



Original article

## Long-term outcomes of the livelihoods of displaced households after hydropower dam construction: A case study in Thua Thien Hue Province, Vietnam

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### ABSTRACT

Millions of people have been displaced and resettled worldwide to build hydroelectric dams. Most of the previous studies show that the livelihoods of the resettled people have been getting worse, but these studies have only been evaluated over a short time frame and only selected two-time periods for assessment, including before and after displacement. Few follow-up and evaluation studies have been conducted for periods longer than 10 years. Therefore, this study conducted a study that was long-term at a resettlement site for hydropower construction in Vietnam to observe the change in livelihoods over more than 12 years of the people that were resettled. Both quantitative and qualitative methods were used in the research to determine livelihood outcomes and to explain the causes of changes in livelihood pathways after resettlement. Our findings indicate that the loss of productive land for upland rice and dry crops was the greatest challenge for displaced households. Households which were headed by women, or those that were handicapped, were more susceptible to land loss. Displaced people also lost their traditional jobs and faced food insecurity because they did not have productive land for cultivating rice and cassava crops. As a result of this significant reduction in economic and food conditions, displaced households could not maintain their culture and religion, and the coherence of Bo Hon, the study village gradually decreased. However, displaced households made a faster recovery in income generation than other communities displaced by hydropower dams in Vietnam after 12 years. They could generate more income because they live near Hue city and receive strong support from local authorities. Through this study, it has been shown that the selection and arrangement of a suitable resettlement site with good access to the job market will be a prerequisite to help displaced households to adapt and develop their livelihoods after resettlement in conditions of limited access to natural resources.

KEY WORDS: hydropower, displacement, livelihood

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### 1. Introduction

According to IEA (2008) and ERENA (2014), hydropower is an electricity generation technology that is mature, reliable, flexible, available, renewable, and cost-effective. Its development presents opportunities for poverty alleviation and can contribute to regional cooperation by encouraging good practices in managing water resources with a river basin approach for transboundary watersheds (WORLD BANK, 2004). With approximately 50,000 large dams worldwide, half of which are located in China, and as many as 800,000 smaller dams in existence, hydropower has the potential to generate

significant amounts of electricity. However, the construction of dams has led to the displacement of as many as 80 million people worldwide, with the actual figure likely to be even higher when accounting for those displaced by smaller dams (WALICKI ET AL., 2017). Unfortunately, hydropower projects tend to disproportionately benefit privileged groups, while the living conditions of displaced communities tend to worsen after resettlement (BISWAS, 2012; WANG ET AL., 2014).

Dam-induced displacement and resettlement (DIDR) are neither new nor unusual, but they are of concern worldwide because of the increase in scale and severe negative impacts, especially in

developing countries (SCUDDER, 2005; COTULA ET AL., 2009; MATHUR, 2013). As a result, large numbers of farmers have been displaced in Africa, Latin America, Central Asia, Southeast Asia, and in India and China (COTULA ET AL., 2009). Hydropower dam construction affects the livelihoods of forcibly displaced people and communities. Displacement and resettlement induced by hydropower dam development are one of the social pathologies that inevitably result from a modernization agenda aiming for the development of renewable and sustainable energies (CERNEA, 2009). Although several studies acknowledge positive developments for displaced communities after being resettled (NAKAYAMA ET AL., 1999; SCUDDER, 2005; AGNES ET AL., 2009), the majority report that DIDR causes great negative impacts for those people affected, even long-term (MCDOWELL, 1996; ROY, 1999; SATYANARAYAN, 1999; GEBRE, 2003; KARIMI & TAIFUR, 2013). DIDR leads to damage to production capacity, income, culture, and well-being (SCUDDER, 1997; BARTOLOME ET AL., 2000; CERNEA, 2003; WILMSEN, 2011; TY ET AL., 2014).

In Vietnam, 260 large-scale hydro-electricity projects are operational, 211 plants are under construction to operate by 2017, and the rest are licensed and registered. Additionally, 452 small-scale hydroelectricity plants are operating, or under construction, across the country. Hydropower dam construction has displaced 44,557 households, or approximately 200,000 people, (BUI & SCHREINEMACHERS, 2011) and expropriated 133,930 hectares of land (MOIT, 2013). According to a report of the Vietnam Electricity Cooperation, Vietnam had a total of 374 hydro-electric power plants under operation with an installed capacity of 20,774 MW in 2020 (EVN, 2021). A salient feature of this displacement is that some 90% of affected people in Vietnam belong to minority ethnic groups living in mountainous areas who rely on land and natural resources for their livelihood (CAO, 2003; DOCRD, 2007; ISPRE, 2009; CODE, 2010; DAO, 2010, 2011; BUI & SCHREINEMACHERS, 2011, 2013).

Literature reviews show that in Vietnam after resettlement most displaced people are suffering from the loss of land, income, traditional jobs, traditional housing, marginalization, increased morbidity and mortality, food insecurity, loss of access to common pool resources (grassland, water, and natural forests), and social disarticulation (DAO, 2010; CODE, 2010; TY ET AL., 2013; BUI ET AL., 2013; NGUYEN ET AL., 2016). The resettled villages cannot rise out of poverty because they cannot invest in livelihood activities. Villagers must spend most of the money they earn from off-farm activities on food and other household consumption

items. Villagers face substantial challenges in substituting for lost livelihood assets and generating sufficient income, as alternative employment is lacking (SAYATHAM & SUHARDIMAN, 2015). However, most studies on the livelihood resilience of displaced communities assessing the impact of dam-induced displacement and resettlement have typically measured conditions at two points, before and after displacement (BUI & SCHREINEMACHERS, 2011; WILMSEN, 2011). BUI & SCHREINEMACHERS (2013) confirmed that comparing two points only gives a snapshot of the changes and adaptation processes that are often perceived as negative impacts. Meanwhile, the impact of resettlement on livelihood is a dynamic process that requires longitudinal analysis to determine the long-term adaptation, or resilience, of displaced households (SCOONES, 2009). From the current limitation of impact studies, the aim of this article is to analyse the long-term adaptation strategies of displaced households due to hydropower dam construction. This study examines how this community reconstructed their livelihood, and why their livelihood pathways changed due to resettlement. It addresses the following sub-questions: firstly, to what extent is the displaced community vulnerable to impoverishment risks, and if present, what types of livelihood solutions were initiated to reduce vulnerability? Secondly, who is able, or not able, to adapt, and why? Thirdly, what are the implications for improved resettlement policies toward providing good livelihood opportunities for forcibly displaced people to sustain and obtain a better life? To answer these questions, we collected longitudinal data in 2006, 2009, 2011, 2014, and 2018 from the same settlement village.

## 2. Literature review

According to the literature, displacement and resettlement is categorized into three approaches: managerial, movementist, and risks and rights (DWIVEDI, 2002). The first focuses on applied concerns and considers displacement as an inevitable and unintended outcome of development. This approach is appreciated by resettlement planners, managers, and applied academics that often search for solutions to minimize the adverse impacts of displacement by effective ways of designing and handling the appropriate legal, managerial, and policy framework (DWIVEDI, 2002). Three authors, Cernea, McDowell, and Picciotto, are the most influential scholars who articulate this approach (DWIVEDI, 2002). CERNEA (2000) stressed that it is essential not only for studying disruptions but also for helping to formulate reconstructive

strategies to turn displacement into development opportunities. Therefore, CERNEA (1997) proposed the risks and reconstruction model for resettling a displaced population. This approach is supported by the World Bank, however, it is top-down, making resettlement planners sensitive to local needs (DWIVEDI, 2002) that often neglect the benefit of displaced people (TY ET AL., 2013).

Another approach proposed by action research scholars considers displacement as a manifestation of a crisis in development, and they work mainly on its causes. To them, displacement is evidence of development's uneven and unfair distribution of costs and benefits that does not improve people's well-being but destroys their existing ways of life (DWIVEDI, 2002). PARASURAMAN (1999), who is closer to the movementist approach, criticizes the fact that "development projects often favour the benefits of minority elite, while millions of people pay the price without reaping any benefits." However, this approach focuses mainly on community needs and initiatives while failing to link the displacement with broader national and global processes. DWIVEDI (2002) says that Parasuraman appears indecisive, since his heart is dictated by the movementist approach and his mind by the managerial approach. Filling gaps between the two, The World Commission on Dams (WCD) proposes the rights and risks approach, which combines the risks and reconstruction model and the rights articulated by the movementist approach. But representatives of neither approach are happy with WCD's recommendations. Managerial scholars dismiss it as impractical and unimplementable, while movementists consider it as a necessary but not a sufficient step forward. For example, Medha Patka, a movementist, said that "even with the rights recognized, risks assessed, and stakeholders identified, existing iniquitous power relations would too easily allow developers to dominate and distort such process" (WCD, 2000).

Thus, there is no perfect resettlement approach, and, therefore, the implementation of these approaches becomes more problematic in practice. WCD (2000) found that physical relocation often causes a loss of access to traditional means of livelihood, including agricultural production, fishing, livestock grazing, fuel wood gathering, and collection of forest products because it takes the form of forced displacement. Further, compensation measures often fail to offset the damage (FERNANDES, 2008; JAYEWARDENE, 2008; CERNEA ET AL., 2009; WILMSEN, 2011). Bureaucratic compensation processes often underestimate the value of land and loss of other properties; delays in payment and

lost livelihood opportunities are rarely compensated (MATHUR, 1999; WCD, 2000; TAN & WANG, 2003; TY ET AL., 2013). Displaced communities are often forced to resettle in regions with poor land and depleted natural resources. Displaced households' livelihood opportunities and preferences are often given little consideration in resettlement plans (WCD, 2000). Consequently, displaced people often become poorer, marginalized, and isolated (MCDOWELL, 1996; SCUDDER, 1997; ROY, 1999; SATYANARAYAN, 1999; WCD, 2000; BARTOLOME ET AL., 2000; GEBRE, 2003; WILMSEN, 2011; KARIMI & TAIFUR, 2013), forcing them to leave resettlement sites and migrate (WCD, 2000).

In contrast to the disruptive consequences of physical resettlement, some resettlements in Brazil, Ghana, and China do benefit resettlers. Particularly, China is considered as the first country to incorporate the notion of resettlement as a development opportunity with two innovative programs: the Partnership Support Programme and the Development Assistance Fund. In these modalities, the State Council redistributes income from power generation in the relocation areas to improve the living standards and livelihood opportunities for resettlers (PICCIOTTO ET AL., 2001; WILMSEN, 2011). In the case of the town of Zigui, Hubei province, China, resettlers benefitting from employment opportunities provided by local enterprises, saw their income significantly increased after relocation. But low education, or lack of professional skills, constrain them to be employed in these local enterprises (WILMSEN, 2011). Other resettlements improved the living standards of resettlers because they gave the displaced people better access to land ownership titles, infrastructure, irrigation for farmland, health care, markets, banks, city centres, higher education, and job opportunities for the younger generation (MANATUNGE & TAKESADA, 2013; SISINGGIH ET AL., 2013; SOUKSAVATH & NAKAYAMA, 2013). Therefore, WCD (2000) showed that adequate laws, policies, plans, financing capacity, and political will of governments and project authorities could benefit resettlers, but the capacity of resettlers may not correspond to the opportunities that are available.

An important factor that influences the rehabilitation of displaced people consists of the characteristics of five vital livelihood capitals before and after resettlement, including natural, human, physical, financial, and social capital (CHAMBERS & CONWAY, 1992; BLAIKIE ET AL., 1994; CHAMBERS, 1995; DE HAAN, 2000). Households that have more land and natural resources could receive higher compensation and, therefore, start their resettlement in better circumstances than others (KARIMI &

TAIFUR, 2013). As a consequence, resettlement might produce both winners and losers (FUJIKURA & NAKAYAMA, 2013). However, the movement of household development is a dynamic phenomenon, so some could be winners in certain times but might be losers in other contexts (DE HAAN & ZOOMERS, 2005; SCOONES, 2009). Therefore, we should study the livelihood pathways of displaced communities in the long-term to reduce the limitations of research findings based on short-term studies (BUI & SCHREINEMACHERS, 2011; WILMSEN, 2011).

### 3. Materials and methods

#### 3.1. Data collection

In this study, we collected longitudinal data in 2006, 2009, 2011, 2014, and 2018 in the same settlement village.

*Secondary data.* Documents, reports, and data related to Binh Dien hydropower dam, environmental impact assessment, poverty rate, land, and demographic information of Bo Hon village were provided by the Binh Thanh Commune People's Committee (CPC) and Centre for resource and environmental survey.

*Semi-structured household interviews.* A total of 40 households, approximately 75% of the total population of the village in 2018, were randomly selected from the list provided by the vice-village leader because there were 40 households resettled in the new village after resettlement. It was important to conduct the study on the same number of households in subsequent years for a fair comparison. Household interviews were used

to evaluate the resettlement program and to quantify changes in livelihood outcomes to describe the pathway of livelihoods 12 years after resettlement. The inequality among displaced households was also estimated. There were two ethnic groups in Bo Hon village, including Kinh (the majority people) and Ethnic minority groups (the minority people).

*Key informant interviews.* Key informant interviews were conducted with representatives of the commune and district government, village leaders, and the patriarch to investigate initial views about the displacement and resettlement of Bo Hon village in different years.

*Focus group discussions.* A focus group of 12 people was gathered, including four village leaders, the patriarch, and seven representatives from all households, to discuss the history of the village and major changes of livelihoods before and after resettlement. Group discussions were conducted to understand their views about displacement, migration of children, culture change of the younger generation, and economic conditions in their families.

*Field observations.* We also made observations and held informal talks with individual villagers to discover their personal views about resettlement and livelihood changes.

*In-depth interviews.* We undertook in-depth interviews with several households to discover insights into livelihood strategies.

In this study, we used indicators in Table 1 to collect data and to analyse how much displaced people received and spent, how they faced impoverishment risks and what types of livelihood strategies they applied to adapt to their new destination after resettlement due to hydropower dam construction.

Table 1. Indicators for analysing compensation, impoverishment risks, and livelihood strategies. Adapted from McDowell, 2002; Scoones, 1998

Concept	Dimensions	Indicators and explanations
Compensation	Land	Residential and agricultural production land (ha)
	Cash	Payment by the investor and the government for property and land loss of displaced households (VND)
	Assistance	Job creation, food and electricity supports
Impoverishment	Landlessness	Land area before and after resettlement of displaced households
	Food insecurity	Food provided for displaced households before and after resettlement
	Income loss	Income generation by displaced households
	Loss of access to common property and services	The level of access to common pool resources such as grazing lands, forests and woodlands
	Social disarticulation	The change of community cohesion, informal networks and interpersonal ties among displaced households
Livelihood strategies	On-farm livelihood strategies	Livelihoods related to agricultural production, such as rice and crop cultivation, livestock's, forestry, and aquaculture
	Off-farm livelihood strategies	Livelihoods related non-agricultural sectors, such as working for other people, migration to cities or other countries to work, small business, and working for government office



## 3.2. Data analysis

Household data were stored and analysed using IBM SPSS 16 software. Descriptive analysis was run to estimate the statistical value, such as percentage, minimum, maximum, mean, standard deviation, and sum, of land and income data. A paired sample T-test was used to compare mean income differences, and Pearson correlation was used to determine the relationship between income and other influential variables of livelihood changes. Gini and Robin Hood indices were used to examine the distribution of income among households before displacement and after resettlement.

## 4. Results

### 4.1. An overview of the case study

This study investigated the change of livelihoods of a resettlement village displaced by Binh Dien hydropower dam in Thua Thien Hue province, Central Vietnam. For the construction of the Binh Dien hydropower dam, 616 hectares of land was acquired for its reservoir, which included 140 hectares of expropriated land, encompassing the whole village of Bồ Hòn. In 2003, Bồ Hòn villagers were told to resettle in a new village before the actual construction date of Binh Dien hydropower dam. In August 2006, the entire village received compensation and was resettled in the new Bo Hon resettlement village, called the Binh Thanh commune (BINH THANH CPC, 2008).

*History of the old Bồ Hòn hamlet (before displacement).* The former Bo Hon hamlet originated from a group of 33 Cơ tu households of the Huong Nguyen Commune before 1984. The word hamlet (bản) is often used for a minority ethnic group living in mountainous regions. Between 1984 and 1989, they moved to Lác River. Because of the 1995 flood, they moved to Bồ Hòn hamlet named after the popular Bồ Hòn trees along the Huu Trach River. At that time, five Kinh households moved in and lived together with them due to the flood. The village was located in a valley of the Nam Hoa State Forest Enterprise, approximately 15 km from the centre of Binh Thanh commune and 40 km from Hue city. In the old village, Cơ tu accessed riverbanks to plant Lồ ô bamboo and practiced *slash-and-burn cultivation*. The main mechanism of access to land and other natural resources was under the customary law set by the patriarch and all villagers. Kinh had no right to access communal lands but could access natural forests to exploit non-timber products. The infrastructure was very poor; the only way to go out of the village was by

waterways. Also, they had no electricity and water supply, and, without a school, most were illiterate (FOCUS GROUP DISCUSSION, 2009).

*The new Bo Hon resettlement village (after resettlement).* The whole village was displaced and resettled in 2006. The hydropower company constructed the resettlement village downstream of the dam and about 15 km from the old village. It is closer to both the centre of Binh Thanh commune by a 2-km concrete road and to Hue city, which is 25 km away by a well-connected road network. In the village, there is a communal house, a primary school, and a kindergarten. Access to a secondary school and high school is 4 km away in Binh Dien commune. All households have electricity and a water supply. Each household has a piece of land with a house, garden, and crop production in front of the house. The village is situated near four neighboring villages, most of which are inhabited by Kinh people. In 2014, the village had a population of 278 people residing in 54 households, with over 90% being Cơ tu people, and the remaining being Kinh. The majority of the labor force, about 60%, were aged below 45 years. The education level of the population varied, with most having completed primary to high school education, and only 12.5% of the population was illiterate. After resettlement, two people received higher education (Author's survey, 2014). By 2018, the number of households increased to 62, accommodating a population of 248 households, with a poverty rate of 46.8% among the total households in the village (Author's survey, 2018).

### 4.2. An evaluation of the compensation scheme for displaced villagers

According to decision 3721/2005/QĐ-UBND of Thua Thien Hue province, the compensation principle stipulated land for land and cash compensation for losses. Each household received a piece of land (0.3 ha per household) attached to a house, and the majority (92.5%) of households received cash compensation for their losses. On average, each household received VND 35.8 million, and 10% received more than VND 100 million per household. Besides payment in cash, displaced households received other assistance for one year, but were paid in cash together with the compensation package. However, land was not compensated sufficiently. According to the Land Law 2003, the project authority only recompensed legal lands with land use right certificates (Red Book), whereas the displaced village practiced slash and burn cultivation and used land under the customary right system without the official

recognition of responsible local governments. For example, 61 hectares of Lồ ô bamboo land along riverbanks were not compensated because these trees were planted according to customary rule of the village without Red Books. Only Lồ ô trees over land were estimated to have been compensated for. Thus, customary rights were not considered. Additionally, most displaced households were disappointed with the compensation process because it was unfair, and some households had more compensation than others. Particularly, nepotism and corruption were also found in this case (MICHELLE, 2011). After compensation and assistance, hydropower did not provide any further benefit sharing from power generation. Displaced household struggled to survive with a few supports from local authorities and NGOs. Only Lồ ô trees over land were estimated to compensate for. Thus, customary rights were not taken into account. Additionally, most displaced households were disappointed with the compensation process because it was unfair, and some households had much more compensation than others. Particularly, nepotism and corruption were also found in this case (MICHELLE, 2011). After compensation and assistance, the hydropower company did not provide any further benefit sharing from power generation. The displaced households struggled to survive with little support from local authorities and NGOs.

#### 4.3. Impoverishment risks and inequality after resettlement

*Land loss and unequal distribution.* According to the household survey, and focus group discussion with the Binh Thanh Commune People's Committee, the biggest challenge for displaced households was losing land after resettlement. In total, the whole village lost 87.3% of land area after resettlement, from 616 ha to 95.4 ha, in which the loss of productive land for upland rice, dry and perennial crops was the greatest challenge for displaced people because they could not find replacement agricultural lands. Each household lost 87.3% of productive land, from 1.7 to 0.16 hectares, after resettlement (Fig. 1). According to resettlers, they had access to large tracks of fertile land for crop production on hills and along the riverbanks in the old village, but very limited access to productive land for crop production after resettlement. Soil quality was also poorer than before resettlement. Over 90% of households said that traditional cassava became bitter and indigestible because of shallow soil depth and poor fertility. The households that were displaced also lost 30% of their residential

land. Additionally, despite not having ownership of the protected forest or the mountainous unused land that could have been used as common pool properties for food and entertainment, Bo Hon village lost access to these lands after resettlement. In addition to the loss of land, there was an unequal distribution of land among the displaced households after resettlement, in which women-headed and handicapped households were more susceptible to land loss. After resettlement, women-headed households lost 82% of their land. Handicapped households lost 80% of land and owned threefold less than other non-disabled households. Kinh households owned six times less land than Cotu households, with the former losing 90% of their land. Before and after resettlement, households of village leaders owned twice as much land on average compared to others. This unequal distribution of land had a significant impact on compensation and the restoration of livelihoods. Former and new village leaders had much higher compensation and then invested in reclaiming lands for Acacia Forest plantation. They accumulated more land thanks to high financial capacity and therefore this resulted in high inequality of land distribution in the village (Table 2). This could also be explained by the substantial increase of the Gini and Robin Hood indices of land distribution, these doubled after resettlement, from 0.33 and 0.24 in 2006 to 0.6 and 0.48 in 2018 respectively.

Upon resettlement, the village's forest land area increased to 75.8 hectares. In 2007, the WB3 project facilitated the distribution of land use right certificates (LURCs), with each household receiving 1.3 hectares. This is a household that had information about resettlement early, so they returned to their old residence to reclaim and plant forests early. In 2008, the WB3 project continued to support 28 households to be granted LURCs for the area of reclamation and afforestation in the old residence with an area of 70.4 ha. In 2009 and 2010, the project continued to support 5 households to obtain LURCs with an area of 8.1 ha. As a result, the whole village of Bo Hon now has a total production forest area of 75.8 hectares. However, the distribution of production forest land between households is not equal, and in which eight households have a larger production forest area, accounting for more than 75% of the total production forest area of 62 households in the village. There are families with a production forest area higher than 20 hectares, and on average each household of these 8 families has about 7 hectares of production forest land. The remaining 20 other households have a total production forest

area of only 16.4 ha, with an average of 0.8 ha of production forest land per household. With a small area, far from their current residence, there

is no investment capital, therefore, most of these 20 households do not invest in afforestation but leave the land uncultivated (Authors' survey).

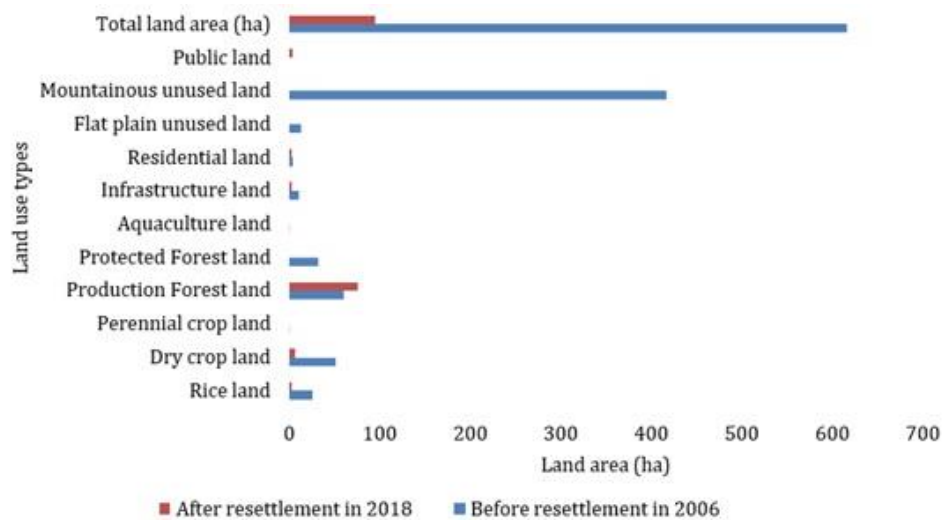


Fig. 1. Land of Bo Hon village before and after resettlement (\* n = 48 households; \*\* n = 56 households) (Source: Binh Thanh CPC, 2006 and 2018; Centre for resource and environmental survey, 2018)

Table 2. Distribution of agricultural, residential, and forest land between social groups before and after displacement (n=40 households) (own source)

Household groups		Land before displacement 2006 (ha)						Land in 2018 (ha)					
		Mean	Min	Max	Range	SD*	Sum	Mean	Min	Max	Range	SD*	Sum
Household head	Female	2.4	0.5	4.2	3.7	1.4	14.5	0.4	0.3	1.2	0.8	0.3	2.6
	Male	3.7	0.8	13.6	12.8	2.5	124.4	2.1	0.3	9.5	9.2	2.5	73.7
Age group	<45	3.1	0.5	6.5	6.0	1.6	51.9	1.4	0.3	7.2	6.9	1.9	33.6
	>45	3.9	0.8	13.6	12.8	2.8	87.0	2.5	0.3	9.5	9.2	2.9	42.7
Ethnicity	Kinh	1.5	0.5	2.0	1.5	0.7	6.0	0.3	0.3	0.3	0.0	0.0	0.6
	Cotu	3.7	0.8	13.6	12.8	2.4	132.9	1.9	0.3	9.5	9.2	2.5	75.7
Health status	Normal	3.5	0.5	13.6	13.1	2.4	128.4	2.0	0.3	9.5	9.2	2.5	74.3
	Disabled	3.5	1.5	6.5	5.0	2.6	10.5	0.7	0.3	0.9	0.6	0.3	2.0
Social status	Normal	3.1	0.5	6.8	6.3	1.7	107.1	1.6	0.3	9.5	9.2	2.2	54.4
	Leader	6.4	3.4	13.6	10.2	4.2	31.8	3.7	0.5	7.0	6.6	3.0	22.0
Total land		3.5	0.5	13.6	13.1	2.4	138.9	1.9	0.3	9.5	9.2	2.4	76.4

SD\*: the standard deviation

*Loss of access to common pool resources.* The household surveys shows that displaced households were very vulnerable to access to common pool resources because they lost access to 450 hectares of natural forests, unused land, and water bodies after resettlement. They lost 90% of fishing products and 97% of rattan. As a result, each household lost nearly 55% of their income, from VND 1.9 to 0.86 million a year. Kinh households were more susceptible than Co tu because they lost 80% of their income. Because of land loss and loss of access to common pool resources, displaced people also lost their traditional livelihoods, in which the loss of Lồ ô bamboo plantation activity was the most

challenging because each household owned 1.3 ha and several households owned over 10 ha before displacement. They could earn VND 15 million per household per year from such production. Lồ ô bamboo was a sustainable income because it can re-grow every year, and its price increased significantly. In 2006, the price was VND 4,000 per trunk and doubled in 2009, then increased again in 2014 to VND 24,000 per trunk, and VND 50,000 in 2018. They could also easily sell to retailers who went directly to the village by electric boats. After the land was flooded for the reservoir, they no longer had an income of Lồ ô bamboo (Author's survey, 2018).

**Food insecurity.** Food insecurity was the most severe and long-term vulnerability of displaced people in the new village because they did not have productive land for cultivating rice and cassava crops. The annual productivity of rice declined significantly from 52 kg to 18 kg per household. Over 56% of households had to spend their compensation and income to buy rice and food in the new village, whereas 70% could supply themselves in the former village (Author's survey, 2018).

**Social disarticulation.** As a result of the reduction in economic and food conditions, displaced households could not maintain their culture and religion. As confirmed by 40% of households, they almost changed to the culture of Kinh people after resettlement: they spoke Kinh (Vietnamese) language frequently, built houses, prepared foods, wore clothes, gave names for their children as Kinh people did. Several households changed from a Cờ tu religious tradition to Buddhism and Christianity because of the hunger relief received from delegates of these religions. Nearly half worshiped their ancestors and organized wedding ceremonies in the ways of Kinh people. Nevertheless, 60% continued with a strong community interaction. For example, Cờ tu girls continued marrying Cờ

tu men. One girl, sixteen years old studying at 10th grade, said that her sister married a Cờ tu man in Nam Dong district because he had land for a rubber tree plantation (Author's survey, 2018).

Besides the cultural shift, the coherence of Bo Hon village declined gradually. Our research indicates that 83% of households maintained positive community interaction, while 17% reported a lack of cooperation and mutual support. (Fig. 2). The patriarch said that many households lived separately, or independently, since they did not trust each other as they did before. Therefore, they did not ask neighbours to keep their houses as in the old village. The disintegration of the village happened because few collective activities were organized in the new village. The transformation of village management system from a customary to a government-oriented regime also increased incoherence. The role of the patriarch was no longer important, although a new village management board appointed by the commune authority played a more important role; it could not prevent conflicts that emerged in the new setting. Finally, unfair compensation and a larger income gap reduced trust among households (HOUSEHOLD SURVEY, 2018).

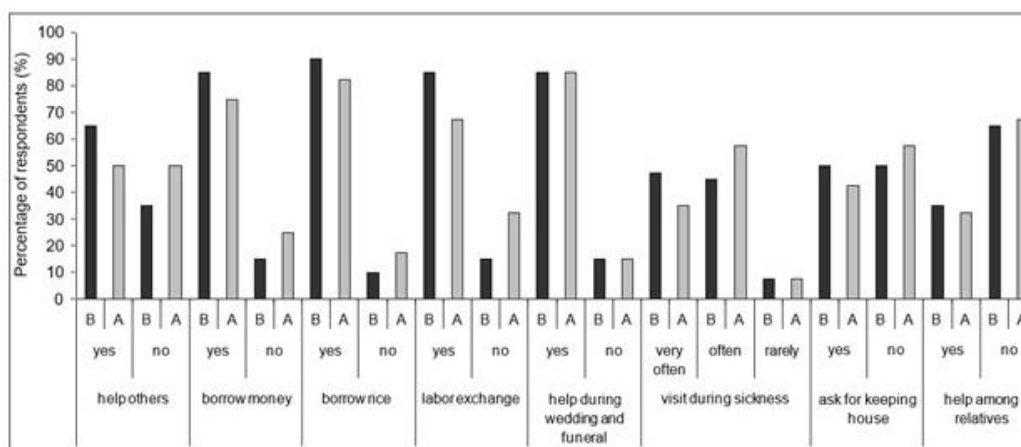


Fig. 2. Community coherence before and after displacement (n=40 households) (own source)  
 Note: B - before displacement; A - after displacement

#### 4.4. Income change and inequality among displaced households

Figure 3 shows that displaced households experienced two development stages after 12 years of relocation, including the disruption stage between 2006 and 2009 and the recovery stage from 2009-2018). In the first stage, the total income of displaced households decreased immensely from 665 to 130 million VND. A paired sample T-test also confirmed that annual income per household dropped significantly from 2006 (m= VND 15.6, SD=17.8 million a household per year) to 2009

(m= VND 3.2, SD=2.4, t (39) =-4.34, p=0.00009 two tailed), in which income from Lỗ ô bamboo forest and common pool resources almost disappeared. Instead, they started working for Acacia Forest owners and selling their cash crops. They also began reclaiming lands and planting Acacia forests (Authors' surveys).

In the second stage, the total income of displaced households increased substantially from 130 in 2006 to 903 million VND in 2018. The fast recovery of income was closely associated with Acacia Forest plantation land and waged labours. A Pearson correction analysis revealed that income



recovery was significantly correlated with income from waged labour ( $r=0.577$ ,  $p= 0.00009$  two tailed,  $N=40$ ) with Acacia Forest land size after resettlement ( $r=0.645$ ,  $p= 0, 000007$  two tailed,  $N=40$ ), and with income from Acacia forests ( $r=0.586$ ,  $p= 0.00015$

two tailed,  $N=40$ ). This suggested that households had more income if they had more land for Acacia Forest plantation and waged labour after resettlement (Fig. 3; Authors' surveys).

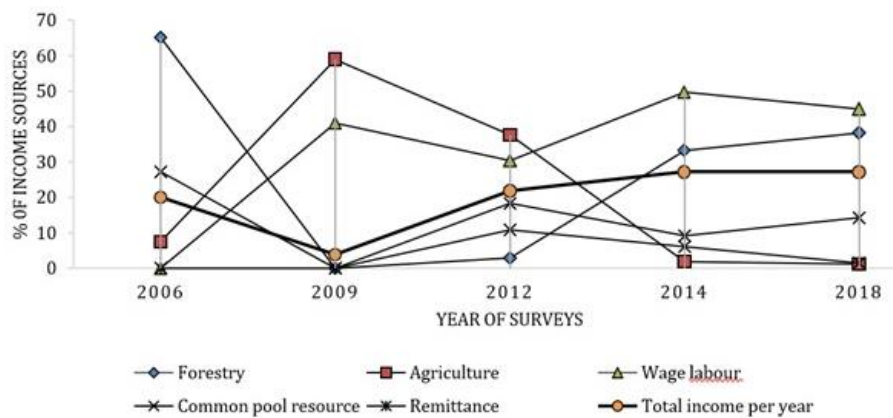


Fig. 3. Income changes of displaced households before 2006 and after displacement (n=40) (own source)

However, comparing income among displaced households before and after displacement by using a paired sample T-test revealed that income in 2018 (m=23.8, SD = 39.7 million VND a household per year) was not statically higher than before displacement in 2006 (m=15.6, SD=17.8 million VND a household per year,  $t(39) = 1.25$ ,  $p=0.220$  two tailed) (Authors' surveys). This shows that there was a considerable variation among households in the process of recovery after resettlement. We found that over 55% of households lost income, but 45% gained more income in 2011; over 42% lost while 58% gained income in 2013. Before resettlement in 2006, six households did not have an income at all, including two women-headed households, one Kinh, two disabled and one old household. However, the women-headed and handicapped households made a good improvement in 2013, but elderly households could not because they had no land for Acacia plantation, or income

from waged labour, and remittance of migration (Table 3). Young households made a moderate increase in income because they earned from working for Acacia Forest owners, gardening, migration, and their own Acacia forests. The strong recovery of income enabled 50% of households to become better off and 7 households to escape from poverty completely. However, 6 households stayed poor, and 5 families became poorer than before displacement. It can be seen from this analysis that livelihood outcomes were different among households, and its change was not linear. To reflect income inequality among displaced households before, and after, resettlement, we also estimated the Gini index (Fig. 4), in which the Gini index in 2006 was 0.48, 0.37 in 2009, 0.42 in 2012, 0.53 in 2014, and 0.47 in 2018. It shows that the income distribution was unequal both before, and after, resettlement.

Table 3. Variation of income among displaced household before and after resettlement (n=40 households) (own source)

Household groups		Mean		Min		Max		Standard deviation		Sum	
		Before	After	Before	After	Before	After	Before	After	Before	After
Household head	Women	11	15	0	0	28	38	13	18	66	90
	Men	18	24	0	0	72	74	18	19	600	813
Ethnicity	Kinh	16	17	0	0	28	36	13	18	66	69
	Cotu	17	23	0	0	72	74	18	19	600	834
Age group	<45	18	24	0	0	72	71	19	18	298	560
	>45	16	20	0	0	62	74	17	21	368	343
Health status	Non-disabled	17	23	0	0	72	74	18	20	631	859
	Disabled	11	15	0	0	18	24	10	9	34	44
Social status	Normal	14	22	0	0	50	74	14	19	524	753
	leader	47	25	7	0	72	48	35	20	141	150
All households		17	23	0	0	72	74	18	19	665	903

Unit: Million VND

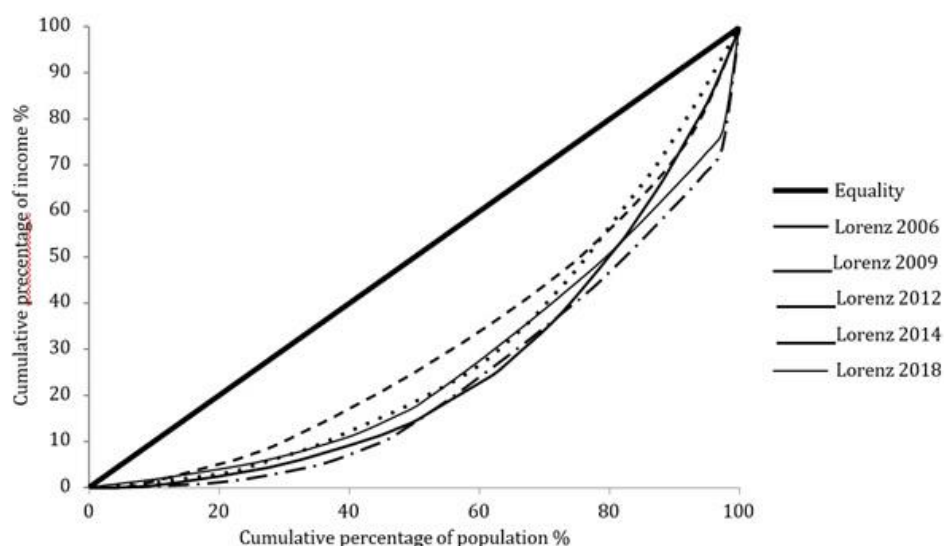


Fig. 4. Lorenz curve and income distribution before and after displacement of Bo Hon village (n = 40 households) (own source)

#### 4.5. Livelihood adaptation strategies

In this case study, we found that displaced households applied seven strategies, as follows:

*Spending compensation money.* Most displaced households spent their compensation money on mitigating food insecurity and income loss during the initial years after resettlement. They used 20% of the compensation for food, 21% for savings, but withdrew all for health care, school fees, food, and water and electricity charges. Half of the compensation was used on buying furniture, motorbikes, mobile phones, TVs, refrigerators, and extending houses after construction by the hydropower company. A small percentage of the compensation money was used for livestock and land reclamation for Acacia Forest plantation. Most households confirmed that the compensation enabled them to overcome the severe shortage of food and improved their living standards after displacement. In which, motorbikes and mobile phones allowed them to communicate better with outsiders to get job opportunities in the region and with their families when they migrated to work in cities.

*Restoration of traditional livelihoods.* Along with compensation spending, displaced households began recovering traditional livelihoods in the new village right after resettlement. They replanted Lồ ô bamboo but could not find suitable lands. Instead, in 2007 and 2008 five households returned to the old village twice per month by electric boat to harvest bamboo not yet totally flooded. From this, each household earned VND 7 million per year. In 2009, they stopped harvesting Lồ ô because the hydropower company restricted access to the reservoir. In 2010, the Centre for

Rural Development (CRD) of Hue University of Agriculture and Forestry (HUAF) came and supported the villagers to replant Lồ ô again. They facilitated the Huong River Protection Forest Management Board (HRPFMB) to share their 40 hectares of land for a Lồ ô bamboo plantation (TY ET AL., 2010). However, the village leader said that land was not officially relocated to them and was quite far from their village, so that they did not take good care of Lồ ô bamboo. As a result, HRPFMB retook the land, and Lồ ô bamboo livelihood practically disappeared (Authors' survey).

They also failed to replant traditional cassava, which was an important and favourable food. After resettlement, all households began growing traditional cassava in their gardens, but poor soil quality prevented cassava from growing well. It became bitter and indigestible. In 2009, they stopped growing traditional cassava and changed to a new variety called KM94 industrial cassava. This idea came from a former leader who planted KM94 cassava first. He said, "industrial cassava was not good to eat but it produced higher yields and its price was good, and thus was easy to sell. After that, I encouraged other households to plant KM94". Ten households planted KM94, and each household earned 700 thousand VND in 2011 and 1.4 million VND in 2013. Nevertheless, the limited garden land restricted them from producing more cassava, while the price of cassava remained quite stable year-on-year (Authors' survey).

Also, resettlers could not restore their income from common pool resources. After resettlement, they looked for alternative natural forests and rivers in the region to collect non-timber products, such as rattan, honey, and Lantien leaves for making hats, as well as for fishing. However, only

six households continued this activity and each household generated only 0.9 million VND per month, which included two women-headed households (Authors' survey).

*Crop diversification.* Because of the poor, and limited land, displaced households were forced to cultivate other crops, including lemon grass, pineapple, and taro. They explained that these cash crops could grow on poor soils and required less land than other crops. In addition, it was very easy to sell to retailers who visited the village every day for business. In 2014, twenty-one households planted cash crops, in which women participated in this activity the most. Although income from cash crops was not high, VND 1.7 million per household per year, and they said that it was very important for buying daily foods. They also exchanged lemon grass, taro trunks, and pineapples with retailers for other foods. Over 90% said that they would continue growing lemon, taro, and pineapple in coming years (Authors' survey).

*Reclaim lands for Acacia Forest plantation.* After resettlement, the authority allowed resettlers to reclaim unused uplands to plant Acacia forests that were the most important economic forests in

the region. In 2007, twenty-seven households started planting Acacia forests. Subsequently, JBIC and WB3 projects came and supported them with technical training and loans with low interest to invest in Acacia Forest plantations. They also assisted local authorities to allocate forest Red Books to resettlers. In 2014, all households received Red Books for 75.8 hectares of Acacia Forest on average, each household had 1.65 ha of Acacia Forest. Most started selling Acacia Forest products, and each household earned about VND 8 million per year (Table 4). The income from Acacia Forest became the second largest source after income from waged labour (Fig. 3). Yearly Acacia planting allows for a successive yearly income.

However, several vulnerable households, including women-headed, handicapped, and Kinh households, had less land and income than others. They explained that plantations of Acacia required quite high costs and labour, and they did not have enough money to facilitate planting. Further, their children migrated to work in other cities, so they could not reclaim land for Acacia Forest. Households of village leaders accumulated much more land for Acacia forests than the others in the new resettlement village (Table 5).

Table 4. Acacia forest land and income in 2018 (n = 40 households) (Binh Thanh CPC, 2008)

Land area and income from Acacia Forest	Min	Max	Sum	Mean	Range	Standard deviation
Acacia forest land (ha)	0.0	9.3	62.6	1.65	9.3	2.4
The annual income of Acacia (Million VND per household)	0.0	45.0	317.3	7.90	45.0	12.4

Table 5. Acacia Forest land and income among household groups (n=40 households) (own source)

Household groups	Acacia forest land (Hectare per household)	The annual income of Acacia Forest (million VND per household)
Household head	Women-headed	0.17
	Men-headed	9.21
Ethnicity	Cơ tu	8.73
	Kinh (majority)	0.00
Health capability	Disabled	2.80
	Non-disabled	8.27
Age group	<45	6.25
	>45	10.03
Social status	Leader	18.25
	Non-leader	6.2
All households	1.65	7.90

*Working for Acacia Forest owners in the region.* As mentioned, Bo Hon village was in the densely planted Acacia forests and close to the points of purchase and transportation of Acacia wood pulp to processing factories. As a result, this was a good opportunity for displaced people to work for other

Acacia Forest owners. Since 2008, 24 households with 35 labourers have been involved in this activity. Both men and women between 14 and 45 years worked for Acacia Forest owners. They often went to work by motorbike and contacted forest owners via mobile phones they had purchased

after displacement. Half of them confirmed that the demand was high, but the rest said that this job was not stable especially in the rainy season. However, it was the largest income source in 2014 when each household earned 19 million VND per year. Women-headed, disabled, and Kinh households benefited most from this activity since their children earned a significant income, improving their living standards. Nonetheless, most households confirmed that Acacia Forest plantation and harvesting was very hard work. They will continue working but will send their children to Ho Chi Minh City to look for work in textile and garment factories (Authors' surveys).

*Worker migration to cities and industrial zones.* Migration was another non-farm livelihood initiated in 2011 by 10 migrants and 13 migrants in 2014. Only two migrants worked in the industrial zone in Hue city. They were aged between 15 to 23 years and had completed primary to high school. Over 80% are men. In 2011, each household of migrants received over 10 million VND of remittance, but about 4 million VND in 2014. The reason for his decline was the economic crisis in 2012 which influenced the growth of the textile and garment industry, and this reflected directly on their salary (Authors' surveys). The majority confirmed that they spent 70% of their remittance on daily food and 30% for health care, education, and buying household facilities. Thus, remittance-assisted displaced people reduced the vulnerability of food insecurity after resettlement. However, there was no program supporting them to find migration work; they found work themselves at first and then introduced this employment to others in the village. They established several groups and stayed together for the whole year, only returning to the village on the occasion of the New Year holiday. The village leader who has three migrants in Ho Chi Minh city said that their salaries were quite low, from 2.5 to 3.5 million VND per month, so it was only enough to feed themselves and, therefore, they did not have enough money to go back often. More importantly, interviews with a group of children showed that more children dropped secondary school to migrate.

*Accept new culture and religion.* We found that 40% of Cotu households accepted other cultures and new lifestyles easily, particularly from Kinh people. One Cotu man, 35, explained that he had many Kinh friends in the commune since he worked with them for the Acacia Forest owners and communicated with them, and, therefore, he spoke the Kinh language frequently. Another girl in the children's group discussion (16 years old studying in 10th grade) said that she studied with

Kinh classmates. At first, she felt nervous because their friends laughed at her as a minority. However, they eventually stopped, and she felt that she was no longer significantly different from her classmates. We also asked the children group "Did your parents often take you to Hue city?": 50% said that their parents sometimes took them to Hue city to buy clothes, while others did not go to Hue city at all because their parents did not have money. We found that over 80% wanted to be Kinh in future, so we asked the children's group "Why did you want to be a Kinh?" They said that Kinh people are smarter and richer, so it is better to become like them to have a better life. During discussion with the children, we also witnessed several Kinh songs. The former leader, 70, predicted that this change would be clearer in the near future, as many Cotu continue migrating to Ho Chi Minh City for work and to Hue City to study (Authors' surveys).

## 5. Discussions

In this article, we would like to discuss our new findings compared with previous studies related to displacement and resettlement due to hydropower dam construction. Firstly, we found that most of the displaced households lost their land after resettlement in the initial period of resettlement, but over a long period of time their forest land area has been increased thanks to the support of local authorities and NGOs. Having more forest land to plant Acacia Forest has helped resettled households have more income. Most displaced households confirmed that they will continue planting Acacia Forest if they have more land because Acacia trees yield high income over other trees (this was explained more in the findings of HA, 2013). These findings show the similar conclusion that access to land continues to play an important role in the process of livelihood reconstruction and the shaping of livelihood outcomes (SAYATHAM & SUHARDIMAN, 2015). Meanwhile, previous studies have shown that most of the displaced households lose their land and cannot access more land for production after resettlement (DAO, 2010; CODE, 2010; BUI ET AL., 2013; NGUYEN ET AL., 2016). Secondly, the resettled village is located in a peri-urban area with a favourable location in terms of infrastructure, connecting it with the outside, and is located in the area where it can access both agricultural jobs and many non-agricultural job opportunities such as working for local people and forest owners and migrating to the city to work. Thanks to their access to many suitable job opportunities,



displaced households were able to increase their income. This is due to the characteristics of the peri-urban area, which is at the intersection between rural and urban areas so that resettled people can access both agricultural and non-agricultural livelihoods. If the resettlement sites are only located in purely agricultural areas, resettled people can only access one source of agricultural livelihood, while most of these areas have exhausted their natural resources and it is difficult to access more land for agricultural production. However, if the resettlement sites are located in a purely urban area, the resettled people completely lose their access to traditional agriculture-related occupations while they are not well-prepared with skills, knowledge, livelihood capital, and network for urban non-agricultural livelihoods. This is confirmed in studies in China (WILMSEN, 2011) and in Indonesia (YOSHIDA ET AL., 2013) when relocating households to urban areas, the livelihood outcomes of displaced households are often poorer than before resettlement, possibly because people lack the skills, networks and other assets necessary to do well in a very different environment (WILMSEN, 2011). Thirdly, this study also has found that there are inequalities in land access and income among resettled households and that few studies mentioned this inequality after resettlement of displaced households. Often, households headed by women, disabled, and ordinary households have less access to land and income than healthy, male-headed, and village leaders or government officials. This result is consistent with STANLEY (2004) who stated that displaced people are impoverished differently, and many displaced households lost incomes and moved downwards while others gained and moved upwards (ZOOMERS & ALBÓ, 2000). Vulnerabilities occur when affected people are unable to counterbalance adverse impacts to cope short-term and adapt long-term (SCOONES, 1998b; LUERS ET AL., 2003; ADGER, 2006; CUTTER ET AL., 2008). Finally, a long-term study in a resettlement village helps researchers to see more clearly the process of changes in access to resources, income, culture, and inequality of displaced households, from which it is possible to confirm more clearly the factors that cause difficulties and bring advantages for resettled households.

## 6. Conclusions

Our research findings indicate that Bo Hon village experienced a faster recovery compared to other communities that were displaced by hydropower dams in Vietnam. After 12 years, their income had slightly surpassed pre-displacement levels, resulting

in many vulnerable households escaping poverty. This increase in income significantly improved the households' resilience to food insecurity and marginalization.

The village's rehabilitation after resettlement was attributed to two critical factors. Firstly, the new village's convenient location near Hue city provided access to better infrastructure, education, healthcare, water and electricity, sanitation, labour, and agricultural product markets, enabling them to earn an income from their labour and cultivate cash crops for a daily income. They also learned new livelihood activities and tailoring skills from neighbouring Kinh people. Secondly, displaced households received strong support from local authorities and NGOs, which allowed them to reclaim unused uplands for Acacia Forest plantation, thereby enhancing their land security, financial, and technical capacity to invest in Acacia Forest plantation, resulting in increased forestlands and incomes. The combination of both land-based and market-oriented livelihood models significantly improved their livelihood outcomes.

The longitudinal study provided a comprehensive understanding of the resilience process in the context of dam-induced displacement and resettlement, with a focus on livelihood resilience. Displaced households adopted various livelihood strategies post-resettlement, including using compensation money for survival, restoring traditional livelihoods, and adapting to a new culture, crop diversification, land reclamation for forest plantations, wages from labouring, and migration for long-term adaptation or improved resilience. All livelihood adaptation strategies are economic and useful to adapt to their new place and culture. The study also demonstrated that displaced households exhibited a good capacity for self-organization when livelihood opportunities were available, even with little support, or benefit sharing, from hydropower developers after resettlement. Furthermore, the study supported the notion that peri-urban resettlement provided more diverse livelihood opportunities than rural resettlement. However, additional research comparing the livelihood changes of displaced communities in peri-urban resettlement, rural relocation, and urban areas is necessary to confirm this conclusion.

To support the resettlement of communities affected by hydropower dam projects, we recommend that authorities and NGOs take the following policy actions: select resettlement sites that offer good access to job markets and infrastructure, especially in peri-urban areas, to enhance the livelihood opportunities of displaced households; ensure that displaced households

receive adequate financial and technical support to invest in their chosen livelihood activities, especially in land-based and agriculture-based livelihoods, to help them recover from the loss of traditional livelihoods; provide assistance to vulnerable households, such as those headed by women or handicapped individuals, to help them overcome the challenges of land loss and food insecurity; and develop policies and programs to support the self-organization and community building of resettled households to help them maintain their cultural and religious practices.

While this study provides important insights into the long-term livelihood outcomes of displaced communities, further research is needed to expand our understanding of the factors that contribute to successful resettlement.

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