Journal of Environmental Management xxx (2008) 1–9

Contents lists available at ScienceDirect

Journal of Environmental Management

journal homepage: www.elsevier.com/locate/jenvman

Social impacts of large dam projects: A comparison of international case studies and implications for best practice

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ARTICLE INFO

Article history:
Received 15 September 2007
Received in revised form 1 April 2008
Accepted 30 July 2008
Available online xxx

Keywords:
Social impact assessment
Large dams
Displacement
Resettlement
Lesotho
China

ABSTRACT

This paper applies the tool of social impact assessment (SIA) to understand the effects of large dam projects on human communities. We draw upon data from two recent SIA projects: the Lesotho Highlands Water Project in Southern Africa, and the Manwan Dam, located on the upper Mekong River in southwestern China. These two cases allow us to examine the social impacts of large dam projects through time and across various geographical scales. We focus on a range of social impacts common to many large-scale dam projects, including: the migration and resettlement of people near the dam sites; changes in the rural economy and employment structure; effects on infrastructure and housing; impacts on non-material or cultural aspects of life; and impacts on community health and gender relations. By identifying potential impacts in advance of a large dam project, agencies and policymakers can make better decisions about which interventions should be undertaken, and how. We conclude our analysis with an overview of lessons learned from the case studies and suggestions for best practice in assessing the social impacts of large dams. Conducting proper social impact assessments can help to promote development strategies that address the most important concerns for local populations, enhancing the long-term sustainability of dam projects.

1. Introduction

Over the past several decades, there have been heated debates over the pros and cons of building large dams.[3] Beyond the physical and ecological impacts associated with hydropower projects, such debates also focus on the geographical distribution of electrical power and water resources, the administrative decision-making process, the inclusion of relevant stakeholders, the relocation and resettlement of displaced inhabitants, and the disruption of social, cultural, and economic life in communities affected by dam construction. Growing global concern about the social costs of large dam projects, and about how to solicit meaningful participation from those most affected, resulted in the formation of the World Commission on Dams in 1998 and the publication of the first systematic assessment of large dams around the world in 2000 (World Commission on Dams, 2000a).

Since that time, social impact assessment (SIA) has been conducted on large dam projects in a variety of settings, including southern Africa (Thabane, 2000), China (Jackson and Sleigh, 2000; Jing, 2000), Guatemala (Aguiree, 2005), and India (Phadke, 2005). These research efforts have begun to shed light on the widespread, prominent and long-lasting effects of hydropower development. However, there is as yet little consensus about how best to use social impact assessment as a research tool for understanding the impacts of dams on human communities, and what variables to consider in the SIA process.

Our objective in this paper is to introduce the tool of social impact assessment and reflect on its usefulness for understanding the social impacts of large dam projects. To illustrate our points, we present the results of two recent SIA projects: the Lesotho Highlands Water Project in Southern Africa, and the Manwan Dam, located on the upper Mekong River in Yunnan Province, China. Large dam projects often attract controversy, and the two projects reviewed here rank among the most contentious in recent history. These two disparate cases allow us to examine the social impacts of large dam projects through time and across various geographical

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[3] There are various interpretations of what exactly constitutes a "large dam." For the purposes of this paper, we follow the definition offered by the International Commission on Large Dams (ICOLD): those more than 15 m in height or having a storage capacity of more than 3 million cubic meters (ICOLD, 1998; see also Scudder, 2005: 2–3).

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doi:10.1016/j.jenvman.2008.07.030

scales. We conclude our analysis with an overview of lessons learned from the case studies and suggestions for best practice in assessing the social impacts of large dams.

2. Assessing the social impacts of large dams

Vanclay (2002b: 388) defines SIA in the following manner:

> Social impact assessment is the process of analyzing (predicting, evaluating and reflecting) and managing the intended and unintended consequences on the human environment of planned interventions (policies, programs, plans, projects) and any social change processes invoked by these interventions so as to bring about a more sustainable and equitable biophysical and human environment.

The goals of SIA are quite straightforward. By identifying potential impacts in advance of a large project, agencies and individuals can make better decisions about which interventions should be undertaken, and how. Furthermore, mitigation and compensation measures can be undertaken to minimize the undesirable impacts of development interventions. This is in line with Principle 1 of the Rio Declaration (1992), which affirmed that "human beings are at the center of concerns for sustainable development."

In the United States, social impact assessment often takes place under a federal mandate. Since the passage of the National Environmental Policy Act (NEPA) in 1970, environmental impact assessment has become an integral part of the environmental decision-making process in the United States. Under NEPA, federal agencies must conduct thorough environmental impact statements (EISs) prior to undertaking any actions with the potential to significantly affect the quality of the human environment. Environmental Impact Statements typically include a social science component that assists agencies in understanding the social consequences of policies, programs and projects. In 1994, the Interorganizational Committee on Guidelines and Principles for Social Impact Assessment produced basic guidelines for conducting SIA in federal projects, updated in 2003 (ICGP, 1994, 2003).

Because social, cultural and political conditions differ in disparate locations, conducting social impact assessment in international contexts can be particularly challenging. Responding to the need for internationally relevant guidelines for SIA, the International Association for Impact Assessment (IAIA) developed a set of principles that are broadly applicable to large development projects. These principles include, among other things, a dedication to the precautionary principle, intragenerational and intergenerational equity, the preservation of social and cultural diversity, and the internalization of costs associated with a planned intervention (Vanclay, 2003).

These principles can be used to predict and assess the impacts of large-scale dam projects. As might be expected, many of the most challenging socioeconomic impacts of dam construction relate to the migration and resettlement of people near the dam site or in the catchment area (Bartolome et al., 2000; Cernea, 2003; Egre and Senecal, 2003; Scudder, 1997, 2005). This primary impact results in a wide array of subsequent social impacts, including changes in household size and structure (Lerer and Scudder, 1999); changes in employment and income-generating opportunities; alteration of access and use of land and water resources; changes in social networks and community integrity (Fuggle and Smith, 2000); changes in the nature and magnitude of various health risks (Lerer and Scudder, 1999; McMillan, 1995); and often a disruption of the psycho-social wellbeing of displaced individuals (Scudder, 2005; World Commission on Dams, 2000b). Managing and mitigating the socioeconomic impacts of dam construction is an important task since, as the WCD noted in its seminal report, these effects are "spatially significant, locally disruptive, lasting, and often irreversible" (World Commission on Dams, 2000b: 102).

3. The Lesotho Highlands Water Project

3.1. Background and methods

The Lesotho Highlands Water Project (LHWP) was designed as a water delivery scheme between the governments of South Africa and Lesotho and is one of the five largest dam-development projects currently under construction in the world. Based on a treaty signed in 1986, the $8 billion project is funded in part by the World Bank, the African Development Bank, the European Community, and several European funding agencies, and implemented by the parastatal Lesotho Highlands Development Authority (LHDA) in Lesotho. The water delivery scheme will include five dams linked to cross-national tunnels constructed in four phases over a period of 30 years (1987–2017). Three dams (Katse, 'Muela, and Mohale) have been completed and two others (Mashai and Tsoelike) are still in the planning phases (see Fig. 1).

The first objective of the LHWP is to sell, transfer and deliver water from Lesotho's Senqu River and its tributaries to the Gauteng (including Johannesburg) industrial region of South Africa. In return, South Africa was estimated to pay approximately $55 million in royalties to Lesotho each year; however, recent reports show that Lesotho has received closer to $18 million in average annual revenues (Hassan, 2002; United Nations, 2003) because water levels were below initial projections. The second objective is to create a hydroelectric power station allowing Lesotho to generate electricity domestically.[4] An important documented obligation of the project is to not worsen the current standards of living of the project affected peoples (Lesotho Highlands Development Authority, 1986).

The prospect of large dams as a development strategy for Lesotho was first voiced in the 1950s, but only in the late 1970s and early 1980s was it seen as viable. For South Africa, the challenge was to identify an extensive water source for the prospering commercial and industrial sectors of the Gauteng region (including Johannesburg). In contrast, Lesotho was seen as having almost no other development options, for several reasons. Its predominantly rural population is engaged in primarily subsistence-oriented agriculture; its suffered from not having a viable market as exported crops could not compete with those of South Africa; and male labor migration rates to the mines of South Africa peaked during the late 1970s (Epprecht, 2000; Gordon, 1981). Ironically, the convergence at that time of the needs of the apartheid South African state and the military government of Lesotho, and the historical dominance of South Africa's relationship with Lesotho, seems to have set the stage for Lesotho's participation in the LHWP (Bardrill and Cobbe, 1985; Nkomo, 1990; Tsikoane, 1991).

As a "least developed country" (Ferguson, 2004; United Nations, 2003), Lesotho has a long history of externally funded development projects, but none quite as extensive as the LHWP.[5] The highlands

[4] The small number of households with electricity prior to the LHWP imported electricity from South Africa. Preliminary figures suggest that even after the operation of the 'Muela hydropower station, the cost of setting up electricity is prohibitively high for new consumers. The small proportion of households with electricity prior to the LHWP continues to import it.

[5] In fact, it is quite surprising for a small country with such minimal economic resources, and questionable institutional capacity for project of this extent, to have been eligible for receiving World Bank funding. At the time of the LHWP agreements, South Africa was under apartheid rule with full sanctions against aid of this type. Lesotho was made the proxy receiver of the loans despite their ineligibility (for a more detailed discussion see Tsikoane, 1991).

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Fig. 1. Map of the Lesotho Highlands Water Project. Source: Trans-Caledon Tunnel Authority (TCTA, 2005).

areas chosen for construction of the completed dams (Katse, 'Muela, Mohale) contain some of the most remote and poorest communities within Lesotho, with some of the highest rates of unemployment and destitution. At the beginning of the LHWP, 60 percent of households in both areas of Katse and 'Muela fell below the average income for each area and were considered "very poor" (Sechaba Consultants, 1994; Tshabalala and Turner, 1989).

Construction of the dam-related infrastructure began in 1987, creating an extensive geographical area impacted by the LHWP before any dams were built. In 1993, dam construction at Katse began, eventually creating a reservoir to serve as the largest holding tank for the water being sold to South Africa (through 'Muela). The 185 m double curvature arch dam completed impoundment in 1998, creating a 1950 million m^3 reservoir. The catchment area for 'Muela, the second dam of Phase 1A, underwent impoundment in 1999. Eighty-two kilometers of transfer and delivery tunnels from Katse and tunnels to the Ash River in South Africa connect at the tailpond site in 'Muela, thus impacting an extensive geographical area. Mohale Dam, a concrete-faced rockfill dam standing 145 m high, was still under construction during the social impact study (2000–2001), but the first of two phases of resettlement was in process and many Mohale communities had been impacted by the project for years prior. The Mohale dam was completed in November 2002 and in 2006 reached its full capacity as a 947 million m^3 reservoir (Lesotho Highlands Development Authority, 2006).

Data for the social impact assessment of the LHWP is drawn from two periods of research. In 1997, one of the authors (Braun) spent two months working with an indigenous non-governmental organization, the Highlands Church Action Group (HCAG), at all three dam sites. Thirteen semi-structured, open-ended interviews were conducted (in English) with development officials. In addition, 25 semi-structured, open-ended interviews (in the Sesotho language, with English translation) were conducted with people directly impacted and living in the three dam project areas. During the second phase of research in 2000 and 2001, six teams of research assistants carried out two waves of surveys and interviews with a sample of 263 households in the three LHWP areas, revisiting approximately 15 percent of the original households in the second wave. Villages were stratified by dam site, categories of impact, and other socioeconomic characteristics for a total sample including 10 villages in the Katse area, fourteen villages in the 'Muela area, and 17 villages in the Mohale area. Households within these villages were then sampled randomly.

3.2. Social impacts of the LHWP

Most participants in the LHWP study had ambivalent feelings about the project as a whole. While there were benefits that most people embraced, such as new roads, many residents impacted directly by the LHWP reported intense disappointment, distrust, and specific grievances with the substance and execution of the policies of the project and its impacts on their lives. Below are some of the main categories of social impacts, by no means an exhaustive list, presented in three categories: effects on the rural economy; effects on culture, health and gender; and effects on infrastructure, transportation and housing.

3.2.1. Effects on the rural economy

Rural residents experienced changes in their relation to their environment and its resource base. These changes occurred either directly (through loss of access to land or other resources) or indirectly (through policies that had the effect of changing the nature of relations to resources or division of labor). The current geopolitical structure of wealth and power disadvantages the rural poor of the highlands in Lesotho. As the Lesotho government increasingly prioritizes the commercial uses of resources and the re-organization of rural resources towards the benefit of the state and urban areas, rural households undergo serious disruption to their livelihoods, absorbing the economic, ecological, and social costs of their resources being re-structured. Study participants reported losing sources of potable water and natural springs; decreased access to wild vegetables and herbs that are important food and medicinal resources; losing access to forests and wooded areas that were submerged in the reservoirs; losing some of the best arable land in the river basin areas; as well as stones and mud for building purposes (Braun, 2006). In losing these resources without compensation, the impacted population effectively subsidizes this international development project as they attempt to replace their lost resources using strategies of increased labor allocation, increased purchasing or a greater reliance on cash, or are left to go without these resources.

Development authorities are typically required to have compensation policies to mitigate some of the material losses that households absorb, as well as rural development programs that address some of the socioeconomic changes that result. Most development programs are typically justified as poverty-reduction measures and, in the case of dam infrastructure projects, as mitigative measures for those impacted. While the World Bank has declared that any subsidized economic project must also be a development project (Cernea, 1988), the programs that comprise the "development" portion of the LHWP generally are secondary measures that aim to serve the dual purpose of fulfilling the World Bank standards and the LHWP's treaty obligations to ensure that the standards of living of the affected peoples are not lowered.[6]

However, contextualizing the LHWP as part of this larger pattern of dam projects, the rural poor are in fact burdened with a disproportionate share of the losses from these schemes, and arguably receive an inadequate share of the benefits (Panel of Environmental Experts, 1997, 1995, 1994, 1993). This has clearly been in the case in

[6] See the LHDA Order of 1986, Article XII for the original conditions.

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Lesotho; in fact, the experiences of suffering and difficulty faced by many of the people impacted and resettled stand in stark contrast to the development promises that came with the LHWP (Thamae and Pottinger, 2006). The struggle between the governments of South Africa and Lesotho to minimize their respective costs or to pass on costs to the other, including the costs of rural development and compensation programs, underlies the decision-making processes regarding planning and implementation (Panel of Environmental Experts, 1989).

The Rural Development Plan (RDP) of the LHWP was designed to provide skills training and alternative income-generating activities in recognition that those seriously impacted would be hard pressed to have a means to maintain their standard of living (Panel of Environmental Experts, 1995, 1991). However, the implementation and the planning were seriously underdeveloped and underprioritized (Panel of Environmental Experts, 1995: 16). The costs of the RDP were in the "grey area" that neither Lesotho nor South Africa's development authority saw as its responsibility. While the loss of land and compensation policy began as early as 1988, the RDP was not in effect until 1993 and it is still not considered highly structured or effective.

Impacts on the employment structure of the area were also significant. Migrants from South Africa and other parts of Lesotho often settled on the outskirts of Khokhoba, a large village in close proximity to the employee housing at Katse Dam, while looking for work. Very few Basotho people, local or migrant, found formal work with the LHWP. In particular, the development authority hired men for almost all positions so most work available to women was informal, unregulated, and poorly paid. Some women from other villages came to the highlands area in the hope of getting jobs as domestic servants in the skilled employee village, thus creating more competition for the local women trying to obtain the few jobs available (Detter and Gunnewig, 1994). Jobs included cleaning, cooking, or sweeping at "whites' houses." These labor hierarchies created by the project contributed to a racialized and gendered landscape of increasing inequality.

3.2.2. *Effects on infrastructure, transportation and housing*

At Katse dam, an earthquake occurred in September 1996 as the reservoir was filling after impoundment. In the middle of the night, tremors shook the village of Mapeleng the hardest, scaring people out of their homes as they ran in fear for safety. Some homes suffered moderate damage while others experienced their belongings falling off the walls unexpectedly. Reservoir-induced seismicity is a less common, less discussed outcome of certain types of large dam projects. Lacking adequate preparation, education on the potential for earthquakes, or an early warning system, this seismic activity was a shocking and devastating event for those directly impacted. In addition to triaging the emergency conditions, this earthquake required the relocation of most of the village of Mapeleng and additional compensation for people impacted.

Approximately 20,500 residents in over 120 villages in the Maluti Mountains project areas were affected by the construction phase of the LHWP in a variety of ways (Tshabalala and Turner, 1989): by the construction of the dams themselves; by the construction of the infrastructure for the dam and tunnel system through Lesotho to South Africa; by the construction of roads through mountains; and by the construction of employee "camps" due to the long duration of LHWP (Braun, 2006; Detter and Gunnewig, 1994). When households were resettled, they were moved into new homes that approximated the same size of their previous homes and had some limited choices about style. Many resettled people expressed ambivalence about their new houses; most appreciated the beauty of the cement structures but complained of the difficulties of heating and cooking. Households who lost land during the resettlement process were given monetary compensation rather than replacement land, but most had a small garden space. In addition, resettled households received a financial "disturbance" allocation over a period of four years to help them get settled.

Households that would be submerged by the Katse reservoir were resettled within the same river basin area with no other options. While this avoided significantly altering social ties in affected villages, it proved problematic as those resettled often lost their agricultural lands and had few economic alternatives to farming. The resettlement program at Mohale was significantly different from the one at Katse in that it allowed resettled people to choose among several destinations. In particular, resettled people could choose to move uphill and stay in the larger Mohale area, to relocate to villages near Mohale (the lowlands), or to move to peri-urban areas near the capital, Maseru. Many households were moved in "clusters" into host villages which had agreed to absorb some of the resettled population. Host-settler conflicts occur in some villages, particularly over the allocation of burial space (Braun, 2005a).

Compensation to affected households was an important part of the LHWP. In large dam projects, affected people often subsidize the project with their agricultural and grazing lands, gardens, trees, river valleys and water sources, homes, burial grounds. Compensation packages that serve as mitigation for these losses depend on the sets of values determined by the development authorities, and on the successful implementation of those policies. For example, the compensation plans for Katse and 'Muela, the first two dam areas of the LHWP, were designed and implemented under the same project phase (1A). After significant local and international pressure, the compensation plans for these areas were retroactively changed. In the new plan, compensation for losses included lump sum cash payments for small plots of land and annual deliveries of maize and beans for larger agricultural plots, with some households receiving annuities in perpetuity. Private fruit and wood trees were to be replaced with saplings, but there are conflicting reports about whether this happened systematically, or at all. Compensation was not provided for communally owned or managed resources, except for small amounts of fodder for animal owners for five years.

At the third dam area, Mohale, the compensation plan was part of the second phase (1B) of the LHWP and was designed more comprehensively. This package includes annuities in perpetuity for agricultural land and assets of certain sizes. Households in the vicinity of the dam that lost arable land, but were not resettled, are being considered under a compensation policy that gives special consideration to those who have lost 50 percent or more of their landholdings. According to the LHDA, losses range from 309 m^2 to almost 5 ha per household (LHDA, 2006).

In addition to the direct losses that people experience in large dam projects, there is the social experience of having the physical presence of a large dam being built in close proximity. As the LHDA built roads and infrastructure in preparation for the construction of the dam, a main road was paved through the middle of the village of Makhoabeng on its way to Khokhoba village, arguably the most adversely affected village in the Katse area, which became centrally located just above the main traffic intersection. The LHDA then appropriated all of Khokhoba's pasture lands and built a hotel, shopping center, development authority offices, and a gated, suburban-style employee residential village just downslope from Khokhoba. The creation of a "gated foreign suburban community" next to the most severely affected village in the Katse basin, and actually built on their grazing land, stood in contradiction to the stated expectations that local businesses and local people would benefit from the presence of the large foreign workforce.

3.2.3. *Effects on culture, health and gender*

In many cases, the losses and impacts of large-scale dam development disproportionately burden the rural poor, and

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create especially intense pressures on women (Braun, 2005a). While the LHWP was justified as a national development strategy for poverty reduction, the implementation of the project has the potential to create contradictory circumstances for many Basotho women. Women are generally more vulnerable to the negative consequences of the LHWP. In particular, women reported increased workloads, the burden of having to make more household purchases, decreased nutritional status in some cases, less access to gatherable resources, and less access to the compensation benefits from the development authority (Braun, 2005b, 2006).

In contrast to other programs, the Rural Development component provided different training for men and women. Welding and masonry were training programs designated for men, while dairy and poultry programs were designed for women. The programs designed for men are generally outside the home, while for women they are tasks that can be done at or close to home. While this may be helpful for women with young children, it also serves to reinforce the identification of women's labor within the home.

Men's skills as designated by the RDP led to wage labor and did not require large investments for technical inputs. In contrast, women's labor under the plan centered around selling a marketable product and required a large investment for either dairy cows or poultry. Women do not generally have access to large amounts of money or cattle, which hold special importance as a source of financial security for rural households (Ferguson, 2004). Dairy cows are very rare in Lesotho and beginning a dairy business entails a very large capital expenditure. The poultry training program was more feasible in rural Lesotho; however, practical obstacles still existed for many women in trying to use the training they received.

More broadly, the position of rural Basotho households in the larger economy limits their ability to access large amounts of capital to fund these start up projects. The project authorities realized to a certain extent that these rural development programs would require a financial investment of households that would be beyond their capacity, and special credit availability was planned to be given to those directly impacted by the LHWP. However, by law in Lesotho women do not have access to credit and "special availability" was useless to women unless they received their husband's signature. Through the RDP, the development authorities in Lesotho reinforced women's customary secondary status by allowing women to access credit programs only through husbands or fathers, reinforcing and exacerbating existing gender inequalities. While the credit program was not implemented fully in most cases, this points to a more general problem of social programs being neglected, delayed, or underprioritized relative to the engineering and construction components of large dam projects.

The dam projects had other unforeseen effects on gender relations. As the first, largest, and most remote dam, the degree of infrastructure needed to support the building of the Katse dam demanded a large workforce of engineers, planners, and variously skilled laborers to be in the area for almost a decade. While foreigners—mostly white men—from more industrialized countries received the longer term, more secure, and higher paid professional, skilled, and semi-skilled positions with the project, most Basotho men only had access to insecure, casual, and low paid "piece" jobs demanding heavy physical labor. Women had almost no formal work opportunities. Many people directly impacted by the LHWP discussed with great concern the rise in sex work during the construction of the Katse dam, noting the impacts that these economic strategies had for women and girls, including health risks such as STDs, HIV/AIDS, and exposure to violence and stigma, as well as the impacts for marital relations and the broader community.

4. The Manwan Dam, upper Mekong River, China

4.1. Background and methods

China has a history of dam building that stretches more than 2000 years into the past. The Dujiangyan, for example, was constructed on the Chengdu Plain of southwest China 2200 years ago and is still used effectively today for flood control and irrigation. Dams remain an integral part of the national infrastructure; approximately 86,000 dams were built in China during the period from 1949 to 1990. The past several decades of rapid economic growth fuel China's ever-increasing demand for electrical power. Although basic environmental impact assessments have been conducted prior to major hydropower development in China since the 1980s, these were quite simple, often resulting in unforeseen social and environmental problems.

The exploitation of the upper Mekong River Basin (called the Lancang River in Chinese) for electric power potential commenced more than 60 years ago. The Tianshengqiao Hydropower Station, with an installed capacity of 400 kW, was completed in 1946. It is situated on the Xier River, a tributary of the Lancang River. Since the 1980s, Lancang hydropower development has taken place on the middle and downstream sections of the mainstem with a cascade development of eight dams planned (see Fig. 2). The Manwan hydropower station, with an installed capacity of 1500 MW, was completed in 1996. Dachaoshan hydropower station, with an installed capacity of 1350 MW, was completed in 2003. Both are currently in operation. The Xiaowan hydropower station, with an installed capacity of 4200 MW, is under construction and will be completed in 2012. Jinghong hydropower station, with an installed capacity of 1500 MW, began construction in 2006 (He and Chen, 2002).

This section of the paper addresses the impacts of the Manwan Dam, located in the middle reach of the Lancang River, and the first dam of the Lancang mainstream cascade development. The Manwan hydropower station was initially a joint project of the Yunnan

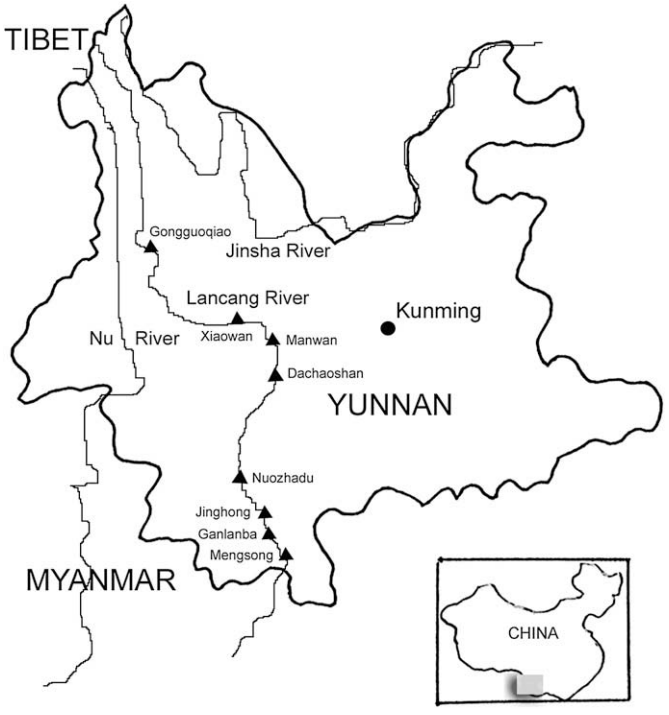

Fig. 2. The distribution of hydropower projects along the mainstem of the Lancang River.

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provincial government and the Ministry of Water Resources and Electric Power, but has since become a stock company called Hydrolancang, a subsidiary of China Huaneng Group, which holds a state-granted monopoly on hydropower development in the region (Magee, 2006). Data for this section of the paper is drawn from a social and environmental impact study which was sponsored by Oxfam Hong Kong during the summer of 2000 and incorporated into a document entitled "Reasonable and Equitable Utilization of Water Resources and Water Environment Conservation in International Rivers in Southwest China," a key component of China's 9th National Five Year Plan for Science and Technology.[7]

The dam measures 132 m high with a crest length of 418 m and a backwater of 70 km. At the normal water level of 994 m, its reservoir covers an area of 23.6 km^2. After its completion, 6225 mu (411 ha) of farmland and 8508 mu (562 ha) of woodlands were inundated, resulting in significant impacts for 114 villages in 8 townships and 4 counties (Jingdong, Yun, Fengqing and Nanjian)[8] Prior to construction, the number of displaced farmers was estimated to be 3052, but the actual figure was 7260. Worldwide, dam resettlement programs often underestimate the number of potentially displaced people, which can be especially problematic when budgeting is based on the initial lower estimate. Resettlement of the local population can be classified into five types: (1) rural resettlement outside the reservoir region; (2) rural resettlement within the reservoir region; (3) resettlement into nearby cities and towns; (4) in situ resettlement with reallocation of resources; and (5) in situ resettlement without resource reallocation.

Several research methods were employed to assess the social impacts associated with the Manwan Dam. Our inquiry began with a survey of the relevant social science literature on dam impacts. Data were then gathered through participative processes that included case studies, focus groups, and home visits with affected individuals. Visits and interviews were conducted at the county, township, and village levels, as well as with farmers and power plant staff.

4.2. Social impacts of the Manwan Dam

4.2.1. Effects on the rural economy

The economy of the rural areas adjacent to the Manwan Dam experienced significant impacts, including a decline in productivity in agriculture and animal husbandry, shortages of water for irrigation, increasing costs for electricity, and depletion of forest resources.

The agricultural sector of the affected counties was severely impacted by the Manwan Dam project. In 1991, per-capita farmland ranged from 1.02 mu to 1.96 mu (0.067–0.129 ha), with an average holding of 1.79 mu (0.118 ha) per capita. Following the completion of the Manwan Dam in 1996, this figure dropped to 1.21 mu (0.08 ha). The quality of available agricultural lands also changed significantly. In rural China, paddy fields with intensive irrigation systems are the most highly valued land type and are used for growing the staple grain crop. Prior to the Manwan Dam project, the ratio of paddy fields to non-irrigated fields in the reservoir area was 6:4; this dropped to 4:6 after the inundation of the valley, resulting in decreased rice yields and a shift to other dryland crops such as maize and sugar cane. Many villagers have resorted to trading maize for rice to meet household consumption needs. Moreover, newly created paddy fields lack adequate irrigation and soil fertility, producing yields at approximately one-third previous levels.

While fruit trees provided a major source of cash income prior to inundation, 71.6% of orchard lands were lost after reservoir impoundment. Livestock production and breeding were also a mainstay of the local economy and centered on cattle, sheep and mules. Hundreds of mu of forage lands were inundated when the reservoir filled up, resulting in a drastic scale-back of animal husbandry. In Nanjian County alone, 4.8 km^2 of forage lands were submerged, placing the future viability of the livestock industry in question.

Ironically, while the impoundment of a massive reservoir at Manwan has meant a reliable irrigation source for downstream communities, it has resulted in water shortages for adjacent communities. In Hongyan Village, one of our study sites, the county government spent over RMB 3 million to provide at least 1 mu of irrigated paddy fields to each resettled household.[9] But the infrastructure required to deliver such a service proved too difficult to manage with local resources. The water originated in Yongde County and ran for 21 km, passing through three villages. A channel was dug through Mangguai Shan Mountain and a pump was installed to deliver water to the village. However, a year later, massive erosion and landslides rendered the project inoperable.

Meeting household heating and cooking needs has become an unforeseen problem in resettled villages. In Hongyan Village, located in Yun County, 800 mu (52.8 ha) of firewood slopes were allotted to the village when it was relocated in 1993. At present, only one-third remains due to intensive harvesting. As a result, villagers frequently walk 3–4 km in search of firewood, a task that generally falls to women. The county governments, in conjunction with the power company, have stepped up efforts to provide alternative energy sources to villagers, including biogas facilities which use human and animal waste from households. Such facilities require an investment of RMB 4500–5000 per household, only part of which is provided by government and private investment.

Ironically, chronic electricity shortages plague the area adjacent to the Manwan Dam, which is geared primarily towards sending electricity eastward to the booming cities of Guangdong province under a national plan called "Send Western Electricity East" (Magee, 2006). Although every resettled village has been connected to the power grid, power supplied by the Manwan facility can be purchased for RMB 0.9–1.5 per unit, which is several times more expensive than the electricity previously supplied by a micropower station on a small tributary, which was inundated by the reservoir.

These changes have brought a measurable downturn in economic productivity in the study area. According to surveys conducted by the Statistics Bureau of Yunnan Province on the rural economy of the province, per-capita income of Manwan resettlers in 1991 (before the valley was flooded) was 6.7% higher than the provincial average. By 1997, (after the valley was flooded), findings from our general survey on the livelihood of resettlers indicated that per-capita income in the reservoir region was only 46.7% of the provincial average. The available evidence suggests that the Manwan case is typical in this regard. A recent survey of 50 large dams around the world found that resettlers seldom see their living conditions improved, and in fact often slip further into poverty (Cernea, 2003; Scudder, 2005: 56–86).

4.2.2. Effects on transportation and housing

In general, the Manwan Dam has brought improved transportation infrastructure to the region, but there have been some

[7] This study draws upon data published in the "Master Report of the Study on Wanwan Dam Related to the Social, Economic and Environmental Impacts on the Lancang River," which was jointly completed by Daming He, Xiaogang Yu, Lihui Chen, Jiaji Guo, Shu Gan, and Qin Li, and translated by Oxfam Hong Kong from Chinese into English in 2002.

[8] The mu is a standard unit for measuring land area in China. One *mu* is equal to 0.066 ha or 0.165 acres.

[9] The renminbi (RMB, or "people's currency") was valued at 1 RMB = 8.3 USD in the late 1990s.

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unanticipated effects on local communities. Prior to construction of the dam, State Route 214 passed through the area, running parallel to the Lancang River. After reservoir impoundment, the road was diverted away, and some village roads were submerged. Tractor roads, ferry piers and temporary bridges were built in all four affected counties as mitigation measures, but permanent bridges and tunnels were not provided. This has resulted in disruption of transportation, particularly during the summer monsoon season when landslides are frequent. Citing a lack of funds, county authorities have not yet built any roads in several resettled villages, including Jianbian and Abadi, located in Jingdong County. Insufficient transportation infrastructure makes it difficult for farmers to distribute their crops to markets.

Lack of roads and poor road conditions are perennial problems. In villages most affected by resettlement, like Jianbian and Abadi, not an inch of road had been built because of the funding shortages. Similar impacts exist in communities outside the reservoir region. In Bixi Township of Nanjian County, for example, more than 10,000 villagers typically participated in weekly produce markets. But dam construction turned their main thoroughfare into a dead-end road; participation in weekly markets has been cut by 90%, resulting in a drastic drop in local cash income from the sale of agricultural produce and livestock.

One of the key policies regarding dam-induced resettlement in China is the "developmental resettlement policy," which mandates that government agencies work to minimize social and economic impacts on communities affected by resettlement (Bartolome et al., 2000: 41). Compensation for lost housing is a key piece of this policy. In principle, resettlers in the Manwan reservoir area were to receive monetary compensation based on the size, quality and value of their houses. But the practicalities of rebuilding resettler housing proved difficult to manage. During the late 1980s and early 1990s, China was undergoing a massive transition from a centrally planned economy to a market economy. Government economic planners gradually allowed prices to fluctuate for a variety of commodities, including important construction materials such as steel and cement, which meant that these goods became considerably more expensive during the 1990s. Some villagers had difficulty using their compensation funds to build houses of comparable quality to the ones they had lost. The villages of Goujie and Wangjiang were particularly hard-hit; in these two villages, poor-quality construction and recurring landslides resulted in 17 houses being declared too dangerous for habitation.

4.2.3. *Effects on culture, health and gender*

With the help of resettlement aid, improvements were made in transport, medical services, education and market conditions of most of the affected villages. However, variation in the ability to utilize transport and market facilities brought about the widening of disparities in internal development among different sectors of new settlers. In addition, conflict over land and other resources between resettlers and neighboring villages is a growing problem. In villages that have been resettled far outside the reservoir region, traditional social capital and interpersonal relationships have dwindled. Northwest Yunnan, which is home to at least nine of China's 55 officially recognized "minority nationalities," is a region of remarkable cultural diversity. Many of the impacted villages in the Manwan case are home to minority populations, including the Yi and Dai minority nationalities. Displacement thus raises critical issues about the loss of traditional cultural and ecological knowledge.

Findings of a 1994 World Bank survey indicate that effects of resettlement on individuals varied by gender. One key problem relates to customs and traditions regarding the ownership or property. When money was provided as compensation to resettled villagers, for example, it was typically given to the man as household head; family property thus became liquidated and concentrated in the hands of elder males in the household, marginalizing the role of women.

Changes in the rural economy have also resulted in different work roles for men and women. Because of the downturn in agricultural productivity, many men have sought wage-earning jobs outside the community in construction, tourism and related industries, sending remittances back to their households. Meanwhile, agricultural production is becoming the purview of women, who even perform tasks such as plowing, which were traditionally seen as men's work. Gender ratios in secondary schools are likely to become more male-biased as household incomes drop and families must make a decision about which children to send to school. Because male children have a filial obligation to care for their family in Chinese society, many households may choose to educate their sons while keeping their daughters at home.

5. Discussion and conclusions: putting SIA to work in large dam projects

Despite the challenges outlined above, we believe that collaboration between natural and physical scientists, engineers, and social scientists can result in social impact assessment that accurately predicts and examines the effects of large dam projects. Based on our experiences with the above case studies, we present here an adaptation of best practices in SIA for assessing dam impacts, grounded in existing literature (Sadler et al., 2000; Scudder, 1997, 2005; Vanclay, 2002b, 2003; World Commission on Dams, 2000b). Table 1 provides a guide to SIA practitioners tasked with understanding dam impacts, including a description of steps to be followed and a brief discussion of the importance of each step. These steps may help to ensure that large dam projects meet the strategic priorities outlined by the World Commission on Dams (WCD, 2000a,b).

Conducting successful SIA of dam projects requires a dual emphasis on getting the impacts right and getting the process right. Both are crucial to the task of assessing dam impacts.

5.1. *Getting the impacts right*

One of the key challenges of assessing the social impacts of dam projects is establishing a standard set of variables to measure. As Vanclay (2002a: 200) has noted, "The variables that are important must be locally defined, and there may be local considerations that a generic listing does not adequately represent." The process of SIA itself provides a partial solution to this problem, however, since the step-by-step process described above involves an in situ evaluation of stakeholder identification and scoping of activities likely to result in impacts. While the important variables may differ considerably from project to project, a comprehensive SIA process should allow practitioners to identify and measure locally salient variables.

Certain socioeconomic variables, such as income or cost of housing, are easier to identify and measure than others. As a result, mitigation policies often suffer from a lack of emphasis on sociocultural impacts as well as the propensity to underestimate the economic and social value of prior livelihood strategies. Many assets, particularly those that are communally owned and managed or are non-material, are not likely to be prioritized in remuneration plans and may not be compensated for at all. "Irreplaceable" losses, such as those of social connections to lands held by families for generations, are challenging to evaluate in a cost-benefit driven analysis and, consequently, are often externalized by development authorities (World Commission on Dams, 2000b). As the Manwan Dam case study illustrates, displacement of indigenous people raises difficult questions about how to assess non-material losses such as traditional ecological knowledge.

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Table 1
Steps in conducting social impact assessment of large dam projects.

Step	Description	Importance/significance
Step 1	Identify interested and affected individuals and communities (stakeholders).	Failure to include all stakeholders can result in improper assessment of impacts. For dam projects, stakeholders may include relocated people, upstream and downstream residents, communities affected by roads and transmission lines, and conservation groups concerned about environmental impacts.
Step 2	Facilitate the participation of stakeholders in the decision-making process.	Ensures that all affected individuals are included from the beginning. This increases the likelihood of local support for the intervention, minimizes impacts, and begins the process of considering measures to mitigate or compensate. All stakeholders should be able to contribute to the selection of variables to be considered in the SIA.
Step 3	Collect baseline data (social profiling).	May include published scientific literature, secondary data from census or other agencies, or the collection of primary data from survey research, interviews, etc. Both qualitative and quantitative research methods may be used. Ensures that demographic, economic, health, social and cultural information is understood about the present state of the community before the intervention, thus providing a baseline for comparison after project completion.
Step 4	Identify and describe the activities that are likely to cause impacts (scoping).	Should be described in enough detail to help identify what data is needed to predict impacts. For example, practitioners should assess the footprint of the reservoir, timeline for construction, number of people to be displaced, and other key variables.
Step 5	Predict likely impacts and determine how stakeholders may respond.	Compares the present baseline conditions with likely conditions following the intervention. Direct impacts (such as relocation) and secondary impacts (such as change in employment status, etc.) must be considered in sufficient detail to allow monitors to judge when post-resettlement living standard goals have been met.
Step 6	Identify possible intervention alternatives (including a non-intervention alternative).	Provides an array of alternatives for the location and design of dam projects. Each alternative should be assessed separately. This provides decision-makers with a range of options, in order to select an alternative that is both technically and financially feasible and minimizes environmental and social impacts.
Step7	Recommend mitigation or compensation measures.	Mitigation or compensation measures may be built into the selected intervention alternative. Practitioners should also identify the agency or organization responsible for mitigation or compensation.
Step 8	Develop monitoring and management programs.	Assures that impacts are managed through the four phases in the life cycle of a dam, including planning, construction, operation, and decommissioning. Allow practitioners to compare actual impacts with projected impacts.

The distribution of impacts within communities can be highly variable. The Lesotho Highlands Water Project illustrates that many of the burdens associated with resettlement, including increased labor allocation and nutritional deficiencies, are borne by women and children and disproportionately affect poor families. Attempts to mitigate these burdens prove difficult, due to a cultural tendency to deny financial credit to women without permission from their husbands, thus reinforcing existing gender inequalities.

One of the most problematic aspects of conducting SIA of large dam projects is ensuring that the analysis takes place at the proper temporal and spatial scale. Multilateral development agencies, national governments, and private developers alike tend to primarily monitor the initial years of resettlement, for example, which has the effect of missing the long-term effects of these social adjustment processes. Evaluations during the initial years of resettlement may give a false reading of success. In the case of dam projects, practitioners should instead think about the "life cycle" of the project and anticipate impacts at each of four stages (Sadler et al., 2000), including conceptualization and planning, construction, operation, and decommissioning (Interorganizational Committee on Guidelines and Principles for Social Impact Assessment, 1994).

Analyzing the correct spatial scale can be equally troublesome. At what geographic location or level of analysis are the effects of dam projects best examined or understood? While people living near a dam site or reservoir may experience drastic negative impacts, the net effect downstream may in fact be positive due to increased reliability of irrigation water supply. Furthermore, if we consider impacts from a regional or national scale, large dam projects may appear to offer a net benefit due to increased hydropower. The Lesotho Highlands Water Project, for example, is embraced by the government as an important national development strategy, while many of its costs, including resettlement and lost economic opportunities, are borne by residents in the reservoir area. Similarly, in the case of China, the Manwan Dam and similar facilities in this underdeveloped region provide a growing share of electricity to fuel rapid industrial development in coastal areas with access to global capital some 2000 km away (Magee, 2006). In the case of large dam construction on trans-boundary rivers, the situation becomes even more complex due to limited data availability and geopolitical considerations. In the China case study, for example, downstream nations such as Laos, Myanmar, Thailand, Cambodia and Vietnam all experience biophysical, ecological and socioeconomic impacts from China's decision to seriously alter the hydrograph of the upper Mekong River.

5.2. Getting the process right

Beyond simply measuring the appropriate variables, meaningful social impact assessment must be grounded in current best practices that seek to empower stakeholders. Participatory social impact assessment is crucial, both as a pragmatic way of soliciting buy-in from stakeholders and as a moral and normative necessity in the field of international development, which increasingly espouses a community-driven development model. Stakeholders may have radically divergent ideas about whether and how a given project should proceed, and it is the task of social impact assessment to assure that these various voices are heard. The landmark report published by the World Commission on Dams in 2000 emphasizes the application of a "rights and risks" approach to evaluating large dam projects. This approach includes, among other things:

> Self-determination and the right to consultation in matters that affect people's lives, the right to democratic representation of people's views on such matters, the right to an adequate standard of living, freedom from arbitrary deprivation of property. (World Commission on Dams, 2000a: 200).

Best practices in SIA of large dam projects are ultimately grounded in the fundamental human rights frameworks agreed upon by the international community, including the United Nations Declaration of Human Rights (1947), the Declaration on the Right to Development (1986) and the Rio Declaration on Environment and Development Principles (1992). Attending to these ideals in SIA, through the encouragement of stakeholder participation in the decision-making process, increases the likelihood that dam projects are economically viable, socially equitable, and environmentally sustainable (World Bank, 2003; World Commission on Dams, 2000a: 202).

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This presents us with a special challenge in undertaking SIA in international contexts, where cultural and political conditions may be markedly different from the Western, rights-based paradigm. China's Manwan Dam is a case in point. There, proper scoping and stakeholder involvement were limited by an authoritarian government with limited respect for individual rights and a severely restricted legal and institutional framework for including stakeholders in the decision-making process.[10] Furthermore, the effectiveness of SIA related to large dam projects often hinges on many outside factors, including cultural and political constraints on local populations to voice their concerns, the willingness of governmental, multilateral and private development agencies to support the measures proposed in the SIA, and the institutional capacity of these agencies to implement these measures (Egre and Senecal, 2003: 224).

It is important to remember that SIA serves only as a starting point which must be followed up with equitable mitigation and compensation measures appropriate to the project at hand. As development institutions continue to promote the use of hydropower projects, altering the social as well as ecological landscapes of many communities, it is crucial that we develop a systematic understanding of the impacts of dams. Such an undertaking can help to promote development strategies that address the most important concerns for local populations, enhancing the long-term sustainability of development interventions.

References

Aguiree, I., 2005. Social Investigation of the Communities Affected by the Chixoy Dam. Rights Action, Washington, DC.

Bardrill, J.D., Cobbe, J.H., 1985. Lesotho: Dilemmas of Dependence in Southern Africa. Westview Press, Boulder.

Bartolome, L.J., et al., 2000. Displacement, Resettlement, Rehabilitation, Reparation, and Development. World Commission on Dams, Cape Town.

Braun, Y.A., 2005a. Resettlement and risk: women's community work in Lesotho. Advances in Gender Research 9, 29–60.

Braun, Y.A., 2005b. Selling the river: gendered experiences of resource extraction and development in Lesotho. Research in Rural Sociology and Development 10, 373–396.

Braun, Y.A., 2006. Large dams as development: restructuring access to natural resources in Lesotho. In: Kick, E., Jorgenson, A. (Eds.), Globalization and the Environment. Brill Academic Press, Leiden, the Netherlands.

Cernea, M.M., 1988. Involuntary Resettlement in Development Projects: Policy Guidelines in World Bank-Financed Projects. World Bank Technical Paper 180. World Bank, Washington, DC.

Cernea, M.M., 2003. For a new economics of resettlement: a sociological critique of the compensation principle. International Social Science Journal 55 (175), 37–45.

Detter, A., Gunnewig, E., 1994. Transformations caused by Lesotho Highlands water project phase 1-A with a focus on the Ha Lejone and Ha Mensel in Katse local catchment, Maseru.

Egre, D., Senecal, P., 2003. Social impact assessments of large dams throughout the world: lessons learned over two decades. Impact Assessment and Project Appraisal 21 (3), 215–224.

Epprecht, M., 2000. This Matter of Women is Getting Very Bad: Gender, Development and Politics in Colonial Lesotho. University of Natal Press, Pietermaritzburg.

Ferguson, J., 2004. The Anti-Politics Machine: Development, Depoliticization, and Bureaucratic Power in Lesotho. University of Minnesota Press, Minneapolis.

Fuggle, R., Smith, W., 2000. Large Dams in Water and Energy Resource Development in the People's Republic of China. World Commission on Dams Country Review Paper. World Commission on Dams, Cape Town.

Gordon, E., 1981. An analysis of the impact of labour migration on the lives of women in Lesotho. In: Nelson, N. (Ed.), African Women in the Development Process Cass, London.

Hassan, F.M.A., 2002. Lesotho—Development in a Challenging Environment: a Joint World Bank–African Development Bank Evaluation. African Development Bank and World Bank, Washington, DC.

He, D., Chen, L., 2002. The impact of hydropower cascade development in the Lancang–Mekong Basin, Yunnan. Mekong Update and Dialogue 5 (3), 2–4.

International Commission on Large Dams, 1998. Register of Large Dams. ICOLD, Paris.

Interorganizational Committee on Guidelines and Principles for Social Impact Assessment, 1994. Guidelines and principles for social impact assessment. Impact Assessment 12 (2), 107–152.

Interorganizational Committee on Guidelines and Principles for Social Impact Assessment, 2003. Principles and guidelines for social impact assessment in the USA. Impact Assessment and Project Appraisal 21 (3), 231–250.

Jackson, S., Sleigh, A., 2000. Resettlement for China's three Gorges Dam: socio-economic impact and institutional tensions. Communist and Post-Communist Studies 33 (2), 223–241.

Jing, J., 2000. Displacement, Resettlement, Rehabilitation, Reparation and Development: China Report. In: World Commission on Dams Thematic Review 1.3. World Commission on Dams, Cape Town.

Lerer, L.B., Scudder, T., 1999. Health impacts of large dams. Environmental Impact Assessment Review 19 (2), 113–123.

Lesotho Highlands Development Authority, 1986. LHDA Order of 1986. Lesotho Government Gazette Extraordinary, Maseru.

Lesotho Highlands Development Authority, 2006. Mohale Dam Fills Up. Lesotho Highlands Development Authority, Maseru.

Magee, D., 2006. Powershed politics: hydropower and interprovincial relations under great western development. The China Quarterly 185, 23–41.

McMillan, D.E., 1995. Sahel Visions: Planned Settlement and River Blindness Control in Burkina Faso. University of Arizona Press, Tucson.

Nkomo, S., 1990. Confrontation and the challenge for independent development: the case of Lesotho. In: Mazur, R.E. (Ed.), Breaking the Links: Development Theory and Practice in Southern Africa. Africa World Press, Trenton.

Panel of Environmental Experts, 1989. Report to the LHDA and the World Bank. World Bank, Washington, DC.

Panel of Environmental Experts, 1991. Report to the LHDA and the World Bank. World Bank, Washington, DC.

Panel of Environmental Experts, 1993. Report to the LHDA and the World Bank. World Bank, Washington, DC.

Panel of Environmental Experts, 1994. Report to the LHDA and the World Bank. World Bank, Washington, DC.

Panel of Environmental Experts, 1995. Report to the LHDA and the World Bank. World Bank, Washington, DC.

Panel of Environmental Experts, 1997. Report to the LHDA and the World Bank. World Bank, Washington, DC.

Phadke, R., 2005. People's science in action: the politics of protest and knowledge brokering in India. Society and Natural Resources 18 (4), 363–378.

Sadler, B., et al., 2000. Environmental and Social Impact Assessment for Large Dams. In: World Commission on Dams Thematic Review v. 2. World Commission on Dams, Cape Town.

Scudder, T., 1997. Social impacts of large dams. In: Dorcey, T. (Ed.), Large Dams: Learning from the Past. IUCN, Gland, Switzerland.

Scudder, T., 2005. The Future of Large Dams: Dealing with Social, Environmental, Institutional and Political Costs. Earthscan, London.

Sechaba Consultants, 1994. Poverty in Lesotho: a Mapping Exercise. Government of Lesotho Working Document, Maseru.

Trans-Caledon Tunnel Authority, 2005. Map of the Water Flow of the Lesotho Highlands Water Project. TCTA, Maseru.

Thabane, M., 2000. Shifts from old to new social and ecological environments in the Lesotho Highlands water scheme: relocating residents of the Mohale Dam area. Journal of Southern African Studies 26 (4), 633–654.

Thamae, M.L., Pottinger, L., 2006. On the Wrong Side of Development: Lessons Learned From the Lesotho Highlands Water Projects. Transformation Resource Center, Maseru.

Tshabalala, M., Turner, S.D., 1989. Socioeconomic Census of the Lesotho Highlands Water Project Phase 1-A Areas, V. 1. Main Report. Lesotho Highlands Development Authority, Maseru.

Tsikoane, T., 1991. Towards a redefined role of the Lesotho Highlands water project in the post-apartheid South Africa. In: Santho, S., Sejanamane, M. (Eds.), South Africa After Apartheid: Prospects for the Inner Periphery in the 1990s. Sapes Truest, Harare.

United Nations, 2003. Investment Policy Review: Lesotho. United Nations Conference on Trade and Development. United Nations, New York.

Vanclay, F., 2002a. Conceptualizing social impacts. Environmental Impact Assessment Review 22 (3), 183–211.

Vanclay, F., 2002b. Social impact assessment. Encyclopedia of Global Environmental Change 4, 387–393.

Vanclay, F., 2003. International principles for social impact assessment. Impact Assessment and Project Appraisal 21 (1), 5–11.

World Bank, 2003. Stakeholder Involvement in Options Assessment: Promoting Dialogue in Meeting Water and Energy Needs—a Sourcebook. World Bank, Washington, DC.

World Commission on Dams, 2000a. Dams and Development: a New Framework for Decision-making. Earthscan, London.

World Commission on Dams, 2000b. Social Impact Assessment: WCD Thematic Review V. 2. Environmental and Social Assessment for Large Dams. World Commission on Dams, Cape Town.

[10] There are some encouraging signs that China's central government is increasing its commitment to thorough environmental and social review of development projects. In 2003 the State Council passed a new Environmental Impact Assessment Law, which requires all significant development projects to undergo more rigorous regulatory oversight from the State Environmental Protection Agency (SEPA) as well as public hearings involving potentially effected stakeholders. Invoking the new law, Premier Wen Jiabao called a temporary halt to several hydropower projects on the Nu River, which is located adjacent to the Upper Mekong in Yunnan Province. More thorough environmental reviews are underway.

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