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# Evaluation of the environmental impact assessment (EIA) of Chinese EIA in Myanmar: Myitsone Dam, the Lappadaung Copper Mine and the Sino-Myanmar oil and gas pipelines

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## ABSTRACT

The economic relationship between China and Myanmar is regarded as a win-win cooperation. However, Chinese investments, especially in extractive and natural resource sectors, are associated with a number of unwanted environmental consequences. Moreover, the environmental impact assessment (EIA) quality of Chinese enterprises has often been criticized. EIA identifies adverse impacts to the environment through evidence-based decision making. On this basis, this paper provides an evaluation of Chinese EIA performance within the natural resources sector through a structured review of 15 environmental impact statements (EISs). This research also evaluates the EISs of the three largest and most controversial projects, the Myitsone Hydropower Dam, Lappadaung Copper Mine and Sino-Myanmar oil and gas pipelines. The findings reveal several omissions, inadequacies and deficiencies in all the projects with a significant number of EISs falling short of satisfactory quality. Through the analysis, the paper summarizes the factors affecting the EIA performance and proposes feasible recommendations to improve EIA practices in Chinese development projects in Myanmar.

## ARTICLE HISTORY

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## KEYWORDS

Environmental Impact Assessment; Chinese EIA; natural resources; Hydropower Dam; Copper Mine; Oil and Gas Pipelines; Myanmar

## 1. Introduction

China's economic and political relationship with Myanmar is extensive and dynamic (Christie 2014). Since Myanmar's liberalization of trade policy to induce Foreign Direct Investment (FDI) in 1988, bilateral trade between China and Myanmar has been growing steadily and significantly (Dun et al. 2016). Along with China's 'going global' policy in 2001, Myanmar experienced a dramatic increase in Chinese outward foreign direct investment (COFDI) and China has been Myanmar's largest trading partner since 2011 (Dun et al. 2016). Furthermore, Myanmar plays a unique and critical role in China's ambitious foreign policy with the One Belt One Road (OBOR) initiatives. Myanmar is extremely important for implementing China's foreign investment strategies and reshaping the maritime/logistics and transport corridors in the region as a geo-strategic bridge between South Asia and Southeast Asia (Chan 2015). Myanmar's abundant natural resource endowments, especially rich oil and gas resources, and its strategic geopolitical context, make it key to China's pursuit of regional and border stability and in meeting its need for natural resources (Chan 2015). China has significant vested energy security interests in the region, especially in securing crucial energy infrastructure for the OBOR.

However, after the reformist government took office in March 2011, Chinese investment in Myanmar

plummeted and political tension between the two countries grew (Sun 2013). Furthermore, after the inauguration of a democratically elected government in 2016, Myanmar's drastic political and economic transformations have substantially impacted Chinese investments, causing rapid investment decline (Gelb et al. 2017). Investment increased to \$1946.75 million in 2010 from \$20.18 million in 2014 and China invested about \$13.6 billion in the 2011–2012 fiscal year, mostly in energy sector. Political tensions after change of government have caused Chinese investment declined to \$407 million in the fiscal year 2012–2013 and the drop in this figure caused total FDI in Myanmar fell to \$1.42 billion from \$20 billion (Hilton 2013). International and local concern over Myanmar's over-dependency on China and China's contentious influence in Myanmar sparked widespread opposition and 'Chinese-unfriendly' moves among the general population (Dun et al. 2016). Consequently, the three major Chinese investment projects in Myanmar, the Myitsone Dam, the Lappadaung Copper Mine and the Sino-Myanmar oil and gas pipelines, became touchstones for pervasive protests and encountered serious difficulties (Hilton 2013). Hostility towards these investments is mainly based on the allegation of potential environmental and social impacts, as well as revenue transparency concerns. As the majority of China's investments are concentrated in extractive/natural resources sectors with serious environmental

and social consequences, local communities tend to feel a deep distrust towards China's investments, especially State-Owned Enterprises (Christie 2014). Rising political risk against Chinese investments and vocal public sentiments in Myanmar caused major uncertainties and problems for both countries. Arguably, these three major projects symbolize China's most crucial economic interest in Myanmar. Swirling controversies around these projects and the associated uncertainties will have enormous impacts on Sino-Myanmar economic and political ties, and the continuation of OBOR in Myanmar (Sun 2013; Chan 2015).

On the other hand, investment flow from China is exceptionally important for Myanmar's economic development and regional politics. Despite the drastic investment fall, China remains the largest investor in Myanmar. Non-Chinese investment in Myanmar is still noticeably absent and far from being enough to compensate the recent steep drop in Chinese investment (Sun 2013). China will continue to be a dominant economic player in Myanmar. Without doubt, the role of China as a lucrative foreign investor is therefore extremely important to boost Myanmar's socio-economic, financial and infrastructure development. Meanwhile, the political and business environment of Myanmar remains fragile owing to its weak institutional capacity, poor governance, high level of corruption and lack of necessary administrative, and legal structures (Aung 2017). In 2017, Myanmar was ranked as the 35th most fragile and dysfunctional state according to the Fragile State Index (Foreign Policy 2016, Fragile State Index 2018) and it is also ranked 147 out of 167 countries in Transparency International's Corruption Perception Index (CPI). Such a bleak investment environment coupled with an extremely weak environmental regulation and negative business climate will consequently create innumerable adverse environmental and social challenges. In terms of environmental governance, Myanmar currently scores 138 out of 180 countries on the Environmental Performance Index (EPI) in 2018. Given the growing concerns of several environmental challenges, Myanmar urgently requires effective implementation of environmental evaluation mechanisms such as environmental impact assessments (EIAs). However, the formulation of EIA regulations is still in its infancy in Myanmar (Aung 2017).

In general, EIA is defined as an evaluation of the environmental impacts of a proposed project at an early stage (Aung 2017). As an internationally recognized standard environmental management tool for the decision-making process, it is designed to identify the significant impacts and mitigation measures to avoid irreversible damage to the environment and to ensure sustainable use of natural resources (Aung 2017). EIA can be regarded as an environmental

governance mechanism that institutes rules and allocates roles and responsibilities (Arts et al., 2012). The aims of EIA include improving environmental awareness of public and private actors, leading to the integration of environmental values in proposed projects (Arts et al., 2012). Therefore, the extents to which environmental awareness is raised through EIA and environmental values are incorporated into decision-making are also important indicators of the effectiveness of EIA (Arts et al., 2012). In recent years, Chinese government authorities have devoted increasing attention to the standard of EIAs on the domestic front, to improve environmental regulations (Tracy et al. 2017). However, whether China's improvement in the quality of EIAs domestically resonates with these transboundary mega-development projects, remains debatable. Although Chinese investment projects are key forms of development in the region, their EIA quality has often been criticized, especially for these three mega projects (Arkan Oil Watch 2012; Shwe Gas Movement 2013; International Rivers 2016).

Considering the immense scope and scale of Chinese investments in Myanmar, managing environmental and social issues is a key challenge for China, especially in a country like Myanmar, with a predominantly poor record on environmental governance. Increasing criticism and the poor reputation of the environmental performance of Chinese companies has prompted a reassessment of the risks of operating in unstable political contexts and demands more responsible due diligence of Chinese investments in Myanmar. The public has become more skeptical about Chinese investment due to a lack of publicly available EIAs and social impact assessments (SIAs) (Chan 2015). As Myanmar is a country with fragile ecosystems and relatively underdeveloped environmental laws and regulations, the self-discipline and accountability of Chinese companies abroad are particularly important. However, neither the governmental nor non-governmental organizations have initiated an independent scientific study of the EIA compliance of Chinese investments to address uncertainties associated with the projects.

Motivated by this concern, the primary objective of this research is to investigate the performance of EIAs of Chinese investments within the Myanmar natural resources sector. Particular attention is given to the environmental impact statements (EISs) of the three largest and most controversial Chinese projects, the Myitsone Dam, the Lappadaung Copper Mine and the Sino-Myanmar oil and gas pipelines. To date, studies that empirically examine the EIAs of Chinese investments in Myanmar are scarce, let alone the quality of the EIAs in these three mega projects. To bridge this research gap, this paper aims to pinpoint areas of

strengths and weaknesses of the EIAs in the natural resources sector and, in particular, these critical investment projects. The study also identifies the factors affecting the quality of EIA performance and provides feasible recommendations to improve the sustainable development of Chinese projects in Myanmar. This research represents the first systematic attempt to unravel this research gap by clarifying the relevant area of environmental protection measures taken by the Chinese enterprises, illustrating the current process of sustainable development of Chinese mega projects in Myanmar. It is envisaged that the evaluation framework adapted and the methodology developed in this study will make tremendous contributions to the current field of research in assessing Chinese overseas EIAs.

## 2. Environmental challenges of China's investment in Myanmar

Given the magnitude of China's investments and, the environmental and social risks associated with the mega-projects, both countries face multiple challenges along the way. Trade liberalization and FDI inflow, in general, inevitably present a number of potential threats to environmental quality and sustainable development of the host country, especially with developing countries like Myanmar with laxer environmental regulation standards (Aung 2017). Activists and analysts have expressed concerns for the adverse social and environmental consequences of such development projects, igniting criticism of Chinese investments throughout Myanmar. China's major priority now is to secure its existing investments in Myanmar from further damage caused by local opposition, internal politics and instability in Myanmar. For the successful continuation of its long-established economic ties with Myanmar, China seems willing to make concessions in the areas of environmental protection, corporate responsibility and profit-sharing of its projects (Sun 2013).

The Sino-Myanmar oil and gas pipelines, the Myitsone Hydropower Dam Project and the Lappadaung Copper Mine are the most prominent and controversial projects in Myanmar due to their magnitude, significance, operational complexity and environmental and social risks.

- (1) The Sino-Myanmar oil and gas pipelines are operated by the China National Petroleum Corporation's subsidiary, Southeast Asia Pipeline Co. Ltd, and the commencement of the construction coincided with Myanmar's launching of political and economic reforms in 2011 (MCPWC, 2016). Considering the pipeline is the fourth largest energy transportation route for China after the Central Asia pipelines,

sea transportation and Sino-Russia pipelines, it is of national strategic importance for China's energy policy and security (Dun et al. 2016). The 2,380 km long pipelines bring oil from the Indian Ocean to China's south-west region and are intended to reduce China's dependence on the sea passage through the Strait of Malacca (Hilton 2013). However, the construction of the pipelines has led to continuous local and international opposition based on the claim that Chinese investors failed to conduct due diligence or engage with civil society (Shwe Gas Movement 2009). Controversy over the pipeline project is largely focused on its environmental and social impacts. The Myanmar-China Pipeline Watch Committee (2016) have reported that the project has had a massive impact on communities and ecosystems along the pipeline route and that the farmers have endured environmental and social impacts since the commencement of the project. A Thailand-based non-government organization, the Shwe Gas Movement, also claims that there are human rights abuses, environmental damage and poor revenue distribution. Notably, those accusations were echoed by not only local Myanmar residents but also Chinese residents in Yunnan through several protests and demonstrations (Hilton 2016). In response to the opposition, the China National Petroleum Corporation (CNPC) claimed that the company has conducted EIAs, including SIAs, before the construction of the pipelines. However, the EIA report is not publicly available, and the people of Myanmar have not been informed about the extent of the environmental destruction caused by the pipelines. This is because Myanmar had not promulgated an EIA law and procedure until 2015 and EIAs were not a mandatory requirement for foreign investors prior to that time (Aung 2017). Enhanced awareness of both environmental and social issues through publicly available EIAs would have benefitted both Myanmar and China, by addressing the risk raised by opposing factions.

- (2) The Myitsone Hydropower Dam Project, with a total capacity of 13,360 MW and estimated total investment of US\$3.6 billion, is one of the largest seven planned dam projects for the upper Irrawaddy (Martínez-Alier and Rodríguez-Labajos 2011). It is also the biggest Chinese investment in Myanmar (Guangsheng 2015). The Memorandum of Understanding (MOU) was signed between Myanmar's Ministry of Electric Power and China Power International on the development of Myitsone Hydroelectric

Project in December 2006. Geographically, Myanmar is highly suitable for hydropower electric generation and the construction of dams have already provided much of the country's electricity supply (Brennan and Doring 2014). However, the construction of dams, in general, often alters the natural ecosystem and requires extensive relocation of the local population and tends to exacerbate existing ethnic conflicts (Brennan and Doring 2014). Considering the fact that the location of the project is recognized as one of the world's eight hotspots of biodiversity, and is a historically and religiously sensitive area, the Myitsone Dam Project has drawn heightened scrutiny and serious criticism since the beginning (Kirchherr 2017). Moreover, concerns over the dam's inevitable environmental and social impacts, the relocation of local villages and disruption to livelihoods for the people of the area, have prompted several public rebukes (Hilton 2013). It is believed that more than 12,000 people from 63 villages will be forcibly relocated and the dam will dramatically affect the ecosystem of the Irrawaddy River, also directly impacting downstream communities (Kirchherr 2017). Consequently, the former President of Myanmar, Thein Sein, abruptly decided to suspend the project temporarily. Given the immensity and importance of the project, China has been making repeated attempts to resume the stalled project (Kirchherr 2017). For Myanmar, harnessing the abundant hydropower resources can alleviate the dire need for electricity and address their energy poverty (Sun 2013). However, controversy and hostility over the project has been exacerbated by the widespread allegation that the quality and independence of the EIA of this mega-project is doubtful and, that the report does not follow international guidelines on EIAs, even though it has never been systematically studied against international EIA criteria (International Rivers 2016; Kirchherr 2017). Against this backdrop, China shows a willingness to ameliorate all major aspects including environmental preservation, corporate social responsibility and, relocation and compensation of local villages (Sun 2013). A full transparency of the degree of environmental and social impacts through a constructive EIA is necessary to dispel public misunderstanding and doubts about the project.

- (3) Letpaduang Copper Mine Project is another highly disputed Chinese investment in

Myanmar. This enormous surface mine is located in the Salingyi township of the Sagaing division in north-western Myanmar (Ewing and Hangzo 2013). The Letpaduang Copper Mine Project is jointly operated by Wanbao Mining, a subsidiary of China's state-owned China North Industries Corporation (NORINCO) and the Union of Myanmar Economic Holdings Ltd (UMEHL). The mine commenced production in 2012, with a total estimated investment of US\$1.065 billion, but operations soon after, due to local opposition and protest against land grabbing, environmental damage and displaced villages (Ewing and Hangzo 2013). The project spans approximately 7,867.78 acres of land, which includes 5,057 acres of arable land and effects 26 villages. Social and environmental destruction, such as potential contamination of important rivers and direct health impacts, were also proclaimed (Lee 2015). There were widespread and frequent protests by local villagers against the lack of transparency about project details, benefit sharing and environmental pollution. Persistent rallies resulted in a violent police intervention on the protests and resulted in domestic and international criticisms. Accordingly, the Myanmar government appointed an investigation committee to scrutinize the operation of the project and its alleged environmental and social impacts (Sun 2013). Despite the conclusion that the mining project lacks transparency, proper compensation and environmental protection measures, the investigation report supported the continuation of the project operation provided that company made necessary improvements (Lee 2015). Based on the favourable verdict on the project, Wanbao resumed project operations in 2016 and a total of 24,500 metric tonnes of cathode copper were produced as of January 2017, bringing more than US\$20 million from royalties, production sharing ratios, commercial tax and income tax (Thant 2017). In the aftermath of the violent demonstration, China's Wanbao embraced several notable initiatives, with commitment to spend US\$2million annually to ensure an international standard of environmental protection. Further, they committed to a 2% profit sharing for corporate social responsibility process (Lee 2015). Understanding the need to address public resistance, the company also published EIA and SIA reports (Lee 2015). Engagement with the public and stakeholders, coupled with increased transparency through conducting an EIA, is arguably an indispensable way to minimize hostility towards the project.

### 3. Methodology

To evaluate the environmental performance of Chinese companies in Myanmar, and to offer insight into the quality of their EIAs, this research utilized a diverse range of methods, dimensions and perspectives. As part of the method adopted for this research, a sample of Chinese EISs from the natural resource sector under EIA type projects were selected for a comprehensive review. The majority of Chinese projects in the natural resource sector require the submission of a full EIA due to their massive capacity and scale. According to the 2015 Myanmar EIA Procedure, these types of projects fell into EIA type projects, the projects judged by the Ministry as being likely to have potential for adverse impacts (Government of the Republic of Myanmar, 2015). Based on availability, 10 Chinese EISs produced in the natural resources sector between 2010 and 2017 were obtained for analysis. Given that there was no mandatory requirement for an EIA until 2015, and the EIAs were conducted arbitrarily and on an ad hoc basis, the collection of EISs is incomplete and poorly catalogued (Aung 2017). Therefore, the total number of EISs submitted to the Ministry of Environmental Conservation and Forestry (MOECAF) is unknown and the collection is limited. The current research concentrated on a number of specific categories in the natural resource sector for which EISs could be obtained, namely: oil and gas, mining and power sectors. The study sample comprised five EISs for oil and gas projects, three EISs for mining projects and two EISs for power projects. Additionally, a specific comparative analysis was conducted for the EIA reports of the three mega investment projects, China–Myanmar oil and gas pipelines, the Myitsone Hydropower Dam Project and the Lappadaung Copper Mine. These three projects were chosen and given special attention because of their magnitude, significance, complexity of operation, environmental and social risks, and controversy associated with the projects. It is important to note that the Chinese version of the summary of the EIA report of the China–Myanmar oil and gas pipelines was used in this research due to the lack of accessibility to full EIA report for this project. The projects are also representative of the categories described in Annex I and II of the Directive 2011/92 EU of the European Parliament and of the Council where the projects were made subject to an EIA (European Union 2016).

The critical evaluation of the EISs was based on a slightly modified version of a set of evaluative criteria, an Environmental Statement Review Package developed by Lee and Colley (1990). The Lee and Colley Review Package is an established approach to EIS quality review and has been used extensively (Barker and Jones 2013). EISs across a range of sectors around the world have been widely and successfully assessed

using Lee and Colley (1990), either directly or with modified review packages, over the past few decades (Dancery and Lee 1993; Gray and Edward-Jones 1993; McMahon 1996; MacGrath and Bond 1997; Kadir and Momtaz 2010; Badr et al. 2011; Barker and Jones 2013; Jones and Fischer, 2013; Barimah 2014; Mounir 2015). However, the studies that focus on natural resource sector specifically and overseas investment in particular is relatively rare. In this study, modifications were made and additional criteria were added to be appropriate to use in Chinese EIA in Myanmar context. The study also ensures that the criteria reflect the regulatory requirements and set objectives of Myanmar's 2016 EIA procedures and guidance. Lee and Colley review package can be reviewed by reviewers who may not possess specialist environmental expertise but who are familiar with the particular country's EIA regulations, EIA methodologies, good practices in EIA and have a wide knowledge of environmental concerns. Following the original methodology, EISs were reviewed by two experts independently and significant differences are examined and resolved. Both reviewers are environmentalists who are expert in EIA methodology, Myanmar and China EIA regulations and environment problems in both countries.

In addition, this research investigates the differences in effectiveness of EIAs for the three projects, the Myitsone Hydropower Dam Project, the China–Myanmar Oil and Gas Pipelines and the Lappadaung Copper Mine, and conducts comparative assessments based on the score obtained through the evaluation of EISs against thresholds proposed in Lee and Colley (1990) review criteria. For comparative evaluation of three projects, parameters or review grades given to each attribute are normalized by converting them into six-point scales, 1.00, 0.80, 0.60, 0.40, 0.20, 0.00. The score of 1.00 indicates a satisfactory EIS while 0.00 suggests a poor EIS. Weighting for all attributes was assumed to be equal. Integrating mathematical measurements allow to comprehensively compare the different indicator variables of EIA from the three projects. This approach was previously utilized in Otwong and Phenrat's study on comparative evaluation of public participation in the EIA of overseas investments from Thailand. The scores assigned through the review process are then averaged via the following equation to obtain final score:

$$S_p = \sum \frac{S_A}{X_A}$$

$S_p$  is the average score for each attribute

$S_A$  is the score of each attribute

$X_T$  is the total number of attributes

The final score obtained for each project will determine if the quality of the EIA process is satisfactory, borderline or unsatisfactory.

### 3.1. Lee and Colley EIS quality review criteria

The Lee and Colley (1990) EIS Quality Review Package consists of several components such as advice for reviewers, a list of evaluative criteria to be used in each EIS review and a collation sheet to record the findings from the criteria checklist. The criteria are arranged in a hierarchical (pyramid) structure comprising four levels of review, starting from the lowest level to the most complex criteria. A list of review topics provides the evaluative criteria, such as review area, review categories, review subcategories and overall quality assessment. In an attempt to make the review procedure more specific to the Chinese EIA in Myanmar context and to be more comprehensive, this research included one more review area, national involvement in the EIA process, with three additional review categories.

These four areas of review topics are summarized in Table 1. A schematic representation of the hierarchical evaluative review criteria is exhibited in Figure 1. Based on the hierarchically structured criteria, the review process includes assigning assessment grades, from the symbols A–F (see Table 2). In this paper, following the recommendation of the review procedure, two independent reviewers reviewed the EISs.

## 4. Result and discussion

### 4.1. Overall quality of EISs

The review of the 10 EISs produced by Chinese companies in Myanmar, on the natural resource sector between 2010 and 2017 for EIA-type projects, reveals a relatively weak picture of overall performance. The result indicates that only 33% of the EISs sampled were of a satisfactory quality, 40% were unsatisfactory and 27% were borderline. The assessment results of the overall quality of EISs are summarized in Table 3. In many cases, failure to achieve a satisfactory score was attributed to poor performance in review area 3, alternative and mitigation (50% unsatisfactory), and review area 5, national involvement in EIA process (88% unsatisfactory).

Up to the present, there have been no studies systematically conducted to assess the effectiveness of EIS quality in Myanmar, let alone the EIS in the natural resources sector. Independent expert review of Myitsone Hydropower development dam revealed rather negative opinion on the overall quality of the EIS (International Rivers 2016). Moreover, studies conducted in other countries have mostly focused on one specific industry within the natural resources sector, such as the forest sector, the oil and gas industry, wind farms, hydropower dams and mining, and revealed varying results. However, juxtaposing this study against EIS quality review studies in sectors related to natural resources in other countries indicates that the

Table 1. EIS review criteria.

<p><b>Review Area 1: Description of Project and Environment</b></p> <p><b>1.1. Project Description</b></p> <p>1.1.1. Purpose</p> <p>1.1.2. Design and size</p> <p>1.1.3. Appearance of completed project</p> <p>1.1.4. Production process</p> <p>1.1.5. Raw material</p> <p><b>1.2. Site Description</b></p> <p>1.2.1. Land area</p> <p>1.2.2. Land use</p> <p>1.2.3. Duration</p> <p>1.2.4. Number of workers</p> <p>1.2.5. Transportation</p> <p><b>1.3. Wastes and Emission</b></p> <p>1.3.1. Waste quantity</p> <p>1.3.2. Waste handling</p> <p>1.3.3. Waste quantity estimation method</p> <p><b>1.4. Environment Description</b></p> <p>1.4.1. Effected environment</p> <p>1.4.2. Effected environment away from the project</p> <p><b>1.5. Baseline Condition</b></p> <p>1.5.1. Components of effected environment</p> <p>1.5.2. Data sources</p> <p>1.5.3. Local data sources</p> <p><b>Review Area 3 Alternatives and Mitigation</b></p> <p><b>3.1. Alternatives</b></p> <p>3.1.1. Alternative sites</p> <p>3.1.2. Alternative process</p> <p>3.1.3. Re-appraisal</p> <p><b>3.2. Mitigation</b></p> <p>3.2.1. Mitigation of impacts</p> <p>3.2.2. Methods</p> <p>3.2.3. Extend of method effectiveness</p> <p>3.3. Commitment of mitigation</p> <p>3.3.1. Commitment of developer</p> <p>3.3.2. Monitoring arrangement</p> <p><b>5. National Involvement</b></p> <p><b>5.1. Government</b></p> <p>5.1.1. Concerns, recommendation, perception</p> <p><b>5.2. Expertise</b></p> <p>5.2.1. Concerns, recommendation, perception</p> <p><b>5.3. Public</b></p> <p>5.3.1. Concerns, recommendation, perception</p>	<p><b>Review Area 2: Impact Identification</b></p> <p><b>2.1. Impact Definition</b></p> <p>2.1.1. Direct and indirect effects</p> <p>2.1.2. Types of impacts</p> <p>2.1.3. Impacts from non-standard operations</p> <p>2.1.4. Impacts from non-baseline conditions</p> <p><b>2.2. Impact Identification</b></p> <p>2.2.1. Identify Impact</p> <p>2.2.2. Methodology</p> <p><b>2.3. Scoping</b></p> <p>2.3.1. General public contacts</p> <p>2.3.2. Public opinion</p> <p>2.3.3. Key impacts</p> <p><b>2.4. Impact Magnitude</b></p> <p>2.4.1. Use of data</p> <p>2.4.2. Method</p> <p><b>2.5. Impact Significance</b></p> <p>2.5.1. Community and society</p> <p>2.5.2. Method</p> <p>2.5.3. Justification</p> <p><b>Review Area 4: Communication of Results</b></p> <p><b>4.1. Layout</b></p> <p>4.1.1. Introduction</p> <p>4.1.2. Information</p> <p>4.1.3. Chapters</p> <p>4.1.4. Acknowledgement</p> <p><b>4.2. Presentation</b></p> <p>4.2.1. Information</p> <p>4.2.2. Technical terms definition</p> <p>4.2.3. Statement</p> <p><b>4.3. Emphasis</b></p> <p>4.3.1. Sever impacts</p> <p>4.3.2. Unbiased statements</p> <p><b>4.4. Non-Technical Summary</b></p> <p>4.4.1. Main findings</p> <p>4.4.1. Main issues</p>
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finding of our study is consistent with most of the prior studies in forest sector and mining developments, where the effectiveness of EISs were below average (Coles and Taylor 1993; Gray and Edward-Jones 1993; Baker and McLelland, 2003; Li, 2009). Previous research in wind energy, oil and gas and hydropower projects identified modest score for EISs quality (Pinho et al. 2007; Chang et al., 2013). Distinctively, Jones and Fisher (2013) found that 90% EISs studied were satisfactory quality in wind farms in the United Kingdom and Germany. Barker and Jones (2013) also observed that majority of EISs studied were satisfactory quality.

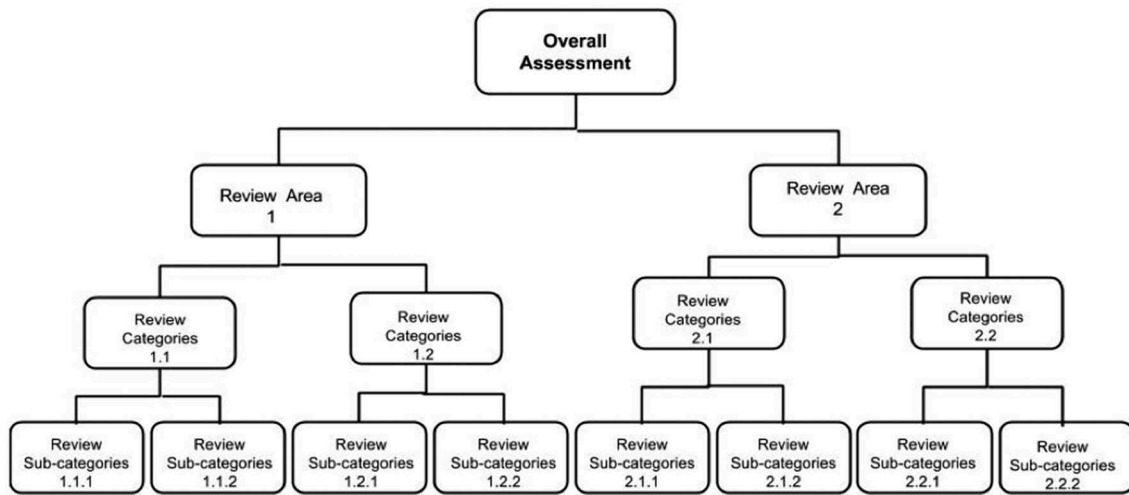


Figure 1. Lee and Colley Review Package Framework

Table 2. List of EIS assessment symbols.

Symbol	Explanation
A	Relevant tasks well performed, no important tasks left incomplete.
B	Generally satisfactory and complete, only minor omissions and inadequacies.
C	Can be considered just satisfactory despite omissions and/or inadequacies.
D	Parts are well attempted but must, as a whole, be considered just unsatisfactory because of omissions or inadequacies.
E	Not satisfactory, significant omissions or inadequacies.
F	Very unsatisfactory, important tasks poorly done or not attempted.
NA	Not applicable. The review topic is not applicable, or it is irrelevant in the context of this statement.

Note: 'Satisfactory' = A or B  
 'Borderline' = C or D  
 'Unsatisfactory' = E or F  
 'Not Applicable' = NA

Table 3. Overall quality of EISs.

Overall Assessment	Percentage of Sample (out of 10)
Satisfactory (A or B)	33%
Borderline (C or D)	27%
Unsatisfactory (E or F)	40%
Not Applicable	0%

Moreover, Table 4, summarizes the result of the comparative evaluation of the quality of EISs for the three mega investment projects, the China–Myanmar oil and gas pipelines, the Myitsone Hydropower Dam Project and the Lappadaung Copper Mine. The table outlines the scores for each attribute based on the review against Lee and Colley (1990) EIS Quality Review Package. The results of the review were normalized and averaged using equation 1. The result of each attribute was converted to a 6 point scale, ranging from 0.00 to 1.00. A final score of <0.40 indicates an unsatisfactory EIA quality while a score of  $\geq 0.40$  but <0.60 suggests the EIA quality is borderline. A final score of between  $\geq 0.80$  and 1 indicates a satisfactory EIA quality.

Based on the analysis, the results revealed that the overall quality of EIAs for the Myitsone Hydropower Dam and the Letpadaung Copper Mine was within the range of 'satisfactory' with the score of 0.70 and 0.72, respectively, even though some shortcomings and

deficiencies were found in review areas, review categories and review sub-categories. These results differ from those of Pinho et al. (2007) and Li (2009) which showed rather negative results. In the case of the Myitsone Hydropower Dam, the quality of the EIA in review areas 1, 2 and 4 were satisfactory while review areas 3 and 5 were unsatisfactory. The EIA report for the Myitsone Dam Project, a hydro-power development in the upper reaches of the Ayeyarwady River, was conducted by Changjiang Survey, Planning, Design and Research Ltd Co. (CISPDR) in conjunction with Biodiversity and Nature Conservation Association (BANCA) in March 2010. The report claimed that it was conducted in accordance with China's EIA standard and referenced the EIA Guidelines of the World Bank and the Asian Development Bank. This was presumably because Myanmar did not have EIA guidelines or a mandatory requirement of EIA until 2015 (Aung 2017). It is observed that the EIA report for this project provided sufficient information concerning the project description, site and local environment, and baseline condition of the environment. However, the reports did not detail the type and quantity of waste which will be produced during the operation of the dam or any waste treatment methods. These findings are similar to the results of Pinho et al. (2007) in Portuguese's hydropower project. Information about



**Table 4.** Result of the comparative EIA quality analysis.

Review Area	Review Category	Review Sub-Category	Myitsone Hydropower Dam	Letpadaung Copper Mine	China–Myanmar Oil and Gas Pipelines		
Description of the Development	Project Description	Purpose	0.80	1	0.80		
		Design and size	0.80	1	0.80		
		Appearance of completed project	0.80	0.80	0.60		
		Site Description	Production Process	0.80	0.80	0.60	
			Raw material	0.60	0.80	0.60	
			Land area	0.80	0.60	0.80	
			Land use	0.80	0.60	0.80	
			Duration	0.80	0.80	0.60	
			Number of workers	0.80	0.60	0.20	
			Transportation	0.40	0.80	0.40	
		Wastes and Emission	Waste quantity	0.60	0.60	0.60	
			Waste handling	0.40	0.80	0.60	
			Waste quantity estimation method	0.40	0.60	0.40	
		Environment Description	Effected environment	0.80	1	0.60	
			Effected environment away from the project	0.80	1	0.60	
		Baseline Condition	Components of effected environment	0.80	0.80	0.40	
			Data sources	0.80	1	0.40	
			Local data sources	0.60	0.60	0.40	
		Area 1 Score Identification and Evaluation of Key Impacts	Impact Definition	Direct and indirect effects	0.80	0.80	0.80
				Types of impacts	0.80	0.80	0.20
				Impacts from non-standard operations	0.60	0.80	0.60
Impact Identification	Impacts from non- baseline conditions		0.80	0.60	0.60		
	Identify Impact		0.60	0.40	0.60		
	Methodology		0.80	0.60	0.60		
Scoping	General public contacts		0.80	0.60	0.80		
	Public opinion		0.80	0.60	0.60		
Impact Magnitude	Key impacts		0.80	0.60	0.8		
	Use of data		0.80	0.8	0.80		
	Method		0.80	0.60	0.60		
Impact Significance	Prediction of impacts		0.80	0.60	0.60		
	Community and Society		0.60	0.80	0.60		
	Method		0.60	0.60	0.60		
	Justification		0.80	0.80	0.60		
Area 2 Score Alternatives and Mitigation	Alternatives	Alternative sites	0.40	0.60	0.60		
		Alternative process	0.60	0.40	0.40		
	Mitigation	Re-appraisal	0.40	0.20	0.40		
		Mitigation of impacts	0.40	0.80	0.60		
		Methods	0.20	0.60	0.60		
		Extend of method effectiveness	0.00	0.80	0.60		
	Commitment of mitigation	Commitment of developer	0.40	0.80	0.40		
		Monitoring arrangement	0.40	0.80	0.40		
	Area 3 Score Communication of Results	Layout	Introduction	0.35	0.62	0.5	
			Information	0.80	0.80	0.40	
Chapters			0.80	0.80	0.40		
Presentation		Acknowledgement	0.60	0.60	0.60		
		Information	0.80	0.80	0.60		
		Technical terms definition Statement	0.80	0.80	0.20		
Emphasis		Severe impacts	0.80	0.80	0.60		
		Unbiased statements	0.60	0.60	0.40		
Non-technical summary		Main findings	0.40	0.80	0.40		
		Main issues	0.60	0.80	0.40		
			0.70	0.76	0.47		
Area 4 Score National Involvement in EIA Process		Government	Concerns, recommendation, perception	0.40	0.80	0.20	
		Expertise	Concerns, recommendation, perception	0.40	0.80	0.20	
	Public	Concerns, recommendation, perception	0.40	0.80	0.20		
Area 5 Score			0.40	0.80	0.20		
Final Score			0.70	0.72	0.48		

the levels of waste generation produced by the development and waste handling methods are an important aspect of an EIA as it helps to determine the impact of the development and mitigation measures. The details provided for impact identification, scoping and, prediction of impact magnitude and significance were found to be satisfactory. The report layout, presentation and emphasis were of an acceptable standard as was the provision of a non-technical summary. Nevertheless, the quality of this report was found to be significantly poor in the area of alternatives and mitigation. The report did not provide adequate information on whether any feasible alternatives to the project had been considered. The same issues were observed in the study of Pinho et al. (2007). The scope and effectiveness of mitigation measures and commitment of mitigation were also considered unsatisfactory. Moreover, there was no reference to the government, national expertise or public involvement in the process of the EIA for this project.

Regarding the Letpadaung Copper Mine, review areas 1, 4 and 5 performed within the 'satisfactory' range while review areas 2 and 3 were borderline, with some omissions and inadequacies. The EIA report for this project was prepared by Knight Piesold Pty Limited in January 2015. The report stated that it had been prepared in accordance with Environmental Conservation Law, Rules and Procedures under the instruction of the Ministry of Environmental Conservation and Forestry. The report described the project, site, environment and baseline condition appropriately and waste generation was mentioned, with minor omissions. Therefore, review area 1, description of development, is the best performed area of this EIA report. Layout, presentation, emphasis of the importance and the non-technical summary of this report were also found to be well-performed. Noticeably, involvement of the government, local expertise and the public was also found to be satisfactory for this project. This might be due to the fact that the report was prepared in response to widespread nationwide protests and the subsequent findings of a National Investigation Commission. Community consultations with stakeholders and relevant authorities were also mentioned in the report. In this context, Morrison-Saunders et al. (2003) and Pinho et al. (2007) have argued that the principle driving force of good quality EIA is pressure from the public, political expectations, environmental administration and time and resources to prepare EIA reports. Adequacy of national regulations and availability of technical guidelines on the format and structure of EIA are also considered crucial contributions to a good EIA (Environmental Protection Agency 2015). Impact identification and evaluation of this report is just borderline, with significant omissions in

key impact identification. Moreover, alternatives and mitigation were also assessed as borderline as the report failed to provide adequate information about alternative processes, design and operating conditions, and a reappraisal of the alternatives.

For the China–Myanmar oil and gas pipelines, the EIA report was carried out by a Thailand-based company, the International Environmental Management Co., Ltd, in June 2013, but was not made publicly available. The report claimed that it was conducted in accordance with World Bank Guidelines and the Equator Principle's norms and standards. However, an analysis of the EIA report evidenced that the overall quality of the report was unsatisfactory with major omissions, inadequacies with some important tasks poorly completed or absent in the majority of areas under review. The final score of this EIA report was 0.48 which is below the range of borderline and is considered unsatisfactory. This result contrasts with Barker and Jones (2013)'s study where satisfactory EIS quality was found in Oil and Gas sector in the United Kingdom. Such apparent discrepancy may be due to the incompatibility between expertise and experience of EIA system and the companies responsible for EIA in oil and gas sector in the United Kingdom and Myanmar. The majority of the review area of the EIA report resulted in an unsatisfactory result, besides review area 2, identification and evaluation of key impacts, was considered borderline. This finding correlates with Barker and Jones (2013)'s result in this review area where 70% of EISs achieved satisfactory grades. The report failed to provide sufficient information concerning a clear description of the overall development and consideration of feasible alternatives to the project. The presentation and communication of the report and national involvement in the EIA process was also found below the satisfactory standard. Table 5 displays the summary of the comparative analysis of the three projects based on the review areas. Figure 2 portrays the visual presentation.

**Table 5.** Result of the comparative EIA quality analysis.

	Myitsone Hydropower Dam	Letpadaung Copper Mine	China–Myanmar Oil and Gas Pipelines
Description of the development	Satisfactory	Satisfactory	Unsatisfactory
Identification and evaluation of key impacts	Satisfactory	Borderline	Borderline
Alternatives and mitigation	Unsatisfactory	Borderline	Unsatisfactory
Communication of results	Satisfactory	Satisfactory	Unsatisfactory
National involvement in EIA process	Unsatisfactory	Satisfactory	Unsatisfactory
<b>Overall Quality</b>	<b>Satisfactory</b>	<b>Satisfactory</b>	<b>Unsatisfactory</b>

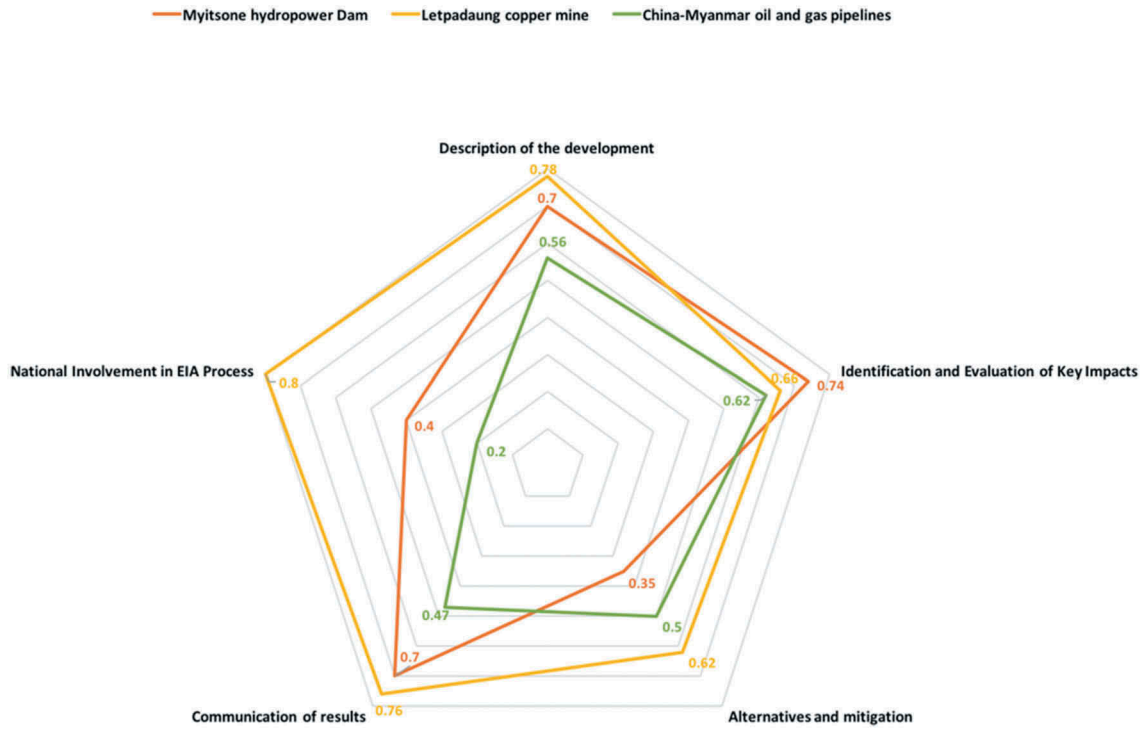


Figure 2. Visual Presentation of the EIS Quality

## 4.2. Results by review area

### 4.2.1. Description of project and environment

Review area 1 was the best performed task, with 88% of the EIS samples assessed as satisfactory and a great proportion of the review categories graded as satisfactory or borderline (see Table 6). This result is consistent with previous findings on EIS quality reviews (McMahon 1996; Barker and Wood 1999; Cashmore et al. 2004; Badr et al. 2011; Barker and Jones 2013; Chang et al., 2013). Majority of the EISs in this review area generally perform better than other parts of EISs because this review area is considered more straightforward and simpler task within the wider EIA process (Barker and Jones 2013). Chang et al. (2013) also stated that this task tends to be the easiest and least expensive procedure of the EIA process. This review area includes information for the development, site, waste generation, the local environment and baseline conditions. Some weak areas observed are: providing detail information on the waste estimation and disposal; description of the environment effected by the project; and the baseline condition of the environment. The description of the

development project was the best performed review category (100%), whereas estimation and disposal of waste and emission was the worst performed category with 40% of the cases assessed as unsatisfactory.

In this review area, in common with previous findings, the Myitsone Hydropower Dam and the Letpadaung Copper Mine were assessed within the satisfactory range, with the score of 0.70 and 0.78, respectively. Conversely, China–Myanmar oil and gas pipelines showed a contradictory result with unsatisfactory score of 0.56. However, the interpretation of this result for the China–Myanmar oil and gas pipelines should be made with caution because the report used for analysis was the summarized version of the original report. Initial consideration against the review package also showed identical results (see Table 7). Based on the results, the Myitsone Hydropower Dam provided detailed explanations for all the review categories except for the waste and emission section. The Letpadaung Copper Mine performed well in most of the review categories. The China–Myanmar oil and gas pipelines report did not provide sufficient information for all the review categories, other than the project

Table 6. Variation in EIS quality for review area 1.

Overall Assessment	Review Area 1	Review Category				
		1.1	1.2	1.3	1.4	1.5
% Satisfactory	88	100	77	27	80	50
% Borderline	2	0	33	33	5	31
% Unsatisfactory	10	0	0	40	15	19
% Not Applicable	0	0	0	0	0	0

Table 7. Result for review area.

Projects	Review Area	Review Category				
		1.1	1.2	1.3	1.4	1.5
Myitsone Hydropower Dam	B	B	C	D	B	B
Letpadaung Copper Mine	B	B	C	C	A	B
China–Myanmar oil and gas pipelines	D	B	C	D	C	D

description. In general, all the projects are particularly weak in the 'describing waste and emission' category. In particular, the information for waste quantity estimation method was inadequate (see Table 8).

#### 4.2.2. Impact identification

For the identification and evaluation of key impacts, the majority of the review categories were assessed as borderline (60% of the EISs), 30% as satisfactory and 10% were unsatisfactory (see Table 6). Majority of the previous studies identified this area as one of the weakest areas of EIA (Gray and Edward-Jones 1993; Guilanpour and Sheate 1997; Pinho et al. 2007; Badr et al. 2011). Phylip-Jones and Fischer (2013) and Barker and Jones (2013) found that scoping in this review area was mostly satisfactory in their studies. The most satisfactory review area was scoping (69%) and the assessment of impact significance was the comparatively weakest area (35% unsatisfactory and 35% borderline). Prediction of impact magnitude is another higher performing review area with 55% of EISs graded as satisfactory. Reviewers noted that a great number of EISs graded as borderline in this review area, especially for definition of impact (80%) and identification of impact (77%). The effects of the projects are not always explained in detail, and the methods and the approaches used in impact identification are not clear. It is important to focus on potential direct and indirect impacts using systematic methodologies to evaluate likely risks associated with the projects. The attention given to the significance and magnitude of the impacts were also inadequate.

The identification and evaluation of key impacts are regarded as the most important area of the EIA process. This review area comprises critical tasks in impact assessment of the development such as defining and identifying key impacts, scoping, prediction of impact magnitude and assessment of impact significance. The score of 0.74 indicates that the Myitsone Hydropower Dam's EIS was satisfactory in this review area while the EIS of the Letpadaung Copper Mine and the China–Myanmar oil and gas pipelines were borderline, with the scores of 0.66 and 0.62, respectively. Common deficiencies observed in this area were a failure to identify impacts using a systematic methodology and a failure to follow international quality methods and standards to assess the significance of impact. Inadequate explanation of methods

**Table 8.** Variation in EIS quality for review area 2.

Overall Assessment	Review Area 2	Review Category				
		2.1	2.2	2.3	2.4	2.5
% Satisfactory	30	8	16	69	55	30
% Borderline	60	80	77	20	30	35
% Unsatisfactory	10	12	7	11	15	35
% Not Applicable	0	0	0	0	0	0

used to predict and evaluate impacts, was also observed for the Letpadaung Copper Mine and the China–Myanmar oil and gas pipelines. Other principal weaknesses identified for these two projects were the lack of public participation in the EIA scoping and methods used in the prediction of impact magnitude. Table 9 summarizes the result for review area 2.

#### 4.2.3. Alternatives and mitigation

The review area 3, alternative and mitigation, is the second weakest review area after review area 5. Half of the EISs were graded as unsatisfactory, 32% were borderline and only 18% achieved a satisfactory grade (see Table 10). This result is in common with most of the previous EIS quality review around the world which indicated this review area to be the weakest category (Barker and Jones 2013; Jones and Fisher, 2015; Pinho et al. 2007; Gray and Edward-Jones 1993). Common deficiencies observed in this review area were a failure to provide information for consideration given to alternative project sites and operation processes, inadequate information for mitigation methods and their commitment to the proposed methods. Consideration of alternatives is also recognized as a problematic category in previous studies conducted for EIS quality in other countries (Glasson 2005; Badr et al. 2011). Monitoring of the mitigation measures was also weak and seldom linked to an Environmental Management Plan, mentioned in the EIA procedure.

Similar to previous findings, this review area is the least well-performed area for all three projects, with only the Letpadaung Copper Mine assessed as borderline (0.62) and the other two assessed as unsatisfactory, with the result of 0.35 for the Myitsone Hydropower Dam and 0.50 for the China–Myanmar oil and gas pipelines. Notably, the Myitsone Hydropower Dam performed worst in this review area, with almost all the review category scoring below the satisfactory level. Therefore, this result correlates to the result of Pinho et al. (2007) in their study of EISs in hydropower

**Table 9.** Result for review area 2.

Projects	Review Area	Review Category				
		2.1	2.2	2.3	2.4	2.5
Myitsone Hydropower Dam	B	B	C	B	B	C
Letpadaung Copper Mine	C	C	D	C	B	B
China–Myanmar oil and gas pipelines	C	C	C	B	C	D

**Table 10.** Variation in EIS quality for review area 3.

Overall Assessment	Review Area 3	Review Category		
		3.1	3.2	3.3
% Satisfactory	18	10	7	16
% Borderline	32	30	40	48
% Unsatisfactory	50	60	53	36
% Not Applicable	0	0	0	0

projects. There is, therefore, considerable scope for improvement in this review area. Consideration of alternatives and mitigation is particularly important for an EIA process since it seeks to ensure that the project proponent has considered other feasible approaches, including alternative development locations, operation processes, scales and layouts (Glasson 2005). Consideration of alternatives, especially reappraisal of those alternatives, was identified as the most problematic area for all the projects. Table 11 summarizes the result for review area 3.

#### 4.2.4. Communication of results

Communication and presentation of an EIS is also a vital area in the EIA process as it allows readers to understand the information and estimates of impacts derived from the various steps in the process (Glasson 2005). A great number of the EISs under review, in area 4, communication and presentation of information, performed well with 74% of the EISs scored satisfactory while 21% were borderline and only 5% being unsatisfactory (see Table 12). Much prior research also found that tasks related to layout and presentation usually scored higher (Lee et al. 1999; Pinho et al. 2007; Badr et al. 2011). This was also found to be the case in the current study, with 86% scored satisfactory for layout and 75% for presentation. Conversely, emphasis given to severe impacts and non-technical summary were not well-performed, satisfactory EISs being only 9% and 8%, respectively. This is a significant deficiency because the provision of a non-technical summary is especially important for the effective communication of the result of an EIA.

In this review area, the Myitsone Hydropower Dam and the Letpadaung Copper Mine results were satisfactory (0.70 and 0.76, respectively). The result for the China–Myanmar oil and gas pipelines was unsatisfactory with the score of 0.47. Contrary to this result, Barker and Jones (2013) found satisfactory result for the UK oil and gas sector in terms of this review area. Similarly, providing a non-technical summary and

unbiased statements appears to be the most problematic categories for these three projects. Table 13 summarizes the result for review area 4.

#### 4.2.5. National involvement

The last review area, national involvement in an EIA process was the weakest area with only 5% of EISs achieving a satisfactory grade and 88% graded as unsatisfactory (see Table 14). The majority of the sampled EISs were unsuccessful in providing adequate information for government, experts and public participation, in the process of conducting an EIA. There has been only one previous study that included national involvement in their study (Guilanpour and Sheate 1997). They found unsatisfactorily lower grades for all the review categories in this review area. Our result is consistent with this prior finding.

Given the fact that the three mega projects, the Myitsone Hydropower Dam, the Letpadaung Copper Mine and the China–Myanmar oil and gas pipelines, are managed by state-owned enterprises that operate in natural resource sectors, national involvement is extremely important in the EIA process. The participation of government, experts and the public is crucial in executing an effective EIA in Myanmar. The involvement of government officials' opinions and concerns in the EIA process can help to ensure that national environmental policies are incorporated in the EIA decision-making process in Myanmar (Guilanpour and Sheate 1997). The Myitsone Hydropower Dam and the China–Myanmar oil and gas pipelines were assessed as unsatisfactory (0.40 and 0.20 respectively) in this area as they failed to provide adequate evidence of government, expert and public input into the EIA process. The Letpadaung Copper Mine result was satisfactory as the information provided was considered to be adequate, with the score of 0.80. As discussed above, this result can be attributed to the fact that the EIA for this project was conducted in conjunction with National Investigation Commission. Table 15 summarizes the result for review area 5.

**Table 11.** Result for review area 3.

Projects	Review Area	Review Category		
		3.1	3.2	3.3
Myitsone Hydropower Dam	E	E	E	D
Letpadaung Copper Mine	D	D	C	B
China–Myanmar oil and gas pipelines	D	D	C	C

**Table 12.** Variation in EIS quality for review area 4.

Overall Assessment	Review Area 4	Review Category			
		4.1	4.2	4.3	4.4
% Satisfactory	74	86	75	9	8
% Borderline	21	6	10	76	64
% Unsatisfactory	5	8	15	15	28
% Not Applicable	0	0	0	0	0

**Table 13.** Result for review area 4.

Projects	Review Area	Review Category			
		4.1	4.2	4.3	4.4
Myitsone Hydropower Dam	B	B	B	C	D
Letpadaung Copper Mine	B	B	B	C	C
China–Myanmar oil and gas pipelines	D	B	C	D	D

**Table 14.** Variation in EIS quality for review area 3.

Overall Assessment	Review Area 5	Review Category	
		5.1	
% Satisfactory	5		5
% Borderline	7		7
% Unsatisfactory	88		88
% Not Applicable	0		0

**Table 15.** Result for review area 5.

Projects	Review Area	Review Category
		5.1
Myitsone Hydropower Dam	D	D
Letpadaung Copper Mine	B	B
China–Myanmar oil and gas pipelines	D	D

## 5. Conclusion

The EIA process has been accepted as the cornerstone of decision-making mechanisms in environmental policy and the quality of an EIS is of great importance in informing public and decision makers about the consequences of a proposed project and mitigation measures (Peterson 2010). Therefore, a quality review of EISs is crucial in providing effective feedback for the improvement of EIAs. Given the massive scope and scale, rapid expansion of the developments and adverse impacts associated with Chinese Investments in the Myanmar natural resource sector, evaluating and monitoring EISs is vital. The evaluation of the quality of Chinese EISs in the natural resource sector in Myanmar shows that whilst only one third (33%) of the EISs sampled were satisfactory, 27% were borderline and the rest (40%), were unsatisfactory. This demonstrates a relatively poor overall quality of EISs in the industry when related to Chinese EIAs and quality improvements need to be made in several areas. For review area 3, alternative and mitigation, and review area 5, national involvement in the EIA process are the most problematic areas and require specific attention to improve the performance of overall EISs. Within the natural resources sector, the overall result of our study is similar to those in forest and mining sector but differs from those in wind energy, oil and gas, and hydropower.

From the analysis of the quality of the EIA reports of the three mega development projects in Myanmar, several omissions, inadequacies and deficiencies were also evidenced in all the projects despite the fact that the average scores indicate they were within the range of satisfactory for two of the three projects. Significant weaknesses were found in the area of evaluation of key impacts and consideration of alternatives and mitigation, which are vital areas of an effective EIA. It is also important to note that among the three projects, the EIA report of the Letpadaung Copper Mine was considered the best performing in terms of the adequacy of information provided in all the review areas. This can be attributed to the fact that the EIA for this project was conducted after the drafting of the first national EIA law and procedure together with the environmental protection law and environmental conservation rules in Myanmar. Previously, Myanmar did not require EIA for development projects and did not have standardized EIA systems (Aung 2017). Through public disclosure of

effective EIA reporting and successful engagement with stakeholders, the Letpadaung Copper Mine has mitigated the hostility against the project and resumed its operation. On the other hand, the quality of the EIA for the China–Myanmar oil and gas pipelines project is substantially lower and the company did not disclose the report to the public. The report for this project was conducted before Myanmar enacted the requirement to conduct an EIA and make it publicly available. These findings suggest that the strength of the mandatory requirement of EIAs, EIA guidelines and national involvement in an EIA process played a significant role in overall quality of Chinese EIAs and public acceptance of such development in Myanmar.

The results yield several important implications for policy makers, investors and stakeholders, not only in Myanmar and China, but also in other developing countries with similar scenarios. Governmental guidance and policies have proven to be crucial factors in better EIAs and in improving sustainability performance for Chinese enterprises abroad (United Nations Development Programme 2015). It is suggested that both the host and home country governments should emphasise institutional constraints and ensure enforcement to effectively regulate enterprises' EIA practices. Particularly, the Chinese government should strengthen guidance for 'going global' enterprises by providing clarified EIA requirements, penalty measures and supervision mechanisms, especially in the least developed countries like Myanmar, with manifestly poor environmental legislations. Going global policy is China's strategy to encourage enterprises' overseas investments. Project proponents need to strengthen their EIAs, integrate with stakeholders, enhance transparency in environmental management and make practical contributions to local development. In order to avoid disputes between stakeholders and enterprises, effective impact assessments, mitigation plans and an inclusive approach in public decision making is required. Against this backdrop, this study's empirical evaluation of the EIA of mega Chinese developments in Myanmar can be useful to identify strengths and weaknesses in EIA practices and help manage the issues that engender continued controversy surrounding Chinese enterprises' commitment to sustainable development in the region.

## Disclosure statement

No potential conflict of interest was reported by the authors.

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## References

- [MCPWC] Myanmar China Pipeline Watch Committee. 2016. In search for social justice along the Myanmar-China oil and gas pipeline. Myanmar China Pipeline Watch Committee.
- Arts, J., Fischer, T.B., Runhaar, H. & Jha-Thakur, U. 2013. Environmental Governance: Reflecting on 25 years of EIA practice in the Netherlands and the UK. *Journal of Environmental Assessment Policy and Management*. 14(4)
- Arkan Oil Watch. 2012. Burma's resource curse: the case for revenue transparency in the oil and gas sector. p. 51. [accessed 2018 Apr 17] <http://www.burmacampaign.org.uk/images/uploads/Burmas-Resource-Curse.pdf>
- Aung TS. 2017. Evaluation of the environmental impact assessment system and implementation in Myanmar: its significance in oil and gas industry. *Environ Impact Assess Rev*. 66:24–32.
- Badr E, Zahran A, Cashmore M. 2011. Benchmarking performance: environmental impact assessment statement in Egypt. *Environ Impact Assess Rev*. 31:279–285.
- Baker, DC. & McLelland, JN. 2003. Evaluating the Effectiveness of British Columbia's Environmental Assessment for First Nations' Participation in Mining Development. *Environmental Impact Assessment Review*, 23(5), pp. 581–603.
- Barimah PT. 2014. Quality of environmental impact statements in Ghana. *J Environ Earth Sci*. 4(21):140–145.
- Barker A, Jones C. 2013. A critique of the performance of EIA within the offshore oil and gas sector. *Environ Impact Assess Rev*. 43:33–39.
- Barker A, Wood C. 1999. Evaluation of the performance of the European EIA process. *Environ Impact Assess Rev*. 23(4):439–451.
- Brennan E, Doring S. 2014. *Harnessing Myanmar's hydro-power and negotiating conflict*. Sweden: Institute for Security and Development Policy.
- Cashmore M, Christophilopoulos E, Cobb D, Bond A. 2004. The interminable issue of effectiveness: substantive purposes, outcomes and research challenges in the advancement of environmental impact assessment theory. *Impact Assessment and Project Appraisal*. 22(4):295–310.
- Chan T. 2015. Myanmar and China's one belt one road strategy. Hong Kong: China Business Centre.
- Chang, T., Nielsen, E., Auberle, W. and Solp, F. 2013. A quantitative method to analyze the quality of EIA information in wind energy development and avian/bat assessments. *Environmental Impact Assessment Review* 38:142–150.
- Christie K. 2014. Myanmar's China threat: how the UN global compact is changing development in Southeast Asia. *Athens J Soc Sci*. 1:9–20.
- Coles RW, Taylor J. 1993. Wind power and planning: the environmental impact of wind farm in the UK. *Land Use Policy*. 10(3):205–226.
- Dancery R, Lee N. 1993. The quality of environmental impact statements submitted in Ireland and the United Kingdom: a comparative analysis. *Project Appraisal*. 8:31–36.
- Dun C, Ji L, Peng K. 2016. Chinese investments in Myanmar-scoping study. China: Global Environmental Institute.
- Environmental Protection Agency. 2015. Revised guidelines on the information to be contained in environmental impact statements. Environmental Protection Agency.
- European Union. 2016. Environmental Impact Assessment. [accessed 2018 Apr 17]. <http://ec.europa.eu/environment/eia/eia-legalcontext.htm>
- Ewing JJ, Hangzo PKK. 2013. Will the resource tide lift all boats? Responsible development in Myanmar. Canada: Center for Non-traditional Security Studies.
- Foreign Policy 2016 Fragile State Index. Foreign Policy. [accessed 2018 Apr 17]. <http://foreignpolicy.com/fragile-states-index-2016-brexit-syria-refugee-europe-anti-migrant-boko-haram/>
- Gelb S, Calabrese L, Tang X. 2017. Foreign direct investment and economic transformation in Myanmar. China: Carnegie-Tsingua Center for Global Policy.
- Glasson JR. 2005. *Introduction to environmental impact assessment*. 3rd ed. London: Spon Press. Government of the Republic of the Union of Myanmar. 2015.
- Government of the republic of the union of Myanmar. 2015. Environmental impact assessment procedure. Ministry of environmental conservation and forestry.
- Gray IM, Edward-Jones G. 1993. A review of the quality of environmental impact assessments in the Scottish forest sector. *For*. 72(1):1–10.
- Guangsheng L. 2015. Sino-Myanmar ties: lessons from the "Myitsone Dam Event". Singapore: S. Rajaratnam School of International Studies.
- Guilanpour K, Sheate WR. 1997. A systematic review of Tanzanian environmental impact statements. *Project Appraisal*. 12(3):138–150.
- Hilton I. 2013. China in Myanmar: implication for the future. Norway: Norwegian Peacebuilding Resource Centre.
- International Rivers. 2016. Independent expert review of the Myitsone Dam EIA. International Rivers.
- Jones, R. and Fisher, TB. 2015. EIA follow-up in the UK-a 2015 update. *Journal of environmental impact assessment policy and management*. 18(1). <https://doi.org/10.1142/S146433321650006X>
- Jones, JP. and Fischer, TB. 2013. Strategic environmental assessment (SEA) for wind energy planning: Lessons from the United Kingdom and Germany. *Environmental Impact Assessment Review*. 50: 203–212.
- Kadir SM, Momtaz S 2010. The quality of environmental impact statements in Bangladesh. *Conference Proceedings of the Role of Impact Assessment in Transitioning to the Green Economy*. Geneva. April 6–11.
- Kirchherr J. 2017. Conceptualizing Chinese engagement in South-East Asian dam projects: evidence from Myanmar's Salween River. *Int J Water Resour Dev*. accessed 2018 Apr 14. doi:10.1080/07900627.2017.1322942.
- Lee DT. 2015. Myanmar Letpadaung Copper Mining Project. USA: University of Manchester.
- Lee N, Colley R. 1990. *Reviewing the quality of environmental statements*. Manchester: Department of Planning and Landscape, University of Manchester.
- Lee N, Colley R, Bonde J, Simpson J 1999. *Reviewing the quality of statements and environmental appraisals*. Occasional paper no.55. Manchester (UK): EIA Centre, Department of Planning and Landscape, University of Manchester.
- Li, F. 2009. *Documenting Accountability: Environmental Impact Assessment in a Peruvian Mining Project*. Political and legal anthropology review. 32(2):218–236.
- MacGrath C, Bond A. 1997. The quality of environmental impact statements: a review of those submitted in Cork, Eire from 1988–1993. *Project appraisal*. 12:43–52.
- Martínez-Alier J, Rodríguez-Labajos B. 2011. The Myitsone dam in the Irrawady River (Burma – Myanmar), Environmental Justice Organisations, Liabilities and Trade. 1:3.
- McMahon N. 1996. Quality of environmental impact statements submitted in Northern Ireland in relation to the disposal of waste land. *Project Appraisal*. 11:85–94.

- Morrison-Saunders, A, Baker, J and Arts, J. 2003. 'Lessons From Practice: Towards Successful Follow-Up', *Impact Assessment and Project Appraisal*, vol 21, pp43–56.
- Mounir ZM. 2015. Evaluation of the quality of environmental impact assessment reports using Lee and Colley package in Niger Republic. *Mod Appl Sci.* 9 (1):89–95.
- Peterson K. 2010. Quality of environmental impact statements and variability and scrutiny by reviews. *Environ Impact Assess Rev.* 27(3):189–205.
- Phylip-Jones J, Fischer T. 2013. EIA for wind farms in the United Kingdom and Germany. *J Environ Assess Policy Manag.* 15(2):134008.
- Pinho P, Maia R, Monterroso A. 2007. The quality of Portuguese environmental impact studies: the case of small hydropower projects. *Environ Impact Assess Rev.* 27(2007):189–205.
- Shwe Gas Movement. 2009. Corridor of power: China's Trans-Burma oil and gas pipelines.
- Shwe Gas Movement. 2013. Drawing the line: the case against China's Shwe Gas project for better extractive industries in Burma. Shwe Gas Movement.
- Sun Y. 2013. Chinese investment in Myanmar: what lies ahead. Washington: Stimson.
- Thant H 2017 Letpadaung Copper Project to bring in US \$20m, Myanmar Times. [accessed 2018 Apr 14]. <http://fundforpeace.org/fsi/data/>
- Tracy EF, Shvarts E, Simonov E, Babenko M. 2017. China's new Eurasian ambitions: the environmental risks of the silk road economic belt. *Eurasian Geography and Economics.* 58(1):56–88.
- United Nations Development Programme. 2015. Report on the Sustainable Development of Chinese Enterprises Overseas. China: United Nations Development Programme.