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Abstract

Emerging issues from Bui hydro-power project are suggesting that the experiences of two earlier hydropower projects in Ghana did not succeed in preventing challenges related to resource access and livelihoods. This paper examined the nature of the challenges, their causes, why they were not avoided and the role of the Chinese builders. Forty-three interviews and eleven focus group discussions were conducted and qualitative data analysed by themes using narrative analysis. Our findings show that the livelihoods of the resettled communities on balance are negatively impacted by the construction of the dam. While Chinese dam-builders played a major role in financing and enabling the dam's construction, the Ghanaian governance arrangements were found to be more important in addressing the livelihood challenges.

Key words: Large Dams, Bui, China, Ghana, Resettlement,

1 Introduction

Large dam projects have been built in many countries in the past and a renewed interest in dam-building has been observed in many developing countries in the last few years. The twentieth century saw rapid increase in the construction of large dams most of them in the industrialized countries. By the end of that century there were over 45,000 large dams in over 140 countries (World Commission on Dams [WCD], 2000). At the peak of large dam construction, nearly 5,000 large dams were built world-wide in the period from 1970 to 1975 (Tchotsoua et al., 2008). Dams have been promoted as an important means of meeting perceived needs for water and energy and as long-term strategic investments, which have many additional benefits such as regional development, job creation, industrialisation, agricultural development through irrigation and recreation.

At the forefront of the renaissance of large hydropower dams are the Chinese as the world's largest dam builder and financiers. Sinohydro, a Chinese state-owned enterprise (SOE), is leading the global hydropower sector in terms of number and size of dams built, investment sums and global coverage (Urban and Siciliano, 2014). While China has a long history of domestic dam-building, recent developments have led to Chinese overseas dam-building, particularly in Low and Middle Income Countries (LMICs) in Asia and Africa (Beck et al., 2012; Bosshard, 2009; International Rivers, 2012; McDonald et al., 2009). China's 'Going Out Strategy' encourages overseas investment to access natural resources and to create employment for Chinese workers overseas (McNally et al., 2009; Mohan and Power, 2008). There are currently more than 330 Chinese-built and Chinese-funded overseas dams, most of them in Southeast Asia (38%) and Africa (26%). The large majority of these are large dams that have been built after 2000 (International Rivers, 2013), in a time when other dam-building nations and organisations, particularly those from the Organisation for Economic Co-operation and Development (OECD) withdrew from the dam-building industry.

Africa has had its fair share of large dam building projects even though it is still confronted with a serious deficit in energy supply. Currently, African countries are tapping only about 8% of their technical hydropower potential (IRENA, 2015). The World Bank has

indicated that Africa needs to develop an additional 7,000 megawatts (MW) per year of new electricity generation capacity in order to overcome the deficit, which is perceived as a serious impediment to the continent's economic and social development (Hensengerth, 2011). This is the gap that China has been playing an active role in filling. Hensengerth (2011) further argues that it is in this respect that many African countries have sought or are seeking assistance from China in developing their hydroelectric power resources such that by 2008 China had become the largest financier of infrastructure projects on the continent including the Bui dam in Ghana.

Ghana currently has two large hydroelectric dams: Akosombo, which was commissioned in 1965 and Kpong, in 1982 with a total installed capacity of 1180 MW (Energy Commission, 2012). Bui is the third large hydroelectric dam with a capacity of 400 MW. The Bui dam is the first dam built by Chinese companies and partly financed by Chinese banks and financiers (Obour et al., 2015). However, very little research has been conducted on the livelihood challenges of resettled communities affected by dams in Ghana and the role of Chinese dam-builders. This paper therefore aims to address these issues by investigating the Bui dam. The overall objective of this paper is to discuss the emerging livelihood challenges associated with the implementation of the resettlement of the communities affected by the Bui hydropower project and to make recommendations towards ameliorating them. The paper also discusses the role of the Chinese dam-builders and how this may have affected the Bui dam and its impacts.

2 Conceptual Framework

This research uses the conceptual framework of the 'Political Ecology of the Asian Drivers'. This framework is a hybrid approach that draws on the political ecology of China's engagement in overseas hydropower projects and the Asian Drivers for explaining the rise of China and its global, national and local impacts. This is outlined as follows: until very recently, the majority of earlier work on China's engagement with LMICs has been speculative (Mohan, 2008), economistic (Jacques, 2009), and Africa focused (Alden et al., 2008; Brautigam, 2009). This has changed in recent years as more scholars are exploring the rise of China and its internationalisation from an environmental perspective as well as drawing on empirical data (see for example Power et al., 2012; Power, 2016; Power et al., 2016; Tan-Mullins and Mohan, 2013; Hensengerth, 2013; Kirchherr et al., 2016). Understanding a complex set of international actors,

interdependencies and ecological impacts necessitates a broad theoretical framework (Urban et al., 2013).

We used the political ecology framework (Greenberg and Park, 1994; Wolf, 1972) as a basis for analysing the conflicts caused by the varied forms of control over the access to natural resources such as water and energy (Blaikie, 1985; Bryant and Bailey, 1997; Peet and Watts, 2004). The political ecology is basically concerned with nature-society relations (Perreault et al., 2015). Power relations between different actors are at the heart of this framework (Tan-Mullins, 2007) and assessing the unequal power relations between actors allows us to explain the uneven distribution of access and control of environmental resources. Power relates to the differential ability to control and/or access the economic benefits from resource exploitation (Bryant, 1996; Dauvergne, 1994; Peluso, 1992). Bryant and Bailey (1997) developed three fundamental assumptions in practicing political ecology in developing countries. First, costs and benefits associated with environmental change are distributed unequally. Second, this unequal distribution inevitably reinforces or reduces existing social and economic inequalities. Third, the unequal distribution of costs and benefits and the reinforcing or reducing of pre-existing inequalities holds political implications in terms of the altered power relationships that result (Bryant and Bailey, 1997).

We combined this theoretical framework of political ecology with the distinctive approach of the 'Asian Drivers' and their impacts. This framework has already been used in an amended form to assess the motives and implications of Chinese investments in the hydropower sector in the Greater Mekong Sub-Region (Urban et al., 2013). The Asian Drivers framework developed by Humphrey and Messner (2006), Kaplinsky and Messner (2008) and Schmitz (2006), assesses China's direct and indirect impacts as a Rising Power and its channels of interaction with LMICs. In each of these channels - aid, trade, investment, global governance, individuals/migrants and environment – there will be a mixture of complementary and competitive economic impacts, and positive and negative impacts in relation to society and the environment (Kaplinsky and Messner, 2008). Urban et al. (2011; 2013) advanced the Asian Drivers Framework further by addressing the motives, actors and beneficiaries in addition to impacts to analyse in detail how, why and with which impacts Chinese actors engage in LMICs. Taken together, this framework of the 'Political Ecology of the Asian Drivers' helps us to

understand the role of Chinese dam-builders and financiers in Ghana, and the impacts of the dam on resettled communities.

3 Methodology

The study on which this paper is based involved a number of steps. The first steps involved the realization of a stakeholder mapping to identify key stakeholders at the national, regional and district levels. At the national level, key Ministries, Departments and Agencies (MDAs) and international organisations were identified and contacted for interviews. Second, a reconnaissance survey was undertaken at the Bui dam project resettlement communities during which the research team met the chiefs or headpersons of the resettled communities, their opinion leaders and elders. Also, the local government units: Tain and Banda district assemblies where some of the resettled communities are located were visited during which the study team interacted with their key staff such as their district chief executive, planning, coordinating and finance/budgeting officers. The third phase of the fieldwork comprised the conduct of interviews and focus group discussions with the different categories of respondents identified during the stakeholder mapping exercise.

In total we conducted 43 interviews and 11 focus group discussions: 15 key informant interviews with institutional actors who had an involvement in the Bui dam construction; 3 interviews with Chinese dam-builders and financiers (carried out in China for the wider project); 25 interviews with affected community members and their community chiefs, Table 1. For the institutional interviews, we undertook semi-structured interviews with MDAs; international organisations; and non-governmental organizations (NGOs) at the national and district levels. These actors were interviewed on their perceptions of the socioeconomic and environmental impacts of the dam, governance issues, political and economic implications. For the community fieldwork, we carried out in the 4 affected villages (Jama, Dokokyena, Bui, Akanyakrom) selected in collaboration with the village chiefs and assemblyman.

Table 1: Interview setup

Targets	Methods	No of interviews	Further details
Affected local communities at Dam sites	Focus groups	11	50% women; 50% men

Affected individuals from local communities	Semi-structured interviews	25	Men and women
Institutional actors	Semi-structured interviews	15	National/local government, NGOs
Chinese actors	Semi-structured interviews	3	Sinohydro, regulators and financiers

Interviews and FGDs with affected communities were carried out in September 2013 in Ghana; Interviews with institutional actors and Chinese actors were carried out during the years 2013, 2014 and the beginning of 2015.

In terms of occupation, the respondents were predominantly farmers and fishermen. All the interviews and FGDs were recorded, transcribed and analysed theme by theme using Nvivo 10 software. The consultation data have been analysed according to nine main themes identified during fieldwork which refer to the following issues: resettlement, life changes, involvement and consultation, interaction and communication, social (access to natural resources, livelihood changes, and access to energy) and environmental impacts, expectations, cultural impacts, compensation and challenges.

4 Results

4.1 The Political Ecology of the Asian Drivers and the Bui dam

The framework of the Political Ecology of the Asian Drivers indicates that for the Bui dam, the costs and benefits associated with environmental change due to the dam-building are distributed unequally. Poor local people are negatively impacted due to resettlement, declines in their livelihoods, loss of access to fertile land etc. At the same time, the Chinese developers Sinohydro and the Ghanaian state represented by the Bui Power Authority (BPA) are reaping the financial benefits of the dam. Second, this unequal distribution inevitably reinforces or reduces existing social and economic inequalities. The poor and marginalised are disproportionately affected whereas wealthy elites are gaining further power and wealth. Third, the unequal distribution of costs and benefits and the reinforcing or reducing of pre-existing inequalities holds political implications in terms of the altered power relationships that result. The close relationship between Chinese dam-builders and Ghanaian government authorities changes power relationships, meaning much closer political and trade and investment ties between China and

Ghana after the dam construction than before. These issues, as well as the channels of interaction that China uses to engage with Ghana, will be presented in this section.

The need for the development of hydroelectricity to facilitate economic development in most developing countries has ignited heated debate about where to strike the balance between development and other important national interests. Beside their economic importance, the development of big dams, however, has been opposed due to severe environmental impacts and socioeconomic consequences (Nusser, 2003). The state in developing hydropower dams is expected to balance the need for energy for development and protection of the environment 'due to its unique remit to act in the national interest' (Bryant and Bailey, 1997:48 as quoted in Tan-Mullins, 2007). As the state remains a major actor, its role often becomes contradictory in promoting development and capital accumulation with its own power and political strategic interest (Bryant and Bailey, 1997:48 as quoted in Tan-Mullins, 2007).

In the construction of the Bui dam, the political ecology framework is used to assess the unequal relationship between the principal actors (the State, Bui Power Authority, Sinohydro, District Assemblies and Resettled Communities) for control of environmental resources (Tan-Mullins, 2007). The proposal for the construction of the Bui dam had always been opposed by many stakeholders citing environmental concerns and Ghana's poor record in dealing with dam related socio-economic problems based on the Akosombo and Kpong dams experience that were built in 1966 and 1982. The two earlier dams came with huge environmental and social costs (Sarpong et al., 2005; Tsikata, 2006). For example, Gyau-Boakye (2001) estimates that more than 88,000 people were displaced and had to be resettled with many irregularities associated with the compensation schemes. The main problems included lack of property right, health and loss of artefacts with cultural and religious significance (IWMI, 2009). Despite these challenges, successive governments in Ghana had attempted to build a third hydropower dam at Bui Gorge on the Black Volta River. The World Bank and other partners declined financial support citing social and environmental impacts, including flooding of the Bui National Park home to some rare black hippopotamus populations (Benjamin, 2007 cited in Obour et al., 2015). With the government's determination to generate power, a solution was found when the state signed an Engineering, Procurement and Construction (EPC) Agreement with a Chinese company

(Sinohydro) and a French consultancy (Coyne et Bellier) to construct a dam at Bui (Barry et al., 2005).

An environmental and social impact assessment (ESIA) was conducted prior to the commencement of the dam construction to satisfy both local and international requirements. The ESIA also highlighted potential adverse environmental, social and economic impacts of the project. The overriding benefit of the project was that it has the potential to enhance economic development at both the local and country level (Bui Power Authority, 2011). Critics, however, challenged the economic viability of the project and argued that the potential benefits were embellished by the government. Among the developmental benefits projected by the state included the construction of Bui City, a public university and an irrigation project. The ESIA also projected that only 859 people will be displaced by the dam. The dam has since been commissioned with numerous challenges emerging. Power generation runs at about a quarter of its nameplate capacity; 1,216 people have been resettled which is 40% the original estimate (Ampratwum-Mensah, 2011). At the end of it, the actual winner of the Bui dam project may not be the state or the local people who have been displaced.

With regards to the Asian Drivers perspective, the Bui dam is built by Chinese SOE Sinohydro and jointly funded by the Government of Ghana, the Chinese Exim-Bank via a commercial loan and buyer's credit, as well as the Government of China via a concessional loan. For the payment of the loans there is a trade agreement between China and Ghana, in that Ghana is paying back the loans to China's Exim-Bank with revenues derived from cocoa production (Dwinger, 2010; Odoom, 2015). This means the bundling of trade, aid and investment has happened for the Bui dam deal.

4.2 The governance process for the Bui dam

Governance has been defined to refer to structures and processes that are designed to ensure accountability, transparency, responsiveness, rule of law, stability, equity and inclusiveness, empowerment, and broad-based participation. Governance also represents the norms, values and rules of the game through which public affairs are managed in a manner that is transparent, participatory, inclusive and responsive. Governance is about the culture and institutional environment in which citizens and stakeholders interact among themselves and participate in public affairs. It is more than the organs of the government (www.unesco.org). In

this paper, governance is used to refer to the management structures set up by the central government to implement and operate the Bui hydropower project. These are BPA, as the core body responsible for the Bui project and all other state institutions, agencies and departments, including local government units that BPA was to collaborate with in executing its mandate. By extension, it also includes the communities and civil society generally.

Despite the positive benefits that countries derive from large dam projects, these projects have been criticised because of their negative environmental and social governance (Lerer and Scudder, 1999). In Ghana, the construction of the Akosombo and Kpong dams resulted in the numerous socio-economic as well as environmental challenges in the adjoining communities and the scope and severity of these challenges have attracted a lot of local and international research and civil society attention (Amoah et al., 2008). The lessons drawn from the Akosombo and Kpong dam projects were supposed to have informed the planning and implementation of the Bui resettlement projects in order to reduce the ill-effects of dam displacements on resettled communities. Like its counterpart, the Volta River Authority, which had the responsibility to plan and implement the Volta River Project including the planning and implementation of resettlement, the Bui Power Authority (BPA) established by Act of Parliament (ACT 740) in 2007, was given full responsibility for planning, executing and managing the Bui project (Zigah, 2009: 25 cited in Hensengerth, 2011).

The area affected by the Bui dam project comprises approximately 2,000 people living in small villages scattered all over the dam area in the former Tain district in the Brong Ahafo Region and Bole District in the Northern Region. Those that were to be inundated or isolated by the dam and had to be resettled were: Bator Akanyakrom, Bui Village, Dam Site, Brewohodi, Dokokyina in the former Tain district and Lucene/Loga and Agbegikro in the Bole district. The first communities (those communities that were immediately affected by the construction namely, Brewohodi, Agbegikuro, Dam Site and Lucene) were settled in May 2008. Between 2009 and 2010, the BPA and Bui communities held a series of meetings to finalise resettlement arrangements and by June 2011, the Bui communities including Bui Village and Akanyakrom (Bui Power Authority, 2011; Doh and Andoh, 2012) had been resettled.

In accordance with best practices, some studies were conducted on the Bui project most notably: an ESIA, an Environmental and Social Management Plan (ESMP) and a Resettlement Plan Framework (RPF). The RPF was developed using the World Bank's Policy on resettlement as a guide and the provisions of the 1992 Republican Constitution of Ghana. On the basis of the RPF, the BPA developed a Resettlement Action Plan (RAP) in 2009 for the Bui project. The principal focus was on the choice of host communities, housing and social infrastructural development, environmental protection, participation and integration with host community. The selected resettlement principles outlined in the RPF and RAP are based on weaknesses in past resettlements in Kpong and Akosombo and also in line with international best practice (Doh and Andoh, 2012). However, a few years into the implementation of the resettlement plan, a report produced by Ghana Dams Dialogue (GDD) has documented some of the challenges that the resettled communities were encountering (Doh and Andoh, 2012). Our fieldwork analysed these challenges in further depths.

4.3 Livelihoods impacts of the Bui dam

4.3.1 Access to natural resources: land, energy, water, forest products, and food

Using Nvivo 10, we performed a word frequency analysis to list the most frequently occurring words in the coded interviews in relation to the impacts of the dam construction on access to resources, such as land, energy, water, forest products, and food. The results of the analysis are presented in Appendix 1 and Appendix 2, where we report the selected references coded and the interview code used in the text to refer back to specific references used.

This analysis relates back to the conceptual framework of the Political Ecology, indicating the role of access to natural resources, the control of this access and altered power relationships with regards to resource control as key issues that are negatively impacting the local population who had to be resettled and lost access to its land.

Access to land and food

According to our analysis land is main source of concern of the affected communities. Moreover, farm, farming and fertile are also listed among the most frequent words, highlighting not only land scarcity, but also land fertility and therefore productivity as the main issues for the

affected population in the resettlement areas (see Appendix 1 for selected quotes and interview codes on land access, scarcity and fertility). According to respondents, access to land has dramatically decreased after resettlement, which is causing problems either in terms of the possibility of engaging in commercial farming activities (INI-M-BUI-L) or in terms of food self-sufficiency. Community members after resettlement rely more on the market for food provision. *“Previously [before resettlement] I was able to harvest 1000 tubers of yam, presently we can’t harvest more than 30”* (quote from FGD with men in Dokokyina resettled village); *“Previously when we were at Nsuoano [near the river bank], we weren’t buying food”* (quote from FGD with female in Jama resettled village). Moreover, according to resettled people the influx of construction workers has resulted in the rise of food prices at the dam site. 1,836 workers were employed for the construction of the Bui dam, most of which being Ghanaian (91%) (Kirchher et al., 2016) and coming from outside the construction area (Baah and Jauch, 2009). *“Food situation, it is expensive because of the influx of the construction workers. (In the old village, we used to get yam for two Cedis¹ but today, yam goes for ten Cedis for about three pieces”* (quote from male respondent in Bui Village)

In terms of food provision, access to fish and the rise of prices of fish in the market due to immigrant workers are also a source of concern of the affected communities. Even if the expanded lake resulting from the construction of the dam has led to a general boom in the fishing business, native communities have been unable to take advantage of the booming fishing industry. There are three main challenges that resettled communities complained about access to fish and fishing activities. These are: the long distance it takes to access the river from the community; the lack of skills to fish on the new expanded lake (INI-M-AK-FH); and the fact that it is more expensive for them to buy fish now than it was before resettlement. Respondents reported that before the construction of the dam when community members were not able to catch fish they paid two Cedis to buy the amount necessary to make a meal for the whole household. After the construction of the dam, they have to pay five Cedis to get the same amount of fish (INI-F-BUI-FH). Access to bush meat for both home consumption and commercial purposes has also declined due to difficulty to access the forest from the resettled communities; villagers have to buy meat from the market now (INI-M-DK-A).

Access to water, forest products and energy

¹The value of the Ghana Cedi at the time of field work was two GHS to one USD

With regards to water access, water scarcity is also a problem in some of the resettlement sites, such as in the case of Jama. According to the quotes reported in Appendix 1, in Jama and Dokokyina water boreholes are not enough to satisfy the water requirement of the population, which has increased after the construction of the dam due to the presence of immigrants moving into the village (FGD-F-JAMA-W; INI-F-DK-W).

Access to forest products (such as charcoal, firewood, commercial trees) has decreased after the construction of the dam, the resettlement sites are far away from the forest and therefore they do not collect them anymore (INI-M-JAMA-T; INI-M-AK-T). Most of the resettled communities have to buy firewood and charcoal which was freely available from the forest before the construction of the dam. The same situation is for sheanut (*Vitellaria paradoxa*), dawadawa (*Parkia biglobosa*), and medicinal plants and trees which were giving extra income to the villagers from the old sites (see quotes for *trees, shea, charcoal, firewood* in Appendix 1).

In terms of energy access, energy and electricity are not a concern for the resettled communities. This is because after the construction of the dam all communities have been provided with electricity, as reported in the quote below.

“The thing we appreciate most about our coming here is that previously we didn’t have electricity at the village close to the lake but now we have light” (quote from FGD with men in Jama).

Across the board, the affected population indicated that they have lost or deteriorated access to fertile land, forests and forest products and other natural resources. The Political Ecology framework links this to unequal power relations between actors resulting in the uneven distribution of access and control of environmental resources. This can be seen for the Bui dam case, where the Chinese developers Sinohydro (during construction) and most importantly the Bui Power Authority (long-term) are in control of natural resources and decide about the fate of the resettled local people. This is further manifested in livelihood changes, as discussed below.

4.3.2 Livelihood changes and impacts

According to the results obtained by the interviews carried out with local community members reported in Appendix 2 there is a high correlation between access to natural resources and livelihood changes/impacts. Most of the livelihood changes perceived by the resettled communities interviewed refer to decreasing livelihoods (INI-F-AK-Fb), shifting livelihoods strategies (INI-F-DK-Fb) and issues of reduced resource access and productivity (FGD-F-DK-Lb), mainly in reference to land and fish. Land scarcity and the reduction of land

productivity/fertility in the resettlement sites have severely undermined the livelihoods of farming communities (FGD-F-DK-Lb). Moreover, due to inundation of land in the dam site area some of the villagers have lost valuable cash crops, such as cashew plantation. Since cashew is hard to grow on the land they received for farming in the resettlement area, villagers who were cultivating cashew do not have any alternative occupations. Due to the declining cashew production, collectors have to go to Côte d'Ivoire to work as hired collectors (FGD-F-DK-WRb). Even if they received compensation for the inundation of cashew plantations, the money they received lasted for two years only (INI-F-AK-Mb; FGD-M-BUI-Mb). Unemployment is therefore increasing. As a result, some villagers had to shift from cash crops such as cashew to other less valuable food crops such as cassava and maize. Moreover, some villagers have shifted from farming to fishing as farming is no more profitable for them (FGD-M-AK-Lb). However, problems of lack of skills and materials to fish on the lake compared to the river (FGD-M-BUI-FIb), as well as the distance to access the river and lake from the new resettlement areas are also undermining the possibility of some villages to access new jobs opportunities (INI-F-AK-Fb).

Again, before the construction of the dam, smoked fish traders were able to access the river to buy fish without using a car. After the construction of the dam however, they have to go further away and they need a car. According to one respondent, they pay around two Cedis to get to the river. In the new settlements they also have to buy firewood to smoke the fish which they previously got freely from the forest. All these additional expenses have negatively impacted on their livelihoods. There are difficulties to change occupations from farming or fishing to trading, due to the lack of money to invest in the transition (FGD-F-DK-Mb). This is because in the resettlement sites communities are more dependent on the market for food provision due to the reduced access to fertile land and fishing activities.

According to our analysis, the Bui dam construction has resulted in competing uses of natural resources (such as land, fish and forest products) between: (i) different uses, i.e. land and water for dam construction and energy generation versus land and water for the provision of local livelihoods; and (ii) different users i.e. local communities versus immigrants, dam builders and the government. The governance structure also seems to have broken down and allowed for illegal activities in the harnessing of economic resources within the dam site. For instance, the flooding of the Bui National Park during the dam construction has made it difficult for the

officials of the Wildlife Division of the Forestry Commission to monitor and control the activities of illegal resource exploiters, including galamsey operators (small scale miners who mostly are unregistered), fisher-folks and illegal chain saw operators within the dam's immediate environs. The latter group includes migrants from other West African countries like Burkina Faso, Niger and Nigeria and Chinese immigrants. An official of the local district assembly commented on these illegal activities as follows:

“This whole environment is being somehow utilised and we don't know to whose benefit. The wood that is being cut we don't control it and the revenue that comes as well”.

Another District Assembly (DA) official also described these activities in these words;

“the DA is not fully aware of what is going on, who owns the timber concessions etc. None of the firms have registered with us”.

The apparent break down in the governance structure and the fact that the local communities including resettled people do not have the requisite skills and financial power to exploit resources like the outsiders means they benefit very little from the construction of the dam. This situation has been compounded by the lack of implementation of alternative livelihood scheme promised by the BPA. The alternative livelihood support schemes were in two forms: new skills training, such as handling of new farm equipment and new fishing techniques; and the provision of new infrastructure, such as irrigation technologies, to support existing livelihoods, particularly farming and fishing, social mitigation strategies by the BPA and local government. Across all communities, there are two most important promises and or agreements between communities and the BPA that have remained unimplemented. As a male participant commented on this as follows:

“BPA and other government institutions need to perform their responsibilities towards the people –especially in making life more bearable since all the promises to better our farming through irrigation have not been fulfilled, currently we feel ignored”. (quote from FGD, Bui Village)

4.4 China's role as a dam-builder and financier

The conceptual framework of the Political Ecology of the Asian Drivers enables us to analyse the various channels of interaction that China uses to engage with Ghana in dam-building. These

channels include aid, trade, investment, global governance, individuals/migrants and environment. Chinese actors are involved in overseas dam investments with different roles. They can act as financiers, developers, builders, as well as sub-contractors only or acting as a combination of these roles. Usually they are involved in at least two of the above tasks (Urban et al., 2013). The Bui dam is the largest Chinese-funded project and the largest foreign investment after the Akosombo hydroelectric power project in Ghana as at 2008. As mentioned before, various channels of interaction are being used with regards to the Bui dam, namely a bundled aid, trade and investment deal is in place that links revenues from cocoa exports to paying off the dam's debt to Exim bank.

Although the Chinese have a very important role to play in terms of providing the technical expertise and funding for the dam, they did not participate in the management and implementation of the ESIA of the dam. We also found out that the Chinese did not participate in implementation of the resettlement and the mitigation plan that details measures for reducing the environmental and social implications of the dam. The ESIA had in fact been commissioned before the construction of the dam by the Ministry of Energy of Ghana and carried out by the UK firm ERM (Hensengerth, 2013; Environmental Resources Management, 2007a). The BPA was created by the Ghanaian government for the management of the dam and its impacts, including the implementation of the resettlement plan. Our fieldwork also found that the main functions of the BPA include the generation of electrical power, the operation of the dam, the construction of a transmission system, the supply of the electrical power generated at the dam, the provision of facilities and assistance for the use of the lake created by the construction of the dam, as well as the development of activities at the dam area. The Authority is also responsible for the control of the flow of water and flooding due to the creation of the reservoir and the acquisition of land and resettlement measures, including compensation payments to the local population.

Obligations of the contractor, in this case Sinohydro, was the implementation of a Construction Management Plan (CMP), including: "workforce and local residents' health and safety; "good housekeeping" site management practices; flow regimes during construction (particularly during diversion); emergency response to significant accidents/pollution incidents; site access; siting of temporary structures/work and locations/materials sourcing. Similarly, employment and workforce policies were an obligation of the contractor, such as: health screening, and health provision for workers; workforce health awareness; employment policies, favouring employment

of local people where possible; codes of conduct for interactions between workers and local communities; and environmental and wildlife awareness programmes for workers” (Environmental Resources Management, 2007b).

Our work found that the Bui dam project in Ghana is an Engineering, Procurement and Construction (EPC) / Turn-key Project Contract in which the construction company is responsible for the construction of the dam, including the health and safety of the workers and their recruitment, but once the infrastructure was finished and operational the host government became the immediate owner and the only one responsible for the project. In this case, even though the construction company had to abide by the regulations of the host country, including environmental regulations, the company was not responsible for the execution of the ESIA and the mitigation strategies. As the BPA is the only authority responsible for the implementation of the environmental and social mitigation measures and monitoring of Sinohydro’s conduct, various concerns have been raised about the lack of proper forms of control and supervision over BPA and Sinohydro’s activities to assure a more transparent and effective application of social and environmental regulations and standards (Hensengerth, 2011). However, in the long-term it is the BPA that manages, operates, maintains the dam and deals with its impacts, such as resettlement and compensation of the affected population. The role of Chinese actors like Sinohydro and ExIm Bank is therefore limited.

5 Conclusion

We used the conceptual framework of the Political Ecology of the Asian Drivers to assess China’s engagement in the dams sector in Ghana and its impacts. We analysed how costs and benefits associated with dam-building are distributed unequally, with poor people losing more and wealthy elites gaining more. The research indicated how this unequal distribution inevitably reinforces or reduces existing social and economic inequalities and how this altered the power relationships between China and Ghana and led to a tighter political and economic relationship between the two countries. This research found that China uses various channels of interaction to engage with Ghana in dam-building, most importantly a bundled aid, trade and investment deal that links revenues from Ghanaian cocoa exports to China for paying off the dam’s debt to Exim bank.

The analysis shows that the Bui dam project has on balance had more costly than beneficial effects on the resettled communities. The limited access to various forms of natural resources has resulted in limited livelihood opportunities for virtually all categories of people in the resettled communities. The lack of access to adequate land of appreciable fertility has greatly reduced the possibilities for enhanced food as well as commercial crop production with serious implications for achieving food security and poverty reduction. The irrigation project promised the resettled communities has not materialised and information obtained from the field indicate the project is to be moved to another district, very distant from the resettled communities. The resettled fishing communities have not fared any better as their communities are located too far from their main source of livelihood-the lake, making journeys to and from the lake for fishing too expensive and making fishing an unprofitable livelihood activity. Worse of all, the creation of the lake has provided them with the opportunity for an enhanced livelihood, yet, they do not have the requisite fishing gear and the skills to fish on the large and open expanse of water and therefore are unable to benefit fully from a resource that was supposed to inure to their benefit and improve their livelihoods. They therefore urgently need to be given the requisite training in the techniques of fishing on the lake that they were promised during the planning of the resettlement but which has not materialised.

Opportunities for livelihood diversification are also limited. While the farmers among the resettlers, who for lack of access to adequate amount of fertile land for farming may wish to diversify into fishing, they are constrained by lack of fishing skills, lack of resources to acquire the appropriate fishing gear and also the long and expensive distance from their community to the lake side. The fishermen equally cannot engage in farming either. Trading seems to be an attractive form of livelihood diversification but lack of capital was found to be the limiting factor. Based on the above it could be concluded that there is a cost to all the previous livelihood activities of people of the resettled communities. On the other hand, the BPA reneged on two promises to the communities during the planning phase of the Bui project: new skills training and provision of new infrastructure to support existing livelihoods particularly farming. The inability of BPA to implement the skills training programme resulted in reduced livelihood opportunities and led to huge migration of the youth from the resettled communities.

In terms of livelihoods then, the dam project seems to have deepened the pre-existing poverty situation of the communities. It seems the dam has rather benefited more the fishermen

and fishmongers from outside the resettled communities (some from Burkina Faso, Niger and, Nigerian) on account of their skills in fishing on the lake and cash resources to be able to engage in fishing more profitably. This has economic and social-cultural consequences for the resettled communities. It is recommended that the BPA implements fully the terms of the RAF including alternative jobs training and other livelihood assistance packages to better the livelihoods of the resettled communities.

The Ghanaian government has negotiated a favourable turn-key (or EPC) contract with Chinese dam-builders Sinohydro and Chinese financiers. In addition, the Ghanaian government established the BPA, a separate entity that manages the dam and its impacts, including resettlement and compensations. Sinohydro does therefore not make any decisions on the dams' management, but relies on very clear cut roles of responsibility and decision-making held by a Ghanaian authority. We therefore draw two conclusions from the analysis of the role of Chinese dam-builders and financiers for the Bui dam: First, the commercial loan from Chinese financiers Exim Bank and the concessional loan from the Government of China enabled the building of the dam in the first place. No other investors dared to invest in the Bui dam due to its social impacts (resettlements, impacts on poor people's livelihoods) and its environmental impacts (location in a national park, elimination of endemic species). In addition, Sinohydro brought a wealth of expertise and engineering capabilities to the Ghanaian hydropower sector. Clearly, the Bui dam would not have been built without the Chinese dam-builders. Secondly, the impacts on the affected people's livelihoods and other social impacts are not strongly influenced by Chinese actors. The main decisive authority is the BPA. As the Bui dam is a turn-key contract, Sinohydro and the Chinese financiers have very little involvement in post-construction issues. We therefore conclude that while Chinese dam-builders played a major role in enabling the dam-building at Bui, the Ghanaian governance arrangements are far more important for influencing and dealing with the livelihood challenges of the resettled communities.

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Appendix 1: Access to resources, word frequency analysis and selected references coded

Word	Selected references coded	Interview code
Land (count 65; weighted % 4.56)	"the land allocated to me over here is not enough, my land is about one and half acre"	FGD-M-AK-L
	"They allocated an acre of land [...] this is not enough"	FGD-M-JAMA-L
	"The land which was allocated to us for farming is too small"	FGD-F-AK-L
	"Currently land for farming would be inadequate if people want to engage in commercial farming"	INI-M-BUI-L
	"Land is very scarce here. Land shortage will continue [...] especially when every young man wants a plot to farm"	INI-C-JAMA-L
Trees (count 22; weighted % 1.54)	"[...] trees like the Nim plant, Moringa, we also had special trees which we used to cure malaria in children but we left all these trees back at our old place, there is nothing like that over here"	INI-M-AK-T
	"Windstorms are high and there are few trees to serve as windbreaks"	INI-F-AK-T
	"[...]access to commercial trees is difficult"	INI-M-JAMA-T
Firewood (count 21; weighted % 1.47)	"we buy firewood and charcoal for cooking which was not the case in our previous community"	INI-M-AK-F
Fish (count 21; weighted % 1.47)	"We pay as much as 4 Cedis for a round trip to the lake with the motor cycle and sometimes we don't even get any fish"	INI-M-JAMA-FH
	"We were close to the river there so we used to get easy access to fish but fish is now scarce here. During that time you could use 2 Cedis to buy fish and it can make soup for the whole household but today, fish worth of 5 Cedis would not be enough for this family"	INI-F-BUI-FH
	"Our water source is a lake which is different from the river we were used to, so most people have stopped fishing. We were supposed to be educated on lake fishing. They were supposed to educate us on the use of life jackets; we informed our leaders about it. We lost 4 people to that disaster, after this incident the fishermen were struck with fear, some of us even decided not to fish anymore"	INI-M-AK-FH

Water (count 21; weighted % 1.47)	"[...] ever since we came here, they brought four communities and they have given us only two pipes and as a result getting water is not easy. We go to the tap early morning and we come back with just a basin of water, at the previous place water was not an issue but here we sometimes end up fighting by the tap"	FGD-F-JAMA-W
	"Inadequate access to water – we have only few boreholes; we have to queue for long hours to get water for households use"	INI-F-DK-W
Farm (count 19; weighted %1.33)	"If you don't farm, what will you feed your family with and when you try getting a place to farm people start to claim ownership of the land so this is a very big problem"	FGD-M-JAMA-FA
Farming (count 19; weighted %1.33)	"For yam farming, after harvesting you need to move to a new farmland but over here the land is not vast like our former place"	INI-F-BUI-FR
Fertile (count 12; weighted % 0.84)	"The land for farming was fertile and so we could harvest plenty yields but the land they gave us here is not fertile. Also they agreed to help us with chemicals to make the land fertile again but we didn't hear from them again"	FGD-M-JAMA-FE
Charcoal (count 9; weighted % 0.63)	(See selected quote for firewood)	INI-M-AK-13-F
Lake (count 9; weighted % 0.63)	"If you take a close look at the new path they have created, it is almost 3 miles away, meanwhile at our previous place we were very close to the lake. The distance was just about 10 feet long"	FGD-M-JAMA-LK
River (count 9; weighted % 0.63)	(see quote on fish)	INI-F-BUI-FH
Shea (count 9; weighted % 0.63)	"We had a lot in our old community. I could gather a lot of sheanuts for sale. None of those are here"	INI-F-AK-S
	"Had a lot of forest products which gave people extra income, such as shea nuts, dawadawa, medicinal plants"	INI-M-BUI-S
Animals (count 7; weighted % 0.49)	"Difficult to get bush meat – animals are fleeing away"	INI-M-DK-A

Source: The Authors. **Note:** in the interview code the first part indicates the type of interviews, distinguishing between focus group discussion (FGD) or individual interviews (INI); the second part indicates the gender of the interviewees, male (M) or female (F); the third part the village where the interview has been carried out, Jama, Bui, Akayakron (AK), Dokokyena (DK); the fourth part indicates the word to which the code refers, such as land (L), trees (T), fish (FH) and so on.

Appendix 2: Livelihoods' changes and impacts - word frequency analysis and selected references coded

Word	Selected references coded	Interview code
Land (count 32; Weighted % 2.36)	"The fishermen are more after the construction of the dam]; [...] because the land is too small some have been forced to divert their work to fishing"	FGD-M-AK-Lb
	"Since moving, if you plant any vegetable for soup, it does not grow well because the land is not fertile so we have to buy everything"	FGD-F-DK-Lb
Fish (count 29; Weighted % 2.14)	"I used to be involved in trading of fish but here I sell tomatoes, garden eggs and okro and pepper"; "We lived close to the river and it was easy to fish and our husbands had better harvest. Life span of fishing net has shortened because the lake/dam has inundated trees and other vegetation and this breaks nets"	INI-F-DK-FHb
	"[...] we walked to the river to buy fish but over here the distance to the river is such that you have to board a car, if you get fish you have to get a <i>pa a o pa a</i> to carry the load, when you get home you have to buy firewood to smoke the fish; after selling your fish when you deduct all these expenses you make just a little profit" "Before I used to be a trader and sell food but over here I am not able to go to the river to buy fish. In our old community I could get about 30 or 50 Cedis in a day but over here I am not even able to make 10 Ghana Cedis"	INI-F-AK-FHb
	"We now buy fish instead of fishing on our own since we are not used to fishing on the lake with our small canoe as compared to fishing on the rivers. [...] We lack the skill to fish on lakes"	INI-M-AK-FHb
Farm(count 26; Weighted % 1.92)	"[...] not able to raise any farm produce to sell"	INI-F-DK-FAb
Farming (count 26; Weighted % 1.92)	"We used to have two jobs, farming and fishing but when we arrived here due to the unavailability of lands, most young people especially those who were cultivating pepper, garden eggs etc. have changed their occupation"	INI-M-AK-FRb
	"We were farming cassava, yam, groundnut, tomatoes, okra, garden eggs etc. We are not farming the same things here so our lives have not improved"	FGD-F-JAMA-FRb
	"At our previous place we were into both farming and fishing. But since we came here, the distance to the lake is very far and before you get back from the lake, you won't be able to go to the farm"	INI-M-JAMA-FRb
	"The inability to farm is a problem here. I used to have all products needed like bush meat and only bought salt and magic cubes from the market. The main problem I have is food and work"	INI-M-DK-FRb
	"even if you have an idea of what to do, there is no money to help you to shift from one occupation to the other. For instance one can say farming activity here is no longer profitable and so wants to shift into trading but the money to even go into trading is not available"	INI-F-BUI-FRb
Fishing (count 22; Weighted % 1.62)	"There is no work for us to do. Nor all of us have the skills for fishing in the lake"	FGD-M-BUI-Flb

Work (count 20; Weighted % 1.48)	"now here I can't get any cashew work to do. If I want to pick up cashew for a living I have to go all the way to Côte d'Ivoire "	FGD-F-DK-WRb
	"The major one [i.e. challenge] is our location from the river because it has led to loss of our fishing work"	INI-M-AK-WRb
Money (count 19; Weighted % 1.40)	"You know we are farmers here so we invested the money into farming and the crops too are not growing well so all the money is gone"	FGD-F-BUI-Mb
	"if you don't have money how can you trade? If your farm gives poor yield how can you get money to go into trade?"	FGD-F-DK-Mb
	"We have been here for 2 years now and the compensation money has exhausted and we are all the time at home with nothing to do"	FGD-M-BUI-Mb
	"Difficult to get/obtain certain resources like firewood. It has affected my main economic activity (i.e. negatively) – used to sell <i>fanti kenkey</i> (cooked meal from corn dough) but people are not buying because they don't have money"	INI-F-DK-Mb
	"had several acres of cashews and I was just given 1200 Cedis. When valued I realized that the money for each tree did not amount to 10 Cedis which is very less compared to the yields from before"	INI-F-AK-Mb
River (count 15; Weighted % 1.11)	"our community is a fishing community and we were not far from the river. However we pay about 2 Cedis to get to the river and even with this there is no assurance of getting fish for cooking" (see also quotes on "fishing" and "fish")	INI-F-AK-Rb
Food (count 14; Weighted % 1.03)	"we had good yields but here we have to buy every food" "In the old place, all our children had farms but here is not like that. Right now if I don't buy food, I will go hungry"	FGD-F-DK-FDb
Cashew (count 13; Weighted % 0.96)	"Currently they are telling us not to cultivate cashew any longer because they are going to do some work over there [they refer to the land inside the Bui National Park they were using for cashew cultivation]; So we only cultivate food crops, we do not cultivate cashew which is like our cash crops. We really need land to cultivate our cashew"	FGD-F-AK-Cb

Source: The Authors. **Note:** in the interview code the first part indicates the type of interviews, distinguishing between focus group discussion (FGD) or individual interviews (INI); the second part indicates the gender of the interviewees, male (M) or female (F); the third part the village where the interview has been carried out, Jama, Bui, Akayakron (AK), Dokokyena (DK); The fourth part indicates the word to which the code refers, such as land (L), trees (T), fish (FH) and so on. The term b at the end indicates that we refer here to livelihood changes and impacts to distinguish from the interview codes used for access to resources.