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Hydropower development and environmental impact assessments in Vietnam: current practice and shortcomings

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Hydropower projects play an important role concerning national energy security in Vietnam; however, the boom in hydropower development in the last ten years had caused many negative impacts on the environment, fisheries, and people's livelihoods at upstream and downstream river basins, revealing certain weaknesses the management of systems, processes and projects. The main objectives of Environmental Impact Assessments (EIAs) are to reduce environmental impact and to be a supporting tool for decision-making processes. However, this study finds that EIAs of small and medium scale hydropower projects in Vietnam did not assess thoroughly the important factors such as water balance changes, deforestation, aquatic production impacts, and cultural impacts on the indigenous population.

Introduction

The need for energy due to economic and population pressure has resulted in a great expansion of hydropower projects around the world, and this is particularly true in Vietnam. According to article 1 of Prime Minister's Decision 176/2004/QĐ-TTĐ, dated 5/10/2004 and regarding approval of the strategy on development of Vietnam's electricity industry looking towards 2020; '*the development of electricity industry must be carried out in advance so as to meet the requirements of socio-economic development, and assure national energy security, in which the strategy is to give priority to the development of hydropower and to encourage investment in small-sized hydropower sources in various forms with a view to making full use of that clean and regenerated power source.*'

In light of this strategic shift, we have observed a boom in hydropower development in the past ten years. The production and use of energy historically has arguably caused and is causing more environmental damage than any other single economic activity. The energy industry is playing an important role in global climate change, and many countries are committed to adaptation in their energy use in order to address impending disaster. Hydropower is considered renewable energy, which is cheap and environmental friendly; therefore, in Vietnam it has been widely encouraged to develop as an industry.

In Vietnam, many rivers dry up in the dry season, but have floodwaters in rainy season. These phenomena are becoming ever more significant due to the extraordinary changes in weather and climate change. In addition to climate related risk factors, the rapid growth in the density of hydropower plants in Vietnam in recent years has also contributed to increased risk factors and exacerbated problems related to the environment and society (Lam et al., 2013).

The social and environmental consequences of hydropower development are inherently complex and often controversial, in Vietnam as elsewhere (World Bank, 2009). These hydropower projects have ultimately resulted in considerable environmental, economic, and social damage and the economic development-environmental degradation dynamic has previously been examined. However, rarely has the economic development-environmental degradation-public health connection been made (Polimeni et al., 2014).

The first negative environmental impact of hydropower projects is a change in flow. Hydropower projects often transfer water to other basins, to a tunnel, or channel to other downstream segments that may create

drought rivers downstream. In addition, the biodiversity of an ecosystem is often heavily impacted. This is because no hydropower projects in Vietnam, including the largest hydropower projects such as Son La, Hoa Binh and Lai Chau have been designed with docks and fish passages. These impacts need to be understood fully, while methodologies for assessment, evaluation and monitoring must be proposed, to allow decision-makers to adopt an informed position at planning and project approval stage.

The preparation of EIA for hydropower projects in Vietnam, as well as the appraisal of EIA by authorities has not been taken seriously enough, leading ultimately to negative consequences on the ecosystem and livelihoods of communities. EIAs have focussed exclusively on pollution while lacking impact assessment on natural ecosystems and social/cultural considerations. The primary focus of EIAs has been on issue such as how many tons of dust, SO_x, or NO_x are generated and how many dB noise level increases, while other elements such as water balance changes, deforestation, aquatic production impacts, and culture impacts on indigenous populations have been considered only in passing. Furthermore, many proposed solutions to minimize the negative environmental impacts of projects are ultimately non-specific. For example, it is recognised that fish passage is essential but there are no design techniques proposed.

The EIA of hydropower projects which were appraised by World Bank (WB) such as Trung Son hydropower project (World Bank, 2008), or by Asian Development Bank (ADB) such as Song Bung 4 hydropower project (ADB, 2013), have assessed more comprehensive impacts, taking into account factors such as community engagement, biodiversity and traditional cultures.

Methodology

The research is based on the archive collection of EIAs of hydropower projects and the relevant legislation and policy on EIA in Vietnam. Multiple case studies are investigated in order to understand the role of EIA in the decision-making approval process on small and medium scale hydropower projects. Finally, the typical cases are analysed to find out the root problems related to hydropower development and EIA in Vietnam.

EIA system practice in Vietnam

The first Vietnamese legislation to address EIA was the Law on Environment Protection 1993 (the LEP 1993) which was adopted by the National Assembly of Vietnam on 27 December 1993. Then it has been superseded by LEP 2005 which sets out the current EIA framework. There are also specific by-laws that must be considered, such as Decrees and Circulars that guide law enforcement. This legislative framework is illustrated in Table 1 and Figure 1.

EIA in the decision-making approval process on small and medium scale hydropower project investment in Vietnam as set out under Circular 43/2012/TT-BCT of Ministry of Industry and Trade (MIT) on planning, investment management of hydropower projects and operation, exploitation of hydropower plants; and Decree 15/2013/ND-CP of Government on quality management of construction works, is shown in Figure 2.

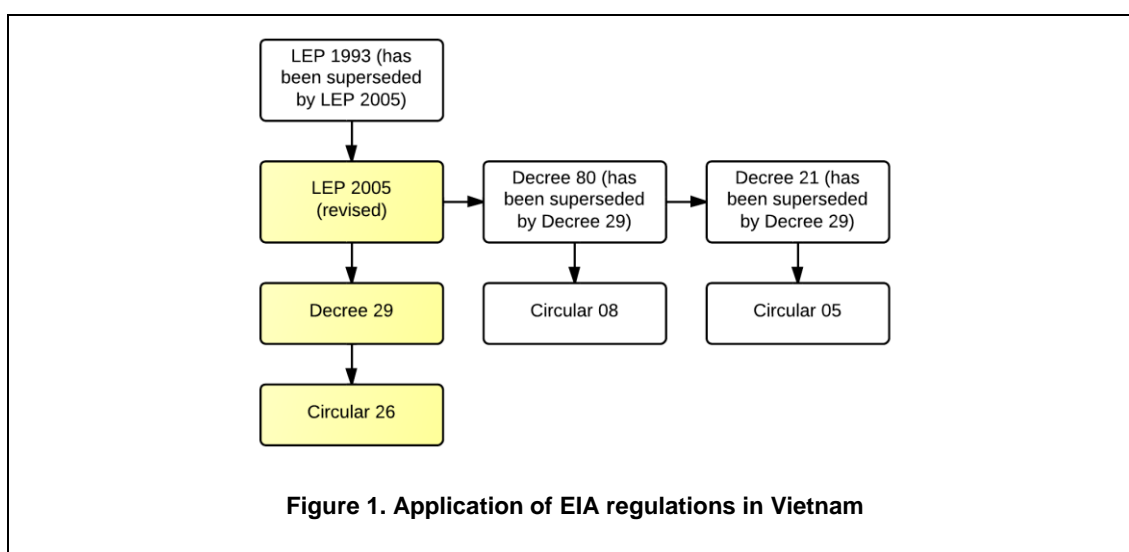


Table 1. Origin of EIA regulations in Vietnam		
Name	Promulgation agency	Content
Law on Environment Protection (Revised) 2005 ('LEP 2005')	National Assembly	Defines a broad regulatory framework for environmental issues in Vietnam, establishes specific requirements for EIA.
Decree 80/2006/ND-CP Providing detailed regulations for implementation of LEP, 9 August 2006 ('Decree 80')	Government	Establishes the timing of EIA in the project planning cycle, define the level of EIA for various projects and establish requirements for appraisal of EIA documents by the Government.
Decree 21-2008-ND-CP Amending and supplementing a number of articles of Decree 80, 28 February 2008 ('Decree 21')	Government	Provides clarification of a number of issues in Decree 80 relating to screening of projects requiring EIAs, establishment of EIA appraisal committees and consultation requirements.
Circular 08/2006/TT-BTNMT Guidance on SEA, EIA and EPC, 8 September 2006 ('Circular 08')	Ministry of Natural Resources and Environment (MONRE)	Original regulation accompanying the LEP 2005 which prescribed the required structure and content of EIA and provide further details of requirements for public consultation activities.
Circular 05/2008/TT-BTNMT Guidance on SEA, EIA and EPC, 8 December 2008 ('Circular 05')	MONRE	Contains revised detailed requirements for content and structure of EIA, public consultation requirements.
Decree 29/2011/ND-CP Providing detailed regulations for implementation of LEP, 18 April 2011 ('Decree 29')	Government	Provides SEA, EIA and EPC; and specifies the list of 146 project teams of 19 fields to report on environmental impact assessment. (Replace 'Decree 80' and 'Decree 21').
Circular 26/2011/TT-BTNMT Guidance on SEA, EIA and CEPs 18 July 2011 ('Circular 26')	MONRE	Provides further details of a number of articles of Decree 29.

Some typical cases in Vietnam analysis

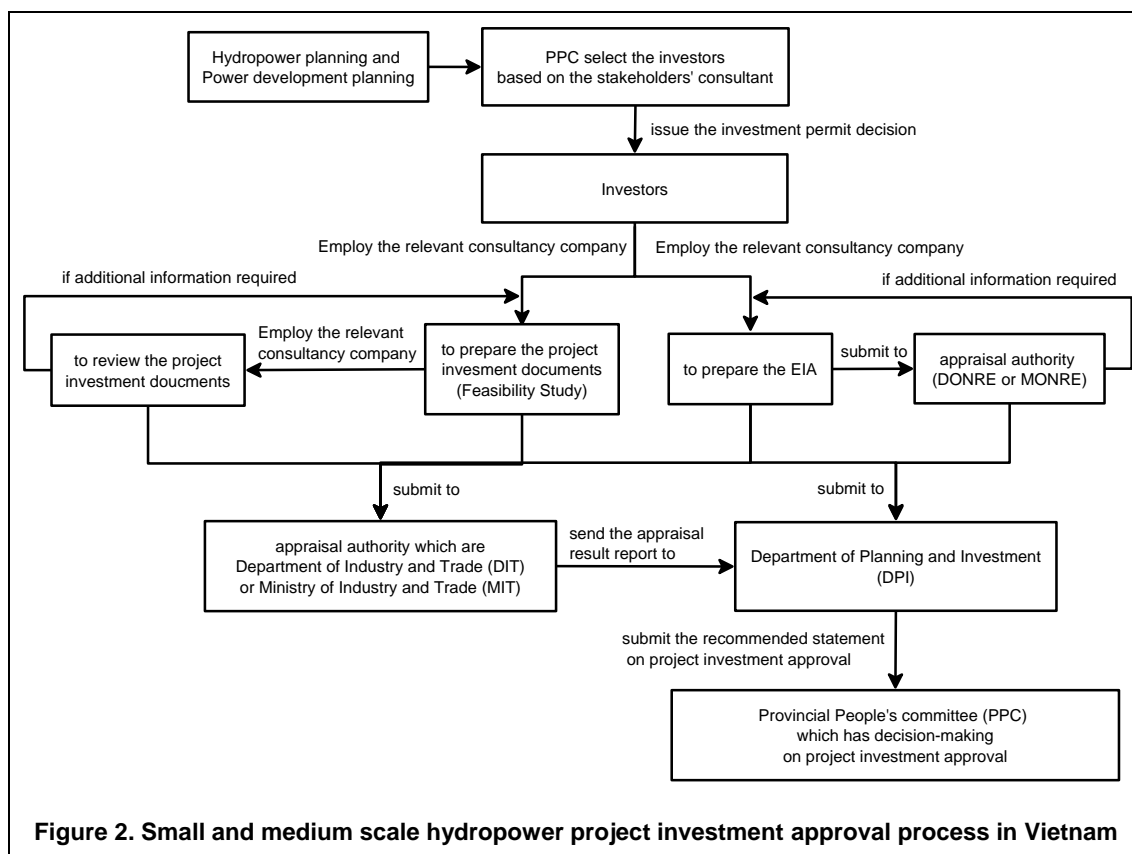
Binh Dien hydropower project which is located at Binh Dien commune, Huong Tra town, Thua Thien Hue province, has been in operation since May 2009. Since then, it has had both positive and negative impacts on the environment. Firstly, it has contributed to a reduction in flooding in the Huong river basin and has generated electricity for the national grid. However, it did not fully implement measures to minimize environmental impacts as required by the EIA. This failure has caused various impacts on the environment. For example, some fish species such as snakehead fish and eels have declined by more than 90%, compared with the year 2009, while 100 % of fish cages have been destroyed on the Huong River (CSRSD, 2012).

Rao An 1 and Rao An 2 hydropower projects are located in the primary forest area adjacent to Vu Quang Nature Reserve in Kim Son commune, Ha Tinh province. EIAs for these projects did not mention the potential impact on under-threat conservation species such as Saola (Vu Quang ox) and elephant. More recently, the EIAs of Dong Nai 6 and 6A hydropower projects claimed that the projects would not affect the environment and systems ecology. However, following appraisal by MONRE, Dong Nai 6 and 6A projects will cause permanent loss of 372 ha forest land, of which 128 ha belongs to the core zone of Cat Tien National Park. The separation between EIA claims and the reality is striking.

The river diversion of some hydropower projects to other basins is often lacking full environmental impact assessment of the river basins, altered hydrology, and likely impacts on ecosystems and people's livelihoods on the basins (VEA, 2012). On 26 December 2013, the Notice No.114/TB-UBND of Gia Lai province reached the following conclusion: An Khe-Ka Nak hydropower project diverted the flow of Ba River (Gia Lai province) to Con River (Binh Dinh province), and made Ba River drought in the dry season, seriously affecting agriculture production and ecological stability downstream.

In addition, other river diversion projects aiming to exploit the terrain elevation difference between the two regions for power generation capacity increase, such as Da Nhim hydropower project, diverted the flow

of Da Nhim River (Lam Dong province) to Cai River (Ninh Thuan province), and Dai Ninh hydropower project diverted the flow of Dong Nai River (Lam Dong province) to Luy River (Binh Thuan province). Similarly, Thuong Kontum hydropower project diverted the flow of Dak Snghe River to Tra Khuc River and causing about 40 km of the downstream river to run dry, affecting thousands of people across 25 communes in Kon Plong, Kon Ray districts, and Kon Tum city.



In addition, many “run-of-river” hydropower projects, which divert a large proportion of a river’s flow into a tunnel or pipeline to power turbines before returning the water to the river further downstream, have been in operation in Vietnam, with further implementation planned. Such river diversions frequently causes drought in dry season and conflict on water resources. For example, there is nearly 1 km of dead river behind the Dong Nai 3 dam, about 4 km dead river behind Dong Nai 4 dam, and about 20 km of dead river behind Srepok 4A. Further evidence of detrimental effects exists in the form of the 5,000 ethnic minority households in Yang Mao commune that suffer from disrupted water supply due to the Ea Kha dam (Dak Lak province) project initiating the diversion of Ea Kha stream.

Shortcomings

Hydropower projects have undoubtedly contributed significantly to national energy security in Vietnam. However, the rapid development of hydropower has seen a certain negligence to the environment, particularly in Central provinces of Vietnam where various negative impacts on the environment can be observed; for example fisheries, livelihoods both upstream and downstream, ecosystem damage. The lack of fish passage design in all dams has proven to seriously degrade biodiversity in river basins and impact on livelihoods.

There are approximately 7,000 dams in Vietnam, most of which are small dams built recently. Small and medium size hydropower projects have grown exponentially with an absence of management capacity, causing many significant negative consequences for both the environment and human inhabitants. The key issues that must be addressed are resettlement, flood discharge information, and water regulation in dry season (H. G. Nguyen, 2013). Meanwhile, many large hydropower projects have been constructed and managed competently; for example Hoa Binh hydropower plant has been monitored and evaluated regularly

every year. The Hoa Binh reservoir operating procedures in flood season have shown excellent efficiency, both for flood mitigation at Red River downstream and electricity output to the national grid.

Without a doubt, energy policy is critical in the development of hydropower resources, especially with regards to multi-objective reservoirs: flood control, water supply, electricity production, raising total capacity from 9,200 MW at present to 17,400 MW by 2020 (Institute of Energy, 2011). However, total flood control capacity of the hydropower system of Vietnam is about 10.5 billion cubic meters in which 10.0 billion cubic meters belongs to 130 constructed large and medium hydropower projects (capacity larger 30 MW). Those remaining are mostly small projects (capacity smaller than 30 MW), but this represents more than 1,100 projects, with a relatively small useful capacity of about 0.5 billion cubic meters (V. D. Nguyen, 2013). Therefore, hydropower development planning must be reassessed carefully to balance the benefit of hydropower project owners with the potential of sustainable development for communities.

There is currently no coordination among ministries and industry sectors in hydropower development planning. The hydropower planning is prepared by electricity sector under the Ministry of Trade and Industry while the irrigation planning is prepared by the Ministry of Agriculture and Rural Development. This inevitably leads to a conflict of interests in the exploitation and use of water, increasing the risk of water shortages and pollution of surface water.

The limited capacity of EIA practitioners is commonly considered to be a major constraint to the effectiveness of EIA in developing countries (Kruopienė et al., 2009). Vietnam is not an exception. EIAs have often failed to mention problems such as the impact on downstream residents in both flood and dry seasons; the disappearance of traditional indigenous culture; the serious pollution on downstream during construction works; and the deforestation risk for farming land after resettlement. In addition, the authorities have failed to monitor project effectively to assess the owner's commitment to taking environmental protection measures construction and operation, as proposed in the EIA report (according to Article 17 of Decree 29). The credibility of EIAs is severely limited based on this perceived lack of ability to enforce; as a result, they have not played a key role in advising the PPC in the project investment decision-making process.

Conclusions and recommendations

Applying environmental considerations in hydropower projects can lead to major savings for governments and developers in the long run. It also helps to meet the growing energy needs and reduce the impacts on nature and people. A Strategic Environment Assessment (SEA) is essential in all river basins and based on this assessment, the general development plan must be revised. Only projects which show synergy with the strategy should be considered, to ensure equality in water usage and meet the interests of all stakeholders (V. D. Nguyen, 2013).

The study finds that the basis of the current EIA legislation is robust, and that future developments of the EIA system in Vietnam should focus on improving the capacity of EIA practitioners rather than further substantial legislative change (Clausen et al., 2011).

The explosion of small and medium hydropower projects in the past 10 years, along with a lack of appropriate management competence, particularly in environmental management, has led to negative impacts on human and natural systems. The EIAs investigated have generally complied with legal formalities but at the same time overlooked or ignored environmental and social impacts. Moreover, many projects have failed to comply with environmental protection commitments in the EIA, both in construction and operation, but there appears to be little will to enforce compliance.

The main priority growth directions from the government will affect the implementation of lower-level authority. For instance, based on the EIAs appraisal result of MONRE of Dong Nai 6, 6A hydropower projects, the Prime Minister assigned the MIT to review the plan for Dong Nai 6 and 6A projects in particular, and hydropower planning in Dong Nai river basin in general.

Finally, the following actions are recommended to promote sustainable hydropower development in Vietnam:

1. EIAs must be prepared and appraised thoroughly in order to minimize the negative impacts on the natural environment and society. It is necessary to strengthen the EIA appraisal process of hydropower projects, given that it is a critical base for Provincial-level People's Committees or Government to make approval decisions. In addition, EIA appraisal agencies must also take responsibility under the law for their appraisal results.
2. Investors in hydropower projects must ensure equity of at least 30% of the total project investment, and the remaining invested capital must be committed by credit institutions, financial institutions or banks in

written investment loan as stipulated in article 13 of Circular 43/2012/TT-BCT of MIT dated on 27/12/2007 regarding investment and planning management of hydropower projects. Therefore, banks in Vietnam would be able to consider the EIA evaluation process in loans related to WB and ADB to ensure reputation and credit security.

3. EIA and SEA must not be used only as a legal tool for the project, but also as a scientific study of the impact on the environment and society (including health, cultural, ethnic, archeology ...). Fish passages and biodiversity have been studied specifically in many other part of the word, and this knowledge must be transferred into the Vietnamese context.
4. Additional factors must also be considered in EIAs, such as flash flood risk increase, especially in steep terrain areas in the northern central of Vietnam. A research agenda for wider EIA research is therefore strongly recommended.

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