

Dams in the Amazon: Net greenhouse-gas emissions and the role of hydropower in Brazil's plans for energy expansion

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Hydroelectric dams in Amazonia emit six times more greenhouse gases especially from the turbines and spillways. Gross recurrent emissions in 1990 (the worldwide baseline year for national emissions inventories under the climate convention) totaled 8 million tons of CO₂-equivalent carbon if calculated using the global warming potential for methane adopted by the Kyoto Protocol. The impact is dominated by Tucuruí (75% of the total), followed by Balbina (18%), Samuel (5%) and Curuá-Una (2%). Emissions from the turbines and spillways are especially important at Tucuruí, while surface emissions are more important at Balbina (Table 1).

The impact of hydroelectric dams on global warming includes CO₂ emission from aerobic decay of dead trees projecting above the water (especially at Balbina). This is considered a form of deforestation. The net impact of dams on global warming includes downward adjustments for pre-dam ecosystem fluxes and for fossil-fuel emissions displaced by the dam's electrical output. A full-chain energy analysis (not attempted here) would include additional impact from cement, steel and fossil fuel used in dam construction. Net impact decreases with reservoir age but stabilizes after about 10 years; in 1990 Tucuruí was 6 years old, Balbina 3 years, Samuel 2 years and Curuá-Una 13 years. Analyses of Samuel and Curuá-Una indicate stabilization at emission levels substantially higher than those for fossil-fuel generation. In 1990 the net impact of all four "large" (> 10 MW) dams was at least double the impact of generating the same power from oil, and taken together they emitted four times more than the fossil fuel they displaced.