March 23, 2011

Comments on the Role of Hydropower in the World Bank's Energy Strategy

Dams and Climate Change

The World Bank Energy Strategy incorrectly argues that hydropower is an appropriate response to climate change. The report argues that hydropower with storage can help cope with climate variability and change through flood and drought management (paragraph 113). However, as noted in paragraph 117, hydrological flow is itself affected by climate change-induced variability. Reduced hydrological flow will render big-dam storage a less reliable source of water and energy, and could perversely reduce the ability of river-based communities to adapt to climate change. Secondarily, reduced storage capacity due to variable hydrological flow provides a weaker hedge against energy shocks, price volatility, and transmission interruptions.

In recent years many countries have suffered major reductions in hydropower generation because of droughts. According to the 2010 World Bank paper "Minding the Gap:World Bank's assistance to power shortage mitigation in the developing world" (Heffner et al.), half of the 18 "notable power shortages" since 2000 were related to drought. Global climate change is very likely to increase rainfall variability and unpredictability in future, meaning that hydrological risks will increase – and will put predominantly hydropower-based economies at grave risk. Much of sub-Saharan Africa is already excessively dependent on hydropower, and many African nations have experienced the economic shocks of drought-induced energy shortages (see, for example: http://www.internationalrivers.org/en/node/5808). A new study by Funk and Williams shows that East Africa is likely to be hit by worse and more regular droughts (http://climatescienceafrica.blogspot.com/2011/01/park-williams-chris-funk-climate.html). And yet, most large dam are approved without a serious assessment of the hydrological risks to the dam's viability and to downstream communities.

The Energy Strategy recognizes that hydropower generates greenhouse gas emissions, in both the form of emissions from reservoir biomass and emissions from construction, while it also recognizes that emissions may be worse in the tropics than in colder climates (paragraph 119). Indeed, Brazilian researchers have argued that methane from dams is responsible for around 4% of human-caused global warming. However, the Energy Strategy must recognize that hydropower infrastructure may also act as a driver of migration-induced deforestation, especially in regions of poverty.

Finally, we applaud the World Bank Group for committing to measuring greenhouse gas emissions in all energy projects, including hydropower (page viii and paragraph 210). However, given current controversial arguments over hydropower emissions, the document must explicitly acknowledge the need for independent methodologies for the assessment of greenhouse gas emissions.

Dams and Biodiversity Loss

Meanwhile, the Energy Strategy does not explicitly recognize that big-dam hydropower is a

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major driver of biodiversity loss, nor does it acknowledge marine environmental impacts.

Recent evidence illustrates that dams are a major cause of biodiversity loss. A study titled *Global Review of Human Impacts on River Ecosystems* in the the journal *Nature* (September 2010) found that 65% of the world's river discharge is under moderate to high threat of biodiversity loss, at least 10,000-20,000 freshwater species are extinct or at risk, and that dam building and river fragmentation are the main factors threatening biodiversity.

The UN's *Global Biodiversity Outlook 3* (May 2010) found that dams and reservoirs have led to high loss of biodiversity in the world's freshwater ecosystems. According to the report, river fragmentation leads to severe disruption of environmental flows, which are significant to the survival of freshwater life and inland river sedimentation systems. The report found that "more than 40% of global river discharge is now intercepted by large dams and one-third of sediment destined for the coastal zones no longer arrives. These large-scale disruptions have had a major impact on fish migration, freshwater biodiversity more generally and the services it provides. They also have a significant influence on biodiversity in terrestrial, coastal and marine ecosystems." Freshwater ecosystems have had higher biodiversity loss than any other major ecosystem type.

The *Millennium Ecosystem Assessment* (2005), an assessment carried out by 1,360 leading global experts from UNEP, World Bank, IUCN, and other institutions, found that between 1970-2000, populations of freshwater species declined on average by 50%, compared with 30% for marine and terrestrial species. Infrastructure development such as dams, dikes and levees was listed as the primary direct cause of wetland loss and degradation in the report.

The *World Commission on Dams* (2000) found that dams have led to "significant and irreversible loss of species and ecosystems," and recommended to avoid or minimize ecological impacts of dams through "setting aside particular river segments or basins in their natural state and through the selection of alternative projects, sites, or designs."

According to the World Bank report *Biodiversity, Climate Change and Adaptation* (MacKinnon et al, 2008), "The World Bank's mission is to alleviate poverty and support sustainable development. The conservation and sustainable use of natural ecosystems and biodiversity are critical to fulfilling these objectives… Biodiversity loss matters because species and habitats are the building blocks on which human livelihoods depend, the foundation for production forests, fisheries, and agricultural crops." A major expansion of damming on rivers in the Global South very directly goes against the Bank's efforts to focus on preserving biodiversity.

<u>Energy Efficiency and Cost Effectiveness</u>

We commend the World Bank Group for embracing mandatory energy efficiency standards. However, the Energy Strategy must include strong language on energy efficiency, renewable energy, and rural electrification in line with its commitment to no longer fund coal projects except in IDA countries (page x), recognizing that hydropower is <u>not</u> the least cost energy option.

How to Promote Development and Fight Climate Change, a presentation from Kenneth Chomitz of the World Bank's Independent Evaluation Group (IEG), found that demand side energy

efficiency – not hydropower – is the most cost-effective renewable energy option available.

The cost of big hydro projects has been on the rise, while many new renewables are dropping in cost. Actual costs for hydropower dams are almost always far higher than estimated; in a number of cases, the actual cost was more than double the estimated cost.

In addition, the Energy Strategy alludes to reliance on "multipurpose" dam projects as a hedge against climate change. Multipurpose projects have been particularly ineffective investments. In too many cases, financial and political pressures result in keeping the reservoirs high to maximize electricity generation and water supply. In most multipurpose projects, these two money-making functions take precedence over keeping the reservoir low to make room for floodwaters. Globally, there are numerous cases where floods have been made worse because dam operators held back water while the reservoir was filling, and then, when the rains kept on coming, had to open their spillways under emergency conditions to prevent their dam from being overtopped. Large multipurpose dams also carry huge construction costs, and their non–power components such as irrigation require large subsidies from power revenues and divert water from being turbined for electricity generation. Such projects were found by the World Commission on Dams to be especially poor at meeting their projected benefits. If the World Bank were to engage in a new wave of such projects, it would be critical for project economic studies honestly assess the reduced benefits for specific uses due to conflicting operating requirements.

Energy Access for the Poor and Decentralized Electrification

We applaud the World Bank Group's commitment to reducing energy poverty for the 1.4 billion people worldwide that do not have access to energy. However, the past emphasis on large dams has not resulted in a major increase in access for the world's poor, and the Energy Strategy does not include any language explicitly guaranteeing that hydropower will be used for this purpose (nor does it acknowledge that the downstream effects of big dams typically worsen poverty for many). Instead, the document only promises that hydropower can "alleviate energy poverty" and generate wealth (paragraph 112).

To meet the goal of increasing energy access for the poor, the Energy Strategy relies on regional integration of electricity supply, especially in the African region, where four electricity pools are planned to provide cross-boundary electricity sharing. However, the International Energy Agency's *World Energy Outlook 2010* found that it is possible to achieve universal energy access through extending decentralized renewable energy systems to 70% of the developing world's rural areas.

In sub-Saharan Africa, the focus on large dams has not (and likely will not) lead to a great reduction in energy poverty, due to the overwhelming number of people living far from national grids, and limited budgets for improving energy distribution to rural communities. Big, and increasingly regionalized, power projects lack accountability, making them highly vulnerable to vested interests, corruption, and disrepair (as the World Bank has discovered with its Inga dam rehabilitation project in DR Congo, where millions of dollars have disappeared into a black hole of corruption and mismanagement).

As such, the World Bank Group should not emphasize investing in large dams that may produce

energy for regional power pools, but rather should prioritize investment for decentralized rural electrification. This is especially the case in Africa.

Small Dams and Non-Dam Hydro

While the Energy Strategy suggests that generating capacity is not the only metric with which hydropower can be measured, we consider the distinction between reservoir and run-of-the-river to be not very meaningful given the fact that some large reservoir hydropower projects have been considered run-of-the-river.

Generating capacity remains quite significant to the assessment of the sustainability of dams as well as to hydropower investment. It is evident that dams with large reservoirs and large generating capacities have not disappeared; instead, both the World Bank (paragraphs 177 and 183) and emerging financiers such as China (paragraph 177) are continuing to focus on large-scale hydropower projects.

As a result, we recommend that the World Bank Group refrain from promoting large dams, and instead promote small- and non-dam hydropower. The World Bank Group's record on large dams in Africa has been poor: dams on the Zambezi River, the Nile River, and the Congo River have not increased energy access for the poor, but have rather provided subsidized energy for industry and mining interests. Non-dam technologies, including in-stream and hydro-kinetic turbines, should be promoted as decentralized solutions to energy access for the poor, especially in Africa.

Large-scale Regional Generation Projects

The Africa section in Annex 6 refers to the World Bank seeking to emphasize large-scale energy projects with the "greatest transformative potential." The record of large dams in Africa is hardly one of positive transformative impact – and the World Bank's record on such projects is a seriously flawed one. We believe the Bank could bring true transformation to the African energy sector by taking on the kinds of clean-energy projects that Africa has only begun to consider, yet does not yet have the capacity to develop, and have the potential to truly change the nature of the continent's approach to power. An emphasis on grid-based solar, including large concentrating solar plants would top the list, as would a major effort to tap gas flaring (as described in paragraph 184). A major and systematic roll-out of energy efficiency programs would complement this plan.

Dams and Seismic Risks

There is no acknowledgement of growing scientific evidence about the seismic risks of dam building.

Recent evidence shows that dams can trigger earthquakes. The International Commission of Large Dams (ICOLD), in its report *Reservoirs and Seismicity,* stated that seismicity risk exists for dams with a height greater than 100 meters.

In addition, dams are often located in geologically-active zones that already present seismic risk, such as the Himalayas, Southwest China, Turkey, and Chile. Scientist Ge Shemin and colleagues (2009) found through computer modeling that the Zipingpu Dam in China "could have hastened

the rupture of the Wenchuan fault in China's Sichuan province by ten to one hundred years."

Free, Prior, and Informed Consent

We must applaud the World Bank Group for recognizing the significance of obtaining Free, Prior, and Informed Consent of Indigenous Peoples before any energy project is financed (paragraph 121). However, we suggest that Performance Standard 7 of the International Finance Corporation be harmonized to reflect the World Bank Group's commitment.

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