VERTICAL INTEGRATION FOR STAKEHOLDER MANAGEMENT OF HYDROELECTRIC POWER PROJECTS IN LAO PDR

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ABSTRACT

During the past three decades, Lao PDR national policy has positioned the country to become the "Battery of Asia," harnessing the Mekong River and its tributaries for electric power generation. This policy has driven the construction of numerous Hydroelectric Power Projects (HPP). The purpose of this research is to analyze the critical roles of internal and external stakeholders in HPP megaprojects in Lao PDR. Data is gathered through in-depth interviews with internal and external stakeholders of two megaproject HPPs. The internal stakeholders are the project owner, first-tier contractors, Lao PDR's Minister of Energy and Mines, Electricity Generating Authority of Thailand (EGAT), and Electricite Du Laos (EDL). The external stakeholders are Lao PDR's Ministry of Natural Resources and Environment, Lao PDR's Province Governor. The interviewees of this research were directors, a governor, and the managing directors. We found that deep collaboration and trust among internal stakeholders are critical for success in HPPs. Such collaboration and trust can be achieved by not only solid communications and following the contract agreement, but also through strategic choices that can limit excessive transaction costs and foster credible commitments of future benefit sharing among internal stakeholders. The critical requirements for successful management of external stakeholders are the mitigation of environmental impacts. Effective stakeholder management (SM) from the early construction stages through the project life cycle will result in efficient cost management, quick resolution of technical problems, and accelerated work progress. This research confirms the positive effects a successful SM process has upon mega-HPP construction. An effective SM process reduces risks during the construction by cultivating positive stakeholder engagement and relationships. These factors have a performance-enhancing effects upon megaproject HPP construction.

KEY WORDS: Stakeholder Management/Strategy/Megaproject Construction

101 Pages

CONTENTS

CONTENTS (cont.)

CONTENTS (cont.)

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

Abbreviations	Terms and Meanings
ASEAN	Association of South-East Asian Nations
CA	Concession Agreement
CITI	Collaborative Institutional Training Initiative Program
COD	Commercial Operation Date
CPO	Compulsory Purchase Order
CSP	Corporate Social Performance
DAB	Dispute Adjudication Board
ECC	Environmental Compliance Certificate
EDL	Electricite Du LAOS
EGAT	Electricity Generating Authority of Thailand
EPP	Environmental Protection Plan
EPC	Engineering Procurement and Construction
ESMMP	Environmental and Social Management and Monitoring Plan
EVN	Vietnam Electricity
HPP	Hydroelectric Power Project

LIST OF ABBREVIATIONS (cont.)

KWH	Kilowatt-Hour
IEE	Initial Environmental Examination
IPP	Independent Power Producer
IRB	Institutional Review Board
Lao PDR	Lao People's Democratic Republic
PI	Performance Indicators
PO	Performance Objectives
PPA	Power Purchasing Agreement
RAP	Resettlement Action Plan
SERS	Sustainability Evaluation and Reporting System
SF	Success Factors
SM	Stakeholder Management
SIA	Social Impact Assessment
MEM	Ministry of Energy and Mines
MRC	Mekong River Commission
MW	Megawatts
NGO	Non-Governmental Organization
USD	United States Dollar

CHAPTER ONE
INTRODUCTION

Lao PDR's economic strength lies in her richness and abundance of natural resources. One of Laos' key national policies is to focus on its energy sector and establish itself as the "Battery of Asia." Lao PDR has harnessed its national resources through Hydroelectric Power Projects (HPPs) construction upon the country's river systems. These HPPs have been developed not only to produce electricity for the nation and for export, but also for improved navigation, agricultural irrigation, infrastructure, and economic development. Foreign and domestic investors have constructed a series of hydroelectric power dams on Laos rivers for internal consumption and for sale through the ASEAN energy exporter policy. Thailand, Cambodia, and Vietnam are Laos' primary energy customers through this policy. Laos hydroelectric power is one of the cheapest energy sources for Thailand. Generally, the Electricity Generating Authority of Thailand's (EGAT) purchase price of HPP's electricity from Lao PDR is variable at approximately six to eight cents per kwh through a concession period. For comparison, electricity meter price in Thailand is approximately eleven to twelve cents charged to household per kwh in 2023.

By 2022, Laos had completed and begun commercial operations of 43 HPPs on the Mekong River and its tributaries. Five of these hydroelectric power plants have generation capacities of more than 500 Megawatts (MW). The other 14 HPPs have generation capacities between 100 – 500 MW, and the 24 smallest HPP have generation capacities of less than 100 MW. Currently on the Mekong River, there are nine Run-of-River HPPs on Lao's national energy plan. These Run-of-River HPPs are *megaprojects* due to their project values and the complexity of construction for environmental impact mitigation. In the construction industry, megaproject constructions are highly complex due to their sheer size as well as the value of the contracts and the number of stakeholders involved. Megaproject construction normally takes many years to research, design, plan, build and

maintain. In addition, the nature of megaproject construction projects becomes more difficult due to the challenges with their construction, contractual agreements, and the allocation of risks between stakeholders. Most megaproject constructions have a project value of above one billion dollars (Flyvbjerg, 2014). For such projects to be completed, they require support from and legal agreements with governments. Megaproject construction is part of strategic planning policy implemented by governments to achieve national economic development (HM Treasury, 2014) and is bounded by legal contracts with government agencies as shareholders at the organization level. Therefore, these stakeholders will have critical impacts on the projects, the people involved, and society. Due to the enormous impact of megaproject construction on communities around the site of the project, a high number of internal and external stakeholders are typically required to collaborate on the project management decisions. One major concern is understanding the public's concerns and how to address these issues. Successful megaproject construction's management needs to establish strong communication with society until the project is completed (Nisar, 2013).

A megaproject is typically a complex construction with multiple stakeholders (Fiori and Kovaka, 2005). Currently, there is only one megaproject Run-of-River HPP following the complete requirement for environmental impact mitigation from Mekong River Commission (MRC) on mainstream Mekong River. The construction of this Run-of-River HPP, which in 2023 possesses the highest HPP production capacity in Lao PDR, will be the focus of this research.

Reservoir and Run-of-River are the two types of HPPs in Lao PDR. The reservoir is an artificial lake formed by constructing dams across rivers. The reservoir dam controls the amount of water that flows out of the reservoir. The Run-of-River dam is an electric generator plant that allows a water inflow equal to the water outflow with no water being stored. At different pressure levels, the natural flow of the water from upstream to downstream spins a turbine and drives generators which produce electricity. Reservoirs are only allowed on the Mekong's tributaries, not on the mainstream Mekong River, only Run-of-River dams are allowed.

In 2019, the Case one HPP located in Northwestern Province in Lao PDR, was the first Run-of-River hydroelectric power plant to have completed construction and begun commercial operation on the mainstream Mekong River. Its installation power output is 1,285MW. This 2019 commercial operation date (COD) provides a successful example for the other seven Run-of-River hydroelectric power plants scheduled to be constructed on the Mekong River in the coming years. Five of these new Lao HPPs will be located at Pakbeng, Luang Prabang, Pak Lay, Phu Ngoy, and Don Sahong. The other three HPPs at Sanakham, Pak Chom and Ban Khoum are located on the Thailand and Lao PDR border. Consistent with the Battery of Asia policy, Laos expects upon full completion of the projects to have more than 100 hydroelectric power plants with a combined installed generation capacity of 28,000 MWh and annual power output of over 77,000 million kWh. By increasing its share of renewables, Lao PDR will strengthen its commitment to sustainable energy production.

The success of these HPPs is essential for driving Lao PDR economy. There are other stakeholders tied to the operation of these HPPs such as EGAT, EVN, EDL, and the MRC. The MRC monitors the Mekong's ecological system, including the livelihood of people working on the river, ensuring the sustainability of fisheries, agriculture, navigation, and providing guidance for sustainable hydroelectric power, data and information management, flood and drought management, and Mekong River basin planning. The MRC's responsibility is to provide mutual benefits among the downstream Mekong River countries of Lao PDR, Vietnam, Cambodia, and Thailand. Until 2022, nine of the forty-three HPPs in Lao PDR had sold their power output to EGAT and the remainder has been sold to EDL and EVN. Although the MRC plays a key role in the effort to sustain the Mekong River ecosystem, it has no direct authority over HPP construction. It only provides advice for Lao PDR for its sustainable management practices for lower Mekong countries. Lao PDR agrees to the MRC's requirements and strictly requires all HPP Run-of-River projects to adhere to the MRC's requirements. Lao PDR regularly audited the Run-of-River project's adherence to its requirements during construction and concession period.

The stakeholders of the HPP at the local level were the Lao provincial government agencies such as the Ministry of Energy and Mines, the Ministry of Natural Resources and Environment. These stakeholders have the authority to review, support, and

monitor the project regularly as the construction progresses. The construction schedule had to be planned carefully due to seasonal constraints, with work progressing more quickly in the dry season. The progress of the construction schedule and adaptive design in accordance with the MRC's requirement was reported periodically to Lao PDR.

This qualitative research seeks to add additional nuance and realism to previous studies of megaproject stakeholder management. Effective stakeholder management (SM) can be achieved through strong cooperation and trust, but these require time to build and are difficult to achieve in real world megaproject construction. This qualitative research explores the SM strategy in Lao PDR HPPs. The author explores why the SM strategy is critical to the project's success from the early stages and illustrates how external stakeholders can have critical influences upon the project. Without careful stakeholder management, external stakeholders who have power, legitimacy, and urgency toward a project can have negative influences during megaproject construction. Project managers must actively engage with the external stakeholders through project completion.

In this research, as stated earlier, there are two different types of dams, Run-of-River, and Reservoir. The author selected HPPs for megaproject construction based on pilot interviews with the government agency of Lao PDR. Case one and Case two were selected to represent different success levels for projects with a COD from 2019 to 2022. Successful completion required the project management teams to overcome technical difficulties, manage risks, conflict between internal and external stakeholders, and conduct responsible measures for environmental impact mitigation.

Case one, the first Run-of-River HPP in Northwestern Province, received strong support from Lao PDR as the pilot megaproject on the mainstream Mekong River. Construction began in 2012 with a successful COD in 2019. The project owner signed a concession agreement (CA) with Lao PDR, and Engineering, Procurement, and Construction (EPC) contract with its first-tier contractor. The original project investment was approximately 3.2 billion USD for the mitigation of environmental impacts with the completed design complying with MRC and Lao PDR requests such as the fish passage facilities, sediment passage facilities, and earthquake protection. After the EPC contract was signed and construction began, the MRC and Lao PDR increased their environmental

impact mitigation requirements for the project. The project owner followed these additional requirements from Lao PDR and the MRC to continue the construction. Therefore, the expenditure increased from the original investment.

Case two is a 177-meter-high reservoir dam located on Nam Kading River (Mekong branch) in Southern Province. Its COD was in August 2022. Reservoirs have fewer construction requirements than Run-of-River dams such as no navigation locks, fish passage facilities, and sediment passage facilities. Case two has a total capacity of 650 MW. The project provides 520 MW of energy generated to the EGAT and 130 MW for EDL. Construction began in June 2016, at a total value of approximately 1.3 billion USD. Case two entered a CA with Lao PDR in June 2016 and is jointly owned by three shareholders. CA is a contract that gives a project owner company the right to operate the power plant and sell its electricity for a fixed time as specified in the contract. On September 2017, Case two signed and entered into a power purchase agreement with the EGAT.

1.1 Research Background

Stakeholder management (SM) is a strategic method by which companies align stakeholder interests and create relationships among them. In this respect, multiple studies have explored the strategies for managing stakeholder interests and relationships (Olander, 2006). Various strategies have been presented in previous stakeholder articles (Freeman, 1984; Savage, et al., 1991; Clarkson, 1994; Aaltonen & Sivonen, 2008; Banerjee & Bonnefous, 2011). From the previous studies on this subject, there is strong evidence to show that one of the primary factors in a project's success or failure is how project management handles the stakeholders. These stakeholder impacts have been studied to determine their influence on the success or failure of the project process (Bourne and Walker, 2005; Atkin & Skitmore, 2008).

However, limited research has been conducted on the influence of stakeholder management (SM) on megaproject construction. Only a few such studies have sought to explain that SM strategy might lead to a competitive advantage (Minyu, 2013). Regarding

previous studies in this field, scholars have verified by quantitative methods that SM positively affects firm performance. The results reveal an association between stakeholder management and firm performance leading to a competitive advantage. However, while internal stakeholder management was found to have a positive association with firm performance leading to a competitive advantage, external stakeholder management was found to be negatively associated with firm performance. Despite these findings, the authors do not recommend that companies neglect external stakeholders entirely, but rather that they continue to explore the opportunity of prioritizing one group over the other (Galbreath, 2006).

Previous studies have explained the different objectives of the various stakeholders and how they often contradict each other, but these differences can be managed (Brunet & Aubry, 2016). Past research has also verified the positive effect from internal primary stakeholders and the negative effect from external primary stakeholders on a firm's performance for a period of up to one year after the project completion (Galbreath, 2006). However, further studies observed the curiosity of how the effect from primary stakeholders might change over time to support the firm performance leading to a competitive advantage. This research will explore internal and external primary stakeholders who have a relationship with the project in accordance with their respective power (Donaldson & Preston, 1995; Mitchell et al., 1997).

1.2 Research Objectives

In this dissertation research, there are three objectives. The first objective is investigating the influence of internal and external stakeholders on HPP megaproject construction. This objective will follow the instrumental stakeholder management theory to verify project management performance consequences for firm relationships with stakeholders (Donaldson & Preston, 1995).

The second objective is to compare internal and external stakeholder strategies on different hydroelectric power plants. In this research, the author will collect evidence to

show how stakeholder management plays a critical role with internal and external stakeholders comparing Case one and Case two projects. There are two hydroelectric power plant types in Lao PDR which are run-of-river and reservoir type. To compare different contractors and hydroelectric power plant types, it will display what are the different stakeholder management strategies from each project management. The third objective is to understand how stakeholders' strategy might create a competitive advantage in the HPP megaproject construction. In this megaproject construction, project management contacts stakeholders and cooperates with them in the construction life cycle. This research verifies practical insights into project management understanding of whether there is strategic value for management that might create the competitive advantage for project comparing among different hydroelectric power plant contractors.

Freeman and McVea (2017) advise researchers to focus not only on theory research but also on real-world problems. There are valid reasons for considering this suggestion in stakeholder theory, especially the requirements from primary stakeholders in relation to environment and social matters. Usually, only internal stakeholders have direct authority over a project, but not the external stakeholders. For HPP megaproject construction in Lao PDR, external stakeholder in megaproject construction is Mekong River Commission (MRC) who can affect a project's activities through the power they exert by raising concerns to Lao PDR. In theory, megaproject construction must satisfy the multiple interests of stakeholders and prevent negative impacts from them. The project management applies stakeholder management strategy in the project decision-making to ensure the conditions were agreed by all stakeholders for achieving their specific interests. In construction, stakeholder management is a strategic solution for project management to be applied at the early stage of the project. Various studies have shown how important stakeholder management is for project success, but only a few studies have addressed how stakeholder strategies might create a competitive advantage for the project owner and construction company. For megaproject construction, the success of the project's goals is measured not only by the project being completed, but also by other factors such as corporate reputation, economic growth, sustaining good relationship with stakeholders, public interest, and adhering to government policy (Mok et al., 2015). In this study, the

author wants to illustrate a real-world application of stakeholder strategy from project management for megaproject construction. This study will explore the roles of internal and external stakeholders in megaproject and identify SM strategies that might lead to a competitive advantage.

Adding to the findings of previous stakeholder management studies, this study will be presented as academic research on stakeholder management literature. This study of stakeholders will identify factors related to how stakeholder management strategy might lead to a competitive advantage in megaproject construction which will contribute to stakeholder management literature knowledge. The findings from this dissertation can provide additional knowledge to the stakeholder management literature. Previous literature encourages further study to explore the influence of internal and external stakeholders on the project.

1.3 Research Questions

1. *What influences do internal and external primary stakeholders exert on different hydroelectric power plant construction projects?*

2. How can internal and external primary stakeholders be managed in such a way as to enhance their positive influences and minimize their negative impacts in different hydroelectric power plant projects?

3. How might stakeholder management strategy lead to a competitive advantage in hydroelectric power plant megaproject construction?

1.4 Research Scope and Significance

The process of stakeholder management and its influence have been explored in previous studies through quantitative approaches (Galbreath, 2006). These studies tend to find that internal primary stakeholders are more supportive to the stakeholder management process, while external stakeholders are more obstructive. This research

extends previous studies on internal and external stakeholders by studying their influence on two HPP megaprojects construction in Lao PDR. These two megaprojects were selected because of the large number of stakeholders involved. Each project illustrates significant work and multiple concerns from internal and external stakeholders in a real-life construction environment. These two projects apply different SM processes, which yielded different positive and negative impacts from the planning stage through the projects' completion. In this type of research, quantitative methods are less desirable because, unlike qualitative research, quantitative methods do not obtain in-depth information and insights from interviews with multiple internal and external stakeholders.

Qualitative research is an engagement approach of studying respondents' perspectives (Yeung, 1995). When scholars want to describe an activity or phenomenon, Exploratory Research Method is an appropriate method for collecting data and evidence. The author relied on the insights of internal and external stakeholders who provided the information through their analysis and observations for an evaluation of the SM process. The author's methods of data collection included reading documents, visiting different construction projects, and conducting in-depth interviews of government officials and civilian contractors.

The SM literature agrees that project must address stakeholder engagement from the initial stages of megaproject construction (Yang et al., 2018). The project developer must structure the SM processes for internal and external stakeholders to achieve the most beneficial outcome. Project managers must investigate each stakeholder's levels of power, legitimacy, and urgency and apply strategies to align stakeholder requirements with the project's requirements (Mitchell et al., 1997). This research examines the outcomes of megaproject construction and their SM process strategies at various levels. The internal and external stakeholders were interviewed with structured questions to collect data and to explore their role in megaproject construction. When the interviewees were not stay in Thailand or Lao PDR. The study of the SM process in this research was conducted in three steps. The first step explored the SM process for internal and external stakeholders in

megaproject HPP construction which author have labeled as Case one and Case two. The second step explored the impact of the stakeholders upon the projects. The third step analyzed, by comparing the two cases, how different SM processes implemented in initial stages can benefit projects and their outcomes.

CHAPTER TWO
LITERATURE REVIEW

The purpose of this research is to study the stakeholder influence on megaproject construction. The nature of megaproject construction requires the participation of multiple stakeholders which can often create confrontation leading to project obstacles (Ng et al., 2005). Naturally, the various stakeholders have their own interests and goals, which inevitably influence the outcome of the project following their goals. The influence on the project can be both positive and negative (Olander & Landin, 2008) effects. There is evidence to show that stakeholders affect the project outcome, especially in megaproject construction (Mok et al., 2015). The author concentrated on stakeholder influence in megaproject construction. Existing theories offer strategy roadmaps to reduce the impact of unsupportive stakeholders and encourage supportive stakeholders (Aaltonen et al., 2015). Previous research in this field has discussed conflict among stakeholders with diverging objectives (Leung et al., 2002). This research classified stakeholder influence in construction following these themes: stakeholder interest and influence and stakeholder conflict.

The author concentrates on stakeholder interest and influence. While this theme has been only sparsely studied, it is of immense importance as it examines the effects of stakeholder actions during each stage of the project. Project management who can foresee problems will be the most likely to be successful (Banerjee & Bonnefous, 2011). More empirical studies of stakeholder influence on construction projects are needed to prevent stakeholder problems during each stage of construction. Stakeholder management (SM) has been studied by scholars since the 1960s (Stoney & Winstanley, 2001). Edward Freeman, a famous scholar in the field of stakeholder theory, introduced the classic definition of the stakeholders when he wrote the stakeholder capitalism theory: a stakeholder approach (Freeman, 1984). According to Freeman (1984), the project management must concentrate

on creating interconnected relationships between all related business parties and other stakeholders such as customers, suppliers, government agencies and organizations. Stakeholders must be treated in fairness, not only as shareholders. Freeman considered the sustainability of corporations, which goes beyond the shareholder aspect. Stakeholder management plays a vital role, especially in large infrastructure megaproject construction that involves many stakeholders (Mok, et al. 2015). Each stakeholder comes from a different entity and with different goals from the project. Therefore, SM is a method of strategic thinking that enables project management to estimate situations and analyze how to cooperate with multiple stakeholders. Managers can apply SM to stakeholders in a rational method to develop a sustainable relationship with them. In previous studies, stakeholders have been classified into three types: supportive, obstructive, and passive stakeholders. Each stakeholder type requires a different strategic approach from the project manager (Banerjee & Bonnefous, 2011).

In construction projects, several articles define stakeholders in terms of their necessity for the firm's survival (Freeman & Reed, 1983). Since the definition and concept of stakeholder theory were established (Freeman, 1984), SM has been developed and studied by many scholars and it is now classified as one of the major subjects in management theory.

In this research, the author studies stakeholder management theories and stakeholder influence in megaproject construction. To achieve this, the author extracted articles from the Scopus database and classified these articles by different schools of thought. Then, the author identified stakeholder influence and developed a conceptual framework to display multiple stakeholder influences on construction projects.

2.1 Definitions

The definitions of stakeholders are presented in this literature review. Many different definitions of stakeholders have been provided in literature since the 1960s. There were more than 20 definitions of stakeholders from different scholars (Mitchell et al., 1997),

but Stakeholder management theory of Edward Freeman (1984) identifies who are stakeholders which need to be managed. His theory is the reference for stakeholder management theory. Stakeholder definition can be summarized as broad and narrow definitions which have different meanings as described below.

The broad definition describes stakeholders as "any group or individual who can affect or is affected by the achievement of the organization's objectives" (Freeman, 1984). This stakeholder definition includes all the parties related in some way to the firm's objectives. Stakeholders who bear either risks or no risks are all included if their entities are affected by the achievement of the firm's objectives.

The narrow definition of stakeholders refers to those whose relationship with a firm includes something being placed at risk. Clarkson (1995) has pointed out the difference between voluntary and involuntary stakeholders: "Voluntary stakeholders bear some form of risk because of having invested some form of capital, human or financial, something of value. Involuntary stakeholders are placed at risk because of a firm's activities. But without an element of risk, there is no stake" (Clarkson, 1995).

The main differences between the broad and narrow definitions are that the broad definition includes all relationships a stakeholder has with a project either with or without risk. In contrast, the narrow definition is based on a stakeholder that has any form of risk in relation to the project. In general, the narrow definition of stakeholders defines stakeholders in terms of economic interests in a project.

For the stakeholder management theory literature review, the author extracted data from the Scopus database using the keyword "stakeholder management". The author reviewed the top thirty cited articles related to stakeholder management. There are other articles that were not in the top thirty, but which are frequently cited. Since classic articles tend to be cited more often than new articles, the author reviewed modern stakeholder management articles such as the top twenty cited articles on SM influence.

Regarding the issue of stakeholder management for literature review, the author extracted knowledge of SM from the Scopus database. Stakeholder management in construction was classified by a scientific mapping review method in this paper. The review found 929 relevant SM articles in the Scopus database, which can be classified into different

knowledge bases. They are stakeholder engagement, the stakeholder management process, stakeholder analysis methods, stakeholder influence, and stakeholder management contribution to effective management.

The knowledge base on SM has developed over decades and can be used as a resource for understanding how to reduce risks and improve the achievement of projects. The achievements of construction projects can be measured by cost, time, and quality. Stakeholders will have some influence upon these factors. The author aims to review stakeholder influence in megaproject construction to understand what their actions and effects are on these projects and how managers can set up the strategies to improve in real world situations.

To identify stakeholders for construction articles, the author defined five key phrases in the Scopus database, which were "stakeholder" and "project participant" for the people and "construction projects", "complex construction projects" and "civil engineering projects". These key phrases were then used to filter the SM knowledge base. Second, to achieve a reliable knowledge base, the author considered the most influential authors, specifically the co-citation authors in the field of SM. Third, to limit unrelated articles, the author excluded subjects, document types, keywords and languages that were not related to SM. Fourth, to ensure the accuracy of the articles' data, the author got 1,147 articles from the first round of extraction from the database, but some of these were not related to stakeholder influence in construction. The author manually deleted 218 unrelated articles in CSV file. Finally, there were only 929 articles on stakeholder influence in construction for the scientific mapping review method. The author extracted data from Scopus using search procedures that followed the Prisma flow chart. The results were analyzed with VOS viewer program. The findings of these articles formed the knowledge base of SM for civil construction that has been studied since the 1960s.

From the co-citation author analysis, when two articles were co-cited together, they would have closely related data. This can be interpreted as being part of a school of thought in this paper. A link is a connection between two authors. Co-cited authorship links authors (Van Eck & Waltman, 2018). After the author extracted SM articles from Scopus, the author reviewed these articles by selecting the most cited articles and the top twenty

cited articles. The author used the Scimago Journal web page to search for the related authors with the most citations in related topics as well. For manual review method, the author reviewed stakeholder influence in construction articles from the database. The author classified stakeholder influence on construction projects into seven types which select from the top cited 100 articles from the database. The author selected stakeholder influence on construction projects which overlaps with stakeholder management theory to verify that stakeholder management theory has an influence on construction projects. There are theories that have been found as the following.

2.2 Descriptive Stakeholder Management Theory

Legal issues are required to address the stakeholder's issues. The accommodation strategy is a less active approach to dealing with issues. Finally, the pro-action strategy involves doing more than required to address a stakeholder's issues.

Clarkson (1995) presented a framework and methodology on practical corporate behavior related to corporate social performance (CSP). Three principal sections can be summarized as follows: the first principle is the approaches, models, and methodologies in practical CSR; the second principle is a discussion of the conclusions from corporate relationship management with stakeholder groups, which indicated the importance of distinguishing between social stakeholder issues and identifying the appropriate level of analysis to evaluate CSP; and the third principle is a discussion related to the manager's actions.

This article recommends that the role of managers is representative of all stakeholders and not only shareholders. Once managers realize their roles, then morals and fairness will thrive. This article may not be directly related to stakeholder influence, but the author considers it to be a good awareness of all stakeholder rights. Strategies were applied to stakeholders who influenced the project. Managers must consider not only shareholders, but also the other stakeholders. Eventually this awareness will create fairness with other stakeholders and enhance the sustainability of the firm.

Mitchell, Agle, & Wood (1997) described multiple stakeholder types as follows. The first type is based on assets, such as the owner assets and non-owner assets of the firm. The second type is based on different purposes, such as actor or acted upon stakeholders. The third type is based on the level of willingness, either a voluntary or involuntary relationship with the firm. The fourth type is based on the type of contract entered between the firm and the stakeholder, such as right holders or contractors. The fifth type is based on the moral obligation of the stakeholder or the legal principles of the firm to bear a fiduciary duty. The sixth type is based on resources, such as resource providers or dependents of the firms. The final type is based on risks and includes risk takers or influencers.

There are three classes of stakeholder attributes. The first attribute is the power to influence the firm. The second attribute is the legitimacy to influence the firm. The third attribute is the urgency to influence the firm. These three attributes of stakeholders are concluded as power, legitimacy, and urgency. This literature differentiates stakeholders into nine types: latent, dormant, discretionary, demanding, expectant, dominant, dependent, dangerous, and definitive. It described the stakeholders by their different behaviors a authority over projects. Each has a different combination of between one and three of these different attributes as described above (power, legitimacy, and urgency) in relation to the projects. The stakeholder with the least authority is the latent stakeholder due to possessing only one of the three attributes, namely legitimacy. Project managers can choose to ignore this stakeholder type. This stakeholder type has no power or urgent claim over the project. The other stakeholders hold different attributes which have different effects on the project in their own types, but the stakeholders with the highest authority over a project are dangerous stakeholders and definitive stakeholders.

Dangerous stakeholders have urgency and power attributes. Although this stakeholder type does not have the legitimacy attribute, project managers consider them dangerous due to their power and urgency contributing to the potential for conflict and even violence, having a dangerous effect on the project. For example, they may commit unlawful acts, such as terrorism, employee strikes, and any kind of protest. The most powerful and

critical type of stakeholders are definitive stakeholders. Project managers must realize who the definitive stakeholders are at the beginning of the project. This stakeholder type has all three of the stakeholder attributes (power, legitimacy, and urgency). Project managers must be careful with this stakeholder type and give immediate priority to them. Examples of definitive stakeholders are shareholders and stockholders. The author considers this article to be a valuable stakeholder management reference as well. Stakeholder attributes are a tool to analyze each stakeholder for their influence over a construction project. If managers can specify the attribute types of multiple stakeholders, they can choose a suitable strategy for each construction stage.

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Harrison & Freeman (1999) identified a relationship between stakeholder management and corporate social responsibility. Although the models and theories involved in these issues are expanding, there is still only limited empirical research. This article presents six aspects of the relationship between stakeholders, social responsibility, and corporate performance.

In future research, stakeholder management scholars need to find a better way to measure stakeholder effects other than economic and social issues. The author agrees with this statement that the effect of SM on construction projects can influence a project in many aspects, not only economic and social issues, but also the completion of the work. The qualitative research method would be a suitable method to extend the study of stakeholder influence beyond economic and social issues.

Hillman & Keim (2001) stated that shareholder value, stakeholder management, and social issues have developed a good relationship among internal and external stakeholders, such as employees, customers, suppliers, and communities. This good relationship has been verified and its significant role summarized to help firms develop valuable assets which lead to a competitive advantage. In contrast, project managers must select resources for social aspects carefully, due to their value not being directly related to shareholders. SM theory's main purpose is to increase shareholder value, while reducing negative impacts from social issues. Stakeholder influence on a project is very significant. It will create a competitive advantage in the long run, which can improve the wealth of the firm. The author recommends that the conclusion from this empirical research be studied further in relation to construction projects. The construction stage of a hydropower plant can last for up to ten years. Each stage of the construction project can be studied from the beginning to the end of the project to see the extent to which a good relationship will affect project accomplishment or the wealth of the firm.

In the evaluation of stakeholder influence on the implementation of construction projects, the author grouped stakeholders using the power/interest matrix so that project managers can get a better picture of which type of communication and relationship is most appropriate for different stakeholders. Stakeholder relationships impact a project and its implementation (Olander & Landin, 2005). However, the power and interest of the stakeholder result in different impacts on each stage of a project, such as the proposal stage and revised stage. It is the duty of project managers to acknowledge different proposal stage and revised stage. It is the duty of project managers to acknowledge different

types of stakeholders and determine how to reduce their impact. There are multiple stages

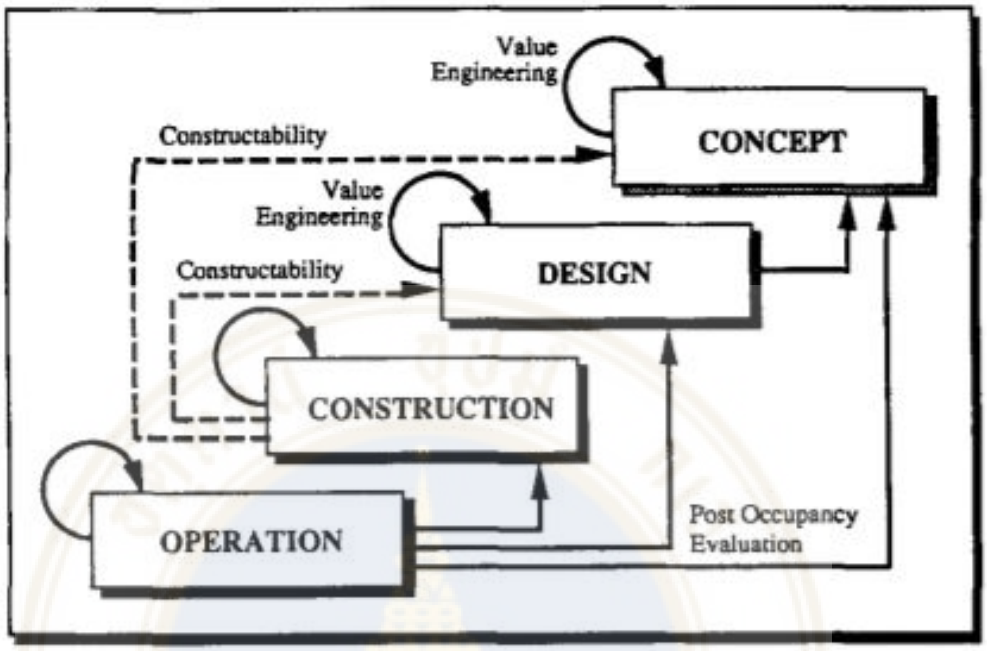


Figure 2.1 Project Life Cycle

to be followed to complete construction projects. The first stage is the feasibility and conceptual study stage, while the second stage is design. The third stage is the construction stage, and the final stage is the operation stage (Kartam, 1996). The project life cycle is illustrated in Figure 2.1.

Eventually, project managers must work together with stakeholders to complete the project. Project managers must align stakeholder goals with the project goals. This article represents the power and interest of stakeholders in each construction stage. It suggests the need for further research to investigate the identification of stakeholders in terms of their demands, potential influence, and strategies, as well as the project decision results, stakeholder management process, costs, and risk assessment. The aim of this further research should be to study multiple stakeholder influences on construction projects.

Perrini & Tenkati (2006) presented corporate sustainability which depends on the stakeholder relationship. Corporations will have appropriate measurement systems to assess the strength of their relationship with stakeholders. Companies need to ensure that they communicate efficiently with stakeholders to achieve their corporate goals. Their paper went beyond the normal balance scorecard to present the idea of integrating stakeholders into accounts with financial measurements as well. It presents a sustainability evaluation and reporting system (SERS) to monitor the overall corporate performance according to a stakeholder framework. This article considers the overall stakeholder relationship network with the various interests of different stakeholder groups who will influence the project in economic, social, and environmental aspects.

Aaltonen & Sivonen (2008) divided stakeholders into internal and external stakeholders. In contrast with internal stakeholders, external stakeholders are not formal members of the project. They identified the following five strategies for stakeholders: adapter strategy refers to complying with the customer's response and deciding to wait for the resolution of the conflict; compromise strategy refers to a strategy whereby the organization is willing to compromise its objectives with stakeholders to reduce pressure; avoidance strategy refers to when the organization is willing to lose its relationship with the stakeholder, which is an option for organizations that can transfer the responsibility for managing conflicts to other organizations; dismissal strategy refers to ignoring the demands and pressures from stakeholder, which may not be an effective way to handle stakeholders, but it may work in some situations such as when there is a lack of local knowledge and lack of experienced stakeholders: and influence strategy refers to the alignment of interests among different stakeholders to create a similar interest in the project.

The author would like to review these five strategies for stakeholders in construction projects to determine when it is the right time for each strategy. These five strategies have positive or negative effects on multiple stakeholders in construction projects.

Harrison, Bosse, & Phillips (2010) presented a type of value creation which companies create trust and friendship with stakeholders by allocating more resources to satisfy the stakeholders. This process will add value to the company from the strength of its relationship with its stakeholders. In a trusting environment, stakeholders will share valued information to support the company, as well as increasing demand for business transactions with the firm. This value creation process can enhance long-term competitive advantages from trusting relationships and create sustainable economic growth for the company.

Although there is positive support from empirical studies of the relationship between stakeholders and a company's competitiveness and performance, future research should aim to test this hypothesis. If this trend is correct, there will be a strong reason for improving the relationship with stakeholders. Stakeholder influence can be tested to validate how their relationship can enhance the economic performance and competitiveness of the company.

Ackermann & Eden (2011) presented the ways in which companies apply strategies from the stakeholder management literature in real working practice. The stakeholder network is a tool with which to explore the formal and informal relationships between companies and stakeholders. In previous research, formal networks have been studied, but there is little research on informal networks. Their paper developed a power and interest grid to analyze stakeholders and found that some stakeholders are more powerful than others. Studying these informal relationships leads to increased understanding of stakeholder power.

This stakeholder network power and interest grid represents an attempt to separate stakeholders who have real power from all stakeholders. Therefore, managers can concentrate their strategy on key power stakeholders. This is an interesting concept that has similar aspects to measuring the attributes of stakeholders (Mitchell et al., 1997).

Banerjee & Bonnefous (2011) classified three strategies to represent three stakeholder types as follows. The first strategy for supportive stakeholders is reinforcement strategy, while the second strategy for obstructive stakeholders is containment strategy and

the third strategy for passive stakeholders is stabilization strategy. Their paper extended the stakeholder study by conducting empirical research of stakeholders in a French nuclear power project. It identified each stakeholder to create the strategy map for the project development.

Although this article presented three strategies for different stakeholder types, it did not provide the result after the implementation of each strategy with each stakeholder type. Each strategy represents a method to manage stakeholders, but further study is necessary to measure the result of implementing each strategy with each stakeholder type.

Li, Ng, & Skitmore (2012) observed that if the interest of the stakeholder can be captured, it should help to improve the project's long-term viability and benefits to the community. However, they also noted that the stakeholders are always in conflict with each other. Their paper aimed to develop a way of measuring stakeholder satisfaction through their "fuzzy approach". They established an evaluation index system to determine the membership function of different major stakeholder groups. They then developed an appropriate weight system between diverse stakeholder groups and major stakeholder groups. After the review, not all stakeholders expressed satisfaction, but if public participation was required, each stakeholder group had to compromise and consider the benefits to the public. This case study presented a way to develop an evaluation index system for all concerned stakeholders. The importance of effective communication plays a major role in achieving stakeholder satisfaction at an acceptable level.

Bridoux & Stoelhorst (2013) studied stakeholder management in terms of applying fairness to encourage relationships with stakeholders. The results of this empirical study, however, showed that some companies could use their bargaining power to achieve their corporate goals. This paper focused on a fairness approach as an effective tool to create fairness and enhance stakeholder value, but the authors found that bargaining power was an effective tool for stakeholders. Maintaining fairness for all stakeholders comes with an economic cost. When managers make a strategic decision, they must choose the strategy depending on the stakeholder attribute level before making the decision.

Mok, Shen, & Yang (2015) analyzed stakeholder influence on mega construction projects (MCP). Their research showed that stakeholder management in MCP was more difficult and required a more complex solution than small projects due to it involving many stakeholders. Project managers must identify stakeholders' needs and prepare a suitable strategy to handle stakeholder actions, either to support or to obstruct their actions. This paper confirmed that stakeholders are a main cause of uncertainty over successful project completion. Project managers must put effort into managing stakeholders and maintaining good relationships with them. There are only a few empirical studies of MCP. There is, therefore, a need to apply an empirical method to study stakeholder influence on MCP more deeply in the future.

The author considers this to be a revealing article on the influence of stakeholders. It is one of only a few to review in relation to MCP. This article confirms the influence of stakeholders that managers must manage stakeholders with appropriate strategies. Further studies are required of stakeholder management in MCP.

Oppong, Chan, & Dansoh (2017) presented SM performance model indicators. Performance objectives (POs), success factors (SFs) and performance indicators (PIs) are tools to manage SM performance in construction. This performance model indicator will help managers to monitor the satisfaction levels of multiple stakeholders. This SM tool presents the flexibility of selecting multiple attributes that are suitable for the construction environment. This SM tool can be selected for any type and stage of construction projects. Ayman et al., (2023) reviews the effective stakeholder management (SM) for its crucial for project realization. By understanding and evaluating SM measures and indicators, project organizations can enhance project efficiency. The findings of this research are valuable to others interested in SM. Weak enforcement of SM factors can lead to unforeseen outcomes and dissatisfaction. Government authorities can promote proper SM by establishing a mandatory framework for construction projects. Stakeholders, particularly consultants and contractors, should prioritize the extensive list of critical success factors (CSFs) to improve their SM practices. Professional and government agencies should organize training programs to keep updated on the latest SM development and prepare the necessary skills for project stakeholder management.

Sepani et al., (2024) reviews the challenges and strategies identified were known to mitigate the generic of external stakeholders. This study presents specific for managing sustainability-related stakeholder issues in megaprojects, avoiding external stakeholder management approaches. This research can serve as a foundation for further case studies for project management. Project management can apply these strategies, considering the unique characteristics of their projects. While the strategies are applicable to all megaprojects, their implementation may vary concentrate on social, economic, cultural, and political factors. This research is present in developing regulations that ensure stakeholder involvement in decision-making and implementation, even for megaprojects with significant carbon footprints, through stakeholder-oriented sustainability management.

Carolina et al., (2024) reviews the key challenge in large civil infrastructure projects by managing conflicting interests among stakeholders from the public and private sectors. This research presents risk sharing and misaligned goals. In this research, the public sector focuses on project performance, while the private sector focuses on profitability, leading to potential conflicts. In pursuit of cost reduction, quality can be compromised, negatively impacting project outcomes. Additionally, this research highlights instances where disregarding local culture which has resulted in negative social consequences.

2.3 Scientific Mapping Review for The Schools of Thought

There are five schools of thoughts on stakeholder influence in construction as shown in Figure 2. The scientific mapping method review identifies the school of thought from the CSV file. Co-citation is defined as the frequency with which two units are cited together by other documents (Zupic & Cater, 2015). When examined over time, co-citations are also helpful in detecting a shift in paradigms and schools of thought (Pasadeos et al., 1998). Each school of thought is identified by a different color. VOSviewer is a program used to analyze the CSV files from the Scopus database. It provides Network Visualization in different colors for articles grouped by their similarity in Figure 2.2

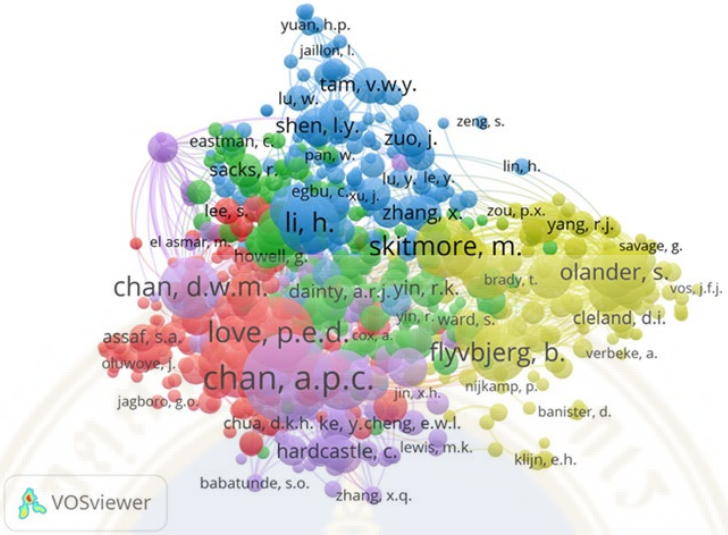


Figure 2.2 Five Schools of Thought in Scientific Mapping

For the first school of thought, Stakeholder Engagement is presented in red. There are 139 co-citation authors who share the same cited documents in this school. Stakeholder engagement purpose involves all project stakeholders in the planning, decision making and implementation of the project. This method would reduce conflicts and verify project goal priorities clearly with all stakeholders.

For the second school of thought, the Stakeholder Management Process is presented in green. There are 133 co-citation authors who share the same cited documents in this school. Its purpose is to gain stakeholder support in project implementation and to make the projects activity driven rather than stakeholder driven.

The third school of thought is the Stakeholder Analysis Method, which is presented in blue. There are 84 co-citation authors who share the same cited documents in this school. Its purpose is to provide an interpretation process for project managers to analyze the project stakeholder environment, which is defined as a project setting including all organizations and relationships between them which can affect or be affected by the project.

The fourth school of thought is the Stakeholder Influence, which is presented in yellow. There are 80 co-citation authors who share the same cited documents in this school. Its purpose is to apply strategies that affect project decision-making in a way that matches their specific objectives and the stakeholder approach to strategic management.

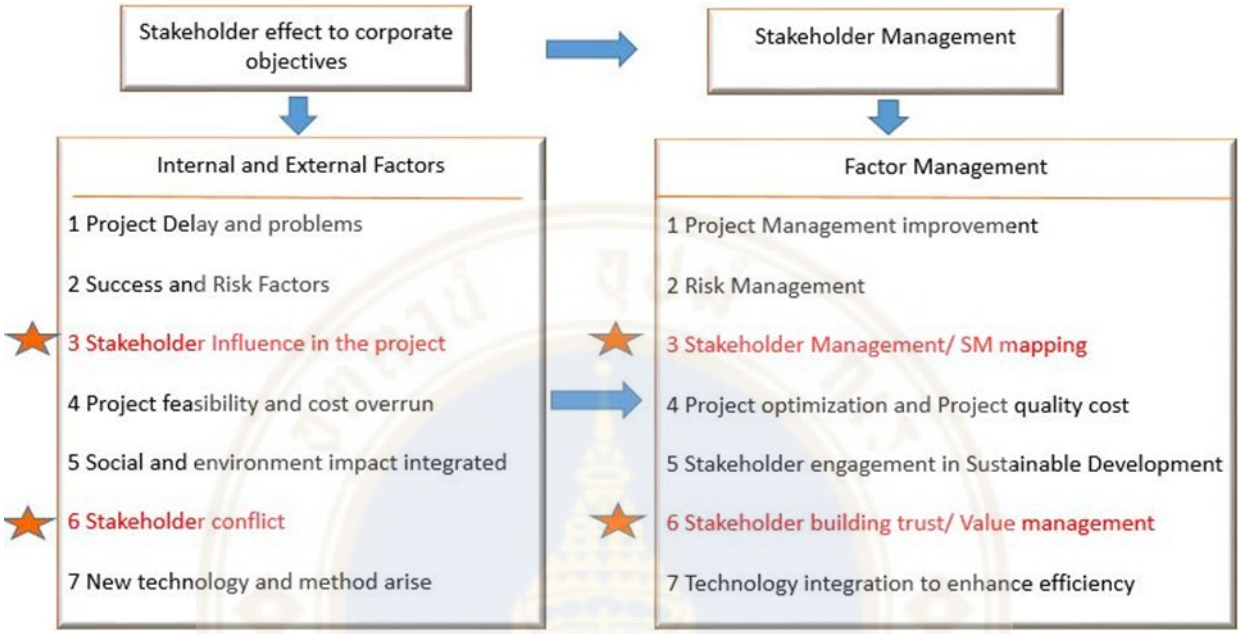
For the fifth school of thought, the Stakeholder Contribution Factor for Effective Management which is presented in purple. There are 62 co-citation authors who share the same cited documents in this school. Its purpose is to indicate the stakeholder contribution for effective management. There are certain requirements for stakeholders, such as the establishment of communication, a conflict solution strategy, resource-sharing among stakeholders, social responsibilities, a win-win attitude, and an effective monitor partnering process.

The author explores the fourth school of thought, which is Stakeholder Influence, in the project. The author applies a qualitative method to interview each stakeholder related to the different megaproject construction and then verify the problems and verify SM strategies in the project.

2.4 Manual Review of Stakeholder Influence on Construction Projects

From a review of previous studies of stakeholder management on projects, the author categorized the stakeholders by their influence types, which can be improved by the stakeholder management methods taken from the 929 articles in the author's stakeholder influence database. Although there are hundreds of articles, they can be grouped into seven types of stakeholder influence in relation to construction projects. These stakeholder groups were identified from similar articles that have the same influences and problems, but for different types of projects and countries. Each type has its own level of influence on the project objective. The author can differentiate stakeholder influence types into seven categories. The author compared them with stakeholder management methods to propose solutions to the problems as shown in Table 2.1.

Table 2.1 Manual Review of Stakeholder Influence on Construction Projects



As shown in Table 2.1, the author summarized the types of stakeholders by their influence on a project and the solutions needed by the project manager. Previous studies of stakeholder management have analyzed stakeholder influence and developed SM theories from these problems. Although there are seven types of influences, the author concentrated on the third and sixth influences because they are related directly with stakeholder influence over the project. For the seven types of influence, they can be summarized as follows:

1.Stakeholder influence: Project delay / Project management improvement.

Project delays are defined by the cause of the delay (Assaf & Hejji, 2006) or construction problems in a specific country (Toor & Ogunlana, 2008). Project Management concentrates on how to improve the efficiency of project management (Eriksson, 2010) or the effectiveness of project control methods (Mckim et al., 2000).

2.Stakeholder influence: Success and risk factors / Risk management.

Success factors are categorized for different project objectives (Chua et al., 1999), and risk factors are defined by understanding of the key risk factors in construction

(Zou et al., 2007). Risk management concentrates on new processes and methods to reduce the risks (Dey, 2002). The definition of risk evaluation takes into consideration the interests and goals of the stakeholders (Zavadskas et al., 2010).

3.Stakeholder influence: Stakeholder involvement / SM Mapping.

Stakeholder influences are defined from an analysis of stakeholders' expectations from the project. These influences determine the impact of the stakeholder influence (Olander & Landin, 2005). Stakeholder management introduces the stakeholder involvement model as a tool to utilize projects (El-Gohary et al., 2006). This article introduces a description of how project management teams work with the stakeholders in a relationship toward a favorable situation (Eskerod & Vaagaasar, 2014).

4.Stakeholder influence: Project feasibility and cost overrun / Project optimization.

Project feasibility comes from an analysis of the keys to successful implementation of construction projects, not only from an economic aspect, but also in terms of social impact as well (Shen et al., 2010). Project cost overrun is determined by the various problems of the construction industry (Cheng, 2014). Project optimization applies optimization and financial viability analysis to overcome the limitations of traditional financial management (Zhang, 2005). The project cost is developed using software to determine the cost and any shortcomings in the project activity so that appropriate action can be taken to improve future projects (Love et al., 2010).

5.Stakeholder influence: Social and environmental impact /Sustainable development

Social and environmental factors are progressively integrated alongside the economic and development aspects of the projects. Major construction projects must focus on their social and environmental impacts and promote project achievement (Morrissey et al., 2012). Stakeholder engagement is described as the opportunity for social learning by changing attitudes and behaviors to promote the sustainability of the project (Mathur et al., 2008). The social sustainability of the project is related to the satisfaction of the stakeholders (Almahmound, 2015).

6.Stakeholder influence: Conflict – both internal and external between stakeholders/ Stakeholder trust-building and value management.

This study summarizes the key conflict factors and ranks them in terms of their degree of importance (Awakul & Ogunlana, 2002). Resolution in value management is described as a goal setting process to satisfy the client's project requirements. This study examines the relationship between value goal conflict and participant satisfaction through case studies (Leung & Cheung, 2002).

7.Stakeholder influence: New technology and methods/Technology integration.

Using the internet to enhance construction communication, information systems represent the potential of IT to improve coordination between project participants and internal project management (Tam, 1999). A web-based system has been introduced for effective communication as a datacentric database system to enhance the efficiency of the communication process during project execution (Chassiakos & Sakellaropoulos, 2008).

The author reviewed the stakeholder influence and found that the most frequent topic is the stakeholder management process followed by stakeholder engagement, and stakeholder analysis methods, with stakeholder influence the least studied topic among the stakeholder management articles, especially in relation to megaproject construction. The author intends to identify previous research and extended in the studies of stakeholder influence because previous research in this field is limited to only 114 papers (Mok et al., 2015).

The author can determine the nature and impact of stakeholder influence in this field (Olander & Landin, 2005). There is also little research on stakeholder conflict in mega construction projects, such as communication issues and internal and external organization conflict due to different stakeholder involvement in the project. This research aims to expand upon the study of stakeholder influence and conflict in summary numbers three and six, focusing on megaproject construction. While the majority of previous research concentrated on project management improvement through project control methods and project improvement, this study seeks to identify key factors for effectively mitigating conflicts and aligning the interests of diverse multiple stakeholders in real-world megaproject which align with the stakeholder influence on number three and number six than the other influences.

In this literature review, the author reviewed stakeholder management for construction. The narrow definition of stakeholders to consider primary stakeholders as those who 'bear some form of risk as a result of having invested some form of capital, human or financial, something of value, in a firm" (Clarkson, 1995). The author follows this narrow definition as it makes it possible to classify stakeholders into manageable groups. In the broad definition of stakeholders, all the parties involved with the project are included, making it much more difficult to classify all stakeholders by their relationship with the project. Some stakeholders have a relation with the project, but they have no impact on it. For this reason, the narrow definition will be more appropriate for classifying the project's stakeholders.

In the narrow definition, internal stakeholders will include shareholders, employees, employers, and corporate members as some form of risk bearers, while external stakeholders will include suppliers, customers, related community members, environment agencies, and government agencies which bear some form of risk as well.

Each stakeholder will have some form of attribute, such as power, legitimacy, and urgency. There are many stakeholder types depending on which angle is considered. The author will classify stakeholders by their attributes but will also address the stakeholder action, such as supportive or unsupportive toward the project as well. To be able to apply an effective strategy for stakeholder management, the author must first classify the types of stakeholders. The following five strategies for handling stakeholders' influences were identified from previous studies: adaptation, compromise, avoidance, dismissal, and influence (Aaltonen & Sivonen, 2008). There is a table of decision-making strategies for stakeholder management (Yang et al., 2018). Stakeholders in mega construction projects include customers, employees, shareholders, loaners, suppliers, local communities, environment agencies, government agencies, and other related risk-bearing stakeholders, the needs of whom the project manager must understand and align in terms of their different objectives to achieve the goal of the project (Olander & Landin, 2005). Stakeholders in megaproject construction also tend to be more complicated due to the multi-dimensional goals from the project. For them, successful accomplishment is not only about the project being completed, but also about other factors such as corporate reputation, economic growth,

sustaining a good relationship with stakeholders, public interest, and going along with government policy as well. Therefore, to achieve all their goals, companies must deal with multiple stakeholders, both internal and external. It is almost inevitable that conflict will arise from the different priorities of stakeholder interests. To satisfy the multiple interests of all stakeholders, project management must apply strategies that affect project decision-making in a way that is an acceptable compromise of their specific interests. Strategy roadmap planning is required to handle these stakeholder needs (Mok et al., 2015) (Li et al., 2012). Stakeholder influence will have an impact on the entire project lifecycle. The author focuses on how companies apply the various aspects of SM identified from the stakeholder articles in the working practice of mega construction projects. The stakeholder influence network is a tool to explore the formal and informal relationships between companies and stakeholders (Ackermann & Eden, 2011). If a company can succeed in strengthening its relationship with its stakeholders, it will increase its intangible assets and thereby enhance its corporate ability and recognition to give it a competitive advantage as part of the long-term value creation process of the company.

From the literature review of stakeholder management articles, the author applies SM in construction projects to explore stakeholder influence. However, there are fewer studies of mega project construction than normal construction. The author focuses on hydroelectric power plant megaprojects which located in Lao PDR.

The author considers that SM theory must account for all attributes, such as power, urgency, and legitimacy (Mitchell et al., 1997) from all types of stakeholders. These attributes are especially accountable in a socialist country where government agencies will be the center of the stakeholder attributes, such as is the case in Lao PDR. Project management must know about the entities in their work environment in which the agencies hold power, urgency and legitimacy and explore the strategies to apply with the stakeholders, especially dangerous and definitive stakeholders, who have the highest impact upon the projects.

The author can explore the stakeholder influence Hydropower Plant based on stakeholder influence on the project (Olander & Landin, 2005). A qualitative method can be applied due to stakeholder influence not being static as the identified risks related to each construction stage for different stakeholders. This method can be used to verify the different risk related to different stakeholders by comparing the two hydropower plant construction projects to understand the stakeholder influence each project. The decision-making strategies for stakeholder management from previous studies can be verified to review these two projects (Yang et al., 2018). The author can use these decision-making strategies to compare the actual strategies as discovered from this study's interviews and questionnaire. Addressing further study of previous research can help to confirm that the further study of stakeholder influence on megaproject construction. It will be a good opportunity to examine the strategies from previous research for managing stakeholders compared with the real-world situation. Therefore, the author can add contribution to the stakeholder influence in previous research gap.

2.5 Stakeholder Strategy

A review of stakeholder articles has outlined the definitions, attributes, and strategies involved in managing different types of stakeholders in different ways. However, the most important tool for managers in handling stakeholders is stakeholder strategy.

Regarding stakeholder strategy, if managers want to ensure the sustainability and success of their projects, then consider applying the most appropriate strategies for dealing with stakeholders and aligning the goal of each stakeholder with that of the project. The multiple strategies identified from previous stakeholder strategy summary in Table 2.2.

Table 2.2 Stakeholder Strategies from The Literature

Reseacher	Stategy	Explanation of the Strategy
Freeman (1984)	Hold	Doing nothing and monitoring existing programs
	Defense	Reinforce current beliefs about the firm
	Swing	Changing formal rules through government
	Offense	Adapting the stakeholder's position
Savage et al, (1991)	Monitor	Monitoring existing performance except when a negative influence is detected.
	Defense	Reducing the dependence that forms the basis for the stakeholders interests.
	Collaboration	Collaborating with stakeholders and trying to find a compromising solution
	Involvement	Listening to and involve stakeholders in the project process
Clarkson (1994)	Reaction	Either fighting against addressing a stakeholder issues or withdrawing
	Defense	Doing minimum legally required to address stakeholder's issues
	Accomodation	Relative to pro action, it is a less active approach to dealing with issues.
	Pro-action	Doing more than required to address a stakeholder's issues.
Aaltonen & Sivonen, (2009)	Adaption	Obeying the demands and rules that are presented by stakeholders.
	Compromise	Negotiating with the stakeholders, listenting to their claims related to project.
	Avoidance	Loosening attachments to stakeholders and their claims.
	Dismissal	Ignoring the presented demands of stakeholders.
	Influence	Sharping proactively the value and demands of stakeholders
Banerjee & Bonnefous (2011)	Reinforcement	For supportive stakeholder
	Containment	For obstructive stakeholder
	Stabilizing	For passive stakeholder

As summarized in Table 2.2, these authors presented different strategies for managing different stakeholder types. Freeman (1984) presented four strategies, which are hold, defense, swing, and offense. The stakeholder strategies of involvement, monitor, defense, and collaboration presented by Savage (1991) had some partial similarities with those of Freeman (1984). Both strategy sets presented by these two researchers share the similarity of monitoring stakeholders and doing nothing until a threat arises. The manager is responsible

to defend the project standpoint and eventually collaborate with stakeholders to create relationships with them and find solutions together. Clarkson et al. (1994) stakeholder strategies were reaction, defense, accommodation, and reaction involve taking a proactive approach to engaging stakeholders for resolving stakeholder issues. Aaltonen & Sivonen (2008) presented five stakeholder strategies which are adaptation, compromise, avoidance, dismissal, influence. Their strategies were less engaged with stakeholders than Clarkson. Finally, Banerjee & Bonnefous (2011) presented three strategies for different stakeholder types. reinforcement for supportive stakeholders, containment for obstructive stakeholders and stabilizing for supportive stakeholders.

2.6 The Economics of Transaction Costs

Megaproject construction often involves higher risks due to large investments and complex stakeholder interests. To mitigate these risks, if project owners have competent subsidiary companies in the required field, project owners may select to implement strategic management approaches, such as vertical integration. This strategy aims to utilize cost efficiency and enhance control by handling various project aspects internally, leveraging economies of scale with their resources. Stipulations regulating such relationships are often specified in contracts. Because contracts cannot cover all possible contingencies, contractual relationships are susceptible to *ex-post* opportunistic behavior when unforeseen events that fall outside of the contractual agreement take place. When contractual relationships turn sour, the expenses involved in renegotiation, legal resolution, searching for a new partner, and establishing another relationship can significantly intensify transaction costs.

The hazards of escalating future transaction costs play a big role in a firm's *make-or-buy* decision. Here, *make* refers to vertically integrating critical functions while connotes contracting external partners for inputs or services. While either alternative has its benefits and disadvantages, the *make* option can be viewed as a superior choice when it comes to avoiding inflated transaction costs. This is because, compared to external

contractual relationships, the firm can more effectively control internal functions using administrative authority. The nature of transaction cost and its implication on the *make-or-buy* decision were pioneered by Coase (1937) and Williamson (1971, 1975). The role of transaction costs in subcontracting decisions by construction firms was explored by Gonzalez-Diaz, Arrunada and Fernandez (2000).

Factors that are known to escalate transaction costs in a business relationship include the following: (i) Functions that require close coordination between the involved parties necessitate cumbersome ex-ante synchronization and carry a high risk of ex post coordination failure, thus exacerbating the cost of transacting. (ii) Activities whose outcomes are difficult to observe and involve high levels of uncertainty aggravate transaction costs because they make cheating by the outsource difficult to detect and punish. (iii) Undertakings that require the sharing of sensitive information or trade secrets worsen the risk of outsourcing, because the outsource may not guard its partner's proprietary information as zealously as the outsourcer. Finally, *(iv)* transactions that require big, upfront, relationship-specific investments heighten the risk to the parties making the investment if the transaction is broken off in Figure 2.3 (Besanko, et al., 2006).

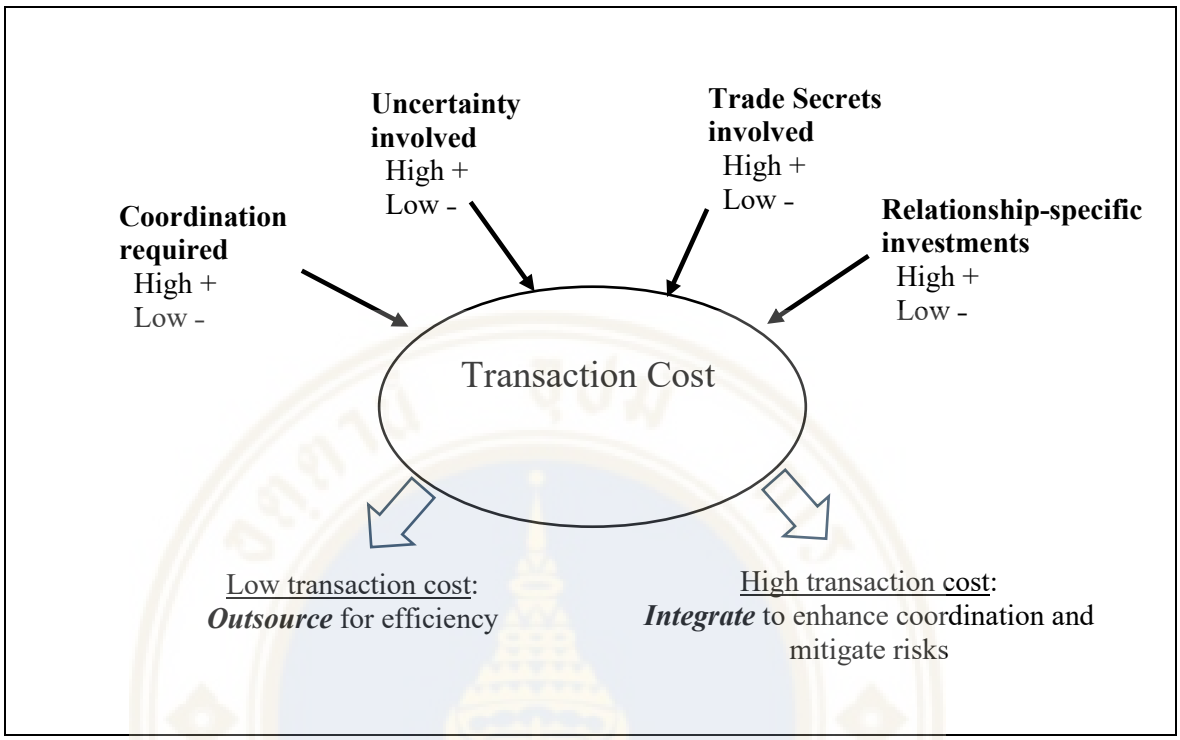


Figure 2.3 Factors Contributing to High Transaction Costs and Their Implications on The Make vs. Buy Decision.

Figure 2.3 summarizes the factors that determine the magnitude of transaction costs. In short, functions that require close coordination involve high levels of uncertainty, include the sharing of sensitive information, and entail large relationship-specific investments will result in high transaction costs. Such functions are candidates for Vertical Integration.

2.7 Literature Gap

The first literature gap exists regarding transaction costs in previous research. While studies have identified strategies to mitigate these costs, further research is needed to explore how these strategies can be adapted to unforeseen circumstances. Additionally,

the four factors contributing to high transaction costs in the construction industry (Besanko et al., 2006) should be examined, considering the unique concerns of project owner companies with their responsibilities. This research will explore additional factors that contribute to high transaction costs in real-world applications.

The second literature gap exists regarding the relationship between external stakeholders and company performance. While previous studies have display the external stakeholders associate to negative company performance (Galbreath, 2006), further research is needed to provide practical guidance for stakeholder management theory. This research examines how external stakeholders can influence projects in real-world situations.

2.8 Contribution to Literature

This research examines how a specific strategy, informed by stakeholder interviews, can mitigate high transaction costs and reduce risks among internal stakeholders in megaprojects. By analyzing in-depth interviews with experts, the research identifies key factors influencing strategic choices and explores how relationships between internal stakeholders and external stakeholders can affect project completion in real-world applications.

CHAPTER THREE
METHODOLOGY

3.1 Exploratory Research Method

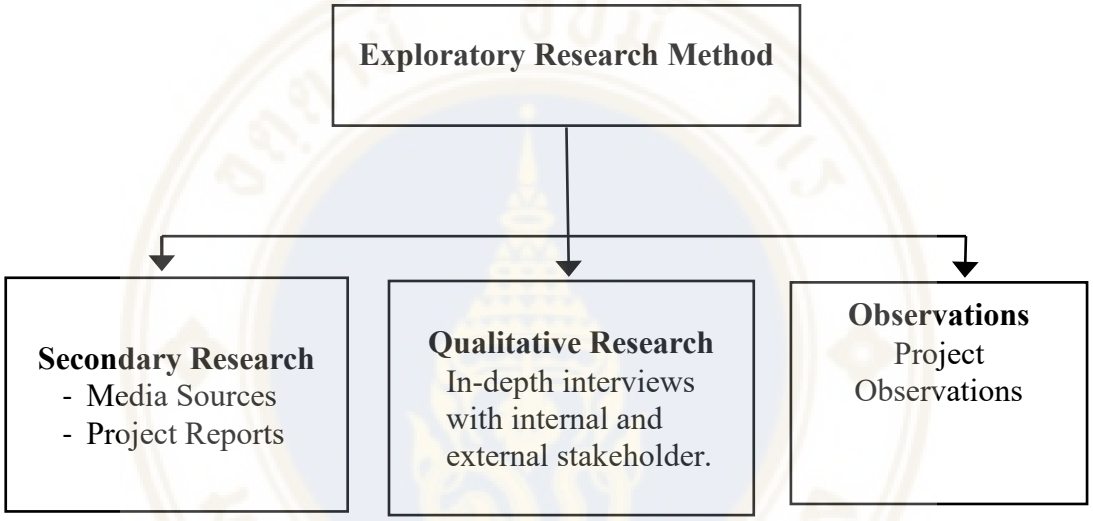


Figure 3.1 Exploratory Research method

From figure 3.1, The author established a research question with in-depth interview for collecting data from the internal and external stakeholders from megaproject construction in Lao PDR. The media and project reports have been collected as secondary report support for additional data from the in-depth interview. The process of data collection is shown in Figure 3.2.

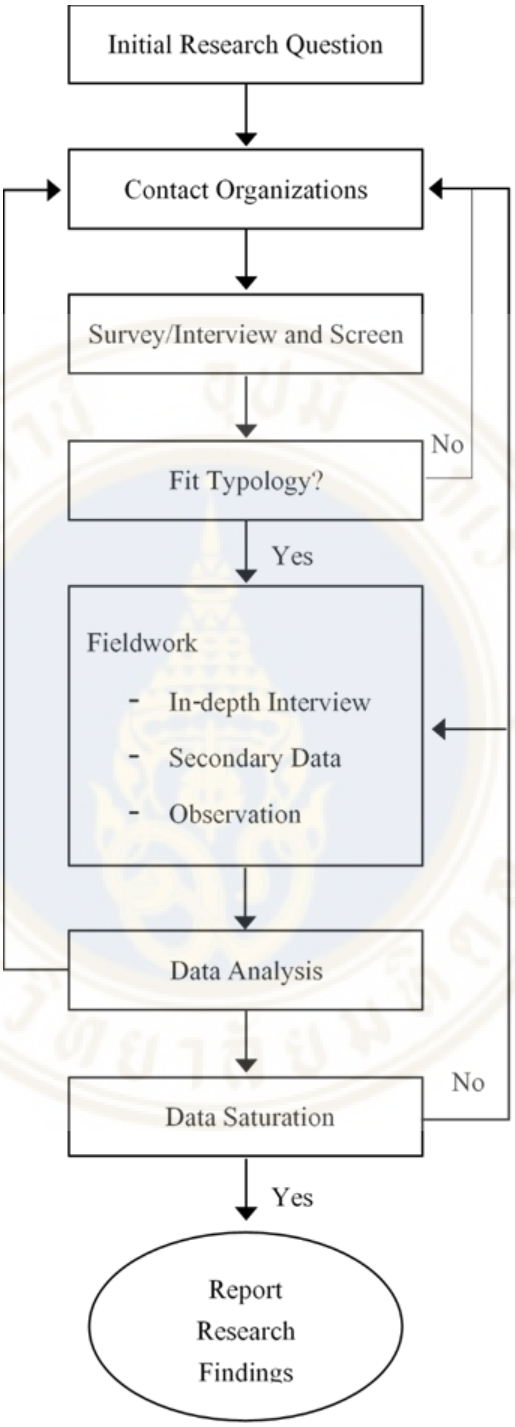


Figure 3.2 Data Collection for Survey/Interview Process.

3.2 Competitive Strategies in The Construction Industry

The construction industry has been challenged by different stakeholders' interests and serious competitiveness. Project management consistently confronts the conflict of interest and different goals among multiple stakeholders such as project owners, architects, engineers, first-tier contractors, subcontractors, and external stakeholders. The Vertical Integration strategies for construction have been implemented to manage the restrictive cost, time, management quality, and relationship restrictiveness among stakeholders. This strategy is implemented as a method to manage not only on construction site, but also help to support the construction management (Krippaehne, McCullouch & Vanegas, 1992). "This strategy perspective is contributed for effective management which is the need for astute management in construction industry. The success of a construction company depends almost entirely on the quality of its management" (Clough, 1981). This strategy defines how the construction company can compete within a competitive industry. The construction company must determine its key competitiveness of the company such as the company's strengths and weaknesses, industry opportunities, threats, personal values of the key implementers, and social expectations. If it successfully addresses key internal and external factors, this strategy can be a key to a construction company succeeding in its industry.

The construction industry is identified as a fragmented and divisive industry due to multiple stakeholders having potentially conflict on different goals. With these unique characteristics, project management needs to explore strategies to align the stakeholders' goals. Vertical integration is one strategy that can be used to achieve the alignment of stakeholders' goals (Porter, 1980; Harrigan, 1983b: Balakrishnan and Weirnerfelt, 1986). The definition of Vertical Integration is "the degree to which a company does things with in-house employees." (Balakrishnan and Weirnerfelt, 1986). Vertical Integration can be classified in four levels: (1) Full integration refers to buying (or selling) all the firm's requirements for a particular material or service internally (Harrigan, 1983b); (2) Tapered integration happens when a firm relies on outsiders for a portion of their

requirements (Harrigan, 1983b). They produce or distribute a portion of their needs internally but purchase (or sell) the remainder through specialized suppliers or distributors (Harrigan, 1983a); (3) Quasi-integration is a bonding of autonomous units. An example of quasi-integration is when large contractors have influence over material suppliers and subcontractors. Such influence is used to reduce prices and bargain for extra services. This generally implies good relations with subcontractors and suppliers, so they willingly offer competitive prices and extra services to the general contractor; (4) Contracting is a non-integration strategy in which external market mechanisms are used, and relationships are defined in drafted documents that delineate responsibilities (Harrigan, 1983a). Vertical Integration strategies can generate the following benefits in construction business (Friedman, 1984): (1) Obtain new management talent (2) Improve cost control (3) Influence demand for constructed products (4) Improve economies of scale (5) Achieve synergies from combining inputs (6) Influence the supply of construction inputs (7) Reduce uncertainty over availability or cost of future supplies (8) Use it to differentiate a company from competition.

Project management must acknowledge who are the internal/external, primary/secondary stakeholders, and their levels of power, legitimacy, and urgency. To identify the influence from the internal and external primary stakeholders, SM strategies are applied in project management, due to stakeholders having multiple goals over a project. Therefore, project management should pay attention to stakeholder influence and their attributes. This research explores the internal and external primary stakeholder influence and their attributes of power, legitimacy, and urgency with their influence over construction projects (Mitchell et al., 1997).

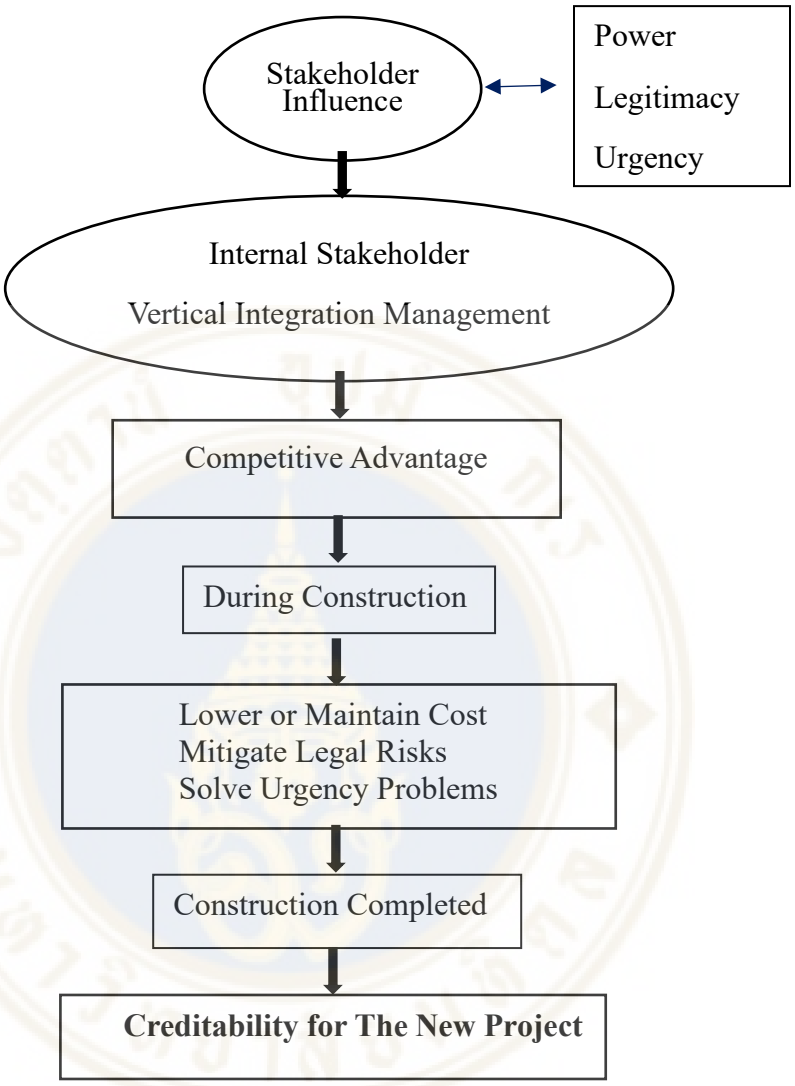


Figure 3.3 Vertical Integration Management Might Lead to Competitive Advantage

In Figure 3.3, the stakeholder management might lead to competitive advantage is displayed. Internal stakeholders who have power, legitimacy, and urgency toward project management without stakeholder management can lead to either positive or negative influence during construction projects. With Vertical Integration management, the project management could create a relationship in the project either adding positive influence or reducing the negative influence which might lead to competitive advantage for the project.

The competitive advantage during the construction period from internal stakeholders can lower or maintain the project cost, mitigate legal risk, solve urgent problems, and after construction is completed, lead to creditability for the new project.

3.3 Data Collection

Table 3.1 The Internal and External Stakeholders of HPP Construction from Case one and two

Stakeholder	Organization	Number	Position
Internal	Project Owner Company	4	Managing Director or Deputy Managing Director
Internal	First-Tier Contractor Company	4	Project Manager or Deputy Project Manager
Internal	Owner Engineer Company	4	Managing Director or Deputy Managing Director
Internal	Electricity Generating Authority of Thailand	2	Assistant Governor or Deputy Governor
Internal	Electricite Du LAOS of Lao PDR	2	Assistant Governor or Deputy Governor
Internal	Ministry of Natural Resources and Environment of Lao PDR	2	Director or Deputy Director
Internal	Ministry of Energy and Mine of Lao PDR	3	Director or Deputy Director
External	Provincial Government of Lao PDR	4	Deputy Governor

For this research, the author interviewed 25 high-level executives from multinational organizations, including 6 from Case one, 6 from Case two, and 13 representing government agencies for both cases. These executives, from Lao PDR, China, Europe, and Thailand, held top management positions and were interviewed to compare similarities and differences between the two cases. They have extensive experience in their field and provide detailed insights into real-world applications of the research. Each one-on-one interview will last approximately one hour. Some interviewees may require a second, one-hour interview to clarify answers. Given the nature of Exploratory Research Method, interviewees often provide in-depth answers that extend beyond the original

questions. Additionally, the author collected supporting documents from media and project reports to supplement the interview data.

The First-tier Contractor is a tier one contractor who is generally referred to as the main contractor. Its primary main construction project responsibilities from start to project completion include managing subcontractors, scheduling planning, and supplier planning, completing the project on time in compliance with the construction contract with the project owner.

The Owner Engineer is a representative of the project owner company for construction or engineering. Its responsibilities include reviewing the project's technical and detailed specifications, and verification of the first-tier contractor work.

The Electricity Generating Authority of Thailand is a state enterprise, managed by the Ministry of Energy, Thailand. It is responsible for electric power generation and transmission as well as electric energy sales in Thailand.

The Electricite Du LAOS is the state corporation of Lao PDR that owns and operates the country's electricity generation, electricity transmission and electricity distribution assets. It also manages the import and export of electricity from the Laos national electricity grid.

The Ministry of Natural Resources and Environment is the government agency responsible for the management of resources and natural environment, including land, water, air, biodiversity, and environment including disaster and natural protection from changing weather for Lao PDR. responsibility for Lao PDR energy national plan is regulating the investment in resources exploration and energy and minerals resources development.

The District Governor is the Laos government agency for managing a local district following Lao PDR's national plan policy. Lao PDR has 17 administrative divisions, which are 16 districts and one capital. Although every district governor follows the Laos national policy plan, the district government can issue district orders that affect the investment and foreign affairs in its district.

These internal and external stakeholders are essential to ensure an effective construction process with different authorities over megaproject construction. For an

effective project, the project management must acknowledge and react to both the positive and the negative influence from their related stakeholders during the project to mitigate project uncertainties. The project management process will ultimately either experience positive or negative influences which will affect competitive advantages such as increasing/decreasing costs, time, and functionality in the project schedule. This research will explore the reasons for these effects and how a stakeholder management strategy might create a competitive advantage in a real-world application toward project completion.

This research examines two case studies: a USD 3.2 billion "Run-of-River" hydroelectric power plant in Lao PDR, operational since 2019, and a USD 1.3 billion "Reservoir" hydroelectric power plant in Lao PDR, operational since 2022.

These two megaprojects, labeled Case one and Case two are the most recently completed megaproject Run-of-River and Storage type construction and have been completed. Therefore, to study the stakeholder influence effect for each HPP type, these projects were most suitable for study because the internal stakeholders of these two projects are mostly still located in Lao PDR and Thailand for their construction's maintenance period. The general projects information is presented in Table 3.

Table 3.2 Project Information

Project	Case one	Case two
Location	Northwestern	Southern
Dam Type	Run-of-River	Storage
Value (USD)	3,200,000,000	1,300,000,000
Capacity (MW)	1,285	650
First-tier contractor	1	3
Supply chain management	Vertical Integration	Standard
Construction period	2012 - 2019	2016 -2022
Operation (COD)	2019	2022
Off-taker	EGAT and EDL	EGAT and EDL

The author follows the Exploratory Research Method in Figure 3.3 and data collection methods include reading documents, visiting different construction projects, and conducting a survey and interviews as presented in Figure 6. Previous studies have explored the effects of stakeholder management on competitive advantages through a quantitative approach (Hillman & Keim, 2001; Galbreath, 2006). This dissertation research will focus on the internal and external stakeholders of two recent megaproject construction in Lao PDR previously mentioned. A quantitative method is not suitable in this research due to

the small sample size of only two project owners and four first-tier contractors. Other reasons for not using a quantitative method include the intention to explore the real-world situation that is not exposed by statistical data but can be examined by interviewing experienced contractors. Such an approach requires in-depth interviews and observations through an Exploratory Research Method. This qualitative methodology is suitable for research without an abundance of statistical data. More in-depth insight can be gathered by interpreting the answers from interviewees.

The author conducted an interview with top management from internal and external stakeholders from the Case one and Case two projects. The author aims to understand the explanation and social phenomenon from these projects. The interview method is a plan for understanding the decision reason, knowledge, expertise (Tracy, 2020). The author selects the participants from top management who were the key people to work on the construction site. Sample questions from the pilot interview and in-depth interview are presented from Table 3.3 to Table 3.6.

Table 3.3 Pilot Interview Questions for External Stakeholders

Pilot interview questions for external stakeholders
1. What is your organization's responsibility in the Hydroelectric Power Project? 2. What are your organization's requirements from the HPP project owner and contractors? 3. What is your organization's power/urgency/legitimacy authority over HPP's owner and main contractor during the construction and Commercial Operation Date (COD)? 4. How does your organization monitor the performance of the HPP's project owner and contractors? 5. How has your organization's policy and requirement affected HPP's project owner and main contractor during the last three years? 6. What is your organization policy for village resettlement, and environmental impact of the HPP's project owner and contractor? 7. For the future HPP development plans, are there additional requirements for the new projects?

Table 3.4 In-Depth Interview Questions for External Stakeholders

In-depth interview questions for external stakeholders
1. What serious problems from the HPP project did you experience in the past? 2. If the HPP's project owner/contractor are the same company group, what were the advantages/disadvantages toward the project and upon your organization? 3. What are advantages/disadvantages to the HPP's project owner/contractors who are of the same company group? 4. Can your organization influence HPP projects, and if so, how and by which method? 5. If the HPP's project owner and contractor accepts/rejects your request, how does your organization monitor the result? 6. If the HPP's project owner/contractor follows your requests, do they receive any additional benefit during current and future project? 7. Is there a competitive advantage between the HPP's project owner and first-tier contractor by being in the same company group? 8. What is your organization's opinion for this business development model?

Table 3.5 Pilot Interview Questions for Project Owner or First-Tier Contractor

Pilot interview for Hydroelectric Power project owner or first-tier contractor
1. When did your company start the business for Hydroelectric Power Projects in Lao PDR? 2. What is your company status? 3. How many HPPs have been developed or construction projects completed by your company? 4. What is your current HPP development or construction projects in Lao PDR? 5. Do you have a different business or construction type in Lao PDR? 6. In your HPPs development or construction, what is your requirement responsibility with government and non-government agencies in Lao PDR or other countries? 7. Who are government or non-government agencies that are related to your HPP development or construction? 8. What is the authority/urgency/legitimacy from these government or non-government agencies during the construction and after the COD? 9. What is your company policy toward environmental impacts? 10. How does your project development or construction plan integrate the environmental impact plan in your project?

Table 3.6 In-Depth Interview Questions for Project Owner or First-Tier Contractor

In-depth interview questions with Hydroelectric Power project owner or first-tier contractor
1. What is the relationship between project owner or first-tier contractors with your company other than the legal contract? 2. Have you ever employed of been employed by other companies who are not in the same company group as the project owner or first-tier contractor? 3. What is the advantage/disadvantage for being employed by the same company group during construction and after COD? 4. Does this stakeholder management model add benefit/cost to your business during the construction and after COD? (cost/time/process/ urgent solving problems) 5. What were the government and non-government agencies' requirements upon your company in the project? 6. If the project owner or first-tier contractor are of the same company group, does Lao PDR treat them differently or as the same group? 7. If the same project owner and first-tier contractor are of the same company group and continue to apply for new projects, what are the advantages/disadvantages toward the new project? What is the recommendation? 8. If the project owner/contractor violates the contract, what will happen? 9. Can you summarize the advantage/disadvantage if a project owner or main contractor are of the same company group for HPP projects in Lao PDR?

Data collection from pilot and in-depth interview were analyzed by qualitative approaches. This qualitative analysis method was inspired by three qualitative approach methods by Eisenhardt (Eisenhardt, 1989). Eisenhardt's case study approach involves analyzing data from multiple cases to develop theories. Cases are selected based on their likelihood of exhibiting the phenomenon of interest and their potential to reveal similarity and differences across cases. The Eisenhardt method is a theory building from cases that are logically testable, coherent, general, and empirically processed. It described its strength as answering "how" questions which can be either normative or descriptive, and variance-based answers. The Eisenhardt method can be applied to elaborate an existing theory.

The Eisenhardt method is to create links among a combination of data and emergent theory. These links would be undisclosed and would interpret the underlying phenomenon from collecting data. In this research, the author followed a case study with multiple levels of data analysis. This data is collected from Exploratory Research Methods such as secondary research, interviews, and project observation. The standard qualitative procedure is conducted by analyzing data collection and then finding a common theme among them. Conversations were recorded and transcribed. The collected data is analyzed using the Microsoft excel spread sheet to categorize data groups. The author compares these outcomes with Microsoft excel from expertise with their field work.

3.4 Project Observation

The author visited HPP project construction sites to collect additional data, observing fish passage facilities, sediment passage facilities, construction sites, resettlement villages and rehabilitation areas. The benefits of project observation are to confirm the accuracy of interview information among different contractors and government agencies. These observations include the stakeholder management for resettlement village and rehabilitation areas according to the contract agreement.

3.5 Data Analysis

Data from transcribed interviews with 25 top executive policymakers, each with extensive experience in megaproject construction, were analyzed. These interviewees understood the research purpose well and provided insightful responses, particularly regarding megaproject construction. The author carefully transcribed and analyzed these responses, including additional insights provided during the interviews.

The author analyzed the transcribed data to identify patterns from recurring repeated answers and explanation. The exploratory research method often led to in-depth responses that extended beyond the original questions of the research. To ensure validity and reliability data, after the first one-on-one interview, the second follow-up interviews were conducted to clarify specific and additional points. The data were then organized into a structured table to synchronize the overall research data which leads to the cohesive theme of the research.

3.6 Ethics

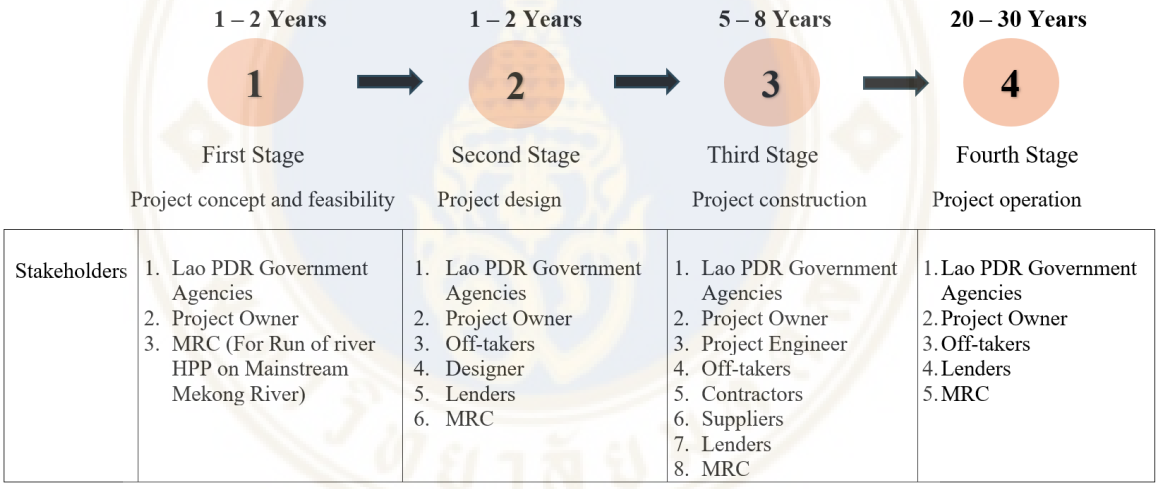
For the ethical approval standard, the author completed the Collaborative Institutional Training Initiative (CITI) program for social and behavioral research. The author design questions and selects interviewees following the Ethical procedure standard from training program. The subject and questions have been verified by the Institutional Review Board (IRB) Ethical Reinforcement for Human Research, Mahidol University. All the interviewees were Lao PDR and Thailand government agency in management position, project owner, first-tier contractor, and owner engineer members for both Case one and Case two. The research interview process for the data collection complies with the ethical standard from the IRB. All the interviewees signed consent agreements before giving the interviews and understood their ethical standard rights in the consent document. The author submitted questions to interviewees for consideration and explained the objectives of the questions to interviewees. The interviewees signed the consent document willingly and understood the

objectives of the questions clearly. Interviewees understood the purpose of the research and the research design. The author selected the interviews from the top management of project one, project two, and external stakeholders who understand the project's rationale and objectives, procedural details, and potential risks/harms that may occur to the participants. The interviewees have been given satisfactory explanations and answers about the research. The identity of the interviewees was protected.

CHAPTER FOUR
FINDINGS

The objective of this research is to explore the influence of internal and external stakeholders in different Hydroelectric Power Projects. It also aims to investigate how stakeholder management strategies may lead to a competitive advantage in the long term.

4.1 Megaproject Timeframe from Case Studies



Stakeholders	1. Lao PDR Government Agencies 2. Project Owner 3. MRC (For Run of river HPP on Mainstream Mekong River)	1. Lao PDR Government Agencies 2. Project Owner 3. Off-takers 4. Designer 5. Lenders 6. MRC	1. Lao PDR Government Agencies 2. Project Owner 3. Project Engineer 4. Off-takers 5. Contractors 6. Suppliers 7. Lenders 8. MRC	1. Lao PDR Government Agencies 2. Project Owner 3. Off-takers 4. Lenders 5. MRC

Figure 4.1 Megaproject Timeframe from Case Studies

The megaproject construction timeframe for these case studies consists of four stages. The first stage, concept and feasibility, involves securing government approval, which typically takes 1-2 years. This involves government agencies, project owners, and external stakeholders, especially those concerned with environmental impact mitigation.

The second stage, project design and investment, involves collaboration with Project engineer and contractors, as well as securing agreements with contractors and suppliers. This stage typically takes 1-2 years upon the contract agreement. This stage involves

government agencies, project owners, off-takers, designers, lenders, and external stakeholders, especially those concerned with environmental impact mitigation.

The third stage, project construction, involves collaboration with designers and off-takers, as well as securing agreements with lenders. This stage typically takes 5-8 years and involves government agencies, project owners, project engineers, off-takers, contractors, suppliers, lenders, and external stakeholders, especially those concerned with environmental impact mitigation.

The fourth stage, project operation, involves collaboration with off-takers, as well as securing agreements with lenders. This stage typically takes 20-30 years and involves government agencies, project owners, off-takers, lenders, and external stakeholders, especially those concerned with environmental impact mitigation.

4.2 Stakeholder Management: Case one

This research finds the SM process implemented at the initial stages of the project will yield a decisive advantage for the stakeholder. Previous research states that "poor management of stakeholder relationships and lack of effective stakeholder management are the reasons for the failure of megaprojects construction around the world" (El-Gohary et al., 2006, HM Treasury, 2014). The SM process plan must be considered as the essential tool to engage the stakeholders effectively (Chinyio and Akintoye, 2008).

For Case one, the project owner and first-tier contractor belonged to the same company group. The project owner employed a Vertical integration strategy. The company group primarily executed project work internally, leveraging its own resources and expertise. Only specialized tasks were outsourced. The project owner was responsible for project development, the CA, Power Purchasing Agreement contract, and operating the hydroelectric power plant after COD while the first-tier contractor was responsible for the EPC construction contract. The original project investment was approximately 3.2 billion USD for the mitigation of environmental impacts with the completed design complying with MRC and Lao PDR requests, such as the fish passage facilities, sediment passage

facilities, and earthquake protection. After the EPC contract was signed and construction began, the MRC and Lao PDR increased their environmental impact mitigation requirements for the project. The project owner followed these additional requirements from Lao PDR and the MRC to continue the construction. Therefore, the expenditure increased approximately 18 percent from the original investment.

The distribution of risks and responsibilities in megaproject construction are dealt with differently depending on the contract conditions. The differences in the time of the period responsible for stakeholders are significantly different. The project owner would be responsible for operating the Hydroelectric power plant through the concession period for approximately 20-30 years while first-tier contractor responsible for construction 5-8 years upon the contract. The project owner chose the Vertical Integration strategy in Case one to ensure the quality of construction work through the concession period and reduce multiple risks during megaproject construction. The SM process between the project owner and first-tier contractor in the same company group was established in the early project development stages. The Vertical Integration strategy enhances trust and collaboration between internal stakeholders. Case one achieved benefits such as mitigating legal risks because of the collaboration between the project owner and the first-tier contractor. If the project owner and first-tier contractor were not from the same company group, more problems could have surfaced in the COD schedule because of substantial increases in the contract value of approximately 18 percent from additional environmental impact mitigation requirements, outline design, and revised construction schedules. In a normal case, the first-tier contractor would have begun the additional civil work required when the revised outline design by the owner engineer and variation order price was completed. This would have resulted in construction delays. Since the project environmental impact mitigation was integrated in the critical path of civil work, approximately two years could be added to the project completion date. This would extend the construction period from eight to ten years. If the project is delayed, the project owner can have additional costs from the delayed COD scheduled with EGAT. The first-tier contractor would also incur additional costs from the

revised construction schedule and standby costs. Such a situation can lead to a breach of contract claim, affecting the construction progress.

Because the project owner and first-tier contractor belonged to the same company group (Vertical Integration), there were only minor conflicts between them regarding the revised construction schedule. These urgent problems were resolved by negotiation between internal stakeholders by amicable settlement. Their primary goal was for the construction to be completed on time. Both the internal stakeholders completed the agreement to work continuously on the additional detail design. In this case, the owner engineer company played a critical role as a third-party agent to verify the detail design, additional costs, and revised construction schedule.

The construction variation order price between the project owner and first-tier contractor was estimated to be parallel to the construction work. This parallel process supported the construction that continues without additional delay from COD schedule.

On the external stakeholder side, the project owner had to redesign the mitigation of environmental impact civil work following the MRC and Lao PDR requirements. The MRC requirements were concentrated on environmental impact mitigation such as fish passage facilities; modifications to the design of the originally proposed upstream and downstream passages; additional navigation facilities; the addition of sediment transport facilities, including low level gates to facilitate the flushing of sediment; and a study of seismic risk with the addition of earthquake protection. Eventually, these requirements were incorporated into the construction plan. These adjusted requirements increased investment by approximately eighteen percent.

The successful stakeholder management in Case one fits the transaction cost theory of the make-or-buy decision. Run-of-River HPPs is technically more challenging than reservoirs, requiring navigation locks, fish passage facilities, and sediment passage facilities for HPP constructed on mainstream Mekong River. Such projects also require close coordination between the project owner and contractors in managing social and environmental concerns. With the project owner and the first-tier contractor belonging to the same company group, two parties are more likely to increase trust, such coordination is almost certainly smoother which benefits the project coordination. This situation, managing

unforeseen events, like the late request to modify the project design during construction, could also be managed with internal administrative mechanisms instead of the legal system, which likely expedited a resolution in the best interest of the overall project.

When belonging to the same company group, the two parties are more likely to be able to credibly commit to sharing benefits from the positive reputation gained from the completion of Case one. The first-tier contractor thus does not need to worry that it would not be part of the future projects owner contracts as they are from the same group. The contractor is therefore more likely to agree to additional work to move the project forward for future business agreements.

4.3 Stakeholder Management: Case two

Case two is a Storage dam in Nam Kading River, Southern province in Lao PDR. The project owner and first-tier contractor were from different company groups. The project owner decided to divide the general construction work among three first-tier contractors: a civil contractor, a hydro and electromechanical contractor, and a transmission line contractor. Following a FIDIC contract, the project owner authorized the owner engineer company to act on behalf of the project owner. With this SM process, project owner shared responsibilities and workload with the owner engineer company. Construction started in 2016, and there were disputes between the first-tier civil contractor and the engineer on Case two is a Storage dam in Nam Kading River, Southern province in Lao PDR. The project owner and first-tier contractor were from different company groups. The project owner decided to divide the general construction work among three first-tier contractors: a civil contractor, a hydro and electromechanical contractor, and a transmission line contractor. Following a FIDIC contract, the project owner authorized the owner engineer company to act on behalf of the project owner. With this SM process, project owner shared responsibilities and workload with the owner engineer company. Construction started in 2016, and there were disputes between the first-tier civil contractor and the engineer on behalf of the employer for design and construction of the upstream pre-cofferdam. This

dispute was submitted to the Dispute Adjudication Board (DAB), three independent people representing the project agreement following the FIDIC-CONTRACT BOOK, which establishes the contract conditions for construction. These three independent persons were appointed for undertaking dispute resolution by the contracting parties. The first person is appointed by the project owner, the second person by the contractor, and the third person an owner decided to divide the general construction work among three first-tier contractors: by the first and second person and acts as the chairman. All three people would be independent from contracting parties and the payment is shared equally between project owner and contractor. These three people visit the site regularly once every three to four months. If there is any dispute on the project site, the DAB would be the first step to mitigate the dispute and issue the resolution.

For Case two, the first-tier civil contractor structure was a joint venture, comprised of three construction companies. The internal process for construction therefore required agreement from each partner in the joint venture. Later, there were problems on the construction site and in 2019 the project owner terminated the first-tier civil contractor and awarded the civil contract to a new first-tier civil contractor. With this decision, the project incurred additional costs.

Case two followed the Environmental and Social Management and Monitoring Plan (ESMMP), which is the implementation standard guidelines in compliance with Lao PDR Environmental Impact Assessment Procedures. Because the Storage dam is not permitted to be located on the mainstream Mekong River, there were no requirements for navigation locks, fish passage facilities, or sediment facilities.

Case two illustrates the transaction cost risk of outsourcing. The project owner considered the Storage dam a comparatively less technically demanding design with lower levels of risks associated with environmental uncertainties compared with the Case one. There were conflicts arising among internal stakeholders. From disputes with contractors emerged, resulting in first-tier civil contract cancellations prior to the completion date. While outsourcing has demonstrable benefits – allowing firms to exploit the bidding process for first-tier contractors, economies of scales, and expertise from external partners

project owners must carefully weigh these against the potential disadvantages, especially those arising from incomplete contracts and transaction costs.

4.4 Managing Resettlement of Villages

Both Case one and Case two required project management to sign an agreement with Lao PDR for village resettlements and a rehabilitation area. This resettlement action plan is like a compulsory purchase order (CPO) 11 in the United Kingdom and Ireland. This order allows the government to enforce the area development for public betterment. Case one construction was from 2012 to 2019. Both Case one and Case two required villager relocation to new resettlement sites, which consisted of completed new infrastructure such as schools, health care centers, and water and electricity supply. Case one dislocated fifteen villages on both sides of the Mekong River, requiring resettlement. Seven of the villages had to be resettled to newly constructed settlement villages. This required constructing every aspect of the new villages from scratch, including housing, infrastructure, public facilities such as electricity and water supply, sewage, access road, schools, health offices, vocational training centers, and farm areas. The other eight villages required relocation to higher ground closer to the old settlement. The Resettlement Action Plan (RAP) was Villagers complied with the resettlement action plan and the compensation program. After villagers relocated to the new village, the project owner was required to provide a social development program for villagers consisting of agricultural training, farming, and suitable career training to promote the living conditions. To ensure the mutual benefits, an agreement with Lao PDR specified that at least 60% of the project workforce must be Lao citizens, increasing the Laotian employment rate and enhancing work skills.

4.5 Managing Environmental Concerns

For HPP project development in Lao PDR, one of the first documents prepared by the project owner and technical advisor to present to Lao PDR is the Environmental

Impact Assessment (EIA) or the Initial Environmental Examination (IEE), depending upon the installation power output. If the HPP installation power output is less than 50MW, the Environmental and Social Plan will be presented to Lao PDR with an IEE. If the HPP installation power output is more than 50MW and impacts more than 1,000 hectares of villages and forests, then the Environmental and Social Plan will be presented to Lao PDR with an EIA. The Ministry of Natural Resources and Environment of Lao PDR will examine the EIA and be responsible for Environmental Compliance Certificate (ECC) for EIA. The EIA is a critical requirement for the completion of the Concession Agreement (CA). The project owner was required to submit EIA studies to the Lao Ministry of Natural Resources and Environment while the feasibility study was submitted to the Ministry of Energy and Mines prior to the concession agreement. Upon contract signature, the contractor is also required to produce an Environmental Protection Plan (EPP). The requirements of the EIA and the contractor's internal procedures are merged in a way to achieve maximum protection. The contractor produced EPP is subsequently further detailed by a specific Environmental Plan attached to Method Statements that describe in detail the activities executed on site.

A Run-of-River Hydroelectric Power Plant has different environmental concerns than those of a conventional Storage dam. For Run-of-River dams, the total outflow of water going through the power plant is equal to the natural inflow of water, and no water is stored, only channeled away. The Run-of-River power plant raises the upstream water level is near its maximum water level in the flood season and releases water downstream without diverting water from the river. Therefore, Run-of-River dams require fish passages, navigation facilities, resettlement village, and sediment transport facilities which reservoir dams do not. In contrast, a Storage Hydroelectric Power Plant requires different plans such as the forest rehabilitation plan, and water quality assessment plan.

The Mekong is the third longest river in Asia and supports an abundance of ecosystems throughout its length. The construction of hydroelectric power plants on the Mekong is controversial and a cause of concern regarding environmental issues such as

fish migration, the dilution of food sources along the river's route, and the sediment flows for agricultural production downriver. As the Mekong is one of the largest inland fish habitats in the world, the construction of dams raises environmental concerns on an international level. concerns on an international level. The construction design of the Run-of-River HPP followed the requirements from the MRC to mitigate these problems. For example, it integrated fish migration passages heading both upstream and downstream. For Case one, it incorporated multi-system fish passages and fish lifts to maximize fish survival rates. For upstream fish migration, the fish locks and fish passage facilities connect to a fish ladder which is 460 meters in length and 18 meters in width to accommodate different fish sizes. The end of the fish ladder connects to the fish locks that raise the fish upstream. For downstream fish migration, the plant was designed to support fish migration. The turbine was designed with fewer blades and lower speeds to keep the fish survival rate high.

The environmental guidelines for Case two are less stringent as there are no requirements for building fish passages, navigation facilities, and sediment transport facilities, but there is more concern on water quality in the storage. Both of Case one and Case two must follow the requirement of environmental impact mitigation by Lao PDR and MRC, reflecting a compromise strategy (Aaltonen & Sivonen, 2008). Failing to accommodate the external stakeholders' standards for environmental impact mitigation would jeopardize the project's viability.

Both Case 1 and Case 2 must comply with the environmental impact mitigation commitments to Lao PDR Failure to comply with these standards could result in project suspension or termination during construction or operation.

4.6 Managing The Media and NGOs

From Case one, the media and Non-Governmental Organizations (NGOs) were concerned with the project's environmental effects especially in the downstream countries, and Lao PDR was concerned with how the media would reflect these concerns. The media and NGOs seemed to assess that this project would have negative impacts upon the mainstream Mekong's ecosystem in Lao PDR and the downstream countries. Case one

demonstrated that the project owner company was willing to comply with all the requirements on protecting the ecosystem with the fisheries passage facilities, navigation lock facilities, sediment transport facilities, and earthquake protection. Therefore, the project owner company invited the media and NGOs to visit the site to assess the environmental facilities and show that it had met all the environmental impact mitigation requirements. A site visit facilitated by the MRC was held for stakeholders, media, and NGOs with the cooperation of Lao PDR's government agencies.

From Case two, the project owner complied with all Lao PDR regulations but adopted adaption and defense approach to stakeholder strategy by not inviting media or NGOs for site visits.

4.7 Vertical Integration in Stakeholder Management

A sound strategy within the SM process from the earliest project development stages is critical for megaproject construction. For the concession contract, the time responsible for the project was significantly different between project owner and first-tier contractor. The concession period of HPP's project owner in Lao PDR extended between 20-30 years, while the construction period would extend between 4-8 years. Therefore, the project owner implemented strategies that prevented risks to the construction quality through the concession period. Eventually, the Vertical Integration of stakeholder management was restructured to strengthen the relationship between internal stakeholders and reduce the conflict among internal stakeholders during the construction.

In summary, a project managed by the project owner who has the first-tier contractor as part of the same company group will require special conditions beyond the normal management structure. The project owner would normally form a special structure for the execution of the project and hold a larger share of the project to strengthen the decision-making authority within the project. In this context, the project owner awarding construction contracts to a first-tier contractor belonging to the same company group is becoming common. It places the project owner company in a strong position of authority

toward the project. In megaproject construction, this Vertical Integration management is achievable due to the requirement for a top-down integration for the whole project when the project owner and first-tier contractor are from the same company group.

In contrast, standard management of outsourcing where the project owner and first-tier contractor are different companies, the roles and responsibilities of the related stakeholders are regulated and balanced in a way to avoid conflict of interest. As the following Figure 4.2 illustrates, the project owner and first-tier contractor are different companies.

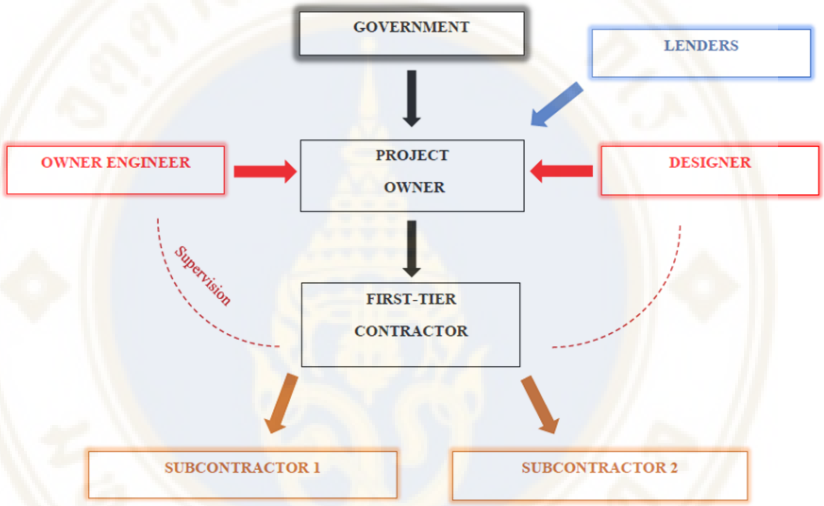


Figure 4.2 Standard Management of Outsourcing

When the project owner and first-tier contractor belong to the same company group, the Vertical Integration of the stakeholder management is implemented smoothly to reduce construction risks through the construction period as shown in Figure 4.3.

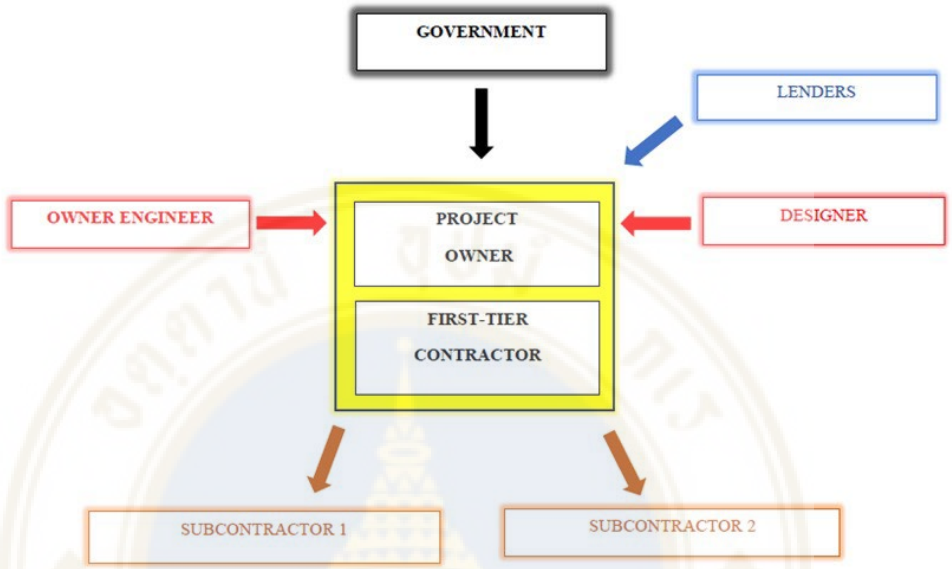


Figure 4.3 Vertical Integration Management

In Vertical Integration management, the owner engineer and designer act as a third party between the project owner and the first-tier contractor. The owner engineer 's role is streamlined as it provides consultancy services to the same company group. In Vertical Integration management, it is very important for the project owner, first-tier contractor, and owner engineer to retain its responsibility with the contract agreement. The owner engineer providing consultancy for both designer and project owner. It must strongly act as a third party for the project. The owner engineer must verify that the design and contractor commit the project's contract.

In summary, a Vertical Integration management where the project owner and first-tier contractor belong to the same company group undoubtedly has advantages as it enables a smooth relationship with the project's lenders and Lao PDR. This helps avoid conflicts between the project owner and first-tier contractor, and conflict and stakeholder negotiation between internal stakeholders is manageable by amicable settlement. This Vertical

Integration management can only be implemented where certain conditions exist. The contour of the agreements needs to be adequately prepared by the developing group, and it may also require a cultural understanding where stakeholders are willing to negotiate before engaging with legal issues. Avoiding internal conflicts in a construction process is always advisable, as they may lead to considerable losses for the stakeholders and project. Nonetheless this advantage exists and can be successfully implemented without conflict of interest when strict commitment through the design, construction quality, and contract especially for megaproject construction. The project owner and first-tier contractor must follow its commitment to provide the best quality of work to improve their performance further. If successful, this integration structure might lead to a competitive advantage for the project developer for new projects and increases lenders' confidence. In contrast, the Standard management of outsourcing where the first-tier contractor has competing bids with the project owner during the implementation of a project leads the stakeholder to improve performance. Dealing with conflicts on site increases the parties' development and understanding of mutual relationships by learning from their own mistakes or observing mistakes from other stakeholders. Table 4.1 displays the advantages and disadvantages for Standard management of outsourcing and Vertical Integration management.

Table 4.1 Advantage and Disadvantage Comparing Between The Management Practice

	Advantage	Disadvantage
Vertical integration (Case one)	① Mitigated legal risks. ② Enhanced communication among internal stakeholders. ③ Enabling amicable resolution. ④ Addressing urgent issues.	① Demands expertise across various sectors. ② Third party professional judgment is required to mitigate the risks. associated with conflicts of interest.
Standard management of outsourcing (Case two)	① Addressing conflicts directly on-site can foster stronger relationships by providing opportunities for mutual learning and growth. ② Independent stakeholders can help mitigate concerns about conflicts of interest.	① Standard management of outsourcing typically poses greater legal risks than Vertical integration.

4.8 Vertical Integration Management in HPP Megaproject Construction

A sound strategy within the SM process from the earliest project development stages, especially between internal and external stakeholders, is a critical influence for HPP megaproject construction. For internal stakeholder management, in this research, it adds multiple benefits such as the following (Friedman, 1984).

(1) Project cost control is improved because internal conflicts, arising from new environmental mitigation requirements set by the Lao PDR and the MRC, can be settled amicably between project owner and first-tier contractor. Additionally, savings can be realized through the stronger bargaining power of the single first-tier contractor with subcontractors and suppliers.

(2) Differentiate a company from competition through the enhanced confidence from lenders, subcontractors, and Lao PDR's government agencies. If project owner and first-tier contractor were not the same company, the lenders would not agree to finance the project. Case one is pilot Run-of-River megaproject construction on mainstream Mekong River which was never accomplished in Lao PDR before 2019. Lenders agreed to finance the project because the full responsibility of the project, from beginning to end, belonged to the owner and first-tier contractor coming from the same company group.

The success of the megaproject construction depends on a sound strategy for strong collaboration and trust between internal stakeholders, which extends beyond communication and the contract agreement. If internal stakeholders in Case one had been from different company groups, additional construction costs would have been incurred. It can take a longer time to solve conflicts among internal stakeholders who do not belong to the same company group, eventually causing project delays and cost overruns. There is a concern, however, among internal stakeholders for maintaining professionalism and avoiding cronyism when the project owner and first-tier contractor belong to the same company group. To gain respect and credibility from other stakeholders, the owner engineer company plays a critical role as a third-party company who verifies details design and construction plan costs for the project owner and first-tier contractor to ensure a professional work standard and project quality. For the megaproject construction, the

external stakeholder has more participants than the normal construction project. This makes the procedures more complex than normal projects while the external stakeholder has influenced the megaproject with their attributes of power, legitimacy, and urgency especially regarding environmental impact mitigation.

Following the successful commercialization of Case one, the project owner and first-tier contractor gain the confidence from Lao PDR. The external stakeholders recognized the company's credibility and work commitment. This credibility has enhanced the company's reputation, giving it a competitive advantage as part of the long-term value creation process for future projects (Ackermann & Eden, 2011). If the same stakeholder begins a new project, this trust can lead to a competitive advantage (Jones, 1995). A competitive advantage in this research is achieved by gaining expertise in construction design, construction planning, faster processes for HPP megaproject construction, readiness of human resources and machinery, and geological expertise to comply with the environmental impact mitigations which might lead to competitive advantage for the new project.

External stakeholders had the potential to obstruct the completion of Case one, especially concerning environmental impact mitigation and social responsibility. The SM process in megaproject construction requires project management to pay special attention to the environmental impact mitigation plan. Project completion depends upon solving critical environmental requirements and promoting clear communication with the external stakeholders for project accomplishment, especially the environmental impact mitigation. The external stakeholder in Case one had a much greater impact on the construction thanon a normal project because of the environmental impact mitigation requirements throughout the project life cycle.

The project owner in Case two divided the construction contract into three first-tier contracts, civil, hydro-electromechanical, and transmission line. Under this model, the SM process was not effectively implemented from the earliest stages when there were disputes about the design and construction of the upstream pre-cofferdam. Although it achieved an amicable settlement between internal stakeholders after DAB resolution, the problems on site continued. It eventually led to the termination of the first-tier civil

contractor. The new civil contractors arrived and successfully completed the work for the contract, but with additional cost to the project.

The relative success of Case one can be viewed through the lenses of transaction costs. Because the project owner and the first-tier contractor belong to the same company group, the cost of renegotiation and settling disputes after a surprise change in project specifications was completed in a smooth and timely manner. The same cannot be said for Case two, where the construction was split between three independent contractors. The substantial transaction costs involved in a contract dispute resulted in the termination of the original first-tier civil contractor.

Another way to understand Case one's success is through credible incentives. By completing the Run-of-River project on time, the project owner gained a good reputation with Lao PDR. Such credibility can yield benefits through bids for, and negotiations of, future HPP projects. Current successes automatically benefit both the project owner and the in-house first-tier contractor because they will be working together again on future projects. If the contractor had not been an internal entity, the contractor might lack confidence that it would be chosen again for future projects. The outside contractor is thus less likely to accept concessions resulting from today's sacrifices in exchange for potential future benefit.

CHAPTER FIVE
DISCUSSIONS AND CONCLUSIONS

5.1 Discussions

This research has two contributions to SM literature on megaprojects. The first contribution for adding the new factor which explores the involving multiple internal stakeholders with different goals and responsibility timeframes. In Case one, Vertical Integration management improves cost control, develops synergies from combining inputs, and helps differentiate a company from competition. Vertical Integration management also enhances trust and collaboration among internal stakeholders when compared to the Standard management of outsourcing. Vertical Integration was particularly successful in smoothing conflicts between internal stakeholders whose interests in the project spanned very different durations. To understand how stakeholders with varying project responsibility timeframes influence decision making. Additionally, it explores additional factors contributing to high transaction costs and their implications for MAKE or BUY decisions when considering high transaction costs in Figure 5.1.

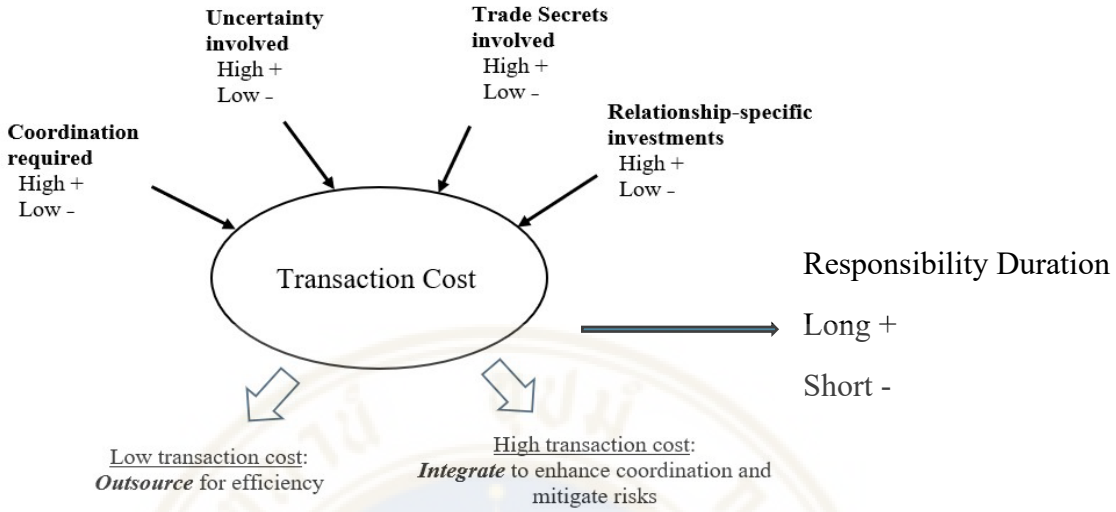


Figure 5.1 New Factors Contributing to High Transaction Costs.

To mitigate high transaction costs and multiple risks in megaproject construction, project owners might choose to utilize competent subsidiary companies for projects with extended concession periods. This ensures quality control and facilitates long-term problem-solving.

The second contribution, from this research contributes to the fact that Managing external stakeholders is also shown to be critical influence toward the project. From previous studies, internal stakeholder management was found to have positive association with firm performance leading to a competitive advantage, while external stakeholder management was found to be negatively associated with firm performance. In this research, the author shows that external stakeholders who have power, legitimacy, and urgency can threaten to suspend or terminate the project when it is related with environment impact mitigation in megaproject construction. It is necessary for project management to show flexibility and readiness to compromise with high demands made by external stakeholders, especially for environmental impact mitigation, which may in some cases prove to be a key determinant for project continuation or cancellation.

5.2 Conclusions

Megaproject requirements may change depending on new industry construction procedures and the regulations of the country where the project is implemented. Most of the current requirements arise from the Concession Agreement which is stipulated by the project owner and then reflected in the provisions of the construction contract. For project owners, contractors and related stakeholders, there are always unique problems to each construction project, faced during the construction process depending on its agreement, environment, and social condition. The distribution of risks and responsibilities in megaproject construction are dealt with differently depending on the contract conditions. Therefore, the project owner would be involved in the project through the concession period while first-tier contractor would not be involved in the project after the COD, as evident in Cases one and two presented in this research. The difference in the time of the responsible period of the project is significantly different. Because of this, the provisions of the project owner provide diverse ways to deal with multiple stakeholders to ensure the project construction quality through the concession life cycle. With these multiple risk factors, project management must explore strategies to strengthen the relationship between internal stakeholders and safeguard the project from negative influence from internal and external stakeholders.

The objective of this research is to explore the influence of internal and external stakeholders on different Hydroelectric Power Projects and present how the project manager can minimize the risk and how stakeholder management strategy might lead to a competitive advantage in HPP construction.

In Case one, Project management by the project owner who has the first-tier contractor as part of the same company group implements strategy planning for top-down Vertical Integration management since the project development stage. This strategy is implemented for project completion, strengthened corporate reputation, boosted economic growth, and sustained good relationships among internal stakeholders while mitigating the negative influence from the internal and external stakeholders. For Case two, the project

owner managed the project by the Standard management of outsourcing. It authorized the owner engineering company as their representative to manage the project. The problems arise from internal stakeholder conflict during construction. Although the project owner, owner engineer, and first-tier civil contractor tried to resolve the disagreement, they could not reach an amicable settlement based on the contract before the DAB resolution. The internal stakeholders possessed conflicting goals with each other. Therefore, the work environment before DAB decision was affected by the conflict among related parties. In Case two, once the collaboration and trust between disputed internal stakeholders were lost, internal communication became more difficult to manage. Eventually, after submitting the case to the DAB, a resolution was reached by DAB decision.

Despite multiple stakeholders having different attitudes and concerns, the hydroelectric power project in Case one was considered a success by Lao PDR and Northwestern Province. The timely construction was a major boon for the local provincial economy. This project was completed on schedule under the terms of the concession and power purchasing agreement to accomplish its COD in October 2019 following the MRC's requirements. This project represents a pilot Run-of-River hydroelectric power project for other contractors to emulate on the mainstream Mekong River. To receive approval and support from Lao PDR, the other Run-of-River HPPs are now obliged to follow Case one's environmental impact mitigation standards for the ecological system, fish passage facilities, navigation lock, sediment transportation passage facilities, and earthquake protection on the mainstream Mekong River. The Vertical Integration management in Case one displays credibility and reputation after project completion. This is evidence that vertical integration led to competitive advantage. It presents the expertise and readiness for concession bidding on the new Run-of-River HPP megaproject in any region for Project owner in Case one.

Although this management strategy can mitigate the legal risk, due to amicable settlement among the internal stakeholders, it may create questions for conflicts of interest from third party stakeholders. For accomplishing this Vertical Integration management, internal stakeholders who apply this management strategy must follow the critical requirement for professional ethics and a need for monitoring from a third-party to ensure the quality of project through concession period.

For Case two, managed by Standard management of outsourcing through an independent stakeholder, construction was completed with a successful COD at additional cost to the project. For Case two, internal stakeholders experience conflict, but these constraints were later mitigated by the amicable settlement after DAB resolution. The project was successfully completed with a COD in August 2022. Due to the complexity of Case two conflicts among internal stakeholders. It does not present competitive advantages after the project is completed. Case two demonstrates that a rigid adherence to contracts without a focus on collaboration and trust among stakeholders can jeopardize the success of a megaproject.

From the findings of Case one and Case two, this research identifies several disciplines that could benefit from stakeholder management approaches for megaproject construction. These disciplines are as the follows.

From Case one, in megaproject construction, prioritizing construction quality over bidding price when selecting contractors is crucial. While bidding price is important for any construction projects, but with significant responsibility of megaproject, project owners should prioritize contractors with proven track records of delivering quality beyond concentrate on bidding price. Even if their bids are slightly higher, selecting such contractors can ensure timely project completion with high quality. Instead of focusing solely on investment costs, companies must consider multiple factors that can affect the project, such as reputation and risk mitigation.

These findings are universally applicable to megaproject construction, highlighting the impact of internal and external stakeholders on project success. Effective project management strategy can mitigate negative influences by aligning stakeholder interests with the project owner's strategy before construction begins. For project owners with capable subsidiaries, vertical integration can enhance business strength beyond mere trust and economic efficiency. To develop sustainable megaprojects, any countries should adopt international environmental impact mitigation standards. Before committing to long-term, large-scale projects, project owners should reassess their business models and ensure robust management strategies are in place. Relying on in-house expertise work in their

expertise field can significantly reduce risks compared to outsourcing all contracts, especially in complex megaprojects.

5.3 Limitations

Two significant limitations of this research are as follows:

First, the author desires to research other megaproject construction on mainstream Mekong River, but until now, there is only one Run-of-River megaproject construction project completed on the mainstream Mekong River which follows the completed MRC environmental impact mitigation requirement. The other Run-of-River HPP from different project owner on the mainstream Mekong River which has the same completed requirement from the MRC has not begun EPC construction in 2023. Therefore, there is no direct comparison between the HPP megaproject construction on the same dam type with different strategy management.

Second, legal issues between the project owner and the first-tier contractor who was dismissed from the contract have surrounded the Case two projects. Therefore, the interviewees were not allowed to present some undisclosed information which might affect the case. There was some confidential information kept secret between internal stakeholders.

5.4 Future Research Directions

For future research directions, there are three recommendations as the following:

First, further study of advantages or disadvantages from the Vertical Integration management for megaproject construction operating in Lao PDR could be further investigated. What would be the positive or negative influence if project owner continues this Vertical Integration management for the new megaproject? The future research can continue to explore the positive and negative influence toward the new project for multiple areas that are not covered in this research.

Second, future research could study stakeholder strategies employed by HPP Run-of- River construction on mainstream Mekong River from different project owners who accomplished the same environmental impact mitigation requirement. If they apply different management strategies, what are their SM strategies compared with Case one?

Third, continue the research of factors contributing to high transaction costs and implications on the make vs. buy decision from different industries. What are the new influences, either positive or negative observed from other industries? Such questions can be explored for additional factors contributing to high transaction costs from other industries' requirements.

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APPENDICE

Appendix A: Development Outlook on Mainstream Mekong River

	Location	Install Capacity	Country
1	Pakbeng	912 MW	Lao PDR
2	Luang Prabang	1,460 MW	Lao PDR
3	Xayaburi	1,285 MW	Lao PDR
4	Pak Lay	770 MW	Lao PDR
5	Sanakham	684 MW	Lao PDR/Thailand
6	Pak Chom	1,079 MW	Lao PDR/Thailand
7	Ban Khuom	1,872 MW	Lao PDR/Thailand
8	Phu Ngoy	728 MW	Lao PDR
9	Don Sahong	260 MW	Lao PDR

Appendix B: Hydroelectric Dam type for River

There are three main types of hydropower projects for rivers. These technologies can often overlap. For example, storage projects can often involve an element of pumping to supplement the water that flows into the reservoir naturally and run-of-river projects may provide some storage capability.

Run-of-river Hydroelectric Power Plant: a facility that channels flowing water from a river through a canal or penstock to spin a turbine. Typically, a run-of-river project will have little or no storage facility. Run-of-river provides a continuous supply of electricity (base load), with some flexibility of operation for daily fluctuations in demand through water flow that is regulated by the facility.

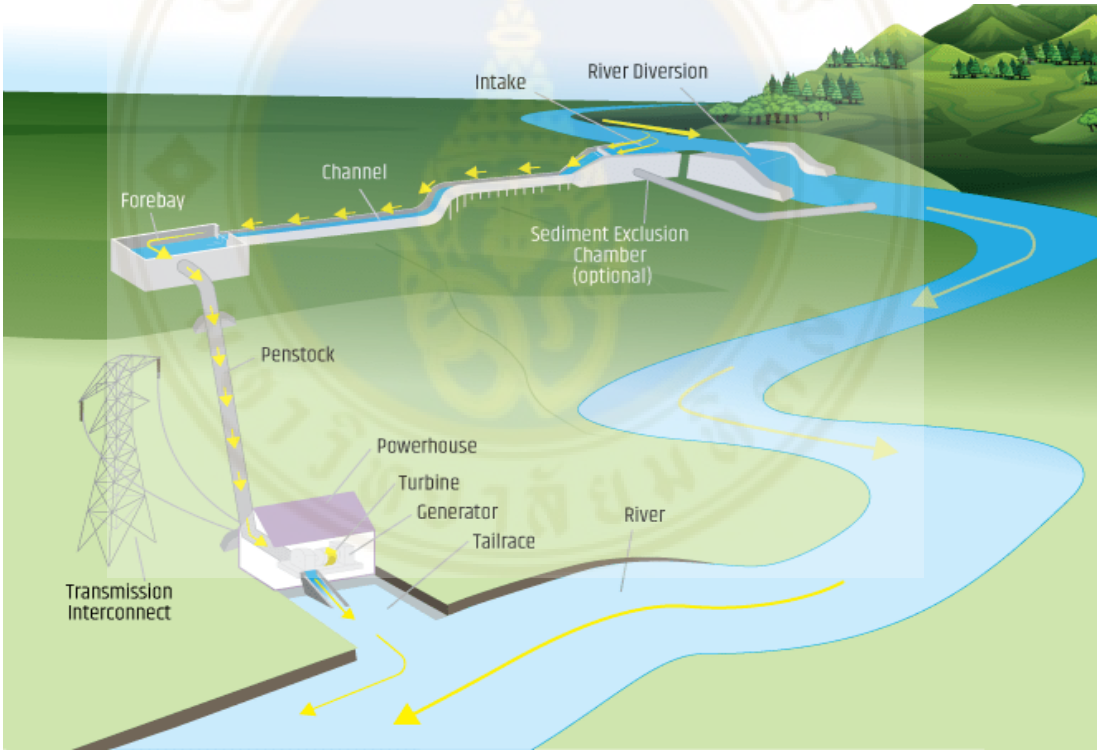

Figure B1: Run-of-river hydroelectric power.

Storage Dam Hydroelectric Power Plant: typically, a large system that uses a dam to store water in a reservoir. Electricity is produced by releasing water from the reservoir through a turbine, which activates a generator. Storage hydropower provides base load as well as the ability to be shut down and started up at short notice according the demands of the system (peak load). It can offer enough storage capacity to operate independently of the hydrological inflow for many weeks or even months.

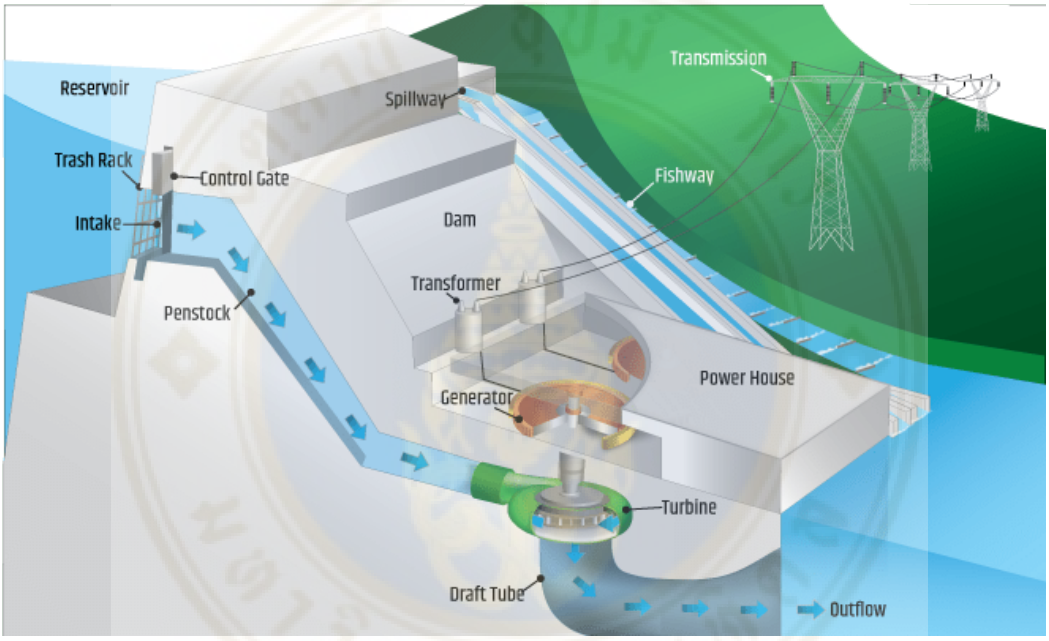

Figure B2: Storage Dam Hydroelectric Power Plant

Pumped Storage Hydroelectric Power Plant provides peak-load supply, harnessing water which is cycled between a lower and upper reservoir by pumps which use surplus energy from the system at times of low demand. When electricity demand is high, water is released back to the lower reservoir through turbines to produce electricity.

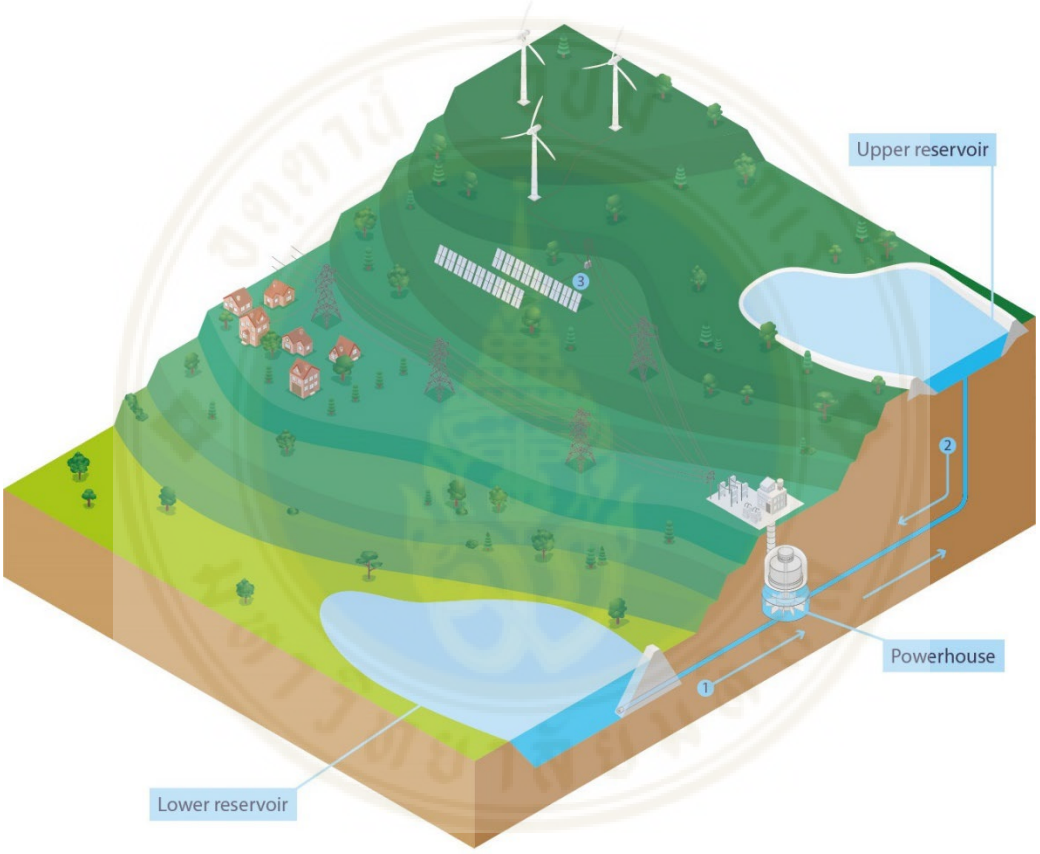

Figure B3: Pumped storage Hydroelectric Power Plant

Appendix C: Description for Hydroelectric Power Plant Construction

A Storage and Run-of-River Hydroelectric power plant is a large structure to block or control the flow along river, forming a reservoir or a lake in front of the dam. Most dams have a necessary structure such as spillway which is the path to allow the overflow of water passing the dam to downstream of the river.

The spillway has many gates which are the overflow controllers for each dam. There is another structure called powerhouse which has multiple turbines and generators for the purpose of power generation. For storage dam, it has no navigation lock requirement while Run-of-River Dam has navigation lock which will be a water traffic route for boat passing along the river. Some countries build dams to control the flow of water in the downstream river systems and prevent flooding while others build dams to generate electricity using hydroelectric turbine generators, or to store water by using this irrigation for farming or water consuming.

Spillway (Hydro Mechanical Works)

A part of dam structure which is called "Spillway" comprise of many gates. The gates are built for the purpose as the following:

(1) To control the water flow which should be in normal flow along the river during period of each month for the whole year.

(2) To control the upstream water level of the dam for maximum capacity of power generation. Moreover, for safety control condition of dam's operation. In case of high volume of water flow to dam, the gates will be opened to release the water from upstream side to downstream side through spillway and controlled the water level at upstream side.

Powerhouse (Electromechanical Works)

Powerhouse is an important structure of hydro power plant which comprise of turbines and generators for power generation. There are many types of turbines for each dam depending on physical geography and design such as bulb turbine type, Kaplan type, Pelton type and Francis's type. The turbines and generators are major equipment in the powerhouse, they also have the auxiliary system to support the safe operation and control the turbines and generators by themselves as well. Power generation at powerhouse by turbines and generators should be achieved maximum generation design capacity depending on water level at upstream and downstream of dam (Net head, ΔH).

Transmission Line

The transmission line of hydro power project is the route to deliver power from dam to the customer. They transmit power through transmission line system at many high voltage levels such as 1000 kV level, 500 kV level, 230 kV level, etc. The voltage level which is designed for each power generation will be based on the distance between the powerhouse and destination of customer including the power generation capacity (Mega watts) of the powerhouse generators.

Appendix D: COD Energy Export from Lao PDR to EGAT in 2022

No.	Name of Project	location (Province)	installed capacity (MW)	Market	COD	remark
1	Theun-Hinboun hydro plant and the Expansion	Khammouane and Bolikhamxay	500.00	EDL/EGAT	1998-2012	IPP
2	Houay Ho	Champasak & Attapeu	152.00	EDL/EGAT	1999	IPP
3	Nam Theun 2	Khammouane and Bolikhamxay	1,075.00	EDL/EGAT	2010	IPP
4	Nam Ngum 2	Vientiane	615.00	EGAT	2012	IPP
5	Hongsa Power	Xayaburi	1,878.00	EDL/EGAT	2016	IPP
6	Nam Ngiep 1	Bolikhamxai & Khammouane	290.00	EDL/EGAT	2019	IPP
7	Xayaburi Hydroelectric Power Plant	Xayaburi & Luang Prabang	1285.00	EDL/EGAT	2019	IPP
8	Xe Pian-Xe Namnoy	Champasak & Attapeu	410.00	EDL/EGAT	2019	IPP
9	Nam Theun 1	Bolikhamxay	650.00	EDL/EGAT	2022	IPP
Total			**6,855.00**			

Appendix E: The MRC Hydropower mitigation guidelines: Guidelines for Hydropower environmental impact mitigation and risk management in the lower Mekong mainstream and tributaries Vol.1 CHAPTER 6

The MRC Hydropower mitigation guidelines: Guidelines for Hydropower Environmental Impact Mitigation and Risk Management in the lower Mekong Mainstream and Tributaries Vol.1

6 Recommended Hydropower Impact Mitigation Options

6.1 Good Industry Practice

The recommended hydropower impact mitigation options contained in these Guidelines are based on Good Industry Practice gathered from international and regional studies and research. Some of the relevant options have drawn on work by:

- the International Hydropower Association (IHA),
- The World Bank Group (WB), including International Finance Corporation (IFC).
- The Asian Development Bank Safeguards (ADB)
- Practice and Research arising from the World Commission on Dams
- MRC, WB and ADB experience in Benefit Sharing Mechanisms, and
- Regional and national experience on major hydropower projects on the
- Mekong and adjoining river basins.

In addition, global industry practice, from projects built in similar large tropical basins globally, have been gathered and a few related research papers have been included in the Knowledge Base.

6.2 Overall Guiding Principles

The MRC cooperation is firmly based on the 1995 Agreement and during the last years the MRC has developed and applied its framework to address the issue of hydropower development in a holistic way. The following describes this framework to set the scene for the performance of the Guidelines and Recommendations.

6.2.1 The 1995 Mekong Agreement and The MRC Procedures

The Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin signed by Cambodia, Lao PDR, Thailand, and Viet Nam on 5 April 1995 defines a set of principles and processes for pursuing a coherent strategy of integrated water resources management (IWRM) on the regional scale.

The 1995 Mekong Agreement encourages cooperation amongst the LMB countries to optimize the multiple use and mutual benefits of all riparian's while protecting the environmental and ecological balance in the basin.

The 1995 Agreement addresses different types of water use including proposed hydropower developments. In the latter respect, the following key chapters and articles are important guides to The Guidelines and The Manual:

- **Chapter II: Definitions of Terms**
- Article 1: Areas of cooperation

- **Chapter VI. Recommended Hydropower Impact Mitigation Options**

The MRC Hydropower Mitigation Guidelines

- Article 3: Protection of the Environment and Ecological Balance
- Article 4: Sovereign Equality and Territorial Integrity
- Article 5: Reasonable and Equitable Utilization
- Article 6: Maintenance of Flows on the mainstream
- Article 7: Prevention and Cessation of Damages of Harmful Effects
- Article 8: State Responsibility for Damages
- Article 26: Rules for Water Utilization and Inter-Basin Diversions

- **Chapter V: Addressing differences and disputes**

The Mekong River Commission (MRC) with its three bodies (Council, Joint Committee and Mekong River Commission Secretariat) serves as an international organization to ensure the implementation of the 1995 Mekong Agreement through its provisions and to adopt Procedures to facilitate and addressing such issues in a cooperative and amicable manner.The vision of the 1995 Mekong agreement is embedded within the following agreement between the member states; "..to cooperate in a constructive and mutually beneficial manner for sustainable development, utilization, conservation and management of the Mekong River Basin water and related resources.."

i. The five adopted Procedures for implementation within the MRC framework are the
ii. Procedures for Notification, Prior Consultation and Agreement (PNPCA; approved in 2003).
iii. Procedures for Data and Information Exchange and Sharing (PDIES; approved in 2001).
iv. Procedures for Water Use Monitoring (PWUM approved in 2003).
v. Procedures for Maintenance Flows on the Mainstream (PMFM approved in 2006).
vi. Procedures for Water Quality (PWQ approved in 2011).

According to the PNPCA, hydropower development on tributaries is subject to notification to the MRC Joint Committee and respective development on the mainstream requires prior consultation towards agreement between the countries.

The implementation of the PNPCA under the 1995 Mekong Agreement in case of a proposed hydropower dam, intends to benefit each MRC country and to facilitate the development of water and related resources in the LMB. Furthermore, the PNPCA commits to the countries to notify their neighbors of proposed mainstream projects when they have sufficient information, then consult and reach agreement on whether to proceed, and if so, under what conditions.

The Mekong Agreement also requires the countries to "make every effort to avoid, minimize and mitigate harmful effects…", i.e. to adopt the mitigation hierarchy in

6.2.2 MRC Preliminary Design Guidance (PDG)

The most important safeguards for hydropower in the LMB are those in the Preliminary Design Guidance (PDG) for Mainstream Dams in the Lower Mekong Basin, which was issued by the MRC in 2009 (presently under review/updating).

The original PDG outlines the expectations of, and an approach to, mitigation of the major risks for hydropower dams in the Mekong mainstream. For example, the PDG requires all mainstream dams to incorporate both upstream and downstream fish passage facilities, which should ensure "effective" passage (i.e. safe passage for 95% of the target species under all flow conditions). The PDG criteria have served as the compliance benchmarks in the technical reviews of Xayaburi, Don Sahong, Pak Beng and Pak Lay hydropower projects, and currently is also used as part of the PNPCA process for Luang Prabang hydropower project.

This Guidelines with the supporting Manual seeks to enhance and expand the PDG and to provide more effective and detailed documentation of the options and methods that may be used to cover the mitigation of hydropower risks in the Mekong mainstream, as well as to expand the applicability of the PDG to the tributary developments. Hence the updated PDG will refer to Guidelines and The Manual, regarding details and solutions for general and specific mitigation approaches and options.

The Preliminary Design Guidance (PDG) for the Proposed Mainstream Dams in the Lower Mekong Basin provides developers with an overview of issues that the MRC will consider during the PNPCA process under the 1995 Mekong Agreement. Regarding the themes of this Guideline the PDG provides recommendations as follows. These will be further updated in the PDG to be issued in 2020.

Environmental Flow and Aquatic Ecology

The PDG stipulates to incorporate instream flow (environmental flow) considerations appropriately at different project stages (design, implementation, operation and monitoring). The Design Guidance states that the developers should systematically assess the effect of combination of flow releases from the dam to address downstream impacts at different times of the year, also taking into account the position

of the dam in possible cascade series of dams. This should be done by introducing appropriate Environmental Flow Assessment (EFA) methodologies at the EIA and feasibility study stage, appropriate to the scale and significance of the flow changes, and referring to good practice techniques and methodologies.The prescribed documentations to refer are IUCN Publication- ‘Flow: The Essentials of Environmental Flows’ and World Bank Publication- ‘Environmental Flows: Concepts and Methodologies’. MRC Environment Program (2011- 2015) also highlights the requirement of further development of EFA approaches. In this guideline environmental flow mitigation is described in Section 6. 4 and is also further described in the Manual under Chapter 5.3.2.3.

Sediment Transport and Geomorphology

The PDG provides an overview of potential sediment related impacts associated with the development of hydropower projects and approaches for mitigation and management. These impacts include reservoir deposition, changes to sediment transport from inflowing tributaries (both in the reservoir and downstream), downstream channel adjustments related to changes in hydrology and sediment.

loads and associated impacts on habitat distribution and quality. A summary of guiding principles for considering sediment related issues during the planning phase is provided for developers, which highlight the importance of:

- Understanding the relationships between hydraulics, river morphology and ecology.
- Assessing whether dam developments should be avoided in reaches susceptible to severe.
- morphological change.
- Making dams transparent to sediment transport as much as possible.
- Considering sediment transport issues associated with tributary inputs.

The PDG discusses a range of sediment management options, including sediment routing, sediment bypass, sediment flushing, mechanical removal, sediment traps and sediment augmentation downstream of the reservoir. General guidance is provided with respect to site selection, modelling, and monitoring of sediments into, within and downstream of the impoundment, and the inclusion of gates to enable sediment management options. Operational and ecological issues associated with the timing of sediment management are also highlighted, with an emphasis on continued monitoring over the life cycle of the project to guide management strategies. Reactive measures, such as physical bank protection are indicated as a means of mitigating impacts which cannot be avoided through management of the project. In this guideline various sediments and geomorphology mitigation options is considered in Section 6.4 and is also further described in the Manual under Chapter 3.4.

Water Quality

The PDG focuses on water quality risks associated with a series of low-head dams as proposed for the mainstream Mekong in the LMB, emphasizing that larger deeper storages may promote greater changes. The water quality risks identified by the PDG include changes to physical and chemical water quality parameters which can impact on the downstream ecosystem, and geomorphology (as related to sediment concentrations).

The water quality parameters that are important to consider in hydropower developments include temperature, pH, dissolved oxygen, Biological Oxygen Demand, total nitrogen, total phosphorus, and coliform bacteria. These parameters can be altered during storage within a reservoir and especially under conditions where thermal stratification can lead to the development of stagnant water at depth.

Guidance for maintaining water quality includes the design and management of reservoirs which will achieve the water quality guidelines as set out in the MRC Technical Guidelines for Procedures on Water Quality. The PDG states the necessity of site – specific water quality monitoring, with the results to be interpreted within larger scale trends provided by the Water Quality Monitoring Network and Ecological Health Monitoring Network. In this guideline various water quality mitigation options are considered in Section 6.4 and is also further described in the Manual under Chapter 4.3.

Fish Passages on Mainstream Dams

The PDG gives an overview of the various fish guilds (10) on the Mekong and its tributaries and the likely impacts of mainstream dams. This is followed by guidance on fish passage design and operation. Important guiding principles are as follows:

- Fish passage facilities for both upstream and downstream passage must be incorporated into all dams.
- The developers should provide for effective fish passage bot upstream and downstream, defined as follows – "providing safe passage for 95% of the target species under all flow conditions";
- Where fish passage rates are unlikely to be adequate to maintain viable populations other mitigation options as part of compensation programs for lost fisheries resources must be developed.
- Fish passages and mitigation options should constitute multiple systems at each site to cater for the high number of species and high biomass.

The PDG details further biological, hydrological, and hydraulic requirements for the fish passages during the various phases of the HPP project life cycle. In this guideline various fish passage mitigation options are considered in Section 6.4, and especially Table 6.3 and 6.4. It is also further described in detail the Manual in Chapter 5.3.3.

6.3 General Principles for Sustainable Hydropower Development

The general principles for sustainable hydropower development, along with the above MA95, guide the selection and design of mitigation in these Guidelines. For simplicity, these are taken from the International Hydropower Association's Hydropower Sustainability Assessment Protocol3.

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

- Sustainable development embodies reducing poverty, respecting human rights, changing unsustainable patterns of production and consumption, long-term economic viability, protecting and managing the natural resource base, and responsible environmental management.
- Sustainable development calls for considering synergies and trade-offs amongst economic, social and environmental values. This balance should be achieved and ensured in a transparent and accountable manner, taking advantage of expanding knowledge, multiple perspectives, and innovation.
- Social responsibility, transparency, and accountability are core sustainability principles.
- Hydropower, developed and managed sustainably, can provide national, regional, and local benefits, and has the potential to play an important role in enabling communities to meet sustainable objectives.

6.4 Selection of Mitigation Options for The LMB

The tables in the following pages (Tables 6.1 – 6.5) constitute a summary of the MRC Hydropower Mitigation Guidelines. The mitigation options are presented in detail by thematic area (hydrology, geomorphology & sediment, water quality, fisheries, and aquatic ecology as well as biodiversity) in the Manual. Each thematic area includes examples of good international and regional industrial practice, available criteria for evaluating the applicability of mitigation measures, technical guidance and information about monitoring and indicators. also includes a chapter on engineering response to environmental risks.

The mitigation options are structured according to the 5 key common overarching changes related to hydropower development, as identified in Chapter 1.2 and 5. These are:

I. Annual / inter-annual changes to flow
II. Daily / short-time scale changes to flow and water level
III. Loss of river connectivity
IV. Impoundments
V. Diversion or intra basin transfers

Within these identified major changes, a set of major risks and impacts (left column in the tables) for each thematic area has been identified. The identified mitigation options are then grouped into avoidance, mitigation (including minimization), compensation and adaptation measures. The associated sub-sections define where in the project life cycle the various mitigation options are to be implemented. A succinct overview of how mitigation considerations should be incorporated into each stage of the hydropower life cycle is presented following the Tables.

More details on the proposed mitigation measures can be found in as follows:

- Hydrology and flows (Vol 2, Chapter 2.3)
- Geomorphology and sediments (Vol 2, Chapter 3.4)
- Water quality (Vol 2, Chapter 4.3)
- Fisheries and Aquatic Ecology (Vol 2, Chapter 5.3)
- Biodiversity and Natural Resources (Vol 2, Chapter 6.3)
- Engineering Response to Environmental Risks (Vol 2, Chapter 7)
- Ecosystem Services (Vol 2, Chapter 8.4)

Some of the most promising mitigation options for hydrology and flows, geomorphology and sediments, water quality as well as fisheries and aquatic ecology has also been analyzed and tested for the Case Study (see here for a detailed reporting on this).

Appendix F: FIDIC Forms of Contracts

FIDIC Contract	Type	Details
Red Book	Conditions of contract for construction for building and engineering works.	This is for the very common job work, designed mainly by the employer.
Yellow Book	Conditions of contract for plant and design-build for electrical and mechanical plant and building and engineering works.	The contractor is responsible for the plant design, building and engineering works. Yet still, the employer might be required to carry some design.
Green Book	Conditions of contract for use on engineering and building works of relatively small capital value or where the construction time is short.	This is the short form of the contract. It is used mostly for simple, repetitive, short-duration jobs.
Pink Book	Conditions of contracts for use of building and engineering works designed by the employer.	The projects funded by certain MDBs, which are supranational institutions such as the World Bank.
Silver Book	Conditions of contract for EPC/Turnkey Projects.	The contractor carries the engineering, procurement, and constructions tasks up to the final delivery of a fully equipped, tested and ready-to-run facility.
Gold Book	Conditions of contract for design, build and operation project.	It implies a long-term commitment of the contractor and offers a new and unique procurement route.
Blue Book	Form of contract for dredging and reclamation works.	The only standard international form of contract designed specifically for the dredging industry.
White Book	FIDIC Client/consultant model service agreement.	The White Book is an important part of the FIDIC suite and is one of the most widely used forms of professional services contract internationally.