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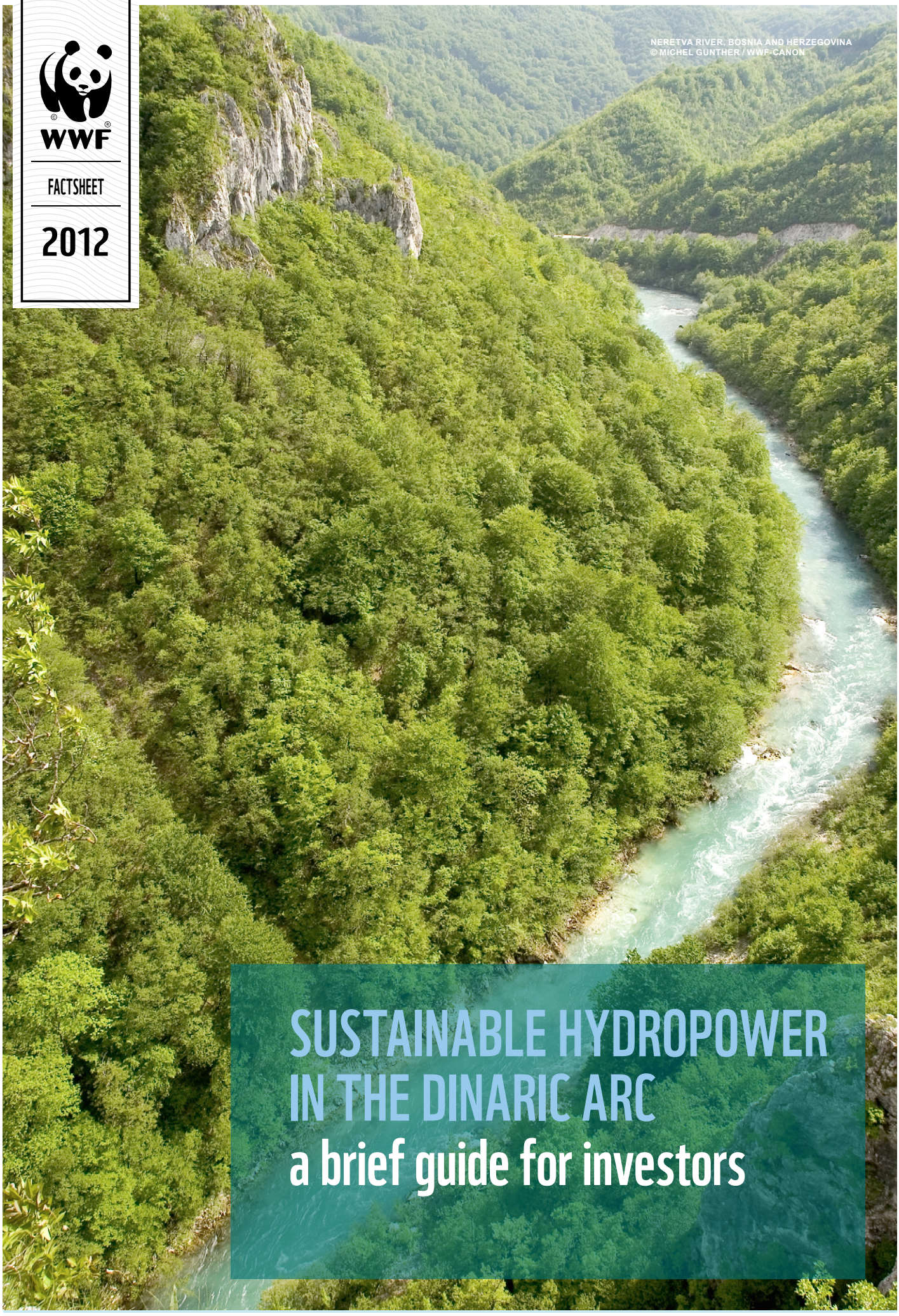


NERETVA RIVER, BOSNIA AND HERZEGOVINA
© MICHEL GUNTHER / WWF-CANON

SUSTAINABLE HYDROPOWER IN THE DINARIC ARC

a brief guide for investors

GRABOVICA DAM. BOSNIA AND HERZEGOVINA © MICHEL GUNTHER / WWF-CANON

The world's needs for water and energy are rapidly increasing but unless these needs are met sustainably the costs — whether economic, social or environmental — will be enormous. With this guide WWF contributes to a new approach to decision making by providing investors and developers with a detailed overview of the benefits, costs and risks to be taken into account when considering investments in dams, and in particular hydropower.

WWF's approach to dams and hydropower

Dams can bring substantial benefits to people by providing electricity from hydropower, water for irrigation and protection from floods or a combination of these. However, the impacts of dams on the environment — in particular freshwater ecosystems — and on people's livelihoods are always significant, while their benefits are often overestimated and the social and environmental costs underestimated. It is crucial to avoid adverse social and environmental impacts of such infrastructure and to ensure that investors' — as well as tax payers' — money is used effectively. Poorly designed projects, exaggerated forecasts of returns and reputational risk have made many dam projects a risky investment. Following a set of recommendations inspired by the World Commission on Dams (WCD), including comprehensive needs and options assessments, stakeholder involvement and the avoidance or minimization of environmental and social impacts will significantly reduce investment risk.

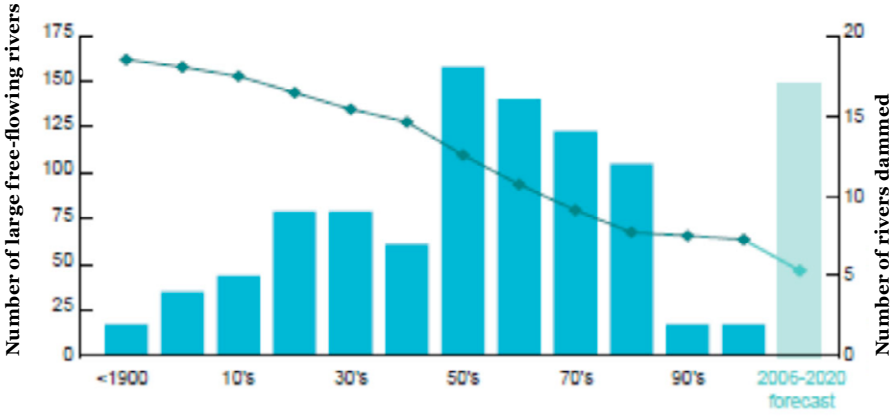
www.dams.org/report
www.unep.org/dams/WCD

This paper offers recommendations and information to stakeholders, in particular investors and developers, on WWF's approach to dams and hydropower. It is intended to assist in the making of sound decisions on such infrastructure so as to secure the best return to investors at the smallest cost to the environment.

Why do dams harm freshwater ecosystems?

The 50,000 large dams in the world have had a major impact on freshwater ecosystems. Together with canals and diversions they are responsible for the fragmentation of more than 60% of the world's largest rivers. Dams have also contributed to a huge loss in freshwater biodiversity. More than half of nearly 200 key freshwater species have declining populations and, of the approximately 177 rivers in the world greater than 1,000km in length, only around a third remain free- flowing according to WWF's latest Living Planet Report.

www.panda.org/lpr



Trends in number of global free-flowing rivers greater than 1,000km in length. Trends from pre-1900 to the present day and estimated to 2020

compared to the number of rivers dammed over time.

WWF 2006.

From an environmental perspective dams that affect protected areas or those of international importance, such as wetland sites designated under the Ramsar Convention, are of most concern.

www.ramsar.org

In many cases, however, severe impacts could be reduced, if not reversed, through measures that limit environmental damage. This approach is referred to as mitigation and can be achieved through the efficient design and enforcement of legal and regulatory frameworks and appropriate market incentives. In the western Balkans, for instance, Croatia and Bosnia and Herzegovina have aligned their water legislation to the Water Framework Directive in the light of future accession to the EU. Switzerland, meanwhile, has opted for a market-driven approach, harnessing the demand for green energy in order to drive up the environmental performance of existing dams.

How to make dams sustainable

With the publication of the World Commission on Dams' report, decision makers worldwide now have access to several recommendations indicating the way towards increasing the sustainability of hydropower and reducing the social and environmental risks of dams development. Suggestions for improving dams' sustainability include notably:

- Winning public support based on reliable information to enable people — institutional stakeholders and local residents alike — to participate meaningfully in decision making.
- Assessing all the options, ensuring that social and environmental aspects are given equal weight with technical factors, and reviewing existing dams from a technical and social point of view.
- Getting the most out of existing dams before building new ones.
- Promoting understanding of aquatic ecosystems and how they are maintained throughout the entire river basin.
- Sharing the benefits of dams.
- Ensuring construction complies with best available agreed standards.
- Addressing cross-border impacts, especially in schemes involving the diversion of water.

IN RECENT YEARS, FRESHWATER ECOSYSTEMS OF SOUTHEASTERN EUROPE HAVE BEEN AFFECTED BY AN INCREASED DEMAND FOR HYDROPOWER, LEADING TO A LOSS OF BIODIVERSITY THAT IS NOW IRREVERSIBLE IN SOME PLACES. MANY NEW DAMS—LARGE AND SMALL—ARE PLANNED OR UNDERWAY IN THE REGION.

www.dams.org/report

When is it appropriate to invest in dams?

At the stage of scoping it is important that the developer conducts a number of preliminary assessments to determine whether their project is the best option for energy development in the targeted region. These are mainly:

Needs assessment

For an investment as large as a dam an accurate needs assessment is essential otherwise the project may fail to satisfy its objectives and produce a suitable return. This is particularly important where a dam project is likely to consume a large part of the country's financial resources for several years — in the expectation, of course, that it will benefit the country's economy in the longer term.

Alternative options assessment

If a definite need has been established, there are two reasons for investigating alternatives. First, a dam is likely to be more politically acceptable to stakeholders if it can be shown that all alternatives have been considered and, where feasible, implemented. Second, if there are no economically viable alternatives then construction of a dam is more likely to be financially justified.

On-going review

As it can take more than a decade from the initial proposal to the construction of a dam there is always the possibility that major changes will influence the assessment of needs and options, both at national and international levels. At a national level, a new government could be in place with a different set of priorities or a major change in national policies. Typical external changes include fluctuating fossil fuel prices. Such changes can radically affect calculations of the financial benefits of a dam or, more dramatically, eliminate the need for its construction.

What to avoid when investing in dams

It is important that all risks are considered and evaluated at an early stage of project planning. This may take the form of a range of "what if" questions addressing natural risks (e.g. climate or geology), political risks and changing global patterns of consumption. The level of detail with which these questions are answered depends on the risk to a satisfactory outcome. The most commonly agreed upon things to avoid when investing in dams include:

Over-optimistic projections of benefits: The review carried out by the WCD has found that costs are often underestimated while benefits (such as electricity generated, irrigation, domestic and industrial water supply, navigation, recreation and fisheries) are exaggerated.

Time and cost overruns: While project managers pledge to deliver "on time, within budget and to specification", unfortunately, with major schemes, the first of these targets is often not reached. Time overruns are usually associated with unrealistic, hasty planning and overestimated original budgets.

Inaccurate assessment of impacts on people's livelihoods: While it is relatively easy to estimate the extent of the area to be flooded by a dam from topographic maps and the designed top water level, the impact on displaced persons and those living downstream, their livelihoods and the wider environmental effects are far more difficult issues. Environmental and Social Impact Assessments (ESIAs) should be carried out by recognised independent experts and their quality verified.

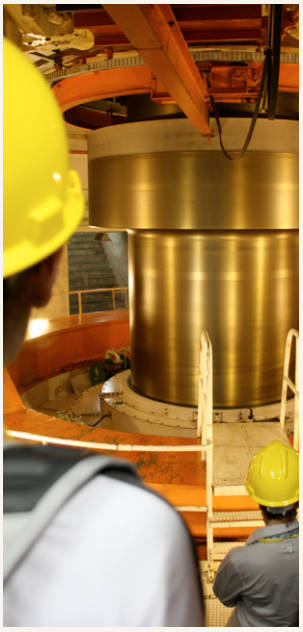
Maintenance and operating costs: While the initial cost of building a dam may be huge, other recurring costs can also be an important part of the financial equation. In general, the running costs (e.g. operations maintenance staff and equipment) of the dam itself are relatively well understood. What is often less understood are the maintenance and operating costs associated with the benefits the dam is intended to provide. Typical costs include new distribution and drainage channels for irrigation, new power lines and transformers for hydropower. All dams become increasingly expensive to maintain in a structurally sound state as they age.

Sovereign risk: Sovereign risk implies the possibility that conditions will develop in a country which inhibit the repayment of funds due from that country. In a large dam project, with a long gestation period for construction and operation, such risks cannot be adequately determined at an early stage. In case of a low investment grade credit rating and high sovereign risk, multiple payment security mechanisms could be established to protect investors from possible future defaults on payments. This can impose higher costs on dam development and should be fully assessed before a dam project is promoted.

Corruption: Corruption has been associated with a number of dam projects and the amounts siphoned off from a dam project can be huge. The Itaipú dam on the border of Brazil-Paraguay, currently the world's most powerful hydropower dam, has been described as "a monument to corruption". One of the measures investors can take to assess the possible risk of corruption is to check the rating of a particular country on Transparency International's Corruption Perception Index.

Geological instability and dam failure: Dam sites are, by their very nature, susceptible to seismic activity. Dams are built in valleys and the shape of the valley influences the size of the dam wall and the volume of water stored. However, a valley implies recent erosion in geological terms. This in turn suggests that uplift has taken place which may be associated with geological instability.

Cost recovery and dam beneficiaries: For multi-purpose dams that provide hydropower, irrigation, fishery and/or flood control, when establishing charges for the various uses it is necessary to devise a formula to allocate cost to the different users. It is not unusual for hydropower to subsidise other uses.



INSIDE THE ITAIPU BINACIONAL DAM, BRAZIL/ARGENTINA © WWF / A. KLAUSCHEN

TRANSPARENCY INTERNATIONAL HAS REPORTED THAT THE CONSTRUCTION AND INFRASTRUCTURE SECTOR IS PERCEIVED TO HAVE THE HIGHEST LEVEL OF CORRUPTION OF ANY SECTOR, HIGHER THAN BOTH THE ARMS INDUSTRY AND THE OIL AND GAS SECTOR.[1]

www.transparency.org

The IHA's Hydropower Sustainability Assessment Protocol provides an exhaustive list of potential risks that should be taken into consideration by developers and investors.

www.hydrosustainability.org

[1]O'Leary D. (2006) The Role of Transparency International in Fighting Corruption in Infrastructure. http://siteresources.worldbank.org/INTDECABCTOK2006/Resources/OLeary.pdf

http://awsassets.panda.org/downloads/wwf_guide_water_for_life_web.pdf

Photos from top:

Springs of the Black Drin, Lake Ohrid, FYR Macedonia.
© WWF / A. Klauschen

Fisherman and perch. Lake Skadar, Montenegro.
© Michel Gunther / WWF-Canon

Lake Skadar, Montenegro.
© Michel Gunther / WWF-Canon

How to minimize the environmental impacts of dams

Determining environmental flows

Maximizing electricity generation or discharge can have serious consequences both for ecosystems and other users downstream.

Changing the operating regime of dams to mimic nature — adjusting to an environmental flow regime — is one of the main mitigation measures available. In many cases it is possible to make adjustments to a dam's operation to meet a variety of needs in both existing and planned projects.

Environmental flows are not the same as the "minimum flows" commonly adopted by dam projects or operators. Nor are they simply an exact copy of natural flows. They should combine water volume, quality and timing as well as sediment transfer so as to cover the needs of ecosystems and communities downstream.

Protecting fisheries

Dams can have a devastating effect on fish (by blocking migration to spawning grounds, for example). However, fish passes are now often integrated into dam design and it is possible to retrofit existing dams accordingly. There are numerous designs and options to facilitate the passage of fish but success depends on design, operations and monitoring as well as the species involved.

Fish habitats in wetlands downstream can also be destroyed or altered by changes in water flow, temperature and oxygen levels. Trying to compensate for this through the creation of fisheries in reservoirs — possibly involving non-native species — or in tail water can harm biodiversity although it can be socially and economically beneficial. Great care needs to be taken to avoid impacts on native fish species by the introduction of alien species.

Establishing High Conservation Value areas

In many countries, river fragmentation by dams means that there are few rivers left in their natural state. This has resulted in an enormous loss of wetlands and other freshwater ecosystems. WWF believes that governments should designate some of the remaining unregulated rivers in areas of high conservation value as "no-go" areas for hydropower schemes.

For example in Iceland, where the Kárahnjúkar hydropower plant will cause considerable damage to two glacial rivers, WWF is urging the Icelandic government to afford protection to a third glacial river, Jökulsá á Fjöllum, including its designation as a Ramsar site.

More information on freshwater prioritization can be found in WWF's recent publication "Rivers for life: the case for conservation priorities in the face of water infrastructure development".

3 ways investors can demonstrate good practice

1 Comply with EU law and regulations

Complying with the relevant EU legal framework, notably the Water Framework Directive, the Birds and Habitat Directives and the Directives on Environmental Impact Assessments (EIA) and Strategic Environmental Assessments (SEA) is a good way for investors and developers to make sure they take the necessary measures when developing or funding a new infrastructure project. While compulsory only within the European Union, alignment with the *acquis communautaire* is an important requirement for countries on the road to EU accession, and investors as well as developers should bear in mind that sooner or later they will need to address this.

Providing information to the public and involving stakeholders in decision making, as required under EU legislation (see the Aarhus Convention-related Directives), can greatly enhance public support for new infrastructure projects as this process implies more transparent and more trustworthy governance patterns.

http://eur-lex.europa.eu
http://ec.europa.eu

2 Use certification schemes and voluntary assessments

There are several private sector initiatives to improve practices in infrastructure development, including dams and hydropower, on a voluntary, non legally-binding basis. Below we list examples of interesting endeavours which could contribute to making the hydropower sector more sustainable and which are supported by WWF.

THE HYDROPOWER SUSTAINABILITY ASSESSMENT PROTOCOL
ENGAGING THE HYDROPOWER INDUSTRY IN IMPROVING STANDARDS

The Hydropower Sustainability Assessment Protocol (HSAP) is an enhanced assessment tool, mainly designed for developers, to measure and guide the hydropower sector's performance in matters of sustainability. The HSAP assesses the four main stages of hydropower project development and implementation: early stage, preparation, implementation and operation. Assessments rely on evidence to create a sustainability profile against some 20 topics depending on the relevant stage and covering a broad range of sustainability aspects.

The HSAP is the result of intensive work between 2008-2010 by the Hydropower Sustainability Assessment Forum, a multi-stakeholder body with representatives from social and environmental NGOs (Oxfam, The Nature Conservancy, Transparency International, WWF); governments (China, Germany, Iceland, Norway, Zambia); commercial and development banks (Equator Principles Financial Institutions Group, The World Bank); and the hydropower sector, represented by the International Hydropower Association (IHA).

The HSAP was officially launched in Brazil in June 2011 and is governed by a multi-stakeholder council. Its management entity resides within IHA in London. WWF International, which was closely involved in the development of this state-of-the art tool, strongly supports its use by the private sector, especially in countries lacking legislation on EIAs and/or SEAs.

http://hydrosustainability.org

ZERNEZ DAM, SWITZERLAND © WWF / A. KLAUSCHEN

"NATUREMADE STAR"
THE CERTIFICATION SCHEME MADE IN SWITZERLAND

Switzerland is very advanced in ensuring that hydropower plants cause the least possible environmental impact, developing one of the world's best certification schemes for green electricity: Naturemade Star, which was developed with the support of WWF Switzerland, other environmental and consumer associations and a number of electricity companies.
This renewable energy label is awarded to plants that meet strict environmental conditions, including environmental flows, sediment flushing, fish ladders and protective measures for wetland habitats. Operators must also pay into a fund for environmental improvement, including habitat restoration additional to the certification criteria, while consumers can choose to buy green electricity at a slightly higher price. The plant operator, local authorities and environmental organizations jointly decide the allocation of the fund. About 20 Swiss electricity suppliers have gained certification under this label.

www.naturemade.ch
www.wwf.ch/it/index.cfm

THE GOLD STANDARD: PREMIUM QUALITY CARBON CREDITS
AN AWARD WINNING CERTIFICATION STANDARD FOR CARBON MITIGATION PROJECTS

The Gold Standard (GS) is recognised internationally as the benchmark for quality and rigour in both the compliance and voluntary carbon markets. The GS certifies renewable energy and energy efficiency carbon offset projects to ensure that they demonstrate real and permanent greenhouse gas (GHG) reductions and sustainable development benefits in local communities that are measured, reported and verified.

Established in 2003 by WWF, the Gold Standard is the only certification standard trusted and endorsed by more than 80 NGOs worldwide, including Care International, World Vision Australia, Forum for the Future and Mercy Corps. It is also the standard of choice for governments and multinational companies, including H&M, DHL, Swiss Post, Nokia, Virgin Atlantic, Panasonic, TUI Travel and FIFA. United Nations agencies use the Gold Standard for the development of their own carbon mitigation and sustainable development projects.

Gold Standard projects must adhere to a stringent and transparent set of criteria developed by the Secretariat, overseen by an independent Technical Advisory Committee and verified by UN-accredited independent auditors. The certification process uniquely requires the involvement of local stakeholders and NGOs.

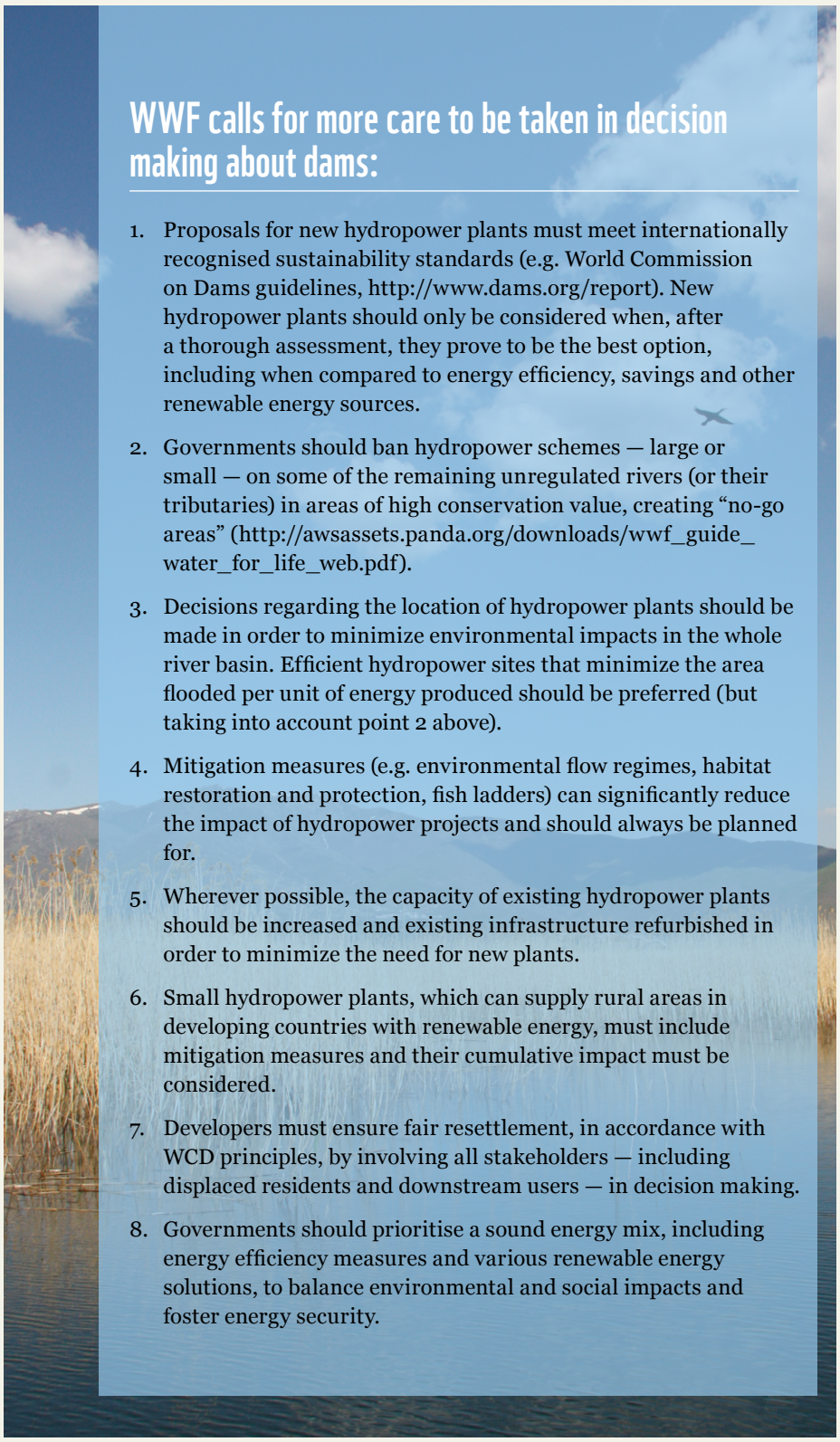
www.cdmgoldstandard.org

3 Implement International Financial Institutions' performance standards and safeguards

Most International Financial Institutions (IFIs) have developed their own sustainability principles, standards or safeguards when it comes to screening infrastructure projects before approving loans. They will seek to ensure that projects they finance are socially and environmentally sustainable, respect the rights of affected workers and communities and are designed and operated in compliance with applicable regulatory requirements and good international practices. The World Bank and the International Finance Corporation (IFC) have a series of "Performance Standards" that were recenty updated to reflect increasing challenges such as resource efficiency, climate change and human rights.

IFIs also conduct Social and Environmental Impact Assessments (ESIAs) to identify, avoid, and mitigate the potential adverse social and environmental impacts associated with their lending operations. Several large international and national banks have moreover subscribed to the "Equator Principles" or the "Principles for Sustainable Investment", a voluntary framework established by UNEP by which investors can incorporate environmental, social and governance issues into their decision-making processes to better align their objectives with those of society at large.

http://www1.ifc.org
http://www.equator-principles.com
http://www.unpri.org



LAKE PRESPA, ALBANIA/FYR MACEDONIA/GREECE © WWF / A. KLAUSCHEN

WWF calls for more care to be taken in decision making about dams:

1. Proposals for new hydropower plants must meet internationally recognised sustainability standards (e.g. World Commission on Dams guidelines, http://www.dams.org/report). New hydropower plants should only be considered when, after a thorough assessment, they prove to be the best option, including when compared to energy efficiency, savings and other renewable energy sources.
2. Governments should ban hydropower schemes — large or small — on some of the remaining unregulated rivers (or their tributaries) in areas of high conservation value, creating "no-go areas" (http://awsassets.panda.org/downloads/wwf_guide_water_for_life_web.pdf).
3. Decisions regarding the location of hydropower plants should be made in order to minimize environmental impacts in the whole river basin. Efficient hydropower sites that minimize the area flooded per unit of energy produced should be preferred (but taking into account point 2 above).
4. Mitigation measures (e.g. environmental flow regimes, habitat restoration and protection, fish ladders) can significantly reduce the impact of hydropower projects and should always be planned for.
5. Wherever possible, the capacity of existing hydropower plants should be increased and existing infrastructure refurbished in order to minimize the need for new plants.
6. Small hydropower plants, which can supply rural areas in developing countries with renewable energy, must include mitigation measures and their cumulative impact must be considered.
7. Developers must ensure fair resettlement, in accordance with WCD principles, by involving all stakeholders — including displaced residents and downstream users — in decision making.
8. Governments should prioritise a sound energy mix, including energy efficiency measures and various renewable energy solutions, to balance environmental and social impacts and foster energy security.

WWF'S WORK IN THE WESTERN BALKANS

Since 2001, WWF has addressed freshwater conservation issues in the Western Balkans — from the Neretva river and Cetina basin shared by Bosnia and Herzegovina and Croatia to Lake Skadar that straddles the border between Montenegro and Albania. WWF focuses on preventing and minimizing the impacts of water infrastructure, in particular dams, by promoting integrated river basin management.

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Why we are here
To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

www.panda.org/mediterranean