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THE SANTO ANTÔNIO DAM'S CDM PROPOSAL: COMMENTS ON THE PROJECT DESIGN DOCUMENT

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THE SANTO ANTÔNIO DAM

Granting the Santo Antônio Dam Certified Emissions Reductions (CERs) under Clean Development Mechanism (CDM) would allow purchasers of these certificates to release 51 million tons of CO_2-equivalent (CO_2e) into the atmosphere elsewhere in the world. As will be explained here, none of the supposed reduction in CO_2e from the dam project is real, and approving the project therefore represents a setback for global efforts to contain climate change.

The Project Design Document (PDD) for the Santo Antônio Dam's proposal for carbon credit under the Kyoto Protocol's is indeed revealing, both of the flaws in the current CDM system and of the inconsistencies between Brazilian government's stated concern for climate change and its engaging in maximum exploitation of loopholes in CDM regulations. The document (Santo Antônio Energia S.A., 2012) considers the dam's greenhouse-gas emissions to be zero. Unfortunately, the fact that Amazonian dams produce large amounts of greenhouse gases, especially during their first ten years of operation (the time horizon for the current CDM project), has been shown in many peer-reviewed studies in the scientific literature (e.g., Abril et al., 2005, Delmas et al., 2004, Fearnside, 2002, 2004, 2005a, 2006a, 2008, 2009a, 2011).

Despite the document's using zero as the emission for the project in its calculation of climate benefits, a table is included (p. 10, Table 4) where the admission is made that the dam would produce methane (although no quantities are mentioned). The same table also states that emissions of CO_2 and N_2O are zero, each of these being only a "minor emission source". Unfortunately, both of these gases are also produced. Creating the reservoir will kill forest trees in the flooded area, and these generally remain projecting out of the water, where the wood decays in the presence of oxygen, thus producing CO_2. The quantities are quite substantial over the ten-year time horizon of the current CDM project. See calculations for existing Amazonian reservoirs in Fearnside (1995). Nitrous oxide (N_2O) is also emitted (Guérin et al., 2008).

The project proponents choose to ignore the scientific evidence for greenhouse-gas emissions from Amazonian dams and take advantage of a CDM regulation that allows zero emissions to be claimed if the power density is over 10 W/m² (p. 28). Unfortunately, having a high power density does not, in fact, result in zero emissions. A high power density means that the area of the reservoir is small relative to the installed capacity, which, in turn, reflects the amount of water available in the river. The small area means that emissions through the reservoir surface (from bubbling and diffusion) will be smaller than in a large reservoir, but not zero. The amount of water in the river, however, has the opposite effect: the more the streamflow the more the emission that

will result from water passing through the turbines and spillways. The turbines and spillways are, in fact, the major source of methane emission in most Amazonian dams (see the references listed above). The water passing through the turbines and spillways is normally drawn from a depth below the thermocline that separates the layers of water in the reservoir. The deeper layer (the hypolimnion) is virtually devoid of oxygen, and decomposition of organic matter therefore generates methane instead of carbon dioxide. The water with high concentrations of methane, under pressure at the bottom of the reservoir, is released to the open atmosphere below the dam, and the most of methane quickly emerges as bubbles (Henry's Law). Note that the only valid means of measuring these emissions is by the difference in concentration of methane in the water above the dam (at the depth of the turbines) and in the river below - not by floating chambers to measure flux through the surface of the river some distance downstream, as has been done in several studies that claim only small emissions from "degassing" at the turbines. See comparative data in the paper by Kemenes et al. (2011).

The document calculates reservoir area for the purpose of computing the power density, which the installed capacity in Watts divided by the area in square meters. The area of the reservoir used is calculated as area at the normal maximum water level of 70.5 m (354.40 km^2), minus 164.00 km^2 described as “the river course,” making the increased flooded area 190.40 km^2 (p. 6). The PDD points out that a clarification approved by the CDM Executive Board (EB15) allows this lowering of the reservoir area used in the calculation of power density (W/m^2) for purposes of taking advantage of a CDM criterion allowing zero emission to be claimed if the power density is less than 10 W/m^2. If the full area of the reservoir at the normal maximum water level were used (354.40 km^2), the power density would be 8.9 W/m^2, or less than the 10 W/m^2 cutoff for making use of the loophole to claim zero emissions. Unfortunately, there is no scientific basis either for allowing a claim of zero emissions if the power density is less than the 10 W/m^2 or for the broadening of the loophole by the Executive Board’s “clarification.”

The assumption is that the water over the "river course" is not emitting methane. Unfortunately, this water also emits methane, as shown by numerous studies that have measured reservoir surface fluxes at a variety of monitoring points in Amazonian reservoirs (see publications cited above). Perhaps the proponents think that the same area of water in the natural river would be emitting the same amount of methane. If so, they are mistaken, since methane emissions from a free-flowing river are much lower than those from reservoirs. Rivers do not normally stratify, especially in the fast-flowing stretches that are appropriate for building hydroelectric dams.

The document calculates a benefit of 51,464,028 CO_2e over 10.5 years (June 2012 – Dec. 2022) (p. 35). This claim represents 14 million tons of carbon. Much, or possibly even all, of this represents "hot air" that will contribute to further climate change. Brazil, as one of the countries expected to suffer most from projected climate changes, cannot afford to contribute to such a scheme. "Hot air" is carbon credit without a real climate benefit. This project creates hot air in two ways. First, it is based on the fiction that the hydroelectric dam will have zero emissions, despite extensive evidence indicating that Amazonian dams have large emissions, especially in the first decade that is the time horizon of the project. Second, the project is not "additional", as required by Article 12 of the Kyoto Protocol in creating the Clean Development Mechanism. Projects are supposed to gain credit only if the claimed emissions reductions would not

have taken place without the CDM funding. In this case, the dam is planned and financed by Brazilian companies with the full expectation of making a profit without any additional help from the CDM. None of the 51 million tons of CO_2-equivalent claimed is additional. The definitive proof if this is that the project is financed and construction is almost complete while the CDM proposal is still under review, meaning that the investors were confident of an attractive return without the CDM. The presentation of an unattractive internal rate of return (IRR) in the Project Design Document is inconsistent with the IRR values used by the investors, reflecting the considerable lengths to which the project proponents went in order to claim that the dam would not be built without help from the CDM (see: International Rivers, 2012)**.** While calculations of the IRR can easily be manipulated to produce a value to support a bogus claim of additionality, the behavior of the investors offers an unambiguous demonstration of the non-additionality of the project that all people can understand, whether or not they have the knowledge or patience to follow the IRR calculations. Apparently the Executive Board of the CDM believes that building a dam before CDM support is obtained is not proof of non-additionality. This, at the very least, has the appearance of revealing a gross bias in favor of approving projects regardless of their true additionality. I would suggest that the Executive Board take note of the damage that this practice does to their credibility and to that of the CDM.

ENVIRONMENTAL LICENSING

The PDD says of the environmental licensing that "This process consisted of 64 public meetings with the participation of 2000 people from the local communities that inhabit the area of direct influence of the hydroelectric plant" (pp. 46-47). It neglected to say anything about the content of those meetings, namely that virtually 100% of what was said was highly critical of the dam.

The PDD form asks for "conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party" (p. 47). The PDD answers this by stating that "The project has all required environmental licenses issued by IBAMA" and listing the licenses. Not mentioned are the multiple irregularities in the licensing process. The gravest was the replacement of the head of the licensing sector of IBAMA just before the preliminary license was approved (the previous head of the sector had supported his technical staff in declining to approve the license). The new head of the licensing department was then promoted to head IBAMA, and approved the installation license in that capacity. This inaugurated a new period in licensing, in which any project can be approved no matter how server its impacts (see discussion of the Belo Monte Dam in Fearnside, 2012).

ENVIRONMENTAL AND SOCIAL IMPACTS

Readers of the section of the PDD on environmental and social impacts (pp. 42-47) will have little idea of the severity of the impacts of the Santo Antônio Dam. The PDD even goes so far as to claim that "the Project will have an overall positive impact on the local and global environments" (p. 47). Unfortunately, the dam will have multiple impacts, including blockage of the migration of the giant catfish of the Madeira (*Brachyplatatystoma rouxeauxii* and *Brachyplatystoma platynemum*), which have, until now, been a vital economic resource not only in Brazil's state of Rondônia but also in

Peru and Bolivia. The dam will also affect floodplain (*várzea*) lakes that are important fish-breeding sites downstream of the dam (not included in the environmental impact study, or EIA), release methylated mercury and destroy the livelihoods of the human population that has traditionally depended on the Madeira River. I suggest consulting the book entitled *Muddy Waters* (Switkes, 2008), some of the chapters in the Public Ministry's review of the EIA (e.g., Fearnside, 2006b; Forsberg, 2006) and other sources on the impacts of these dams (e.g., Fearnside, 2009b; Ortiz, 2007; Vera-Diaz et al., 2007).

The Madeira River dams, including Santo Antônio, are surely among the most controversial hydroelectric projects in the world today because of their impacts and because of the history of their licensing. The CDM, as part of the Framework Convention on Climate Change (FCCC) and the United Nations, should think very carefully about whether it wants to associate its name with a set of scandals such as this. The effect would be to contribute to eroding the public image of the Climate Convention, with damaging consequences for present and future efforts to mitigate global climate change.

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