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Impacts of Hydropower Development on Rural Livelihood Sustainability in Sikkim, India: Community Perceptions

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Mountain economies are undergoing transformation from traditional agrarian to more industrial or service-oriented economies. Such changes invariably have socioeconomic impacts on nearby communities and lead to fragmentation and rural depopulation. Sikkim, a small state of India in the Eastern Himalayas, has recently embarked on a program of hydroelectricity project construction. This study examined community perceptions of the environmental and socioeconomic impacts of these projects in 3 rural areas and considers implications for future sustainable livelihoods. While benefits such as employment have accrued to the rural community from these economic development projects, changes in land use and in people's occupations may have adverse impacts on their future livelihoods. We argue that there is a need to support new types of land-based economic activities on abandoned agricultural lands, reclaim degraded lands, and introduce new products and production methods.

Keywords: *Livelihoods; sustainability; hydroelectricity; land use; agriculture; India.*

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Introduction

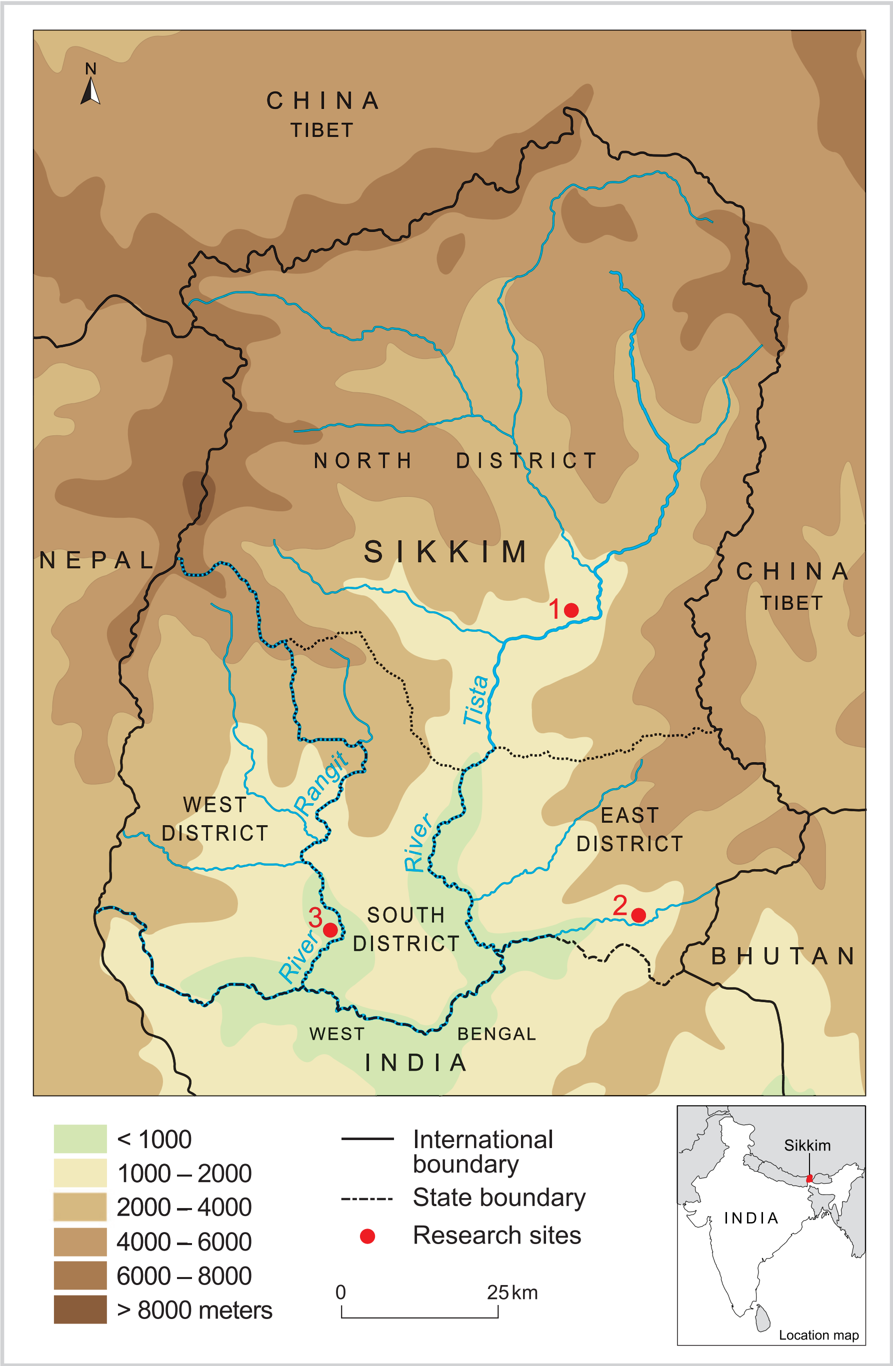
The control of environmental pollution and the development of environmentally friendly economic activities are essential features of a green economy. Adoption of green economy principles, in particular, reducing greenhouse gas emissions and instituting renewable sources of energy to mitigate climate change are strong policy drivers around the world (Rustico and Tiraboschi 2010). Hydroelectricity generation is considered less polluting than the more common fossil fuel-based forms of electricity generation, although hydroelectric projects require very high capital investment and have long development periods (Bartle 2002; Klimpt et al 2002). Increasing the proportion of hydroelectricity in a country's energy mix corresponds with the "green economy" concept, as this helps to control pollution and harness renewable energy. However, hydroelectricity projects can have a range of impacts on communities near the project sites, both beneficial and detrimental. Positive socioeconomic benefits can include provision of employment, welfare, and market accessibility (World Commission on Dams 2000: 99–102, 121; Koch 2002). Detrimental impacts such as loss of agricultural land, with adverse consequences for livelihoods of affected people (Gupta and Asher 1998: 117; Trussart et al 2002; Isaacman 2005), altered river flows, and loss of wildlife habitat have made hydroelectricity projects the subject of strong opposition from environmental organizations. In other words, they bestow physical and, in some cases, human livelihood assets to the community at the expense of natural livelihood assets, which may not represent a balanced approach to sustaining positive livelihood outcomes (DFID 1999).

Most previous work on the socioeconomic impacts of hydroelectricity projects has focused on problems associated with rehabilitation of physically displaced communities (Choy 2004; Isaacman 2005; Tefera and Sterk 2008; Brown and Xu 2010). In Sikkim, dam construction does not involve inundation of large areas and consequent resettlement, because river valleys are steep and narrow. Therefore, the aim of this study was to examine community perceptions of the environmental and socioeconomic impacts of selected hydroelectricity projects on villagers who were not physically displaced and to consider the implications for their sustainable livelihoods.

The research area

Sikkim, a state of India in the Eastern Himalayas, lying between 27°4′ and 28°7′N and 88°4′ and 88°55′E, has an area of 7096 km^2 and a population of 0.60 million. It is well known for its biodiversity and the forests that cover 46% of its land area (Forest Survey of India 2003–2007;

FIGURE 1 Map of Sikkim showing drainage and research sites. (1) Shipgyer; (2) Chujachen; (3) MSK. (Map by Chandra Jayasuriya)



Subba 2008). The state has rugged terrain and unstable rocks dissected by actively eroding streams and rivers. The whole state is well drained by numerous tributaries of the River Teesta, the main one being the Rangit (Figure 1).

These rivers provide abundant water resources, which are assessed to have the potential to generate 8000 megawatts (MW) of hydroelectricity. The government of Sakkim (GoS) has recently embarked on a program of development that aims to generate 5000 MW of electricity by 2015 through construction of more than 20, mostly medium-sized, hydroelectricity projects. The exploitation of water to produce electricity is considered the key to earning the large revenues required by the state for

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funding its welfare programs. Private power developers are obliged to transfer 12% of their profits to the GoS initially and 15% of profits 12 years after project completion (Dahal 2008). The GoS proposes to utilize the revenue earned from sale of electricity to achieve the millennium development goals with respect to social, educational, and other development, and revenue is expected to result in hefty increases in per capita income in the state in the next 35 years (Entecsol International 2009). The GoS will get 12% of power generated from all projects, with the rest going to the national grid (GoS 2012).

As part of their local area development program, hydropower companies undertake community development projects such as school repair, road and footpath construction, electrification and water supply for villages, and livelihood skill development in project-affected areas. Catchment management funds are utilized for maintenance of catchment values and development of communities upstream of dam locations.

Research sites

Three case-study village block (a cluster of villages) units located near hydroelectricity projects were selected for this study (Figure 1). These included Shipgyer (mean altitude 1800 m), in North District of Sikkim, near the 1200-MW Teesta stage III project; Chujachen (mean altitude 1100 m), in East District near the 99-MW Chujachen project; and Mabong–Suldung–Kamling (MSK) (mean altitude 1000 m) in West District near the 120-MW Rangit stage IV project. All projects commenced in 2004–2006 and are being constructed by private power developers in build–own–operate–transfer mode.

The socioeconomic profile of the research sites according to GoS statistics (GoS 2006) is as follows. Shipgyer is a predominantly tribal village with a relatively small population of 619. The other sites have mixed social groups with larger populations of 2583 (Chujachen) and 5086 (MSK). The proportion of below-poverty-level (BPL) households to the total number of households was 34% in Shipgyer, 18% in Chujachen, and 28% in MSK. The literacy level was high (above 75%) in all villages, with more than 95% of literate people studying up to primary and secondary levels only. Farming was the main occupation of villagers in all three village clusters, and the main crops grown were paddy, maize, wheat, pulses, ginger, and cardamom. In association with farming, people kept livestock and highly depended on firewood for heating and cooking. About 30% of the villagers in Shipgyer, 24% in Chujachen, and 41% in MSK lived in temporary houses.

Methodology

To explore community perceptions of the impacts of the hydroelectricity projects, we used qualitative social research methods, including in-depth interviews and later focus groups. This approach was selected because it offers flexibility to explore and understand issues in their totality from the perspective of the affected people. The various samples were stratified by using government lists of BPL (which included small farmers, the labor class, and unemployed villagers) and above-poverty-level (APL) households (which included medium to large farmers and other relatively affluent sections of society), as well as lists of villagers who received various benefits from the hydropower companies. The samples also reflected the range of ethnicity, age, gender, wealth status, and occupations in the population.

Initially, at each research site, we selected 4–8 "key informants" from among members of the village councils, joint forest management committees, and nongovernment organizations and interviewed them to provide general background on the sites. Then, 4 focus groups of 4–8 participants were constituted for each site, consisting of either BPL or APL men or women. Next, 10 to 15 individual interviews were conducted in each village block. Individual interviewees represented the range of occupations, gender, and ethnicity. We used snowball sampling to select and interview villagers who could supply information on specific issues. Interviews were structured by using topic guides, and data were transcribed to a word processor soon after each interview. This allowed continuous analysis of data while in the field, using coding and constant comparison methods guided by grounded theory (Strauss and Corbin 1990; Charmaz 2006). We collected some secondary data from government and private sources, including the hydroelectricity development companies. Discussions were held with some interviewees on the results of our analysis as a means of validation of our interpretations.

Results

The main findings of the research are presented under three major themes.

Degradation of agricultural land and forests and its impacts on livelihoods

The construction of hydroelectricity projects caused changes in land use, involving mainly conversion of agricultural lands and forests to roads, tunnels, buildings, or other components of the projects. The impacts of these changes were similar at all sites and are summarized in Table 1. Although the area of agricultural land acquired by the projects was only 152, 11, and 31 hectares at Shipgyer, Chujachen, and MSK, respectively, the impacts were more widespread.

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TABLE 1 Community perceptions of land use changes due to hydroelectricity projects in Sikkim, their impacts, and possible treatment or mitigation.

Original land use	Current land use	Direct impact	Indirect impact	Treatment/ mitigation
Farmland	Road	1. Loss of farmland	Reduction in farm production[c)]	None
		2. Dust pollution	Loss of fodder, crop quantity and quality	Sprinkling of water in dry season
		3. Dumping of muck and covering of land	Reduction in farm production[c)]	Land reclamation for agriculture/forestry by soil conservation
		4. Landslides	Reduction in farm production,[c)] disruption of marketing	Treatment by engineering works
	Tunnel or adit	1. Cracks on surface	None	Check dam and other soil conservation works
		2. Water supply disruption	Reduction in farm production	Development of other sources of water for irrigation
	Buildings and other project infrastructure	Loss of farmland	Reduction in farm production[c)]	None
	Barren fields due to changed conditions (dying out of *parma*[a)] and *kuth*[b)] traditions)	None	Reduction in farm production	Reclamation and revival of appropriate agricultural practices
	Barren fields due to drier conditions	None	Reduction in farm production	Development of other sources of water for irrigation
Forest	Road	Loss of forest cover, landslides, impediment of natural regeneration	Reduced forest produce availability, soil erosion, loss of intangible benefits	Road cutting protective wall construction and replantation

[a)]Labor exchange where only labor credits are given and no payments are made for work on other villagers' land.

[b)]A formal production-based sharecropping system.

[c)]With regard to land diverted for road construction etc or affected by landslides.

Agricultural land and forests were important rural assets for villagers who practiced farming as their main livelihood activity. Farming consisted of cultivation of cereals and vegetables on terraced farmlands and of cardamom on steeper slopes. Agricultural land and cardamom fields in villages that had been affected by construction work for hydroelectricity projects were damaged to various degrees (Figure 2).

Many participants said that their lands were rendered useless by rolling boulders loosened upslope by careless road construction or by careless earth dumping. Landslides were said to be a common feature in most of the villages studied, and people attributed this to the vibration caused by drilling and blasting during construction of roads and tunnels. Farms were covered by mudslides in the monsoon, resulting in destroyed crops and livelihoods for some people. No compensation was paid for such "indirect" damage to property.

Forests were important as a source of manure for farming and fodder and firewood for livestock, and they conserved soil and moisture. Road construction work caused deforestation and damage to trees in and around the villages. Participants attributed loss of forests to

- road cutting on mountain slopes;
- landslides caused by road construction on fragile land;
- dumping of earth on forest vegetation; and
- tree mortality due to loss of water from soil related to tunnel construction.

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FIGURE 2 Site of a hydroelectricity project construction on former agricultural land in Sikkim. Remnants of agricultural terraces are visible around construction. (Photo by L. Bhutia)

Many villagers said that the village forests they traditionally used for firewood and fodder collection were destroyed by construction work. Agricultural and forest land impacts were mostly temporary and could be reversed by applying suitable mitigation measures, as indicated in Table 1.

Water scarcity due to drying of natural water flows was an impact of project development that all interviewees experienced to varying degrees. While most farmers said they faced a shortage of water for irrigation, some mentioned shortages of drinking water. Most respondents attributed water scarcity to the diversion of surface water to lower levels of the substratum, due to tunneling work, because people experienced water shortage after the tunneling started. Drying up of water was a long-term impact, because people wanted government or project company intervention to supply water by tapping new water sources. Surface water, according to most affected farmers, used to be the main source of irrigation for their farms. The streams used for tapping irrigation water dried up, and some had poor winter flows. Water scarcity was stated by most respondents to be the main cause of poor production of maize, paddy, millet, and lentil crops.

Reduction of agricultural productivity

Traditional agriculture in Himalayan areas depends on factors such as use of livestock for draught and manure production, maintenance of an adequate forest cover (for forage and fuel), availability of water for irrigation, and presence of an informal labor exchange system (Ives and Messerli 1989; Avasthe et al 2005; Chettri and Sharma 2006). The current study showed that hydroelectricity development affected these factors in various ways, leading to reduced agricultural productivity. Farmers felt that the need for livestock rearing declined due to reduced farming, and forests and streams were adversely affected by landslides and muck disposal from tunneling and road construction work. Farmers also reported that they experienced poor plant growth due to dust pollution. As shown in Figure 3, loss of agricultural land

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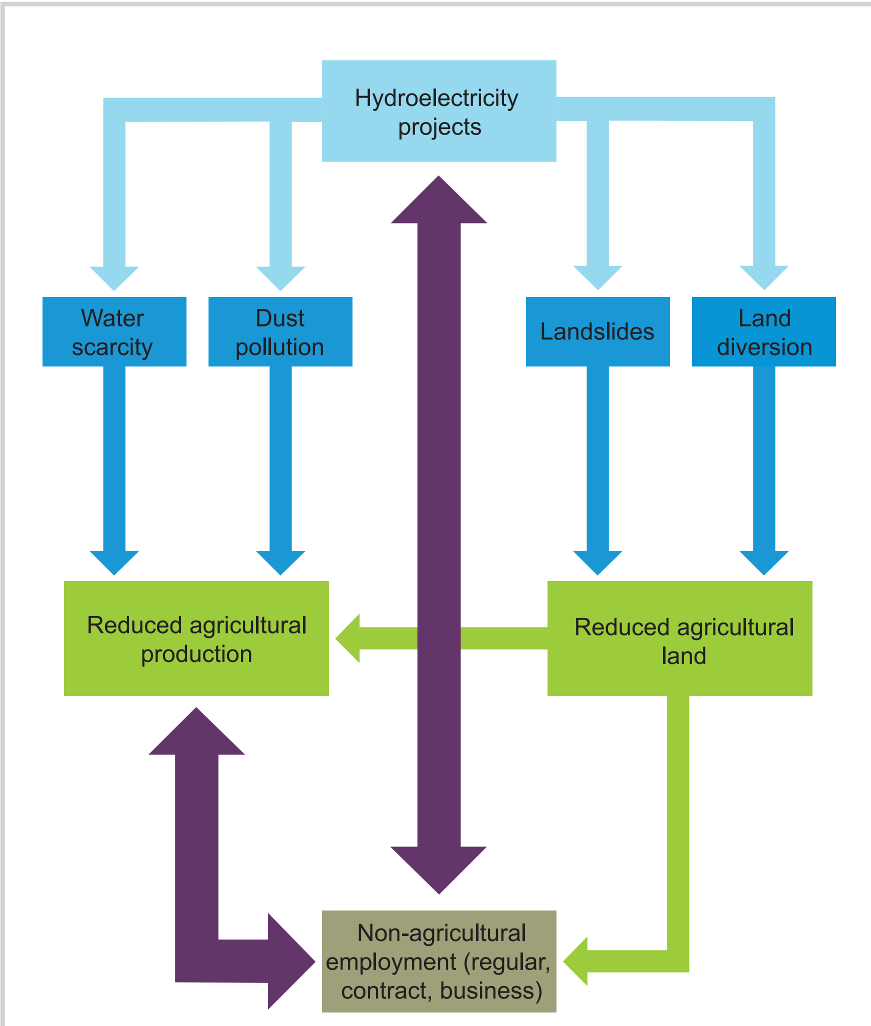
FIGURE 3 Simplified cause–effect relationship between development projects and change of occupation of villagers in Sikkim. (Diagram by Thomas Chandy)



and reduced agricultural production were factors that drove people to change their occupation from farming to nonfarming employment.

Younger and more educated people in particular withdrew from agriculture and took up employment with the companies, because they felt this was a better livelihood option. One interviewee said, "These days, people don't like to work on farms as it's easier to work for the company—you get a steady income."

People's preference for company employment over farming resulted in loss of agricultural labor. Agricultural labor in Sikkim is organized around two systems, a formal production-based sharecropping system and an informal cooperative labor system. According to interviewees, these systems are vanishing in all villages studied. With the setting up of the hydroelectricity company, the general wage rate for labor in the villages more than doubled to match the wage rate paid by the company. This was too expensive and unaffordable to most farmers and led to many farms being left fallow and to reduced farm output overall.

Socioeconomic impacts

Employment of villagers in hydroelectricity projects diminished the social capital of communities. Social networking that existed in the form of cooperative sharing of labor for agriculture weakened. Farmers said that there was increased commoditization of labor, and informal village-level networks to meet exigencies such as food or fuel shortages were losing importance. The outmigration of younger people from villages to towns where hydropower project construction sites were located caused social disintegration, leaving villages occupied mainly by the elderly who were unable to undertake agricultural activities and sustain informal networks. This loss of social capital had greater impacts on small- and medium-scale farmers, whereas the few affluent villagers employed wage labor for farming. Many young villagers

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who had been working for the companies now have little or no knowledge of the traditional agriculture that formed the basis of the village economy before the companies arrived.

The employment provided by hydroelectricity companies to local people helped to address some unemployment problems faced by farmers impoverished by poor agricultural production. The majority of those who benefited from employment in companies included smallholder farmers and less-educated youth who were given unskilled jobs, mostly as casual laborers or temporary watchmen at construction sites.

Educated youth were employed in offices and in a variety of skilled jobs. The companies imparted skills by training local people for technical jobs such as carpentry, plumbing, and electrical work, as well as some nonindustrial training, such as mushroom cultivation.

More affluent villagers with experience in contract work were able to obtain contracts with hydropower companies for various types of work. Most contractors said they made good profits and that this improved their financial situation. However, some contractors reported good pay rates by companies initially but unsatisfactory rates for later work. Many villagers were also given supply jobs for a variety of items, such as sand and stones, food provision for company canteens, and building materials. Larger contractors and suppliers invested their earnings in assets such as buildings or vehicles, which ensured longer-term returns.

The hydroelectric projects, being large engineering undertakings, also resulted in immigration of workers from outside to the project townships and into residential colonies around the project sites. This provided opportunities for some local people to engage in business and trade of various kinds. The company at Chujachen assisted with the formation of women's self-help groups that were trained in various self-employment activities aimed at providing goods and services to company workers and their families.

Table 2 provides a comparison of impacts of hydropower projects at the three research sites.

Discussion and conclusions: implications for sustainability of rural livelihoods

All research sites studied included primarily agrarian villages before the commencement of hydroelectricity project construction. Hydroelectricity companies invested substantial capital in the area and acquired agricultural land for construction of the project components. While villagers whose lands were bought by the companies were compensated (mostly by cash payment, but in some cases by employment offers), many of those who received cash compensation had no investment skills or guidance. Hence, they did not utilize or invest this money for sustainable long-term purposes. It is important in future project development that governments provide investment advisory services to people receiving compensatory payments. This will enable them to ensure long-term livelihood security by investment in government and nongovernment financial institutions or in appropriate enterprises.

Employment generation in the village was an important socioeconomic benefit, but most of the jobs that local people worked on pertained to the construction phase of the projects and thus were short term. These jobs will cease to exist once the construction phase of the projects is over. The change in land use and livelihoods for many in the three village blocks studied represents a transformation from proven sustainable (though in most cases subsistence) livelihood systems to shorter-term unsustainable ones. Though a few households diversified their occupations by doing nonfarming work in addition to farming, many abandoned agriculture and livestock rearing to take up employment with companies. This complete dependence on temporary company work is a risk to the sustainability of the villagers' social networks (social capital) and livelihoods. Hydropower project construction-related depletion of arable land, forests, and water represents a loss of natural capital, and creation of employment opportunities is an improvement of villagers' human and financial capital. The temporary nature of the employment, however, constitutes a livelihood vulnerability issue that needs to be resolved.

A green economy is one that treats natural resources respectfully and provides employment security (Barry 2007; UNEP/ILO/IOE/ITUC 2008). In rural parts of Sikkim, where sustainability of livelihoods has been adversely affected by hydroelectricity project implementation, there is a need to reclaim degraded lands by suitable measures, such as those suggested in Table 1, and provide opportunities for future livelihood activities. Most degraded lands suffered short-term impacts and could be reclaimed with appropriate technical and financial commitment. It is imperative, for the livelihood security of the villages, to revive agriculture, forests, or both on degraded lands and initiate land-based economic activities on all available lands. The financial and marketing requirements of villagers need to be supported, as was being done by the hydroelectricity companies in some cases. Social development activities carried out under the Theun–Hinboun hydropower project in Laos provide an example of such livelihood restoration (Virtanen 2006).

The development of roads, electricity, and markets as a result of hydroelectricity project implementation has also created potential for new areas of economic activity, such as floriculture, tourism, and small-scale industries. A

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TABLE 2 Impacts of hydropower construction at the three research sites in Sikkim, as perceived by the communities.

Impact	Shipgyer	Chujachen	MSK
Farming impact			
Road construction damage	Present	Present	Only in lower parts of villages
Landslides, pollution, muck disposal, and surface cracks	Present	Present	Not apparent except in lower parts of villages
Labor availability	Very scarce	Scarce	Available; system of cooperative labor prevalent though reduced in scale
Hydrological impacts			
Water scarcity	Present	Present	Present even prior to project construction; aggravated thereafter
Farm productivity	Reduced	Reduced	Villagers adapted to farming of drought-resistant crops, as this area has always been drought prone
Forest impacts			
Tree damage	Present, mostly in cardamom fields	Village forests badly affected	Present, but not as much as at other sites
Socioeconomic impacts			
Employment generation	Modest, though mostly in lower-paid jobs	Mostly in lower-paid jobs, but in some skilled jobs	Low, mostly in lower-paid jobs to residents close to project sites
Emigration	Increased	Moderate	Not very apparent

part of the revenue earned by the state can be committed to development of these new livelihood options in project-affected villages to provide greater long-term income security. This would require development of new institutions and skills in the villages to build a culture of business practice and entrepreneurship. Provision of subsidized electricity to the project-affected villages can also provide a greater range of alternative livelihood options and reduce the dependence of communities on forests for heating and cooking. In the western Himalayan Indian state of Himachal Pradesh, improved electricity supply to remote villages through small hydroelectric project construction enabled villagers to engage in new tourism and other livelihood ventures, such as spinning wool (Reddy et al 2006).

Environmental policies followed in pursuance of instituting a green economy generate new avenues of employment (Jacobs 1991; Kink and Reinumägi 2011). To be classified as "green jobs," such employment should provide good working conditions to workers and safeguard their interests and rights (UNEP/ILO/IOE/ITUC 2008). Agriculture has provided livelihoods to villagers in Sikkim for many generations. The abandonment of agricultural land and the loss of traditional farming skills threaten to deprive people of sustainable livelihood options. Jobs provided by the hydroelectricity companies to villagers have temporarily solved some unemployment problems but do not provide long-term economic security. There is a need for policy and investment mechanisms that build capacity among villagers to engage in diverse livelihood activities, both farm and nonfarm. Livelihood diversification is considered a good strategy to augment rural incomes (Ponte 2001; Zhong 2007) and to provide security from climate-related impacts (Ellis 2000; Osbahr et al 2008). People living around and those working in hydroelectricity projects need support, advice, and assistance to maintain or revive land-based economic activities on abandoned agricultural lands and thus to ensure a sustainable and resilient future. Hydroelectricity project companies have primary responsibility for reclaiming lands degraded by their construction activities and introducing new enterprises, services, products, and production methods. Further survey research is needed to establish the extent of occurrence of findings of this study within the population.

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REFERENCES

Avasthe RK, Bhutia TT, Pradhan Y, Das K. 2005. Mountain production system analysis: A case study from Chalumthang, South Sikkim, India. *Journal of Sustainable Agriculture* 27(2):69–104.
Barry J. 2007. Towards a model of green political economy: From ecological modernisation to economic security. *International Journal of Green Economics* 1(3/4):446–464.
Bartle A. 2002. Hydropower potential and development activities. *Energy Policy* 30(14):1231–1239. http://dx.doi.org/10.1016/S0301-4215(02)00084-8.
Brown PH, Xu K. 2010. Hydropower development and resettlement policy on China's Nu River. *Journal of Contemporary China* 19(66):777–797.
Charmaz K. 2006. *Constructing Grounded Theory: A Practical Guide Through Qualitative Analysis.* London, United Kingdom: Sage.
Chettri N, Sharma E. 2006. Assessment of natural resources use patterns: A case study along a trekking corridor of Sikkim Himalaya, India. *Resources, Energy, and Development* 3(1):21–34.
Choy YK. 2004. Sustainable development and the social and cultural impact of a dam-induced development strategy: The Bakun experience. *Pacific Affairs* 77(1):50–68.
Dahal M. 2008. Sikkim's initiatives in hydropower. *Hydro Nepal* 2008(3):1–4.
DFID [Department for International Development]. 1999. *Sustainable Livelihoods Guidance Sheets.* London: DFID. http://www.eldis.org/vfile/upload/1/document/0901/section1.pdf; accessed on 11 April 2012.
Ellis F. 2000. *Rural Livelihood and Diversity in Developing Countries.* Oxford, United Kingdom: Oxford University Press.
Entecsol International. 2009. *White Paper on the Development of Hydropower Resources of Sikkim.* Gangtok, India: Government of Sikkim.
Forest Survey of India. 2003–2007. *State of the Forest Report 2003, 2005, 2007.* Dehradun, India: Government of India.
GoS [Government of Sikkim]. 2006. *Sikkim: A Statistical Profile 2006–07.* Gangtok, India: Department of Economics, Statistics, Monitoring and Evaluation.
GoS [Government of Sikkim]. 2012. Energy and Power Department. http://www.sikkimpower.org/power/index.aspx#; accessed on 20 February 2012.
Gupta A, Asher MG. 1998. *Environment and the Developing World: Principles, Policies, and Management.* Chichester, United Kingdom: Wiley.
Isaacman A. 2005. Displaced people, displaced energy, and displaced memories: The case of Cahora Bassa, 1970–2004. *International Journal of African Historical Studies* 38(2):201–238. http://www.jstor.org/stable/40034919.
Ives JD, Messerli B. 1989. *The Himalayan Dilemma: Reconciling Development and Conservation.* Tokyo, Japan, and London, United Kingdom: United Nations University and Routledge.
Jacobs M. 1991. *The Green Economy: Environment, Sustainable Development, and the Politics of the Future.* London, United Kingdom: Pluto Press.
Kink M, Reinumägi S. 2011. Skills in the green economy. *Vocational Education: Research & Reality* 2011(20):182–189.
Klimpt JE, Rivero C, Puranen H, Koch F. 2002. Recommendations for sustainable hydroelectric development. *Energy Policy* 30(14):1305–1312.
Koch FH. 2002. Hydropower—the politics of water and energy: Introduction and overview. *Energy Policy* 30(14):1207–1213.
Osbahr H, Twyman C, Adger WN, Thomas DSG. 2008. Effective livelihood adaptation to climate change disturbance: Scale dimensions of practice in Mozambique. *Geoforum* 39:1951–1964.
Ponte S. 2001. Trapped in decline? Reassessing agrarian change and economic diversification on the Uluguru Mountains, Tanzania. *Journal of Modern African Studies* 39(1):81–100. http://www.jstor.org/stable/3557291.
Reddy VR, Uitto JI, Frans DR, Matin N. 2006. Achieving global environmental benefits through local development of clean energy? The case of small hilly hydel in India. *Energy Policy* 34(18):4069–4080. http://www.sciencedirect.com/science/article/pii/S0301421505002703.
Rustico L, Tiraboschi M. 2010. Employment prospects in the green economy: Myth and reality. *International Journal of Comparative Labour Law and Industrial Relations* 26(4):369–387.
Strauss AL, Corbin JM. 1990. *Basics of Qualitative Research: Grounded Theory Procedures and Techniques.* Newbury Park, CA: Sage Publications.
Subba JR. 2008. *History, Culture and Customs of Sikkim.* New Delhi, India: Gyan Publishing House.
Tefera B, Sterk G. 2008. Hydropower-induced land use change in Fincha'a watershed, western Ethiopia: Analysis and impacts. *Mountain Research and Development* 28(1):72–80.
Trussart S, Messier D, Roquet V, Aki S. 2002. Hydropower projects: A review of most effective mitigation measures. *Energy Policy* 30(14):1251–1259.
UNEP/ILO/IOE/ITUC [United Nations Environment Program/International Labor Organization/International Organization of Employers/International Trade Union Confederation]. 2008. *Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World.* Nairobi, Kenya: Publishing Services Section, United Nations Office at Nairobi.
Virtanen M. 2006. Foreign direct investment and hydropower in Lao PDR: The Theun–Hinboun hydropower project. *Corporate Social Responsibility and Environmental Management* 13(4):183–193.
World Commission on Dams. 2000. *Dams and Development: A New Framework for Decision-making.* London, United Kingdom: Earthscan.
Zhong F. 2007. The contribution of diversification to the growth and sustainability of Chinese agriculture. *In:* Spoor M, Heerink N, Qu F, editors. *Dragons with Clay Feet? Transition, Sustainable Land Use, and Rural Environment in China and Vietnam. Rural Economies in Transition.* Lanham, MD: Lexington Books.

http://dx.doi.org/10.1659/MRD-JOURNAL-D-11-00103.1