consequences for nature were not considered, all water is taken away from this river in Tyrol. The status is the same today, where in some locations, rivers are entirely diverted through pipes to other valleys. **3 Radurschl.** A river flowing down the drain. Here, this stream in Tyrol in western Austria simply disappears into the earth. *Photos: Anton Vorauer*

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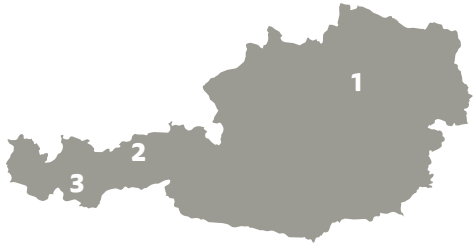

4,260 14 80 **Austria**


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1 Drinjaca River. Bosnia and Herzegovina has been a hotspot of small hydropower in recent years with plants being approved almost on a daily basis, fuelling high levels of opposition across the country. The damage here shows clearly why it's no surprise that Bosnians are waking up to true destruction of rivers in their country. *Photo: Amel Emric* **2 Bjelava River.** Alleged illegal bulldozing of the river during the COVID-19 lockdown. This construction site was physically blocked in May 2020 by local residents, joined by the Coalition for the Protection of Rivers in Bosnia and Herzegovina who have submitted criminal complaints against the construction firm. *Photo: Robert Oroz* **3 Ugar River.** When a river becomes a trickle. This plant has contributed to the loss of spawning habitat for the globally endangered Danube salmon. *Photo: Ulrich Eichelmann* **4 Vrbas River.** Turning a river into a rubbish dump. The tiny 0.97 MW Voljevac small hydropower plant has turned the river into something that was never planned by nature. *Photo: Anes Podić*

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1 Davidkovska River. Fish ladder or a contract for a lot of concrete? Small hydropower dam wall with bizarre fish 'ladder' in the Rodopi-Sredni Natura 2000 site in southern Bulgaria. **2 Botunya River.** Described by Bulgarian conservationists as "a terrible ecological catastrophe," the Luna hydropower plant has completely destroyed this river. Tractors and trucks have been driven into the river in an attempt to remove the sludge. **3 Malyk Iskyr River.** Typical small hydropower plant in Bulgaria, this one just east of Sofia. Organisations including the Balkanka Association have lodged no less than 9 complaints with the EU Commission for alleged unlawful hydropower developments. *Photos: dams.reki.bg*

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Bulgaria 261 5 332

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1 Berounka River. All this for so little. With a capacity of only around 120 kW, the small hydropower plant in Zadní Třebaň sure has had an impact. Leaving the river almost completely dry for many months, often no water passes the dam wall. In the Czech Republic, hydropower plants have been built at almost two-thirds of all "technically exploitable stream places." That does not leave a lot of room for nature. **2 Rolava River.** Thrown off course, this river in western Czech Republic has been completely diverted through the small hydropower plant, still in operation. The original river bed is to the left of the picture, but the hydropower developer "improved" the exploitation by dumping sand and soil into the river to divert it all into the plant. **3.** Every year, an uncountable number of eels is killed when trying to pass through hydropower plants, including small hydropower plants.
Photos: Czech Anglers Union

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1 Hiitolanjoki River. A number of small hydropower plants have dried out sections of this river, one of the most important for completely natural land-locked salmon in Finland. Plans are underway to remove three barriers which will help repopulate the salmon to these river sections. **2 Virojoki River.** Small hydropower plant on this river in south eastern Finland. **3 Karvianjoki River.** Migratory fish routes have been completely fragmented by small hydropower plants. *Photos: Manu Vihtonen / WWF Finland*

Finland 175 6 0

Inefficient and unnecessary

The contribution of small scale hydropower plants to overall electricity generation is very small and unjustified based on the environmental costs.

In the Danube basin, for example, hydropower plants with a capacity of less than 1 MW make up 90 % of all hydropower plants by number, but contribute less than 4 % of electricity generated (ICPDR 2013). Similarly, in the European Alps, small hydropower plants represent 75 % of all hydropower plants by number, but contribute less than 5 % of overall electricity production (European Environment Agency 2012).

In Germany, approximately 7,300 small hydropower plants make up 90 % of all German hydropower plants by number but contribute only 12 % of hydropower electricity generation (Kampa 2011). With all hydropower contributing only 0.5 % of Germany's total energy mix in 2017 (Federal Ministry for Economic Affairs and Energy 2018) the contribution of these 7,300 small hydropower plants is a minuscule 0.06 % of Germany's energy demand. With the associated damage of these 7,300 plants being reflected in the poor state of the Germany's rivers, and this pattern repeated all over Europe, it is simply nonsensical to attempt to continue to support small hydropower as a future energy solution.

No energy source is completely benign, but the quickly advancing technological efficiencies of solar and wind energy, coupled with energy efficiency and sufficiency goals, make the need for the outdated source of electricity of small hydropower obsolete.

"[...] the contribution of small hydropower plants (of a capacity below 10 MW) to the global energy production is extremely limited while their impacts on the environment are disproportionately severe. The 390 small hydropower plants currently in operation in the Western Balkans 6 region represent almost 90 % of all hydropower plants in number while only producing 3 % of the total hydropower generation."

Source: EU Directorate-General for Neighbourhood and Enlargement Negotiations (DG NEAR) in draft document on Western Balkan 6 non-EU countries, 2018. Commissioned by the European Commission.

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1 Rönischbächle. Old hydropower plant near Bernau in the Black Forest in Germany. This structure that has fragmented the river for decades is soon to be removed and the sections of the river will be reconnected. Dam removal is necessary to let rivers run free and momentum is growing as the benefits to rivers, freshwater species populations and communities is increasingly known and experienced. *Photo: Nikolaus Geiler*

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1a + b Mis River. Construction of a small hydropower plant in the Dolomiti Bellunesi National Park in Veneto, Italy. The plant was built against the park regulations and there has been a long legal battle to remove it. The developer has been ordered to dismantle the illegally built dam, but it is still there. *Photo: Marzio Minacori / bellunopiu.it* **2 Rio Gordale.** Making a beautiful river ugly. This serene Ligurian river with a series of enchanting pools has been recently despoiled by this small hydropower plant that has since proved technically faulty and has not been made operational. A new road was paved alongside most of the river further degrading the natural environment of the area. *Photo: Elisa Cozzarini*

Italy 860 3 835

Protected only on paper

When protection means nothing. The Decani River in the Bjeshkët e Nemuna National Park in Kosovo has been 're-engineered.' Its waters now flow underground through pipes which feed the hydropower plant developed by Austrian company KELAG. Here, the once wild river in the remote mountainous region of western Kosovo has been sucked dry. The construction of the plant illegally dug up all the gravel from within the national park. *Photo: Shpresa Loshaj*

Protected areas are paramount for nature conservation. According to the International Union for the Conservation of Nature (IUCN), a protected area is a "clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values" (IUCN Definition 2008). Protected areas set aside places from the impacts of modern development and ensure natural values are maintained for perpetuity. Put simply, there are some places on the planet that are just too beautiful and too special to lose.

Protecting such places is difficult because short term profit objectives and the specious promise of local jobs is often politically persuasive. Proponents of developments that impact on nature often talk about having to maintain a 'balance' between nature protection and job creation. When it comes to Europe's rivers, protected areas and small hydropower plants, there is no balance. **At least 3,483 small hydropower plants exist within protected areas, 69 are currently under construction and 2,189 are planned to be built (Schwarz 2020). In the Balkans, 49 % of all hydropower plants (mostly small) are within protected areas. These critically important protected area boundaries are clearly not respected.** These areas include UNESCO World Heritage sites, national parks and nature reserves, Ramsar wetland sites, Biosphere reserves, Natura 2000 areas, Emerald sites and landscape protected areas. These numbers speak for themselves. Protection regimes are not strong enough nor enforced effectively to protect rivers from inappropriate small hydropower development.

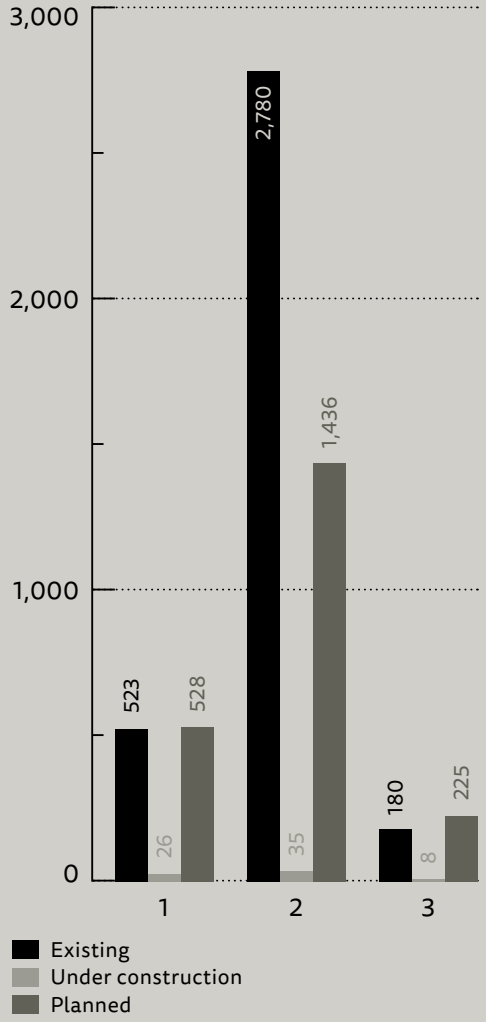

Figure 4: Small hydropower plants in Europe inside of protected areas.
Protected area categories are:
1: National parks, Ramsar sites, World Heritage sites, Biosphere reserves
2: Natura 2000 areas, Emerald Areas for Eastern Europe, Nature reserves
3: Landscape protected area

Fishy ladders

Fish ladders, or fishways, help create the perception that the impact of dams can be mitigated through technological adaptations. Unfortunately, this is largely a false promise (Freyhof et al. 2020). Firstly, many small hydropower plants are not even equipped with ladders. Where they are equipped, issues are manifold, in both up and downstream directions, in comparison to a barrier free river:

- The assumptions of discoverability and successful passage are not true for most fish and other freshwater species. Design can be focused on commercial species at the expense of others.
- Those fish that can find the ladders often cannot climb them. A German study of the use of 212 fish ladders found that only 10 % of them met criteria that fish could find them and only 5 % fulfilled criteria that fish could actually pass them (Schwevers et al. 2005 and Lachsverein Deutschland).
- When residual flows — which compete with flows for energy production — are not high enough to reach the ladder, access and successful passage are obviously impossible.
- Even if fish are able to pass the barrier, migratory routes are further disrupted by the reservoirs and dried river sections created by the barrier itself.
- Downstream passage is complicated and fish often move with the river flow, over spillways and into turbines, where mortality and injury are high.
- Ladders need to be constantly maintained, serviced and monitored to remove debris and ensure lawful flows. These services are very costly and it is not realistic to assume they will regularly take place.
- Regardless of design, a barrier in a river is a barrier. Bidirectional fish death is a given (Weiss et al. 2018).

Take a look at the photograph to the right. A picture tells a thousand words.

Fish ladder on the Davidkovska River, Bulgaria.
Photo: dams.reki.bg

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1a + b Drăgan River. No water, no problem. This small hydropower plant in north western Romania has cut the flow of the river, allowing loggers to access forests previously inaccessible to logging machinery now that the river is dry. The legality of this logging has been questioned by local environmentalists. In 2013, before this small hydropower plant was built, there was still enough water in this upper section of the Drăgan to kayak. Three important fish species, the European bullhead *(Cottus gobio)*, the brown trout *(Salmo trutta fario)* and the grayling *(Thymallus thymallus)* are all now gone from the river. It is presumed the priority Natura 2000 species, the stone crayfish *(Austropotamobius torrentium)* is also gone. *Photos: Călin Dejeu*

498 0 56 **Romania**

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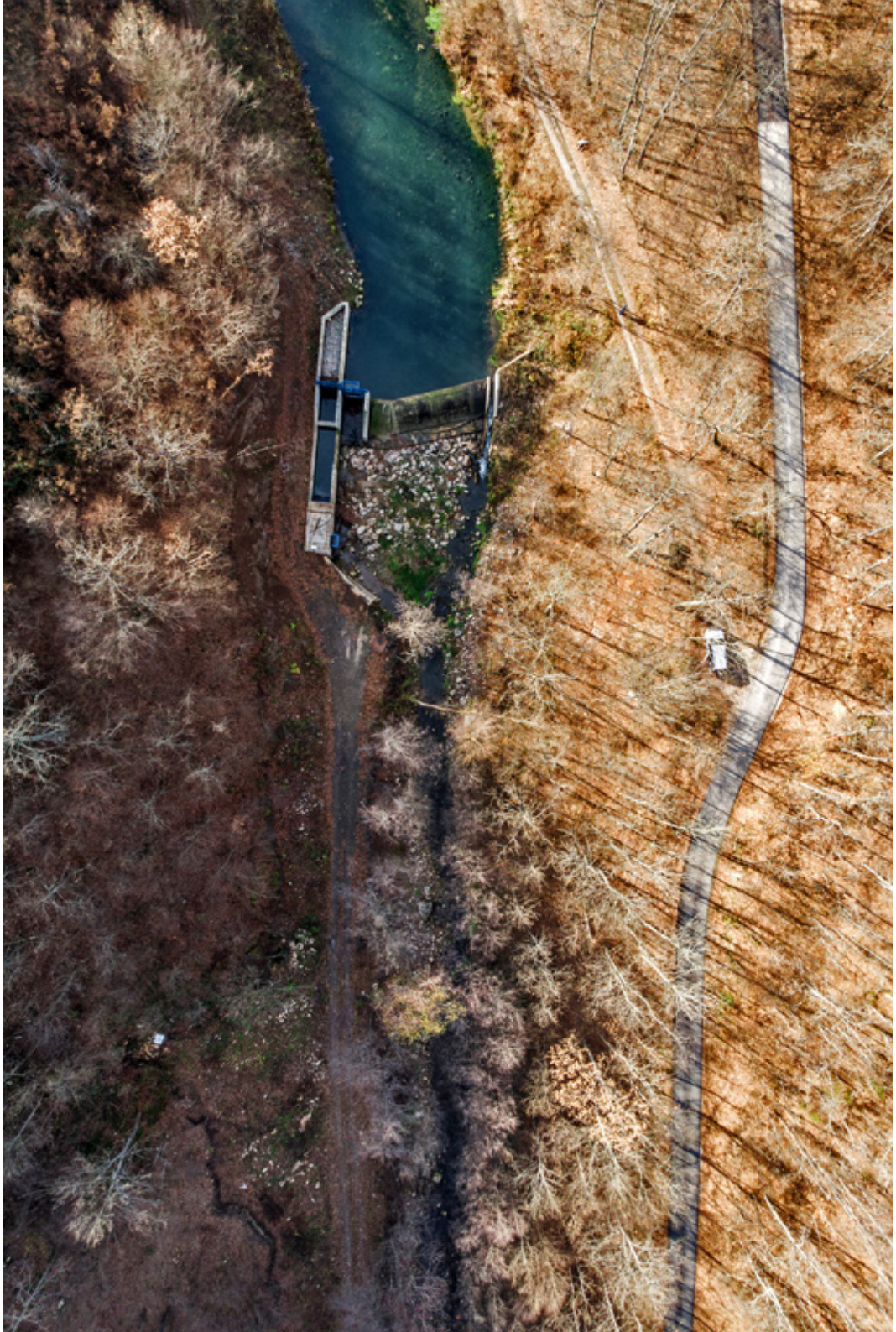

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1 Jošanica River. The Vladici 2 plant shows how a river is completely cut and dissected by small hydropower development. **2a Prištavica River.** The Ravni small hydropower plant in western Serbia brings this section of the river to an end. **2b.** A river turned to stone. The river has been completely dried out by the Ravni small hydropower plant. **2c.** Another cut. The Vrane plant downstream from the Ravni plant adds to the cumulative impact on the river. *Photos: Amel Emric*

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1a + b Hron River. Built in 2016, the almost space-like Zeliezovce small hydropower plant is the first barrier to migratory species from the river's confluence at the Danube River about 36 kilometres downstream. A year after the plant was built, thousands of common barbel *(B. barbus)* were chopped up by the turbines, coming upstream from the Danube. Protective fences had to be installed, but the channel was deepened by almost 4 metres to maximise hydropower utilisation, destroying riparian vegetation in the process. *Photos: Martina Paulikova and Norbert Romada* **1c:** River in natural state in 2015 about 300 metres upstream from where the plant was built. This location is effectively now impounded. *Photo: Martina Paulikova*

Slovakia 17 0 0

1 Krumpah River. Typical dried out river bed downstream from small hydropower plant on this highly modified stream near Ljubno na Savinji in the mountains of northern Slovenia. *Photo: Gregor Križnik* **2a + b Završnica River.** This small plant takes all the water from the river. Water is diverted into a 3.7 kilometre long pipe and does not re-enter the river until the confluence with the Sava River. Hence, the river is dry all the way to the Sava River. *Photos: Brina Sotenšek*

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1a Nianån River. Before and after the dam. Hardly a trickle of water in the river whilst the hydropower plant was in operation on the river, only 70 metres from the sea. **1b.** Water on its way to the sea. The river now flows to the sea after the plant was removed in 2017. The removal has favoured species such as the seatrout, freshwater pearl mussel, lamprey, and whitefish. *Photos: Johan Andreasson*

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Sweden 713 16 0

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1 Aabach. Only one of eleven small hydropower plants on this river in the canton of Zurich. There is no residual water flow and fish migration is completely blocked, impacting about 20 fish species including the endangered lake trout *(Salmo trutta lacustris)* and the grayling *(T. thymallus)*.
2 Merezenbach. Small hydropower plant in the canton of Valais. Again, fish migration has been all but dissected by the plant and there is no residual water left in the river. Over 500 small hydropower plants in Switzerland benefit from feed-in tariffs, paying on average 16 cents per kilowatt-hour produced, way above the market rate of 3 cents. Several hundred more small hydropower plants are planned. *Photos: Daniel Heusser / WWF Switzerland*

608 1 404 **Switzerland**

Subsidies: rubbing salt into the wounds of rivers

It is bad enough that the damage to rivers, freshwater plants and animals and surrounding natural areas is clear and significant. That this only happens because subsidies and financial incentives are made available to pay for them rubs salt into the wounds of the rivers and the communities trying to protect them.

Without subsidies such as "feed-in" tariffs, small hydropower makes no economic sense. Subsidies are designed to help kick-start industries that are considered beneficial to society but whose technology and reach are only in their infancy. Small hydropower is an old industry with no evolving technology and whose damage to the environment and distortion to the market is well known. Subsidies are available to small hydropower as it is considered renewable energy despite the well established understanding of the environmental and social damage that it can cause. These subsidies perversely incentivise small hydropower, pushing plants further and deeper into sensitive upper catchments of rivers and streams that have not previously made any sense to exploit for hydropower production.

> ***"One of the main drivers of the destructive small hydropower boom in the Western Balkans is the availability of public financial support in the form of feed-in tariffs. Originally foreseen as a means to boost all forms of renewable energy, including solar and wind, in the Western Balkans feed-in tariffs have been disproportionately directed towards small hydropower plants. In 2018, small hydropower plants received 70 per cent of the feed-in tariffs paid out for renewable energy across the Western Balkans. Yet they generated only 3.6 per cent of total electricity."***
> *(CEE Bankwatch Network 2019)*

The EU has a policy to end subsidies that are harmful to the environment by 2020 (EU Commission 2010). The Convention on Biological Diversity (CBD) is a global convention that aims to protect biodiversity and is supported by 196 country parties. One of it's strategic Aichi goals is to "address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society" (CBD 2012). To deliver such a goal, Target 3 states that:

"By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions." (CBD Aichi Target 3)

It is clear that subsidisation of small hydropower is in breach of these EU and international commitments. For many years scientists and conservationists have been calling for an end to subsidies for small hydropower. This voice is growing stronger now that the impacts of the tsunami of subsidy-supported small hydropower plants are becoming clearer across the European continent. Nowhere is the illogical feed-in tariff support for small hydropower more stark than in the Western Balkans (see central text box).

In 2016/17, hydropower received more than 4.2 billion euros of public support from EU Member states, backed by the European Commission, through feed-in tariffs and premiums, green certificates and investment grants (WWF, personal comms.). Given commitments of the EU's Green New Deal, particularly in light of its detailed Biodiversity Strategy target of restoring 25,000 kilometres of free flowing rivers, ongoing subsidies and financial support are unacceptable and must cease.

> ***"In terms of development cooperation, it lays down how we will engage in greater cooperation with partner countries and offer increased financing for biodiversity-friendly actions, as well as the phasing out of subsidies that can be harmful for nature. On trade, the Commission will deploy measures to ensure that its trade policies 'do no harm' to biodiversity."***
> *EU Biodiversity Strategy communication (EU Commission 2020)*

> ***"The subsidies for small hydropower are the major driver of ecological destruction and social conflicts in the region, and worst of all, without generating a noteworthy amount of energy. Together with forest biomass, subsidies for hydropower are devastating for our land and people. Governments need to end these incentives."***
> *Ulrich Eichelmann, CEO of Riverwatch*

Right: The iconic Huchen (Danube Salmon) needs free flowing rivers to survive. Small hydropower plants create major barriers to its migratory needs. *Photo: Erhard Kraus*

People power vs small hydropower

In 2014, Italian NGOs submitted a complaint to the European Union highlighting breaches of the Water Framework Directive by hydropower plants on rivers and streams in Italy. Their complaint was submitted the same year that over 100 scientific, environmental and cultural organisations submitted an appeal, the National Appeal for the Protection of Water Courses from Excessive Hydropower Exploitation, to the Italian government to immediately suspend all new concessions and authorisations of hydropower on rivers in Italy. In 2020, the EU complaint is still outstanding and the Italian government continues to subsidise small hydropower plants.

In March 2020, over 60 scientific experts in the fields of aquatic ecology and biodiversity wrote a letter to the Austrian Federal Minister for Environment highlighting that the construction of small hydropower "contradicts the principles of sustainable development" and threatens the EU Biodiversity Strategy's river restoration objectives.

Environmental organisations in Bulgaria have submitted at least 9 complaints related to small hydropower breaches of legislation in the past 4 years to the European Commission Directorate-General for Environment. Their complaints are still outstanding.

In August 2020, hundreds of people from all over Serbia came together to the tiny village of Rakita and dug out pipes that were illegally laid to build a small hydropower plant. Although the Ministry for Environment had ordered the pipes to be removed, authorities did nothing to stop further illegal construction of the plant. The people stood by the law, and dug out the pipe themselves, with their bare hands.

These are but a tiny portion of official appeals to EU and government authorities to end the support for small hydropower development. In recent years, these appeals have been underpinned by a groundswell of peaceful, direct public opposition to small hydropower and support for river protection. In the Balkan region, where around 3,000 small hydropower plants have been proposed on some of the most intact and outstanding rivers left in Europe, this opposition has been explosive. In many countries, legal challenges have halted or delayed small hydropower developments, adding also to the risk of investment in this highly controversial industry.

1 River protest against the Rosenburg hydropower plant on the Kamp River in Austria in 2017. *Photo: Riverwatch*

2 250 people from over 30 countries attend the first European Rivers Summit in Sarajevo in 2018 protesting against the damming of rivers. *Photo: Flying Pangolin Film. Art by Luka Tomac*

3 Rally in Belgrade in January 2019 against small hydropower construction on the tiny Rakitska River in southern Serbia. *Photo: Tijana Jevtić*

4 Serbians stand shoulder to shoulder, digging out illegally laid pipes of small hydropower plant in Rakita, south eastern Serbia. *Photo: Jovan Đerić*

5 Around 300 locals peacefully block hydropower construction on the Neretvica River in Bosnia and Herzegovina on June 1st, 2020. *Photo: Svjetlana Panić*

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Conclusions

The EU Biodiversity Strategy and its goal to restore 25,000 kilometres of free-flowing rivers by 2030 is an acknowledgement that how we have treated rivers in the past cannot be the same as how we treat them in the future. That future begins now.

To restore free-flowing rivers and actually deliver on the EU Water Framework Directive's objectives of restoring river health back to a 'good status,' we must first stop activities and developments that are making things worse. Small hydropower plants have clear, long-term impacts on river systems and their delicate natural ecosystems. Their tiny contribution to energy production does not justify the impacts they have on rivers. We cannot restore rivers on the one hand whilst we continue to degrade them on the other.

The fact that renewable energy policies not only give the green light to small hydropower but incentivise them is a true indication of a senseless and irrational policy setting that clearly undermines society's broader need to protect and restore our precious river systems. Without these incentives and subsidies, the economic viability of most small hydropower plants evaporates.

As scientific understanding of the enormous impact that small hydropower plants is having on nature grows, so, too, does public opposition to them. This growing body of scientific knowledge, coupled with public support for river protection, must now be met and underpinned by public policy that reverses its current support for small hydropower.

The tsunami of small hydropower plants that has swept Europe, and wreaked havoc on the sensitive freshwater ecosystems and smaller rivers and streams must be reigned in and stopped. The almost 8,000 planned small hydropower projects cannot be built.

We call on all European governments and the investment community to act now to protect our previous rivers by urgently following these steps:

The Shushica River, a beautiful intact river flowing through the rugged mountains of southern Albania, is threatened by four planned small hydropower plants. The cancellation of these reckless plans and the Shushica's subsequent protection would signal a different future for Europe's last wild rivers. *Photo: Ulrich Eichelmann*

- **Public finance, in the form of feed-in tariffs or any other subsidy mechanism, for small hydropower plants must stop**
- **The EU must remove small hydropower from the list of State Aid guidelines**
- **In light of the EU's Biodiversity Strategy and the true impact that plants have on freshwater ecosystems, all concessions for existing plans that have not been built must be put on hold and reviewed**
- **Public and private banks should no longer provide funding for small hydropower projects**
- **An analysis of all existing small hydropower plants should be conducted in the context of energy efficiency policy and the contributions that other more benign renewable energy sources such as wind and solar can make, with the goal of removing small plants from rivers to store the ecological integrity of freshwater river systems.**

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