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# The short-term impacts of development-induced displacement on wealth and subjective well-being in the Brazilian Amazon

HEATHER RANDELL*
*Brown University, Providence, USA*
*National Socio-Environmental Synthesis Center (SESYNC), Annapolis, USA*

**Summary.** — Displacement due to development projects such as dams, mines, and urban infrastructure often leads to livelihood decline among affected communities. The challenge, therefore, lies in implementing projects that achieve national or regional development goals while also generating positive social and economic outcomes for displaced populations. This paper uses a longitudinal, mixed-methods design to understand the short-term changes in wealth and subjective well-being of households displaced due to construction of the Belo Monte Dam in the Brazilian Amazon. The households were compensated by either cash or credit for their lost land and assets, and were then responsible for finding and purchasing new property. Using pre- and post-displacement household survey and semi-structured interview data, as well as data from a small comparison group, I find that wealth increased for the majority of the study population and that socioeconomic inequality decreased, as poorer households experienced greater improvements in housing conditions, assets, and property ownership. In addition, subjective well-being improved for most households, particularly among those who did not own land at baseline, those who gained assets such as vehicles, those who remained closer to the original study area, and those who remained in close proximity to other households from the study population. Moving to an urban destination was strongly associated with declines in well-being, as was moving far from family or friends. These results suggest that investing sufficient resources in a compensation-based resettlement program can benefit households displaced by large infrastructure projects in the short term, but additional data collection is needed after the completion of dam construction to determine whether these benefits are sustained over the longer term.


*Key words* — development-induced displacement, subjective well-being, Brazil, hydroelectric dams, wealth, inequality

## 1. INTRODUCTION

Development projects such as mines, hydroelectric dams, and urban infrastructure have important implications for local communities that can range from new employment opportunities and improved public services to environmental degradation, poverty, and displacement. Displacement is a significant element of development projects, as an estimated 15 million people per year worldwide are forced from their homes to make way for infrastructure construction (Cernea & Mathur, 2008). Most cases of development-induced displacement have resulted in socioeconomic decline for the displaced population, as relocated communities face the task of restoring livelihoods amid new—and often less favorable—geographic, environmental, social, and economic conditions (Cernea, 2008; Scudder, 2005). Yet cases of successful resettlement illustrate that displacement and socioeconomic decline need not go hand in hand (Cernea & McDowell, 2000; Mejia, 2000; Partridge, 1993; Picciotto, Van Wicklin, & Rice, 2001). The challenge, therefore, lies in implementing projects that achieve national or regional development goals while also generating positive social and economic outcomes for displaced populations.

Dams are a major contributor to development-induced displacement, and in Brazil alone, their construction has flooded 3.4 million ha of productive land and displaced more than 1 million people (Zhouri & Oliveira, 2007). Brazil has a long history of implementing development projects in the Amazon region, including hydroelectric dams, mines, and highways. While many of these projects achieved national-level objectives centered on utilizing the region's natural resource potential, numerous studies have documented their negative impacts on local populations including smallholder farmers, fishermen, indigenous communities, and displaced households (e.g., Fearnside, 1999; Hall, 1989; Moran, 1981; Roberts, 1995; Smith, 1982). Yet despite the often adverse effects on local populations and ecosystems, dam building continues in Brazil at a rapid pace (Fearnside, 2016). The Brazilian government is constructing or planning to build 22 dams that will begin producing energy during 2015–24, and an additional 16 dams are currently in the study phase (Ministerio de Minas e Energia, 2015.

This paper uses a longitudinal, mixed-methods design to understand the short-term changes in wealth, socioeconomic inequality, and subjective well-being among households displaced due to construction of the Belo Monte Dam in the Brazilian Amazon. Belo Monte will be the third largest dam in the world in installed capacity when complete in 2019, and the Brazilian government argues that it is a crucial source of renewable energy needed to meet the country's rapidly growing energy demands. The dam will lead to substantial social and environmental impacts including altering the flow

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of the Xingu River, threatening fish populations, and displacing 20,000–40,000 rural farmers, urban residents, and subsistence fishermen (Eletrobrás, 2009; Painel de Especialistas, 2009). This paper focuses on a rural population of cacao farmers, sharecroppers, and cattle ranchers whose homes and land have been flooded to create the dam's main reservoir and associated infrastructure. The households were compensated by either cash or credit for their lost land and assets, and were then responsible for finding and purchasing new property without the formal assistance of a resettlement program. The stated goal of the dam's compensation program was to improve the living conditions of the population above pre-displacement levels, with a particular goal of transitioning landless households into landowners in accordance with the Brazilian government's model of "land for people, for people without land" (Norte Energia, 2010, 2012).

In light of the compensation program's goals, I address two main questions in this paper: (1) How does Belo Monte's compensation program affect wealth, inequality, and subjective well-being in the first few years after displacement? and (2) What factors are associated with household-level changes in wealth and subjective well-being? Results indicate that wealth increased for the majority of the study population and that socioeconomic inequality decreased, as poorer households experienced greater improvements in housing conditions, assets, and property ownership. Subjective well-being also improved for most households, particularly among households who did not own land at baseline, those who gained assets such as vehicles, those who remained closer to the original study area, or those who remained in close proximity to other households from the study population. Moving to an urban destination was strongly associated with declines in well-being, as was moving far from family or friends. These results suggest that investing sufficient resources in a compensation-based resettlement program can benefit households displaced by large infrastructure projects. Additional rounds of data collection after the completion of dam construction are needed to determine whether these benefits are sustained over the longer term.

## 2. BACKGROUND

### (a) *Development-induced displacement*

Development-induced displacement is characterized by the permanent relocation of all households within a geographic area as a result of the construction of infrastructure projects, including large dams. In their seminal report, the World Commission on Dams (2000) argued that "the end of any dam project must be the sustainable improvement of human welfare" (p. 2), yet the majority of past research on dam-induced displacement has found evidence of socioeconomic decline among affected populations. In a meta-analysis of 44 communities displaced by the construction of large dams, Scudder (2005) found that in 82% of cases, displacement worsened living standards for the majority of the population. [1] For example, the Kiambere Hydropower project in Kenya led to a drop in average landholdings from 13 to 6 ha and to an 89% drop in household agricultural income among those displaced (Mburugu, 1994). Additionally, communities displaced by the Three Gorges Dam in China experienced significant losses in the amount and quality of farmland, reductions in household income, increases in debt, poorer health, less social support, and greater levels of absolute poverty (Hwang, Cao, & Xi, 2011; Wilmsen, Webber, & Duan, 2011). Numerous past dams in Brazil have been criticized for their adverse impacts on local communities, including the Tucuruí Dam, built in the 1980s in the Amazon. Tucuruí displaced 30,000 people, many of whom received no compensation. In addition, affected communities experienced negative social, economic, and health impacts including mosquito-borne disease outbreaks, poverty, and land abandonment (Fearnside, 1999; LaRovere & Medes, 2000; Monosowski, 1990).

Yet examples of successful relocation programs do exist. Partridge (1993) examined the case of the Arenal Hydroelectric Project in Costa Rica, which resulted in positive socioeconomic outcomes due to thorough planning, the use of anthropological research to inform the program, involvement of the affected community in the planning process, and the gradual introduction of new agricultural technologies to resettled farmers. Mejia (2000) discussed resettlement due to the Yacyretá Hydroelectric Project in Argentina. A comprehensive economic recovery plan was implemented that allowed community members to either continue their traditional economic activities or choose new, alternative livelihood options. As a result, many families were able to make economic decisions that best suited them, and in turn, avoid impoverishment. Further, two hydroelectric projects in China—the Shuikou and Yantan Dams—resulted in better living conditions after displacement, which can be attributed to extensive participation in relocation planning by local governments, close involvement of families in resettlement decision-making, high expenditures for each household, and proactive government programs to create jobs and improve incomes (Cernea, 1996; Picciotto *et al.*, 2001; Zhu, ter Woort, & Trembath, 2000). These cases illustrate that, while the exception rather than the norm, it is possible for well-implemented resettlement programs to result in improved livelihoods.

Displaced households are often compensated for their move by money and/or replacement land. Among rural agricultural communities, replacement land has generally been viewed as the most appropriate compensation strategy in order to avoid complications associated with land speculation and price inflation (Koenig, 2006; Lassailly-Jacob, 1996). In addition, a World Commission on Dams report found that monetary compensation is rarely adequate, as it does not reimburse for lost community resources and often does not provide payments equivalent to the value of the land lost (Bartolome, Wet, Mander, & Nagaraj, 2000). Under-compensation may occur for many reasons including failing to count all assets, delays in payments, and an appreciation in the value of assets after compensation amounts have been determined (Cernea, 2003; McCully, 2001; World Commission on Dams, 2000). Indeed, Cernea (1997) states, "what is needed. . .is a change in concept and method predicated on treating resettlement operations as opportunities for development, as development projects in their own right. . .one essential implication of this approach must be spelled out clearly: the cost of reestablishing a family and a community is generally bound to exceed the strict market value of the physical losses imposed on that family or community. Compensation alone, by definition, is therefore never sufficient for reestablishing a sustainable socioeconomic basis for resettlers" (p. 1579). This paper examines whether a compensation-based resettlement program *can* lead to improved socioeconomic conditions among displaced households.

In order to measure the impacts of development-induced displacement, an ideal research design would collect both pre- and post-displacement data from displaced households as well as from a similar control group who was not

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