

**NET IMPACT VALUATION FOR OIL AND GAS EXPLORATION
AND PRODUCTION INDUSTRY**



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NET IMPACT VALUATION FOR OIL AND GAS EXPLORATION AND PRODUCTION INDUSTRY

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ABSTRACT

Net Impact Valuation is a new practice to quantify the business impacts and value them in the monetary unit. It demonstrates a comprehensive of the business's impact values, covering the economic, environmental, and social dimensions. This practice could help the organizations to have a better understanding of their impacts and guide them in strategic decision making. This research aims to study the concept and process of the Net Impact Valuation methodology and find the most applicable model to oil and gas exploration and production (E&P) industry, which is one of the vital global sectors with high impact potential. It is designed as applied research by mainly studying and analyzing the existing methodologies from (1) Ernst & Young Global Limited (EY), (2) KPMG International Cooperative (KPMG), and (3) PricewaterhouseCoopers International Limited (PWC), altogether with the principle and framework of World Business Council for Sustainable Development (WBCSD), and Social and Human Capital Coalition. Consequently, "the conceptual model of Net Impact Valuation" and the "Integrated model of Integrated Reporting framework and Monetization" are proposed to apply to the business, including oil and gas upstream. However, the key findings reveal that the monetization approach is not yet standardized and needs further study for the most efficient methodology application.

KEY WORDS: Impact/ Impact valuation/ Sustainable values/ Oli and Gas exploration and Production (E&P)

85 pages

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CHAPTER I

INTRODUCTION

1.1 Background

Nowadays the concept of “Sustainable Development” is widely stated in many organizations and industries around the world (Bassi et al., 2019). Its definition is defined in many ways but the most frequently quoted is from Bruntland Commission Report in 1987 as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” (Emas, 2015 cite in United Nations General Assembly, 1987). The principle of sustainable development focuses on three main dimensions; Economy, Environment and Society, illustrated in figure 1.1. These three dimensions are interrelated where organizations have to well manage and balance them.



Figure 1.1: Components of Sustainability

Source: https://www.researchgate.net/figure/Components-of-sustainability_fig2_292127499

Previously, organizations mainly focused on financial or economic performance as shown in their organization reports where profits, revenues, and percent of business growth were all over the place (Arowoshegbe & Emmanuel, 2018). On the other hand, at present, investors and other stakeholders pay more attention to companies' environmental and social performances as well as issues management (Singer, 2018). A recent survey of institutional investors show that more than two-thirds

responded that nonfinancial information frequently played a pivotal role or occasionally in their investment decisions (EYGM Limited, 2017). Consequently, in recent years many corporations have been providing information about non-financial aspects such as amount of water and energy consumption, waste management, pollution emission, operations safety, and corporate social responsibility projects (Arowoshegbe & Emmanuel, 2018).

Moreover, international organizations, leading by United Nations (UN), play an essential role in driving sustainable development concepts to organizations and countries worldwide. For instance, the Sustainable Development Goals or SDGs were officially announced in 2015 to provide clear guidelines and targets to all countries under their development priorities (Division for Sustainable Development Goal, 2019). Dow Jones Sustainability Indices or DJSI is the first global index to benchmark the company's performance covered in economic, environmental and social criteria (RobecoSAM AG., 2019). World Business Council for Sustainable Development or WBCSD is another key global organization leading to sustainable development. Its pivotal mission to drive and make the business more sustainable and prosperous (World Business Council for Sustainable Development, 2018). According to the changes and directions mentioned above, the concept of sustainable development has been adopted and integrated into many businesses. Most of them are applied to essential company strategy.

Numerous companies paid more attention to sustainable development and tried to balance the business operations in the economic, environmental, and social dimensions. These can be seen in the company's annual report, where there are more disclose information on non-financial performance aspect (EYGM Limited, 2017). The higher standard in sustainable development benchmarking led to the increasing of DJSI members to over 2,000 companies worldwide within two decades (RobecoSAM AG., 2019). Also, the collaboration in sustainable development among world-leading companies by the expansion of WBCSD partnerships have been expanding from 120 members at the beginning of 1992 to over 200 members and 70 partners in 2019 (World Business Council for Sustainable Development, 2018).

Although the sustainable development framework is the business's focus, the "impacts" of business in all three dimensions (economic, environmental, and social)

still depend on the business nature of industry types. Each impact, positive/negative and direct/indirect, should have environmental different measurements and mitigation upon the business context (United Nation Evaluation Group, 2013)

Oil and gas industry is the global industry with operational standards conducted in every corner of the world. The main activities of this industry can be presented in three sectors; (Davcheva, 2019)

1. Upstream – involve with exploration and production activities
2. Midstream – involve with transportation and storage activities
3. Downstream – involve with production preparation and usage

Each sector of the oil and gas industry plays a vital role in the world's economy and has a crucial contribution in providing energy for society's development, such as revenue-generating, tax providing, and employment (Anis & Siddiqui, 2015). On the other hand, it potentially creates direct or indirect impacts on stakeholders in all economic, environmental, and social dimensions. The impact also reflected both positive or negative ways, in particular, air emissions, oil spills, ecological footprint, waste generating, human rights, labor treatment, and any other anticipating issues with the environment and communities. The sustainability impacts in the oil and gas industry are interrelated among these three dimensions (IPIECA, 2016). The overview of the most significant issues commonly associated with the oil and gas business can be exemplified as revenue transparency, energy use, oil spill, climate change, community engagement, local economy impact, etc. It can be demonstrated in figure 1.2

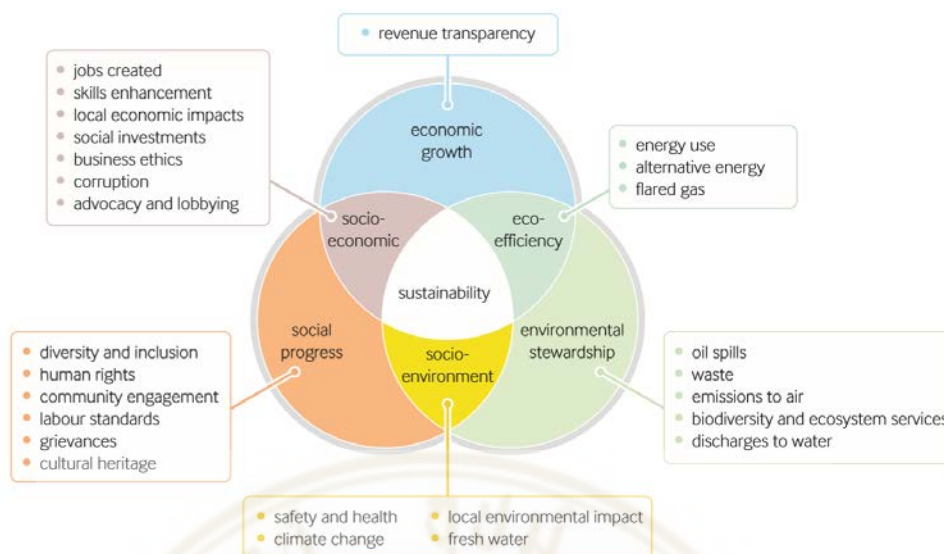


Figure 1.2: Sustainability issues in oil and gas industry

Source: IPIECA, 2016

Since there are numerous impacts created by many business sectors, including the oil and gas industry, the global organizations as well as major professional consultancies attempt to initiate the methodology to measure and evaluate the “net impacts” covered in three dimensions - economic, environmental, social - then turn it to monetary terms (United Nation Evaluation Group, 2013). However, those methodologies are still inclusive and need further scrutiny (Singer, 2018).

Hence, this research aims to examine methodologies for net impact valuation and apply to oil and gas exploration and production industry. It will analyze a whole process of net impact valuation, starting with an overview, measurement and valuation process, and application for oil and gas exploration and production business. The result helps sharpen a company’s decision-making in sustainable development and investment aspect. Moreover, this valuation can be used as a tool for gap analysis and provide the company with a room for improvement in their sustainable development.

1.2 Research Objectives

- To study net impact valuation methodologies and apply to the oil and gas exploration and production industry

- To study a tool for translating a sustainability performance into economic values

1.3 Research Scope

The research of net impact valuation for oil and gas exploration and production industry will start by identifying the business impacts, reviewing and analyzing the existing methodologies and case studies in various industries to find the key insights, methodologies comparison, and propose the proper approach to oil and gas exploration and production industry. The period of study is from October 2019 to May 2020.

1.4 Expected Benefits

This research will be helpful for business sector, including oil and gas exploration and production in impact valuation by;

- To have a clear picture of sustainability outcomes and lead to a better decision-making in their sustainable development
- To define gaps and create mitigation plans for further sustainability values creation

1.5 Definition of Terms

- Impact: “A portion of the total outcome affecting ecosystem or human well-being which ascribing to the company” (EYGM Limited, 2016)
- Positive Impact / Externalities “An economic, social or environmental benefit that a company creates for society for which it is not directly or fully rewarded in the price of its goods and services” (KPMG International Cooperative, 2014)
- Negative Impact / Externalities: “An economic, social or environmental cost that a company inflicts on society for which it does not directly pay a price” (KPMG International Cooperative, 2014)

- Impact Valuation: “The practice of quantifying and monetizing a company’s economic, social, and environmental impacts” (singer, 2018)
- Oil and Gas Exploration and Production: “A beginning process of oil and gas industry which comprises of searching for potential underwater or underground natural gas or crude oil fields, drilling of exploration wells and operating the wells to recover and bring the crude oil and/or natural gas to the surface” (Davcheva, 2019)



CHAPTER II

LITERATURE REVIEW

The research of “Net Impact Valuation for Oil and Gas Exploration and Production Industry” is comprehensive reviewed of the secondary data and empirical studies, covering the principles and frameworks, existing methodologies, relevant researches, and journal papers, to be a guideline of the study in following topics;

2.1 Impact

2.1.1 Definition

2.1.2 Type of Impact

2.2 Impact of Oil and Gas Exploration and Production Industry

2.2.1 Overview of Oil and Gas Industry

2.2.2 Oil and Gas Exploration and Production Business

2.2.3 Impacts of Oil and Gas Exploration and Production

Industry

2.3 Net Impact Valuation

2.3.1 Definition

2.3.2 Development of Net Impact Valuation

2.3.3 The Context of Net Impact Valuation

2.1 Impact

2.1.1 Definition

“Impact or Externality” can be defined as a consequence of the actions or operations of the company, covering an economic, environment, and social dimension. Likewise, it can affect the stakeholders in positive and/or negative ways.

“Impact” has been defined by organizations and often used in different contexts. In general meaning, the Oxford dictionary defines impact in two terms: “the action of one object coming forcibly into contact with another” and “a marked effect or influence” (Oxford Learner’s Dictionaries, 2019). The Longman dictionary also defines

it as “the effect or influence that an event, situation or other, has on someone or something (Longman Dictionary of Contemporary English, 2019)”. In the business context, especially sustainable development organizations, the definition of impact has been given in more detail.

According to the United Nations Evaluation Group or UNEG (2013), the definition of impact was given as long-term generated by a development intervention both in primary and secondary, positive and negative, intended or unintended and directly or indirectly. World Business Council for Sustainable Development or WBCSD (2011) also defined it as the consequences of the actions that affect someone else rather than the one who undertook that action itself.

Moreover, the word “impact” was also defined by leading professional consultancies. Ernst & Young (EY) (2016) stated that impact is a portion of the total outcome affecting ecosystem or a human well-being which ascribing to the company, whereas KPMG International Cooperative or KPMG (2014) saw it as an economic, social, or environmental benefit or cost that a company creates for society.

However, some organizations, such as WBCSD and KPMG, may call impact on society and environment as “Externalities” and use it in the same context. Impact or externality can be classified into two aspects – positive and negative. Positive externality means benefits, whereas negative externality refers to costs in economic, social, and environment that the company creates or inflicts on society, and it does not directly reward or pay the price (KPMG International Cooperative, 2014). This meaning is in line with EY’s definition, where positive externality refers to benefits, while the negative side is costs that affect a party who did not choose to incur (EYGM Limited, 2016).

2.1.2 Type of Impact

In order to align with a company’s sustainable development framework, impacts can be categorized into three dimensions; economic, environmental, and social.

First is economics impacts. It can be measured by many crucial indicators as taxes, profits, wages, or any anticipated indicators that the organization contributed to the economy. This impact refers to the effects or direct consequences of business activities on the economy within a defined area, contributing to the economy via many

indicators. KPMG International Cooperative (2014) described these indicators as taxes, dividends, loan interests, and wages. World Business Council for Sustainable Development (2017) also mentioned the Gross Domestic Product (GPD) as the primary indicator, especially taxes, profits, and wages. Meanwhile, PricewaterhouseCoopers LLP. or PWC (2013) measured economic impact by changes in economic growth, such as output or gross value added and employment. However, PWC separately noticed the tax impact as values on business contribution to the public finances, with the significant indicators as taxes on profits, production, property, and environment.

Second is environmental impacts. The most critical impact in environmental dimension is Greenhouse Gas (GHG) emissions, followed by air and water pollution, waste management, and land usage. Environmental impact refers to impacts of the company on the environment and puts the values of it on national capital such as Greenhouse Gas (GHG) emissions, air and water pollution, land usage, and waste generation (PricewaterhouseCoopers LLP., 2013). Besides, KPMG International Cooperative (2014) focused on the environmental impact on Greenhouse Gas (GHG) emissions, ecosystem, waste management, circular economy, water pollution, and resource utilization. World Business Council for Sustainable Development (2017) also referred to environmental impact in many points such as Greenhouse Gas (GHG) emission and climate change, land and water use, water pollution, and waste.

Third is social impacts. There are numerous elements of social impact, many studies identified that people's well-being and quality of life are the key elements of social impact, especially in healthcare, education, and infrastructure. However, other details related to social improvement should be considered upon the business context.

Social & Human Capital Coalition (2019) has defined social impact as a positive/ negative, intended/unintended effects from business activities that create a persistent change in people or social well-being experiences. There are various indicators to measure this kind of impact. Well-being is one of the significant indicators that determine people's quality of life. It can also be specified in eight elements; social connection, health condition, work and life balance, skills and education, personal security, public engagement and governance, and overall life satisfaction as perceived by individuals (Social & Human Capital Coalition, 2019).

PricewaterhouseCoopers LLP. (2013) stated that a social impact is the effects of company activities on society, which measures and values the consequences through the quality of life, health, education, and community cohesion. KPMG International Cooperative (2014) also measured a social impact as a provision of infrastructures that can be able to uplift the quality of life, healthcare, education, and safety of workers.

2.2 Impact of Oil and Gas Exploration and Production Industry

2.2.1 Overview of Oil and Gas Industry

The principal activities in the oil and gas industry can be analyzed as the three sectors throughout the supply chain – upstream, midstream, and downstream (Davcheva, 2019), as illustrated in figure 2.1. Each of these sectors has its specific activities as follows;

1. The upstream sector is also known as the E&P (Exploration and Production) sector. The process comprises searching for potential underwater or underground natural gas or crude oil fields. This process includes the drilling of exploration wells, subsequently, drilling and operating the wells to recover and bring the crude oil and/or natural gas to the surface (Davcheva, 2019). After the end of its commercial life, typically 20-40 years, this production process will turn into structure and equipment removal as well as the site restoration to environmentally-sound conditions. This process is called decommissioning (United Nations Environment Programme, 1997)

2. The midstream sector involves the transportation, storage, and processing of oil and gas. The recovered resources will be transported to refineries through pipelines, trucks, or rails, depending on the commodity and distance (Muspratt, 2019).

3. The downstream is the last sector in the oil and gas supply chain. Its activity includes oil refining, natural gas purifying, marketing, and commercial-to-customers producing. The product can be in the form of gasoline, fuel oil, LPG (Liquefied Petroleum Gas), or petrochemical product (Muspratt, 2019).

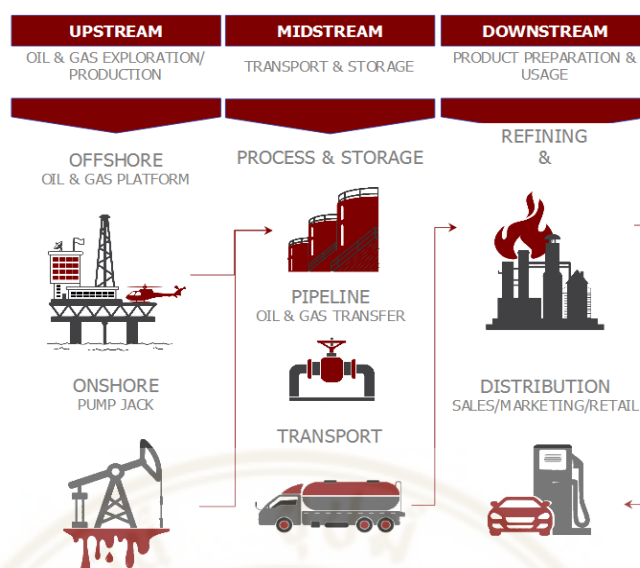


Figure 2.1: Overview of oil and gas industry activities

Source: Davcheva, 2019

2.2.2 Oil and Gas Exploration and Production Business

The operation in the upstream sector can be classified into five stages. Starting with “**exploration stage**” this is a process for searching potentially oil and gas sources through geological surveys and drilling exploration wells to identify areas of potential interest. The promising petroleum potential later will be identified, the “**appraisal stage**” will be conducted to ensure the potential of targeted resource fields and their economic values. The “**development stage**” occurs after effective appraisal. The main activities established a conceptual development and construction of the facilities and production units. After development stage, the drilling of producing wells will be conducted to produce and recover the crude oil and/or natural gas to the surface. This phase called “**production stage**”. The last phase called “**abandonment stage or decommissioning**”. When the oil and gas production is no longer commercialize, wells are plugged and abandoned, production facilities are removed (Paulauskiene, 2018). The oil and gas exploration and production’s life cycle can be illustrated in figure 2.2.

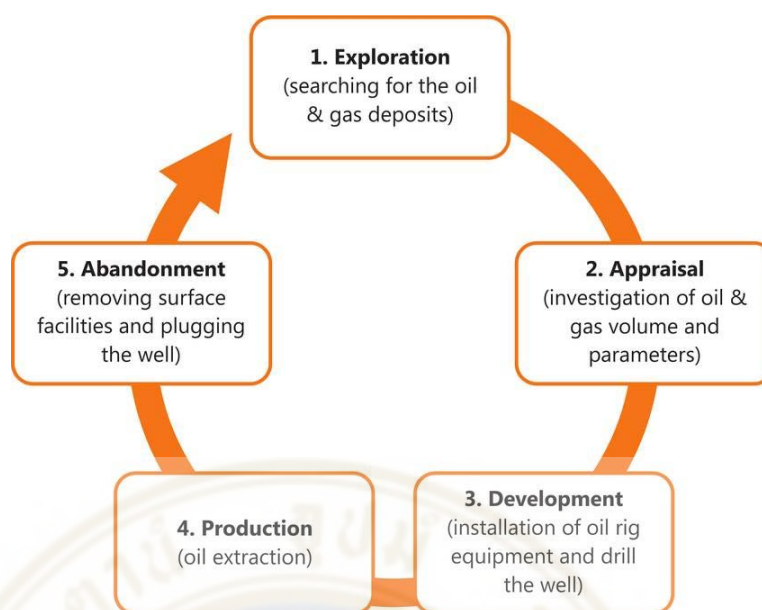


Figure 2.2: The oil and gas exploration and production's life cycle

Source: Paulauskiene, 2018

2.2.3 Impacts of Oil and Gas Exploration and Production Industry

The oil and gas industry is dealing with many challenges such as energy transition, oil prices fluctuation, technologies disruption, and more intensive government regulations. These factors increase the complexity and create impacts to oil and gas industry, including at upstream. (BCG Global., n.d.)

Moreover, the complexity of operations in the oil and gas exploration and production industry illustrated the involvement of stakeholders in each process. It potentially creates direct or indirect impacts on stakeholders, covering economic, environmental, and social dimensions, in both positive or negative ways.

In the economic aspect, the impact can be the substantial contributing to relative financial factors such as tax and other types of revenue to governments, its financial performance like revenue, cost, and profit are focused by the investors and shareholders. The global operations both offshore and onshore generate direct and indirect jobs to the countries where the company operates in. The advanced technologies and innovations enable the economic in competitive advantage. In addition, a good governance plays a crucial role as it demonstrates the transparency and reliable of the

company (United Nation Development Programme., International Finance Corporation., IPIECA, 2017).

The key environmental impacts are focusing on air emissions, especially the Greenhouse gas (GHG) emissions. Schneider (2019) examined the universal sustainability issues bases on EHS (Environment Health and Safety) indicators focused on the upstream operations in ten recognized oil and gas companies e.g., British Petroleum, Shell Global, Total Oil Company, Eni, ExxonMobil, Chevron, and ConocoPhillips, and he found that air emissions, especially the Greenhouse gas (GHG) emissions are the most vital impacts. In the same way, another study clearly stated that Greenhouse gas (GHG) emission is the major environmental impacts, followed by water contamination, ecological footprint, hazardous and non-hazardous waste, spills, energy consumption, and biodiversity. (Mardhika, 2018)

As aforementioned that oil and gas upstream business concerns with many stakeholders, the common issues in social impacts therefore relate to human's health and safety, human rights, and its associated impacts on communities such as community income and well-being (United Nation Development Programme., International Finance Corporation., IPIECA, 2017). The social infrastructure such as education, water supply accessibility, transportation, and roads are also noticed as crucial impacts (Consiglio, Kco, & Witchalls, 2006)

2.3 Net Impact Valuation

2.3.1 Definition

As stated earlier, the impact can be both positive and negative, depending on what a company creates or imposes any effects on society. Net impact may be called "Total impact". It is the practice of quantifying and monetizing a company's impact covered in economic, social, and environmental (Singer, 2018) Moreover, the net impact can be the application of welfare economics to define the positive and/or negative value that businesses contributed to society in monetary terms (Participants of the Impact Valuation Roundtable, 2017).

2.3.2 Development of Net Impact Valuation

At the beginning, the concept of total impact valuation has been adopted by a few companies to place the monetary values on their nonfinancial impacts, and mostly focused on environmental impacts. The first company used this concept in quantifying and monetizing their environmental impacts for environmental accounting. A decade later, Puma - German multinational athletic wear, applied this concept to initiate environmental profit and loss statement. The social factors were later brought into the total impact valuation in more recent approaches (Singer, 2018).

The total impact valuation has been developed by many organizations to promote and refine methodologies (United Nation Evaluation Group, 2013). In 2014, the Natural Capital Coalition initiated a new framework, called the Natural Capital Protocol, to guide the businesses how to measure value their impacts on natural capital. Later in 2015, Social Capital Protocol was introduced by the World Business Council for Sustainable Development or WBCSD to help the businesses measure and value their social impacts. This protocol was eventually launched in 2017. In the same period, the Impact Valuation Roundtable has been founded. It is a collaboration among over ten international companies that aim to develop the practice of impact valuation. They finally issued the impact valuation initiatives for companies in 2017.

Other distinguished initiatives in this area include The Prince's Accounting for Sustainability Project, which is a guide for natural and social capital accounting. The Social Return on Investment framework and the Roundtable for Product Social Metrics handbook was released the for Product Social Impact Assessment (Participants of the Impact Valuation Roundtable, 2017). Furthermore, the consultancies such as BCG, PWC, KPMG, and EY have each developed their methodologies for net impact valuation and it has been adopted by several companies. Another key organization in sustainable development area, Dow Jones Sustainability Index, first piloted the questionnaire for impact valuation in 2016 and plans to collect data for analyzing and refining the score soon. (RobecoSAM AG., 2019).

2.3.3 The Context of Net Impact Valuation

Previously, the companies measured their performance and did the sustainability report by applying the conventional measurement and reporting, focusing

on inputs and outputs but rarely considered the outcomes and impacts (PricewaterhouseCoopers LLP., 2013). For this reason, many key organizations on sustainable development have more attention to develop the framework and define the methodologies to focus on outcomes and impacts (United Nation Evaluation Group, 2013). Impact valuation goes beyond the traditional sustainability reporting as it links between companies' inputs and activities by focusing on the resources or raw materials use of each business activity. The outputs and outcomes links by emphasizing the result of business activities, and not only does measure the impacts but value them by using monetary values. For example, the company invested 20,000 Euro for supplier employee health and safety training (input). In the end, they got 100 supplier employees with well trained (output). Through this training, the company improves its knowledge, leading the work process safer and more efficient (outcome). As a result, the injury rate of workers decreased (impact). Moreover, the company saves additional costs, such as medical expenses and production losses (value of impact) (PricewaterhouseCoopers LLP., 2013). The new aspects of impact valuation shown in figure 2.3.

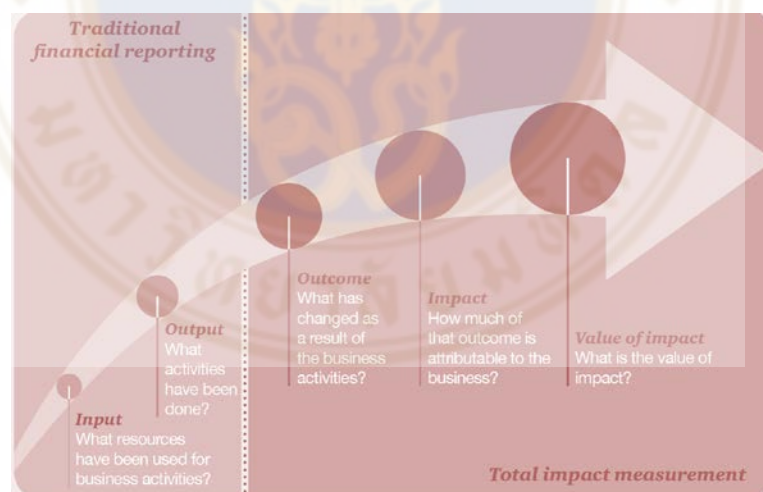


Figure 2.3 From traditional reporting to impact valuation

Source: PWC, 2013

The frameworks to measure and value impact have been developed. However, according to SAM Corporate Sustainability Assessment (CSA) in the collaboration with S&P Dow Jones Indices which is the foremost global sustainability

benchmark, on average of 81% of companies monetize their environmental and social impacts by adopting Natural Capital Protocol and Social and Human Capital Protocol of World Business Council for Sustainable Development (WBCSD) as the measurement framework (S&P Global Switzerland SA., 2020).

The Social and Human Capital Protocol aims to mainstream the measurement of social impacts for businesses such as the skills and competencies of the employee, occupational health of workers, and community well-being (The Social & Human Capital Protocol, 2019). This framework has been developed by the World Business Council for Sustainable Development (WBCSD) and share the same primary process stages, but detailed impact valuation approaches are different. The framework should be conducted based on four main principles; Relevance, Rigor, Replicability, and Consistency to ensure accuracy and efficiency. Relevance means to ensure the most relevant issues of natural and social capital which matters with the business and stakeholders. Rigor aims to ensure the use of reliable information and data that fit for business purpose. Replicability expects to ensure that all assumptions and data are transparent and repeatable. The last is to ensure that all information used for assessment is compatible (The Social & Human Capital Protocol, 2019). The stages of the Social and Human Capital Protocol shown in Figure 2.4.

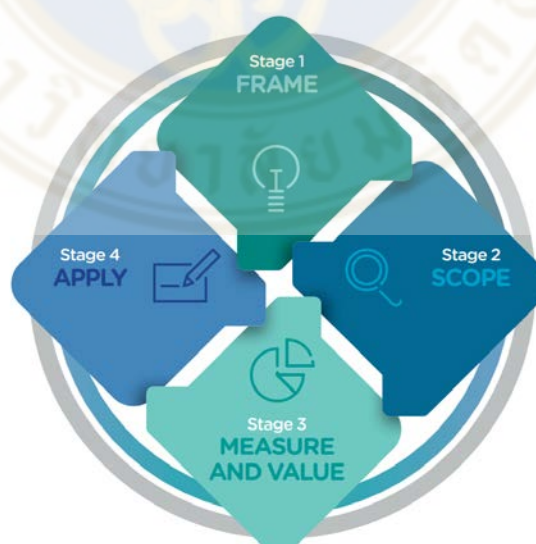


Figure 2.4 The Stages of Social and Human Capital Protocol

Source: Social & Human Capital Coalition, 2019

The Social and Human Capital Protocol (2019) framework aims to set the integrated approach of social and human capital value measurement, to ensure that the social and environmental risks and opportunities will be considered in corporate strategy and decision-making. It consists of four iterative stages. The brief purpose of each stage as follows;

Stage 1: Frame: the company must understand natural and social capital and its relevance to the business as well as the critical business drivers that matter with impacts measurement and valuation.

Stage 2: Scope: The company set a clear objective and determine, key stakeholders and boundary of assessment, which is possible in organizational or geographical level, temporal, and value chain, to ensure the appropriate measurement and valuation. This stage can help the company identify and prioritize the most relevant issues to their business.

Stage 3: Measure and Value: This stage is the core of the protocol. The company has to define appropriate indicators, trusted and accurate data sources, proper measurement, and valuation method, which presented in qualitative, quantitative, and monetary techniques.

Stage 4: Apply: In the last stage, the results from the measurement and valuation will be interpreted and related to business decision. It will help the company to improve its performance in natural and social management, which could contribute to the company's sustainable growth.

CHAPTER III

RESEARCH METHODOLOGY

The research of “Net Impact Valuation for Oil and Gas Exploration and Production Industry” is designed as applied research by studying the secondary data and empirical reviews to analyze the frameworks and process of each methodology and find the most proper approach that fits with the oil and gas industry context.

3.1 Research Design

This research aims to study definitions, types of impacts, the development of net impact valuation, and to identify impacts in the oil and gas exploration and production industry. This study further examined the existing impact valuation frameworks from international organizations in sustainable development aspects such as World Business Council for Sustainable Development (WBCSD), and Social and Human Capital Coalition, as well as the existing methodologies from the professional consulting firms; (1) Ernst & Young Global Limited (EY), (2) KPMG International Cooperative (KPMG), and (3) PricewaterhouseCoopers International Limited (PWC). The next step is analyzing the frameworks and process of each methodology to find the key insights and make a comparison. The final step is concluding and recommending the most appropriate methodology to evaluate the net impacts for the oil and gas exploration and production industry. The studied framework illustrated in figure 3.1.

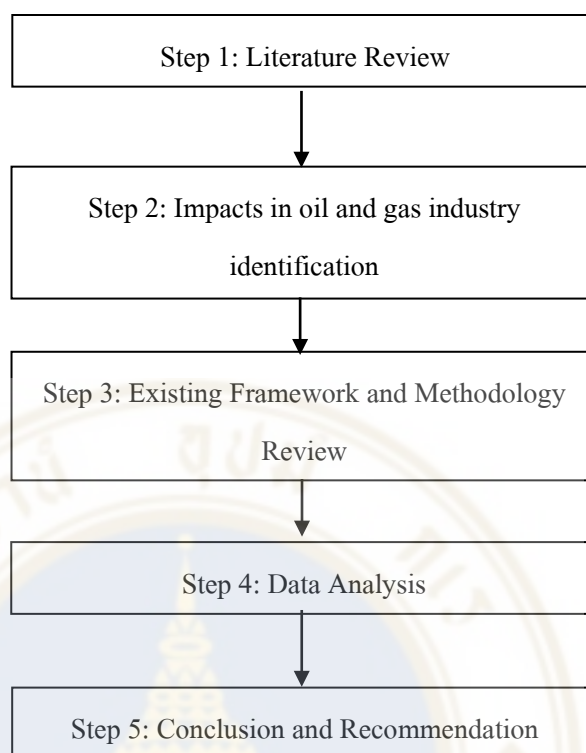


Figure 3.1 Frame of Study

3.2 Data Collection Process

The data collection process was done by studying secondary data and empirical review in net impact valuation topic, which apply to various business type including the oil and gas exploration and production industry. The data was collected from the reliable sources which are documents and websites of international organizations in sustainable development aspects such as WBCSD, and Social and Human Capital Coalition. Other sources are from professional consulting firms such as EY, KPMG, and PWC. Their methodologies, introduced and adopted by many companies across the globe, are applied to measure and evaluate the business impact. In addition, the relevant researches and journal have been studied and reviewed based on the database from Google Scholar websites with specific keywords; “impact”, “impact valuation”, “sustainability values”, and “oil and gas exploration and production (E&P)”.

The researcher had been searching and collecting data from October 2019 – May 2020.

The summary of secondary data shown in table 3.1.

Table 3.1 The summary of secondary data

Type	Author / Organization	Topic	Source
Framework	WBCSD	Measuring socio-economic impact	www.wbcsd.org
	Social & Human Capital Coalition	Social Capital Protocol	www.social-human-capital.org
Methodology	PWC	Measuring and managing total impact: A new language for business decisions	www.pwc.com
	KPMG	A New Vision of Value	www.kpmg.com
	EY	Total Value: Impact valuation to support decision-making	www.ey.com
Research / Journal paper	Impact Valuation Roundtable	Operationalizing Impact Valuation	www.wbcsd.org
	The Global Oil and Gas Industry Association for Environmental and Social Issues	Oil and gas industry guidance on voluntary sustainability reporting	www.ipieca.org
	Anis, M. D., & Siddiqui, T. Z. (2015)	Issues Impacting Sustainability in the Oil and Gas Industry	Google Scholar (DOI: 10.5539/jms.v5n4p115)
	Mardhika Sapto Sari (2018)	Determine Environment Impacts in Upstream Processes of Oil and Gas Industries	Google Scholar (DOI: 10.1051/e3sconf/20187305008)

3.3 Data Analysis

After collecting the secondary data from the sources mentioned in table 3.1, the researcher has proceeded with the data preparation and analysis as the following steps.

1. Analyze the background and thinking framework of each net impact valuation methodology, then writing a summary note.
2. Summarize the keynotes by applying a data coding method to transform the collected information into a set of meaningful categories.
3. Find the key insights, common and different issues of each framework and methodology.
4. Compare the key findings such as benefits, scope of application, measurement and valuation process, limitations and challenges
5. Analyze and propose the conceptual approach for application to oil and gas exploration and production business
6. Conclude and recommend the methodology application, as well as the suggestion for future research

CHAPTER IV

RESEARCH RESULTS

In this chapter, the analysis of “Net Impact Valuation for Oil and Gas Exploration” will be presented with the results in two main parts; the methodology analysis result and application for oil and gas exploration and production industry.

The result of methodology analysis came from the secondary data and empirical review from key international organizations in sustainable development, namely, World Business Council for Sustainable Development (WBCSD), Natural Capital Protocol, Social and Human Capital Coalition. The result also included the impact measurement and valuation methodologies from key consultant and accounting firms who extended their analysis on business sustainability and developed their own methodologies to shape the business more sustainable. The three methodologies in this study are; (1) Total Value methodology by Ernst & Young Global Limited (EY), (2) True Value methodology by KPMG International Cooperative (KPMG), and (3) Total Impact Measurement and Management or TIMM methodology by PricewaterhouseCoopers International Limited (PWC). After the methodologies were analyzed and summarized, the application for the oil and gas exploration and production industry will be applied. The research results can be shown as follows;

4.1 Methodology Analysis Result

4.1.1 Overview

- (1) Concept and objective
- (2) Scope
- (3) Key driver

4.1.2 Measurement and Valuation process

- (1) Define boundary
- (2) Identify materiality
- (3) Collect data

(4) Measure and value

(5) Apply

4.2 Application for Oil and Gas Exploration and Production Industry

4.2.1 Apply methodology

4.1 Methodology Analysis Result

The methodological review and analysis in the areas mentioned above led to the results in two main parts. Firstly, the overview is composing of concept and objective, scope, and key driver. Later, the measurement and valuation process are divided into five main steps; 1) define boundary, 2) identify materiality, 3) collect data, 4) measure and value, and 5) apply. The summarized topics of methodology analysis result are shown in figure 4.1.

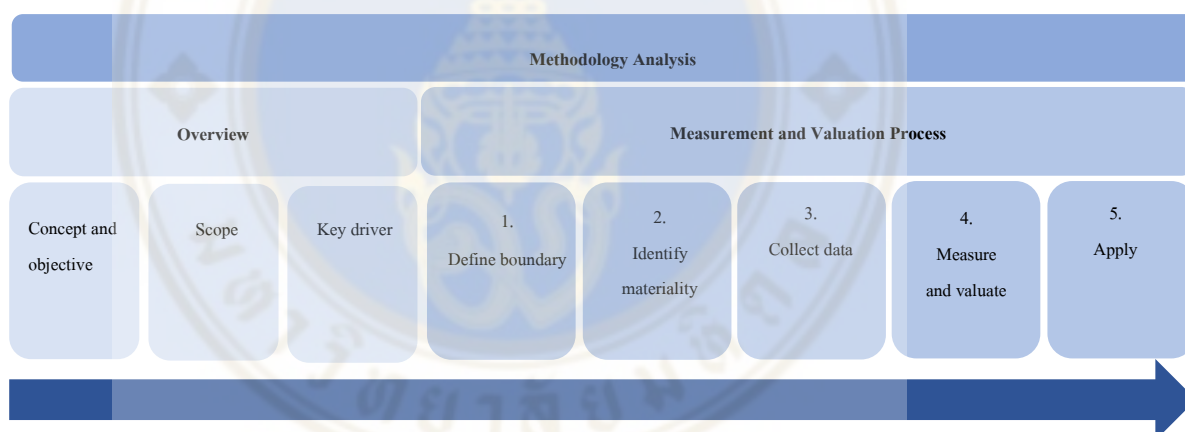


Figure 4.1 The summary topics of methodology analysis result

4.1.1 Overview

All three selected methodologies were developed under the framework of WBCSD, which currently completed a review of frameworks and tools for impact assessment covering economic, environmental, and social dimensions. Prior to the scrutiny of the measurement and valuation process, the company has to define a clear understanding of the background and overview of the methodology as well as its business's context and essential materiality. These will help the company to gain a more concrete understanding of how businesses interact with the impacts. The methodological

overview can be summarized into three main elements; concept and objective, scope, and key driver.

(1) Concept and Objective

The central concept of net impact valuation is intended as a tool for the company to measure and evaluate its impacts, both in financial and non-financial aspects, by translating the intangible impacts such as environmental and social into monetary forms. This concept enables the company to recognize the whole picture of values or impacts and be able to compare them on the same basis.

From the methodological study and analysis, all of them mentioned the essential objectives as it is capable of helping the company for a more effective decision-making process and shaping its strategic design and implementation. EY and KPMG stated that this methodology could be a tool to assess the company's opportunities and risks and its stakeholders, e.g., investors, suppliers, and communities. It also helps the company to evaluate options and lead to more effective decision-making and investment. Besides, the opportunities and risks mentioned by EY and PWC help the company to form a strategic decision-making process to optimize impact and consequently gain or secure a license to operate. It is indicated by PWC's statement, saying that *“This exercise is, in itself, interesting and helps support a business’s licence to operate. But the real benefit to business is in decision making.”* (PricewaterhouseCoopers LLP., 2013). The concept and objective of each methodology can be summarized in table 4.1.

Table 4.1 The summary of concept and objective

Concept & Objective	EY Total Value	KPMG True Value	PWC Total Impact Measurement and Management (TIMM)
▪ Business decision	✓	✓	✓
○ Opportunity & Risk	✓	✓	
▪ License to operate	✓		✓
▪ Strategy design and implementation	✓	✓	✓

(2) Scope

Net impact valuation will provide a holistic view or big picture to the organization. Therefore, it has a wide range of applications which includes economic, environmental, and social dimensions. The analysis used to assess the organization's key impacts, both positive and negative, covering all three mentioned dimensions.

Similarly, all approaches state the scope in three main dimensions: economic, environmental, and social. EY presented its methodology's scope in the triple bottom line, as shown in figure 4.2, and mentioned that "...In this graph, the triple bottom line concept is used for simplified presentation..... (Ernst & Young LLP., 2016)"



Figure 4.2 The conceptual presentation of Total Value analysis

Source: EYGM Limited., 2016

The scope of KPMG's methodology also aligned with the triple bottom line concept as stated that "*KPMG analysts carry out a detailed assessment of your organization's most significant economic, social and environmental impacts, both positive and negative. (KPMG International Cooperative, 2014)*" However, PWC presented a slightly different scope by highlighting and spelling out "Tax" as another focused dimension. In their view, taxes represent the business's cost, while it helps contribute to the economy. "*Tax: Overall contribution to public finances. (PricewaterhouseCoopers LLP., 2013)*". However, the tax impact is included in EY and KPMG economic dimensions. The scope of each methodology can be summarized in table 4.2.

Table 4.2 The summary of scope

Scope	EY Total Value	KPMG True Value	PWC Total Impact Measurement and Management (TIMM)
▪ Economic	✓	✓	✓
▪ Tax			✓
▪ Environmental	✓	✓	✓
▪ Social	✓	✓	✓

(3) Key driver

To have an effective methodology, practically for the business adaption and in harmony with the global context, it has to develop upon standards and knowledge from several disciplines such as Global Reporting Initiative (GRI)¹ and Social Return on Investment (SROI)². Moreover, the changes in the global context and other forces have to be considered and included in the development process. Those are the key drivers behind the methodological analysis and can be summarized into three key factors; *stakeholders' expectations, material issues, and regulations and standards*. Each factor has its fundamental sub-elements that play a different role and affect the assessment and measurement in different ways. The key drivers are illustrated in figure 4.3

¹ "Global Reporting Initiative (GRI) is the most widely adopted global standards for sustainability reporting. It is developed with multi-stakeholder contributions and rooted in the public interest that helps the businesses understand and communicate their impact on critical sustainability issues." (GRI., n.d.)

² "Social Return on Investment (SROI) is an organizational method of accounting for value creation, primarily social or environmental value. It enables organizations to measure the changes created by tracking relevant social, environmental, and economic outcomes." (SoPact., n.d.)

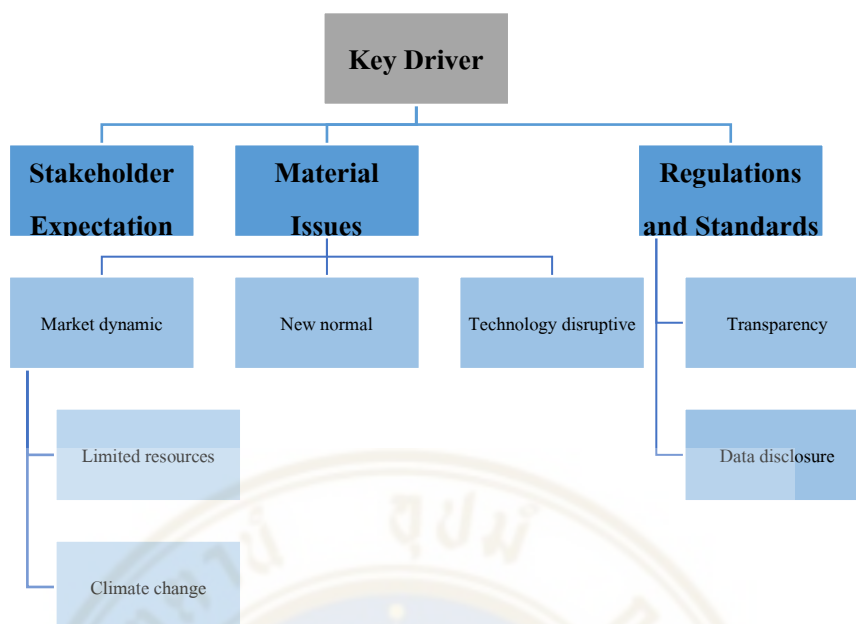


Figure 4.3 Key drivers

Stakeholder expectation is first prioritized as a crucial factor since their concerns and actions affect the business's operation, both direct and indirect way. Therefore, all three approaches focus on stakeholders and their influence over the business and take it into account as the methodology's key driver. Presently, stakeholders are increasing their concerns about the company's performance and impacts. Also, they have channels to communicate their issues to the public, as stated by KPMG: “People are more aware of what companies are doing and its impact to them. They have channels to express their voices and stand up for their own interests. With this reason, many companies are responding to stakeholder action by doing more to understand and address their externalities and societal value creation. (KPMG International Cooperative, 2014)” It is similar to PWC's statement that stakeholders have an essential role in the company's business performance and social responsibility. “Stakeholders are having an increasing influence over business and are demanding more better information as they pursue higher standards of responsibility and accountability from business. (PricewaterhouseCoopers LLP., 2013)” Consequently, the business must carefully operate with responsibility and embed the sustainability concept to its working framework.

Secondly, the company needs to consider the issues that matter most to the business since those material issues may affect their business operation and strategy. The material issues are grouped into three core matters: market dynamic, new normal, and technology disruptive. The market dynamic is a force that impacts the company's finances, resulting from a market's fluctuation in demand or supply side. It can also affect both in a positive and negative way. The resource scarcity, for example, is mentioned by KPMG that *"Many commodities are increasingly scarce, which affects corporate profitability as prices rise or production is halted because key inputs are unavailable. (KPMG International Cooperative, 2013)"*. Another example of a dynamic market factor is climate change. It significantly increases the impact on a business; *"The threat of climate change will heighten the risk to capital investments. (PricewaterhouseCoopers LLP., 2014)"*

New normal is one of the vital material issues as it presents in the global economic shift with more valuing on stable rather than rapid economic growth. These will bring more sustainable development in the business operation. This issue is in line with KPMG's analysis; *"As the megaforges present major social and environmental challenges, there is vast corporate value creation potential in new markets that focus specifically on societal value creation. (KPMG International Cooperative, 2013)"*. It is parallel with PWC, who considered a new way of doing business as a key driver. *"Competitive advantage based on access to cheap labour and materials will become a thing of the past: instead, the global battle for talent and access to knowledge will increasingly be the basis for competition. (PricewaterhouseCoopers LLP., 2014)"*. Technology disruptive is another key issue that the business is unable to overlook since it has many universal effects. For example, it is emerging in new markets, product and service transformation, and cross-business collaboration.

Lastly, the company must take into account the force of regulations and standards since it has a direct impact on the business's performance, cost, or benefit. KPMG mentions that *"Legislation and other forms of regulation – such as industry self-regulation – increasingly require companies to pay more of the costs they impose on society (negative externalities) and improve the rewards companies receive for providing benefits to society (positive externalities). (KPMG International Cooperative, 2013)"* The requirements of information disclosure and report are meaningfully

increasing as stakeholders focus more on the company's transparency. This request also stated in an analysis of EY that *“transparent, auditable and reproducible analysis will provide trust and usefulness in decision-making” (EYGM Limited., 2016)*, same as PWC as *“It is becoming impossible for companies to operate behind closed doors, so transparency is the new paradigm for conducting business successfully. (PricewaterhouseCoopers LLP., 2014)*The summary of key drivers defined in each methodology is presented in table 4.3.

Table 4.3 The summary of key driver

Key driver	EY Total Value	KPMG True Value	PWC Total Impact Measurement and Management (TIMM)
▪ Stakeholder expectation	✓	✓	✓
▪ Material issues	✓	✓	✓
○ Market dynamic (limited resources and climate change)		✓	✓
○ New normal	✓	✓	✓
○ Technology disruptive			✓
▪ Regulation and Standard	✓	✓	✓
○ Transparency	✓	✓	✓
○ Data disclosure	✓		✓

4.1.2 Measurement and valuation process

Measurement and valuation are a core process as it is a key to integrating and mainstreaming the company's materiality in the economic, environmental, and social aspect, with business operation and decision-making. The process should be practical, reliable, and fit for purpose. For instance, if the company is considering setting up a new business unit and conducting the impact assessment for a rationale for their decision-making, they should start with a limited study scope by focusing on capitals, operations, and related stakeholders of new business. These will help the assessment process more effectively and reflect the impact results in line with the company's

objective. Furthermore, the indicators and data selection should be accurate and credible with high-quality primary data under a company's control, or the secondary data from direct suppliers. Studies and analysis showed that each methodology has been developed under WBCSD's framework but is different in a measurement and valuation process. The measurement and valuation method are based on the Triple Bottom Line (TBL) concept and integrates many approaches and principles such as the Impact Pathway approach, Integrated Reporting framework, and Monetization technique. It is saying that the method has been developed on the ground of the Triple Bottom Line concept. It starts with defining the study area and identifying the business's material issues by adopting the Impact Pathway approach. The second step is collecting data and applying the Integrated Reporting framework and Monetization technique to measure and value the impacts in six forms; capital, namely financial, manufactured, intellectual, natural, human, and social and relationship, in order to translate the impacts to monetary value. The final step is applying to the business, which is represented in the sample of case studies. The conceptual model of impact valuation is illustrated in figure 4.4. The Y-axis represents the impacts in six forms of capital, grouping in three main aspects; economic, environmental, and social. The monetary values of each impact are shown in the x-axis, both in a positive and negative value.

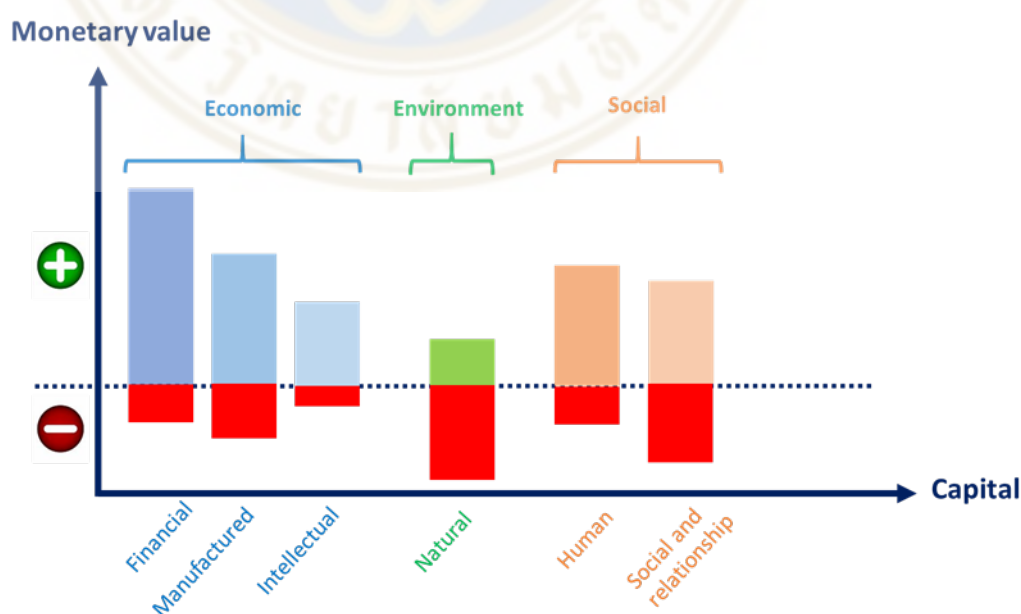


Figure 4.4 Conceptual model of Net Impact Valuation

The details of each process will be explained in five main steps as follows.

- (1) Define boundary
- (2) Identify materiality
- (3) Collect data
- (4) Measure and value
- (5) Apply

(1) Define boundary

A clear identification of boundaries could help the company to specify the areas of study to ensure that the measurement and valuation process will be well structured and serve the objective. The boundary is defined in several dimensions with different objectives, whether it is the organizational boundary - including incorporate level, product or service level, or project level -, value chain boundary, upstream to downstream and timeframe, or a financial year, strategy, and roadmap period, and project lifetime. The example can be seen when PUMA, the sports lifestyle company, applied the net impact valuation by setting the study boundary through the product value chain. Its primary purpose is to use the result for production improvement and product development (PricewaterhouseCoopers LLP., 2014). A visible boundary setting would help the company assess the impacts which accurately reflected the company's objective.

All three methodologies are placed its importance on a boundary setting. EY and PWC prioritized a scope defining at the first step in different areas of business level, value chain and timeframe of the methodological application by mentioning that "*Our approach starts with establishing a primary focus. When starting the journey, it is important to understand at which level and for which purpose the analysis is performed. (EYGM Limited, 2016)*" and "...Then, it is about defining the scope of the impacts to be included, for example the timeframe, the geography, the areas of business and the relevant parts of the value chain. (PricewaterhouseCoopers LLP., 2014)".

The boundary will be set with a different scope depending on the company's objective. For instance, a consumer company applied EY Total Value methodology by setting the impact assessment boundary through its supply chain as they want to mitigate

the risks associated with its complex global supply chain. (Ernst & Young LLP., 2016) Another case study came from the PWC project for the Scottish Hydro Electric Transmission company in the UK, which showed that the boundary could be scoped on a project base to measure and value all material social, economic, and environmental impacts for project planning and future implementation (PricewaterhouseCoopers LLP., 2014). The summary of the boundary setting mentioned in each methodology shows in table 4.4.

Table 4.4 The summary of boundary setting

Boundary	EY Total Value	KPMG True Value	PWC Total Impact Measurement and Management (TIMM)
▪ Organizational/Corporate	✓	✓	✓
▪ Value chain	✓	✓	✓
▪ Project or Product level	✓	✓	✓

(2) Identify materiality

In this stage, it will focus on the issues that most matter to the business within the setting areas and the key issues that are the consequence of the business's activities. The company needs to conduct the materiality analysis to define impacts or externalities, either positive or negative, covering key dimensions in economic, environmental, and social. For example, Nestle conducted the materiality analysis every two years to identify the issues that matter most to its business and stakeholders. In 2018, the sample of its key materiality was defined as supply chain stewardship, product nutrition, food, and product safety (Nestlé Global, 2018). The company should obtain the stakeholder's perspectives in practice for an effective material analysis to ensure that all key material issues of both internal and external views are considered. The stakeholder engagement can enhance the company to obtain more information and perspectives. It has been recommended by the Social and Human Capital Protocol that stakeholder engagement is a compulsory process for impact measurement and valuation since it helps the company to receive direct useful data. The recommendation is stated that "*High-quality, continuous stakeholder engagement can enrich the Protocol process*

and strengthen the quality and credibility of the results...Stakeholder engagement is mandatory for some measurement and valuation techniques, particularly when this requires the perspectives or data of those people whom business actions directly impact. (Social and Human Capital Protocol, 2019)”

Nevertheless, there are several ways to conduct the materiality assessment. Some consulting firm has developed its own approach, like KPMG. Some adopt the existing approach, like Impact Pathway - the approach that shows the value creation process beginning with the first input until the impact at the end - to their methodologies such as EY and PWC. However, the result of the assessment of each company will be different according to its business and impacts to stakeholders.

KPMG has developed its own framework by analyzing the company's internalization and externalities to identify the impacts. This framework is applied in their case studies and significantly shown the different issues of each business. For example, the plastic plant in the United States, the most considerable positive impact in the social dimension, is training skills to workers, while the most negative impact on the environment is the pollution from production. *“The most **material element** of the LDPE plant's positive externalities (aside from economic contributions) is the skills training provided to plant workers.....The most significant element of negative externalities is pollution from the production of polyethylene...(KPMG International Cooperative, 2013)”* However, when conducting the analysis on brewery company in India, the materiality is different. The most positive material issue in the social aspect is the farmer education, while the most negative impact on environmental is greenhouse gas emission. *“The brewery's material positive externalities....come from its education of barley farmers, which enables them to be more productive and results in increased farmer income and quality of life...and most material negative externality is its GHG emissions (KPMG International Cooperative, 2013)”*.

EY and PWC have adopted the Impact Pathway approach to identify the materiality. Impact Pathway approach is recommended by WBCSD in Social and Human Capital Protocol. It helps the company to draw a relationship between business activities and inputs to its outputs, outcomes, and impacts. This approach helps the company clearly identify its materiality. However, the materiality may create impacts on different stakeholders at a different level. Therefore, the company has to carefully

conduct a materiality assessment. The concept of the Impact Pathway is illustrated in figure 4.5. The first step in this assessment is to define the input. Later, it processes the input through the company's activities and will turn to output and outcome, resulting in the business impact. For example, in the case of a company conducting a major cost-cutting exercise, they applied this impact pathway approach to foresee the final impacts on staff lay-off campaign to reduce a company's cost. They started the process by putting the amount of cost-cutting as "input," cost-cutting exercise (staff lay-off) as "activity." The "output" resulted in a positive financial capital, while the "outcome" resulted negatively affected human capital. Consequently, the company found that positive impact showed an excellent financial performance while the negative impact showed in the societal dimension on human capital effect as an employment rate was reduced. “A company conducting a major cost-cutting exercise has a positive effect on the output of financial capital. As an outcome, it can have a negative outcome for human capital and a negative attributable impact on societal value as a direct result of reduced availability of employment. (EYGM Limited, 2016)”

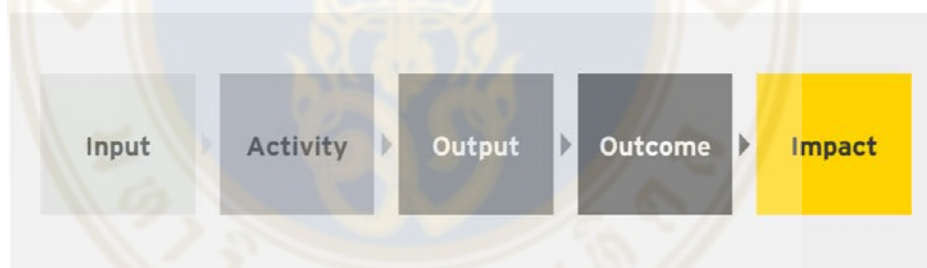


Figure 4.5 Impact Pathway

Source: EY Total Value, 2016

The approach of each methodology identifying materiality can be summarized in table 4.5.

Table 4.5 The summary of materiality identification approach

Materiality Identification Approach	EY Total Value	KPMG True Value	PWC Total Impact Measurement and Management (TIMM)
▪ Impact Pathway	✓		✓
▪ Own approach		✓	

(3) Collect Data

Net impact measurement and valuation processes require a variety of data since it has a wide range of applications. Therefore, the company should carefully consider the data selection process to ensure the data coverage either inside or outside the company. All three methodologies clearly stated that the data should be accurate, reliable, and materiality relevant. EY stated that “...Hence, it is important that the presented data is reliable and free of material misstatements. (EYGM Limited, 2016), while KPMG said “The most appropriate data for quantification must be selected from both within the company and from outside sources....It is important that information is material, focused and relevant (KPMG International Cooperative, 2013)”. PWC also highlighted that “Good decisions require consistent, reliable and timely data. (PricewaterhouseCoopers LLP., 2014)”. The data qualification defined by each methodology is concluded and presented in table 4.6.

Table 4.6 The summary of data qualification

Data qualification	EY Total Value	KPMG True Value	PWC Total Impact Measurement and Management (TIMM)
▪ Accurate	✓	✓	✓
▪ Reliable	✓	✓	✓
▪ Materiality relevance	✓	✓	✓

(4) Measure and Valuate

After data preparation is completed, the next step is to measure and valuate the impacts. Although the measurement and valuation approach did not completely set as a standard, the monetization technique and the Integrated Reporting framework are the most recommended as it provides a standard unit of measurement in monetary term along with the six forms of capitals (financial capital, manufactured capital, intellectual capital, human capital, social and relationship capital, and natural capital). Figure 4.6 demonstrates the integrated model of the Integrated Reporting framework and monetization when applying to impact measurement and valuation. The model concept can be explained that the total resources covering six capital forms are allocated for the

business's operations or called "input." Then it will proceed in operation driven by the company's business model and strategies and provide the "outputs/outcomes" or "materiality" of the business. Those outputs or materiality will be quantified to see the number of impacts generated by the company, such as revenue, tax, production volume, amount of greenhouse gas emissions, labor skill increasing rate, and the number of local employment. Later, all impacts will be "monetized" and translated to monetary values. The impact valuation primarily focused on the output or materiality, quantified impact, and monetization.

By way of illustration, company A defines its inputs according to six capital forms:

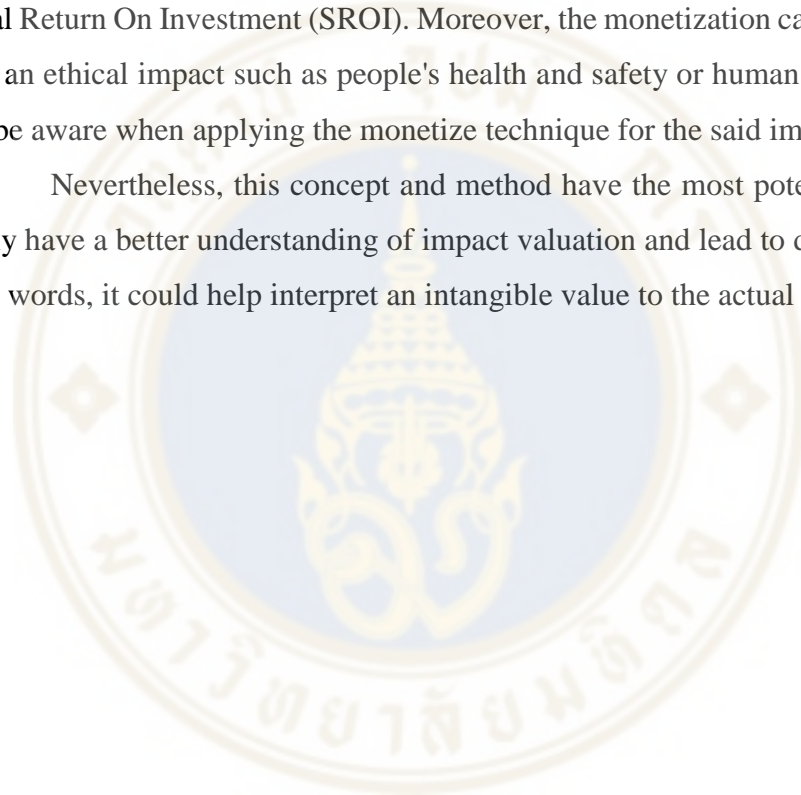
1. Financial data (such as equity and investment)
2. Resources used for production (such as infrastructure, raw materials and equipment)
3. Intellectual property (such as value of the patent and R&D expenditure)
4. The natural resource used in production (such as water use and energy consumption)
5. Human resource investment (such as management cost in people's health, safety and security, training spend, wage and salary)
6. Social investment (such as social project spend)

Business activities will proceed with all inputs according to the company's strategy and, consequently, provide the outputs or outcomes in each capital form. It can be total revenue or net profit in financial dimension, total productions in goods or services from the manufacture, innovation and new technology from intellectual investment, impact on the environment such as greenhouse gas (GHG) emissions, energy consumption and waste, number of people's incident and injury, number and value of employee training, and number of social projects, community income or local economy. Most of these outputs and outcomes are the critical materiality to the company that has an impact on the business. Thus, it needs proper management. After the outputs, outcomes, or the material issues are identified, it will be quantified and monetized according to each approach. In the final step, all impacts will be translated and showed in the same language, speaking monetary units, which will help the company quickly

see and compare the impacts and have better decision-making on a strategic response on the issues.

However, the impacts of some capital forms, such as financial, manufacture, and intellectual, can be directly monetized as they have monetary values itself. On the other hand, some impacts like greenhouse gas emissions or any natural resources used, people's competency, and community well-being, are complicated to value and monetize. These forms need a more proper methodology to translate its values, for instance, the Social Cost of Carbon (SCC) to measure the cost of greenhouse emissions or Social Return On Investment (SROI). Moreover, the monetization can not adequately express an ethical impact such as people's health and safety or human rights. Hence, it should be aware when applying the monetize technique for the said impacts.

Nevertheless, this concept and method have the most potential to help the company have a better understanding of impact valuation and lead to decision-making. In other words, it could help interpret an intangible value to the actual unit.



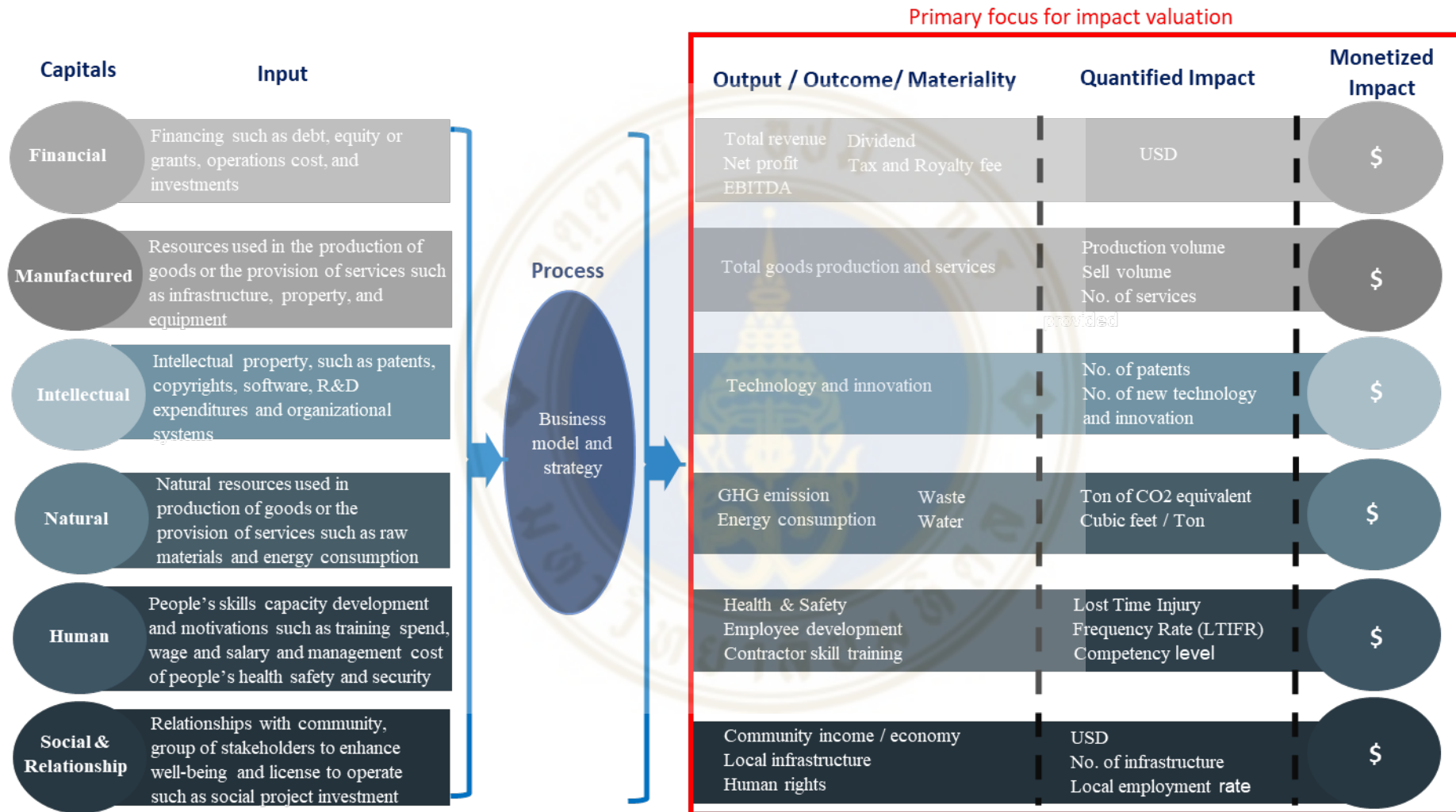


Figure 4.6 Integrated model of Integrated Reporting framework and monetization

The *monetization* technique has been discussed and analyzed as the most modern method for impact measurement and valuation. It is the most appropriate approach to measure and value the impacts even though it still has some limitations. *“However, while we acknowledge the limitations of monetization, we believe that it is the method that currently offers the most potential to bring considerations of societal value into corporate decision making. (KPMG International Cooperative, 2013)”*. This is in line with EY and PWC, who point out that monetization is the fittest for impact valuation and provides a common understanding of impact in monetary terms. *“The current consensus is to express value in monetary terms. Given the sole focus on financial value in traditional accounting, this is logical....Monetizing enables reporting on an environmental or social profit and loss account, and it is a metric that is widely understood. (EY Limited, 2016)”*. PWC also stated that monetization helps to simplify the impacts to a common understanding in the monetary unit; *“TIMM simplifies complex interdependencies by converting these into a language the boardroom is familiar with – money. (PricewaterhouseCoopers LLP., 2014)”*

Although the monetization approach is agreed to apply to the methodology, the gaps remain; the unclear impact value creation process and there is no standard of measurement framework of each impact. Therefore, to fill the gaps, the Integrated Reporting framework is simultaneously implemented. Figure 4.7 shows the value creation process of the Integrated Reporting framework, covering six forms of capital: financial capital, manufactured capital, intellectual capital, human capital, social and relationship capital, and natural capital. It demonstrates the linkages between the company's resource uses and its value creation to the stakeholders by drawing all six capital forms as “inputs” through its business activities. These encompass the company's mission and vision, strategy, risks, and opportunities. Then they convert them to “outputs” such as products, services, and by-products. The company's activities and its outputs lead to outcomes in terms of effects on the capitals. However, the external environment, including economic conditions, societal issues, environmental challenges, and technological change, has to be accounted for significant factors to the business. For instance, Altarea Cogedim, the leading property developer in France, has adopted a value creation model of the Integrated Reporting framework and EY Total Value methodology to create short, medium, and long-term impacts on financial and non-

financial capitals. They could see the overview of the company's value creations to key stakeholders. (EY Limited, 2016)

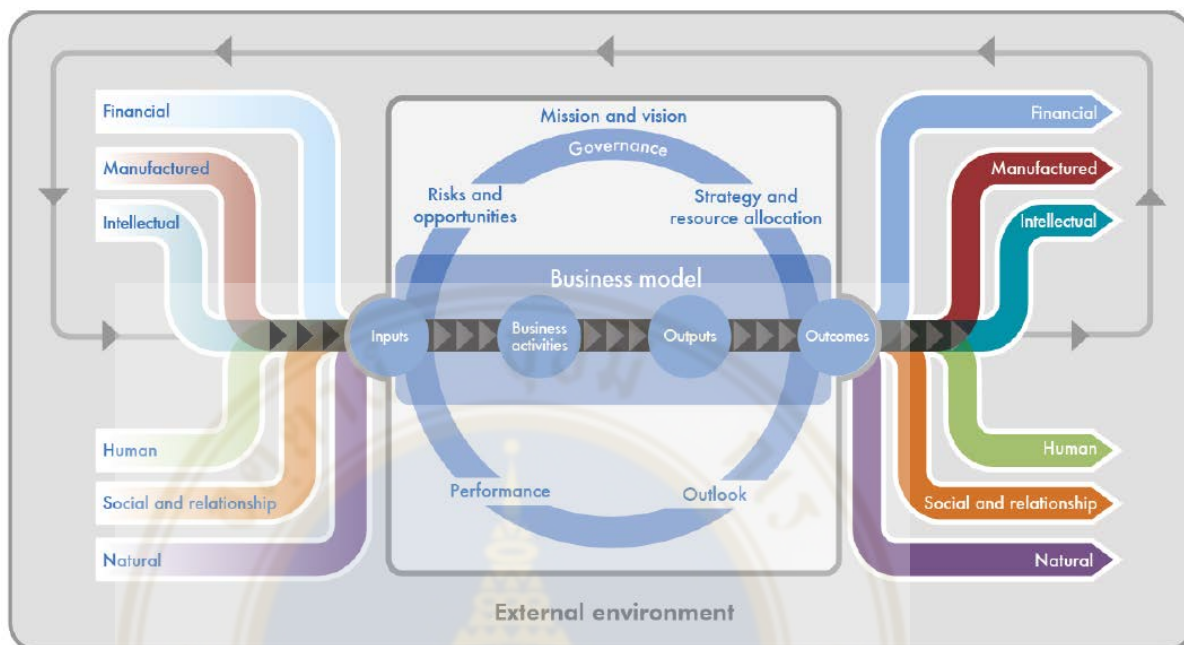


Figure 4.7 The value creation process of the Integrated Reporting framework
Source: Association of Chartered Certified Accountants (ACCA) and Netherlands Institute of Chartered Accountants (NBA), 2013

This framework can help the company to ensure that all significant impacts or values in principal capital forms will be included in the monetization and valuation process. KPMG recommended the Integrated Reporting framework as an excellent point to create the values; *“The International Integrated Reporting Council’s (IIRC) framework gives us a good point of departure in that it identifies six types of capital (or ‘stores of value’) that a company requires in order to create corporate value (KPMG International Cooperative, 2013)”*

EY has implemented this approach as they considered that all primary capital forms should be monetized and valued, not only focused on financial impacts; *“To monetize and value the impacts it could be a beneficial exercise to monetize not only financial and manufactured capital, but all forms of capital. (EY Limited, 2016)”*.

The impact measurement and valuation recommended by each methodology is presented in table 4.7.

Table 4.7 The summary of impact measurement and valuation approach

Impact Measurement and Valuation Approach	EY Total Value	KPMG True Value	PWC Total Impact Measurement and Management (TIMM)
▪ Monetization	✓	✓	✓
▪ Integrated Reporting Framework	✓	✓	

(5) Apply

The final step of the impact valuation process is the result interpretation and apply them to the business process for various purposes such as strategic decision-making, new investment opportunity, and corporate and societal value creation. The application of net impact valuation and its benefits can be defined in three main purposes; strategic decision-making, new business opportunity, and creating corporate and societal value. These have been demonstrated in the case studies. For example, The Dutch Railways adopted a Total Value methodology to investigate their externalities. They found the critical insights of environmental and social issues that the existing transportation created risk on greenhouse gas emissions, and the travelers' waiting time affected social value lost. Consequently, they made strategic decision-making on the greenhouse gas impacts mitigation and social value creation program.

Case study of The Dutch railway

“The Dutch Railways has used the analysis to support decision-making around risk mitigation to reduce their greenhouse gas emissions supported by long-term contracts with utilities providers. Another insight retrieved from the analysis is the insight that about one-third of the negative social value created occurs in “pre- and post-transportation.” NS, therefore, decides to put more emphasis on door-to-door concepts to improve its overall social impact” (EY Limited, 2016)

Net impact valuation also benefits for company's new business opportunities. This valuation can be seen in PWC's case study for Standard Chartered Bank in Ghana. The economic and social impact assessment results showed that the bank played an important role in supporting the country's economic growth, both at the macro-level, like GDP and micro-level, like job creation for communities. With this result, Standard Chartered Bank initiated a new business opportunity with a partner to provide the technical skills in business operations e.g., basic accounting to local SMEs, which helped them have more success in their business.

Case study of Standard Chartered Bank

"This information gained from these studies is helping Standard Chartered to enhance its contribution to these economies and promote sustainable business development by focusing its core skills, products and services. For example in Ghana, one barrier to SME lending was the lack of technical skills in accounting and other business operations. Standard Chartered has since partnered with PwC to provide ongoing technical assistance to SMEs in Ghana." (PricewaterhouseCoopers LLP., 2014)

Additionally, impact measurement and valuation can enable the company to create corporate and societal values. KMPG's case study for Ambuja Cement – India's leading cement manufacturer - found the key impacts in the environment and social aspect, both positive and negative, after the assessment. The supportive local community income through the company's CSR projects showed on the positive side while the impact on greenhouse gas emissions and human health presented in a hugely negative way. Therefore, the company implemented a greenhouse gas emissions reduction plan and put more contribution to CSR projects to enhance the local community's well-being. They realized that the corporate and societal values creation is vital to secure the license to operate.

Case study of Ambuja Cement

"The projects identified include measures to reduce greenhouse gas emissions... The company's ambition is to continuously increase its "true" earnings. It will do this by

reducing its negative externalities, but also by creating more positive societal value...The results confirmed the Foundation's important contribution to the company's CSR strategy: for every rupee spent in 2012, 8.5 rupees of socioenvironmental value were created." (KPMG International Cooperative, 2013)

The benefits of methodology application mentioned above can be summarized in table 4.8

Table 4.8 The summary of application benefits

Application Benefits	EY Total Value	KPMG True Value	PWC Total Impact Measurement and Management (TIMM)
▪ Strategic decision-making	✓	✓	✓
▪ New business opportunity	✓	✓	✓
▪ Corporate and societal value creation	✓	✓	✓

4.2 Application for Oil and Gas Exploration and Production Industry

After the methodology has been scrutinized, it will be applied to the oil and gas exploration and production industry (E&P) according to the steps mentioned in topic 4.1.2. by using the conceptual model in figure 4.2. However, the step by step explanation is as follows.

4.2.1 Apply methodology

(1) Define boundary

The application's boundary will be covered at the corporate level since it can help the company foresee the overall impacts within the direct operation control in every operational area, whether offshore and onshore or domestic and international. This impact will provide a holistic view and informed decision-making to the company. For that reason, setting the boundary at the corporate level is more appropriate than specific in some project or operation area as it shows the company's overview impacts. However,

the value chain of oil and gas E&P is complicated and involved various stakeholders in any operation phase. For example, the acquisition for concession agreement at the beginning closely involves the government of the country where operates. The exploration and production stage is related to investing business partners, numerous suppliers, and contractors for seismic survey services, drilling companies, air, land, sea transportations, and the communities around operating areas. With many stakeholders involved, it makes the company hardly have direct control in every activity and access all key issues.

(2) Identify materiality

Exploration and production or E&P is a specific sector of the oil and gas industry, involving high-risk activities, high investment as well as consuming many resources for the operation (MCCLAY, 2020). The materiality of this industry can be identified in various issues, both positive and negative ways. From the study review in chapter two, topic 2.2.3, the critical impacts of the oil and gas E&P business of all three dimensions can be summarized in table 4.9. The principal materials issues in the economic dimension are focused on business profits, such as total revenue and net profit from oil and gas production. In the environmental dimension, the primary material issue is greenhouse gas emission, whereas the health and safety of people and community impacts are key issues in the social aspect.

Table 4.9 Summary of key impacts of oil and gas exploration and production industry

Economic	Environment	Social
<ul style="list-style-type: none"> ● Economic benefits (total revenue, net profit, and EBITDA) ● Dividend payout ● Taxes and royalty fee ● Oil and gas production 	<ul style="list-style-type: none"> ● Greenhouse gas (GHG) emissions ● Water (water use, discharge, reduce) ● Waste (recycle, discharge) ● Spill rate 	<ul style="list-style-type: none"> ● Health and Safety ● Community and social impacts (community income, job creation, local infrastructure) ● Local content

Economic	Environment	Social
<ul style="list-style-type: none"> ● Proved reserve ● Technology and innovation ● Corporate governance and anti-corruption 	<ul style="list-style-type: none"> ● Energy consumption ● Biodiversity 	<ul style="list-style-type: none"> ● Human capital development (both employees and suppliers or contractors) ● Human rights (child labor, indigenous people)

However, the list of impacts in table 4.9 is the common issue of the oil and gas E&P business. When conducting the impact assessment, they should analyze and identify the most material issues in their business context. To give an instance, if the operation areas of company A do not have the residence of indigenous people, the impact on human rights regarding the indigenous people should not be included in their assessment.

To ensure the relevance of the material issue and its impact, the Impact Pathway model can help to describe how the issue matters and create a possible impact on the company. For example, in unsafe operation, the employee is defined as a resource or input. When the operation is unsafe, there will be a high possibility of accidents and harm to the employees involved in the operations. This issue will impact an employee's health and well-being. Therefore, health and safety should be considered as a key material issue. The Impact Pathway visualization can be presented in figure 4.8

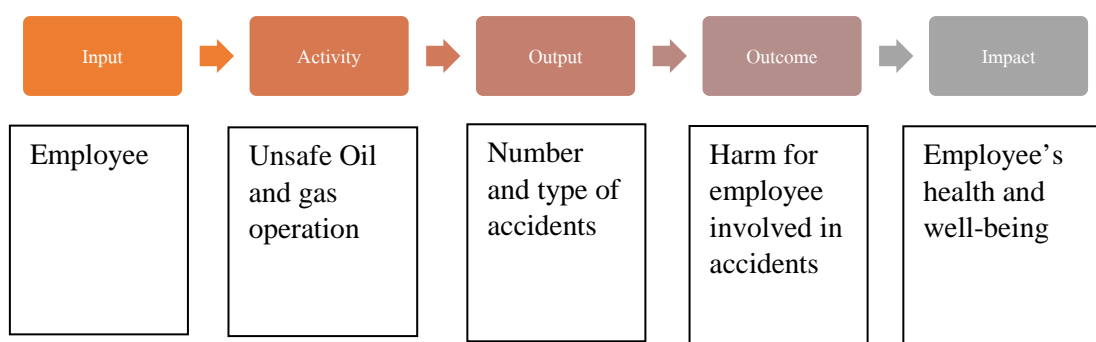


Figure 4.8 Impact pathway visualization for health and safety issue

(3) Data Collection

The company should collect the appropriate quantitative and qualitative data within company reporting boundary, internal and external sources, and then review its accuracy and completeness. The data source must be accurate, reliable, and materiality relevant, as well as transparently disclosed. Thus, the data should be audited and certified by the external firm before process the measurement and valuation in the next step. In the oil and gas industry, the data used for impact valuation should cover six capital forms: financial data, oil and gas production volume, human resources information, environmental footprint data, and social investment cost or benefits. These data should be the same set as the company disclosure in an annual and sustainability report since it complied with the international reporting and information disclosure standards to ensure the reliability and credibility of data. The said standards are the Global Reporting Initiative (GRI), standard in Oil and Gas Sector Disclosures (OGSD), the sustainability management framework for the oil and gas industry- International Petroleum Industry Environmental Conservation Association (IPIECA), AA1000 AccountAbility Principles Standard, The Sustainability Accounting Standards Board (SASB), and Dow Jones Sustainability Indices (DJSI). The data required to disclose and report in these standards are categorized into three main criteria;

1. economic value; total revenue, operating expenses, tax, dividend payment, oil and gas proved reserved and production, and employee's salary
2. environmental value; greenhouse gas emissions and other emissions, oil spill rate, water used and waste disposal
3. social value; the number of fatal accident rates, number of incident rates, and social project investment.

Moreover, the information from external, especially stakeholders, is the key inputs. Hence, stakeholder engagement helps the company with more insightful information.

(4) Measurement and Valuate

In this step, the company will implement the integrated model of the Integrated Reporting framework and monetization in figure 4.6 to measure and valuate

the impacts and materiality of oil and gas exploration and production business as earlier identified and shown in figure 4.9.



Primary focus for impact valuation

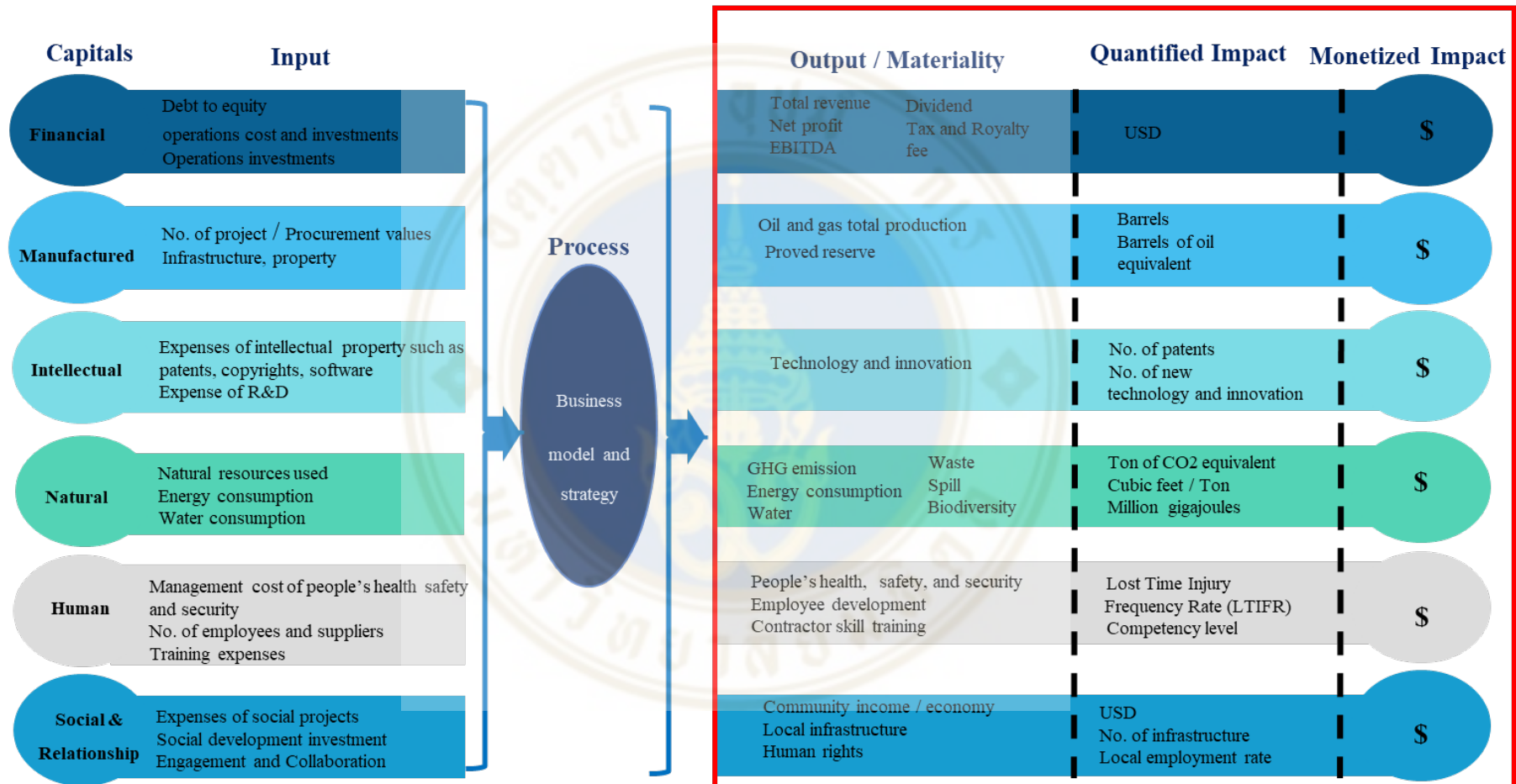


Figure 4.9 Impact valuation for oil and gas exploration and production industry

The model of impact valuation for oil and gas upstream business in figure 4.9 has been portrayed from the materiality study of the oil and gas industry by focusing on upstream business and the business value-creation process based on Integrated Reporting Framework. By illustration, company A - the oil and gas upstream company, has significant petroleum operation sites in Asia, both offshore and onshore. They have to consider the critical resources used for their operations or “input” in all operations or focused projects covering all six capital forms based on Integrated Reporting Framework. First of all, financial capital can be debt, operation cost, or investment of all operations. The manufactured or production capital can be total operation sites or focused projects, and procurement values. Thirdly, intellectual capital can be the expense of R&D and technology used, such as technology for deepwater drilling, Autonomous Underwater Vehicle for sub-sea pipeline inspection, as well as the expenses of intellectual property like patents and copyrights. Natural capital can be energy and water consumption. Human capital can be the management cost of people’s health, safety, and security as the upstream business is an extreme safety concern and training and human development expenses. Lastly, social and relationship capital will be focused on social investment through diverse social development projects in all operating areas.

When all inputs are operated under the company’s business model and strategies, it will generate “outputs” or “materiality” of each capital stream, impacting business at different levels. In this step, the figure shows the sample of materiality aforementioned in table 4.9, a summary of the crucial impacts of the oil and gas exploration and production industry. It can be defined as total revenue, dividend, and tax paid for financial dimension, oil and gas total production volume in production capability, and new technology and innovation for intellectual capital. The four other forms are; greenhouse gas emissions are the principal material issues for the environment, and the other natural resources used like water and energy, people’s health, safety and security, and employee development are shown in the human capital output. Lastly, the local community economy and well-being reflect the output of social investment. Once the materiality is defined, it will then be quantified the impacts in each unit amount. The example of these units is net profit, oil and gas production volume (barrels), number of technology development, number of carbon dioxide emission,

amount of energy consumption (million gigajoules), employees' Lost Time Injury Frequency Rate (LTIFR)³, and number of social project development. The final step is to “monetize” the impacts and translate them to monetary values, which help the company clearly understand the impacts at the same standard. Once the impacts are translated into the tangible unit, it will lead to a better strategic response.

However, not all impacts can be monetized directly, especially the ethical issues concern with a human being like an accident or fatal rate of people. Therefore, the company must carefully study and adopt the most proper calculation methodology to translate the impacts of monetary values.

Nonetheless, within the study scope of this research, the full implementation of this model is not yet to be found in oil and gas upstream companies.

(5) Apply

When the results are interpreted in monetary terms, it can help the company in strategic decision-making, such as implementing the decarbonization strategy if the company has a considerable number of greenhouse gas emissions impact, or intensive on operation safety policy the impact on health and safety shows negative. By focusing on positive impacts, it can bring new business opportunities to the company. For instance, the high revenue generated from in-house technology and innovation development may lead to a new business opportunity or the expansion of the firms. Besides, the company's benefits or the shared values to society are also created from this valuation.

The greenhouse gas emissions are the principal material issue for oil and gas upstream business, as aforementioned above. It can be seen from the specific cases that oil and gas upstream companies are focused more on sustainable design and balanced portfolios to achieve the greenhouse gas emissions-reduction target. They are highly aware that greenhouse gas (GHG) emissions are the most materiality and impact on their

³ “Lost Time Injury Frequency Rate (LTIFR) is the amount or number of fatality, permanent disability or time lost from work that occurred in the workplace that resulted in an employee's inability to work the next full work day”(Safeopedia, 2020)

business. As an illustration, PTT Exploration and Production Company Limited (PTTEP) -Thailand national petroleum exploration and production company - conducted an annual materiality assessment.

They found that greenhouse gas emissions are a significant issue of its business. To solve this, they set the reduction plan as a corporate sustainability strategy with a long-term target to reduce greenhouse gas emissions intensity by at least 25% from 2012 base year. To emphasize on this issue and strategy, the company has concentrated more on existing greenhouse gas reduction projects to enhance the company operation's capability. By doing so, they are working on the installation of Flare Gas Recovery Unit (FGRU); the process of recovering the waste gases that would usually be flared to reuse as fuel gas elsewhere in the facility (Zeeco, 2015), at Greater Bongkot South gas field in Gulf of Thailand to recover the excess gas from the petroleum production process. This installation helps to reduce greenhouse gas for more than 110,000 tonnes of CO₂ equivalent. Additionally, a new project study of Carbon Capture Utilization and Storage, or CCUS, has been initiated and focused on a feasibility study to be applied to operation fields for reducing greenhouse gas emissions (PTT Exploration and Production Public Company Limited, 2020). The CCUS is the technology used to capture carbon dioxide (CO₂) from the operation process and be used as a resource for other valuable products, or that captured carbon dioxide will be permanent stored underground in geological formations to reduce its emissions (International Energy Agency, n.d.).

CHAPTER V

CONCLUSIONS, DISCUSSIONS AND RECOMMENDATIONS

In this chapter, the study of “Net Impact Valuation for Oil and Gas Exploration and Production Industry” will summarize the key insights of the study and research result, discuss the implementation and limitations, and recommend the potential areas for further research. The research aims to analyze the methodologies of net impact valuation and application for the oil and gas exploration and production industries. The result may guide the company on the net impact valuation methodology that is most fit for their industry. This measurement and valuation provide a holistic view of the company’s sustainability performances in the monetary term, which can support the firm in decision-making and strategic design also and implementation.

This research was designed as applied research by analyzing the secondary data and empirical reviews from key international organizations in sustainable development and consultant and accounting firms who developed their net impact valuation methodology. The conclusions, discussions, and recommendations for this research are as follows.

5.1 Conclusions

5.1.1 Methodology Overview

According to the methodology analysis results, the methodology overview can be summarized in three main topics as follows;

- 1) Concept and objectives: The concept and objectives of Net Impact Valuation methodology are commonly defined as a tool for the company to measure and value impacts, then translate it to the monetary term. This methodology could help the company have an overview of their impacts and lead to better business decision-making and strategy design and implementation since the results show either opportunities or risks. Moreover, it can also support the company to obtain and secure

the license to operate. The example can be seen in PWC's business case. The brewery adopted the concept of impact measurement and valuation to balance its business impacts and have a holistic analysis to support its decision and strategy design for the procurement and sourcing process. An approach helped the company to compare the total long-term impact between the use of local barley and the imported ones. Each option has different impacts on economic, environmental, and social implementations, such as supply security, foreign exchange exposures, and strengthen relationships with local stakeholders. These impacts lead the company to a different business decision and strategy that they have to trade-offs and consider the most benefits to their business. Although the final decision did not show in this sample case, it provided a concept and objective of applying the business's net impact valuation methodology (PricewaterhouseCoopers LLP., n.d).

2) Scope: The scope of the methodology is well-defined in three dimensions aligned with the triple bottom line concept: economic, environmental, and social. Even though some methodologies - Total Impact Measurement and Management methodology from PWC - highlighted "Tax" as another focus dimension, it might also include the economic dimension in practice. For instance, a coal mining company in South Africa applied KPMG True Value methodology as a tool for impact valuation to consider their potential investment. In the study, taxes were defined in the economic dimension, together with wages. It also showed a positive impact since the mining business is a significant source of jobs and tax revenues contributed to the country (KPMG International Cooperative, 2013)

3) Key driver: There are several key drivers putting behind the methodology as they can create forces and changes to the business context. The primary driver is stakeholder expectations. The stakeholder influences the business operation in various aspects, including its responsibility for environmental and social issues. As an illustration, customers or buyers are vital stakeholders of a global brand company since they influence the company's products, service, and business performance. Moreover, they are increasing their monitoring of the company actions in social and environmental responsibility. The monitoring is not only looking into the actions of the company itself but also going deeper into the supply chain. Customer expectations could drive these various global brand companies to focus more on their supply chain management

program in responding to the customer's pressure and requirements. Hewlett-Packard, a multinational information technology company, has implemented a Supply Chain Responsibility program for its supplier audit and assessment criteria to ensure that the suppliers implemented social and environmental responsibility into their works (KPMG International Cooperative, 2013).

The material issues are also considered to be the key drivers, and each business will have different material issues upon the business context. In general, most of the issues that matter to the business can be defined in the mainstream of market dynamics, new normal, and technology disruptive. Their consequence affects the business context in terms of changing business models, new product or service, and cross-business collaboration. Another significant driver is the regulations and standards. It plays an essential role as a mechanism to shape the business more transparent and be accepted by the stakeholders.

5.1.2 Measurement and Valuation Process

Measurement and valuation are a core process of methodology. The useful measurement and valuation will make accurate and reliable results, which lead to precise decision-making and strategy implementation. From the study and analysis, impact measurement and valuation methods have been developed under the World Business Council for Sustainable Development (WBCSD) framework, based on the Triple Bottom Line (TBL) concept. Each methodology has been applied several principles and approaches, including the Impact Pathway approach, Integrated Reporting framework, and Monetization technique, into impact measurement and valuation process. The conceptual model of Net Impact Valuation can be simplified and showed in figure 4.4. The model is used to demonstrate the integration of the frameworks and approaches into the impact valuation process. It shows the impacts in six forms of capital according to the Integrated Reporting framework in Y-axis, while the impact value in the monetary unit is shown in X-axis. The total impact will be grouped into three dimensions; economic, environmental, and social, according to the triple bottom line concept.

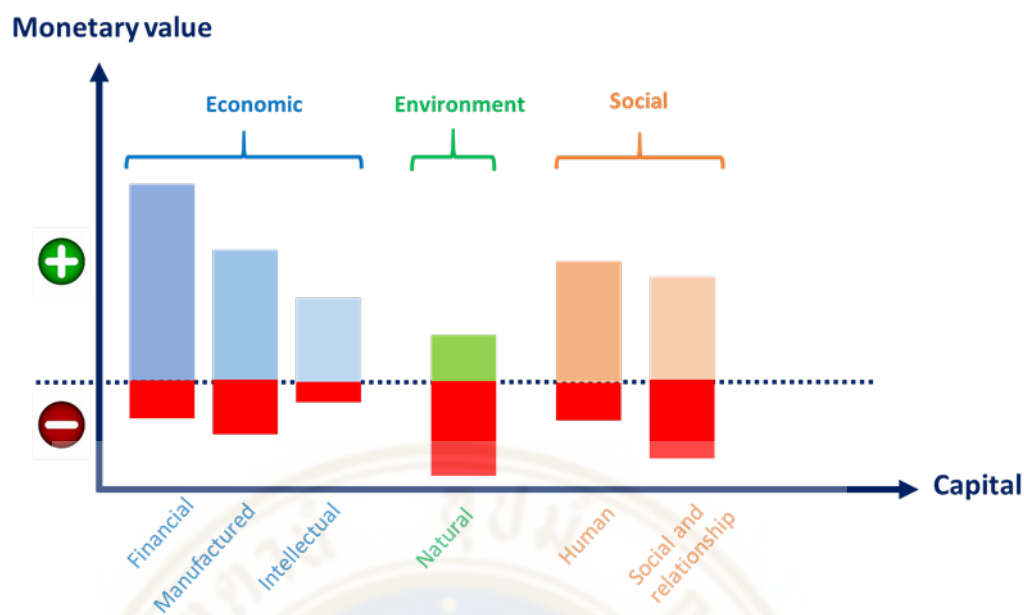


Figure 4.4 Conceptual model of Net Impact Valuation

There process of impact measurement and valuation can be summarized in five main steps as follows;

Step 1: Define boundary

In the first step, the area of study has to be clearly explained. The boundary of impact measurement can be defined in several dimensions upon its nature of business. Almost all methodologies are applied in three main boundaries, whether an organizational or corporate level, project or product level, and value chain boundary covering the upstream to downstream. For instance, the Scottish Hydro Electric Transmission company applied the PWC Total Impact Measurement and Management (TIMM) methodology to evaluate its new transmission line project. By focusing the study boundary at the project level, the company can estimate the value of the transmission line's impact on related operation areas. The result could help the company come up with more effective project planning (PricewaterhouseCoopers LLP, 2014).

Step 2: Identify materiality

After the boundary has been defined, the material issues in the setting area, including economic, environmental, and social dimensions, will be considered crucial factors. In this process, the materiality assessment and analysis will be implemented

step-by-step to ensure that all key material issues from the stakeholders are counted. Moreover, most of the methodologies applied the Impact Pathway approach, which has been introduced by WBCSD. The approach helps to identify the company's materiality and show the business activities and inputs to its outputs, outcomes, and impacts. For example, the company invested employees' and contractors' health and safety training programs. They identified the activities and their consequences according to the Impact Pathway approach. The company put the invested money in the training program as "input," health and safety training program as "activity." An "output" can be shown as a number of employees and contractors were trained, while the safer work standard for the employees and its contractors is defined as an "outcome." Lastly, an "impact" is presented as a decrease in accidents and injuries cases (PricewaterhouseCoopers LLP, 2014). The relation of the impact pathway is demonstrated in figure 5.1.

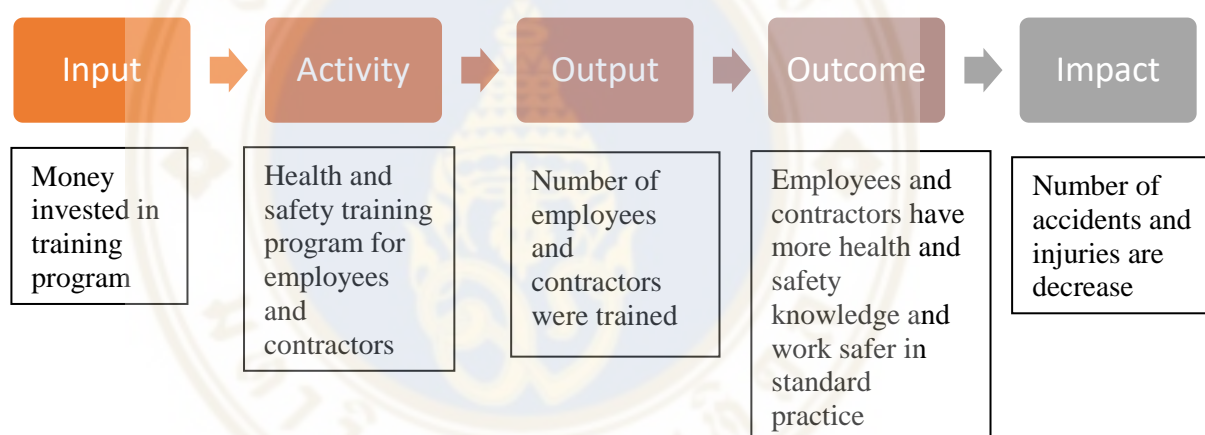


Figure 5.1 Impact pathway visualization

However, each company's materiality will be different upon types of business, period, and stakeholder groups. Therefore, the company must carefully conduct the materiality assessment and analysis to ensure that the result will correctly reflect an exact matter issue.

Step 3: Collect data

The next step is data collection, according to the materiality defined. The acceptable quality of data should be accurate, reliable, and relevant to materiality and be collected from internal and external sources. The excellent quality data will provide useful information for better decision-making and strategy design to the company.

Nonetheless, Net Impact Valuation consumes an extensive amount of data, e.g., total revenue and cost, human resource investment, environmental performance (greenhouse gas emissions and waste management cost), and total social investment in social development projects which covered cost and benefits. The company should systematically collect the data to prevent errors or confusion.

Step 4: Measure and value

The monetization is the most recommended technique to implement in this step. It can be synchronized with the Integrated Reporting Framework to make the measurement and valuation more complete and cover all essential elements. When the two approaches are combined, it will demonstrate the relationship between the company's impacts and inputs in the six capital forms, namely, financial capital, manufactured capital, intellectual capital, natural capital, human capital, and social and relationship capital. The impacts will be monetized and translated into the monetary unit. The integrated model of the Integrated Reporting framework and monetization are presented in figure 4.6. This figure summarizes the concept and process of this model as follows;

In the beginning, the total resources used for business operations, which are categorized into six forms of capital according to the Integrated Reporting framework, are defined as "input." Those inputs are an investment and operating cost, innovation and technology expenses, energy consumption or other natural resources used, employee salary and cost of the staff development program, and social investment. Later, all inputs will be proceeded along with the company's business activities and provide the "outputs/outcomes" or "materiality" of the business in each inputs stream, including revenue, tax paid, new technology, employee skill enhancement, greenhouse gas emission, wasted generated, and community or social improvement. When the materiality is named, it will be quantified to see the number of impacts generated by the company and "monetized" to monetary values in the last step. In some inputs - financial, manufactured, or intellectual capital - can be directly quantified in impact amount and monetized in economic value as it has monetary value itself. However, the impact in some capital forms of natural resources, human resources, and social capital, may not fully be translated to the monetary unit and need a proper methodology to validate its

values. The methodology above is the Social Cost of Carbon (SCC) to measure greenhouse emissions cost and Human Capital Return on Investment.

Even though the monetization approach is the most recommended to apply for net impact valuation, it still has a limitation, especially on the impact monetizing on human-related issues such as healthcare and safety and human rights. Hence, it should be aware when applying the monetize technique for the said impacts.

Step 5: Apply

The final step is a result interpretation and application which indicate risks and/or opportunities of business. The critical insight is how the company integrates the results into its business's purposes, e.g., strategic decision-making, new business opportunities, and corporate and societal value creation. For instance, The Dutch Railways adopted a Total Value methodology to investigate their externalities. They found the key insights of environment and social issues that the existing transportation created risk on greenhouse gas emissions, and the travelers' waiting time affected to social value lost. Consequently, they made strategic decision-making on the greenhouse gas impacts mitigation and social value creation program (EY Limited, 2016).

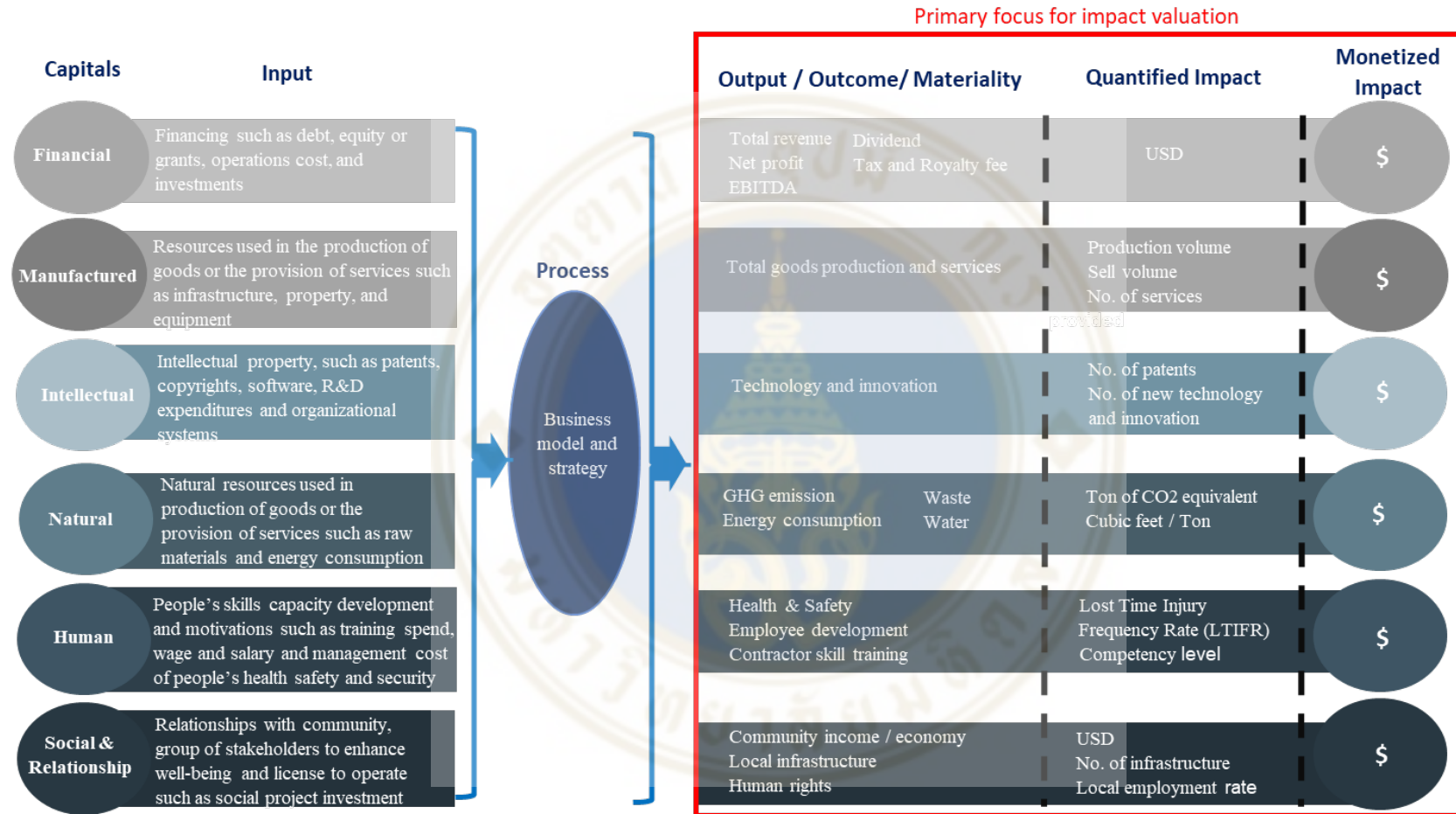


Figure 4.6 Integrated model of Integrated Reporting framework and monetization

5.1.3 Application for Oil and Gas Exploration and Production

Industry

The methodology process mentioned above could be applied to any business, including oil and gas exploration and production business. The oil and gas upstream industry application in each step is illustrated in figure 5.2, and the key insights will be summarized as follows;

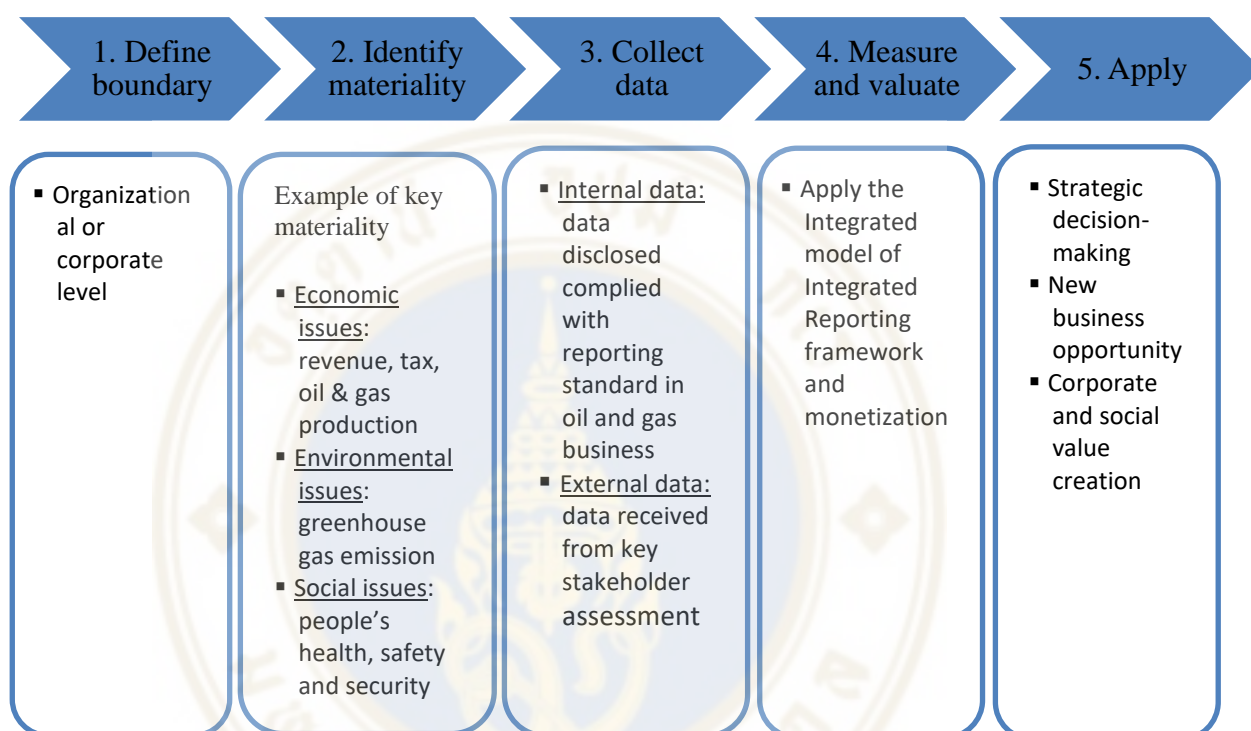


Figure 5.2 Application for Oil and Gas Exploration and Production Industry

Step 1- Define boundary: The most proper boundary of oil and gas exploration and production business is corporate-level boundary since most of the companies in this industry operate globally under the international standard, i.e., International Association of Oil and Gas Producers (IOGP). Therefore, setting the boundary as a corporate-level can represent a better overview of the business than other boundaries such as project-level or supply chain.

Step 2 – Identify materiality: By focusing on the exploration and production industry or oil and gas upstream companies, the main common material issues among these companies can be identified and grouped in three primary dimensions, based on the triple bottom line concept. In the economic dimension, the key material issues are

defined as revenue-generating, tax or royalty fee proving to the country, and the volume of oil and gas production serving the industrial sectors and economic growth of the country. Greenhouse Gas (GHG) emissions, especially CO₂ emissions, are identified as the most crucial environmental issues in the environmental dimension and have a significant impact on the society and global level. The petroleum industry operation has been claimed as a significant producer of greenhouse gas emissions (IPIECA, 2016). Lastly, people's health and safety are recognized as the principal material issues in the social dimension as they directly involve the health and well-being of people. Health and safety of people must be focused, including employees, contractors, and people and communities surrounding the operational areas, as oil and gas exploration and production concerns with high-risk activities (MCCLAY, 2020).

Step 3 – Collect data: The data used for this step must be accurate, reliable, and materiality relevant. Also, the information should comprise both internal and external sources. Internal data should be in line with the company publicly disclosed, such as the annual report or sustainability report. These reports should be certified and complied with international reporting standards, i.e., the Global Reporting Initiative (GRI) and Oil and Gas Sector Disclosure standard (OGSD). The external data sources can be retrieved from stakeholder engagement, a public consultation program, survey, or stakeholder's interview. This information allows the company to have the insight information of each stakeholder.

Step 4 – Measure and value: The integrated model application of the Integrated Reporting framework and monetization will represent the impact measurement and valuation in oil and gas upstream business. As previously stated, the oil and gas exploration and production industry consume various resources for its operations. Implementing the Integrated Reporting framework can entirely help the company consider the factors or inputs in the primary six capital forms and ensure critical materiality, including measurement and valuation. Later, all outcomes or materiality will be monetized in monetary values. The said mock-up model is shown in figure 4.9. On the other hand, the monetization technique has its limitation in monetized impacts involving human beings or sensitive issues (fatal rate or ethics). With this issue, the company has to seriously consider when applying the most appropriate measurement

approach, particularly for people's health and safety, which is identified as the principal material issues in the social dimension for upstream business.

Step 5 – Apply: The methodology results lead the company in strategic decision-making, new business opportunity, and corporate and social value creation. For example, many oil and gas upstream companies aware that greenhouse Gas (GHG) emissions are a key material issue to their business. Therefore, they emphasize the strategy and ambition target setting to respond to this issue. Figure 5.3 shows that many oil have emphasized their strategy setting in responding to the greenhouse gas (GHG) emissions impact as a key material issue to the business. Several strategies and action plans are implemented, including optimizing operations, which are estimated to reduce GHG at 5 – 10%, sustainable design that may reduce GHG at 20 – 30%, and 10 – 20% from balancing portfolios (Gargett, 2019).

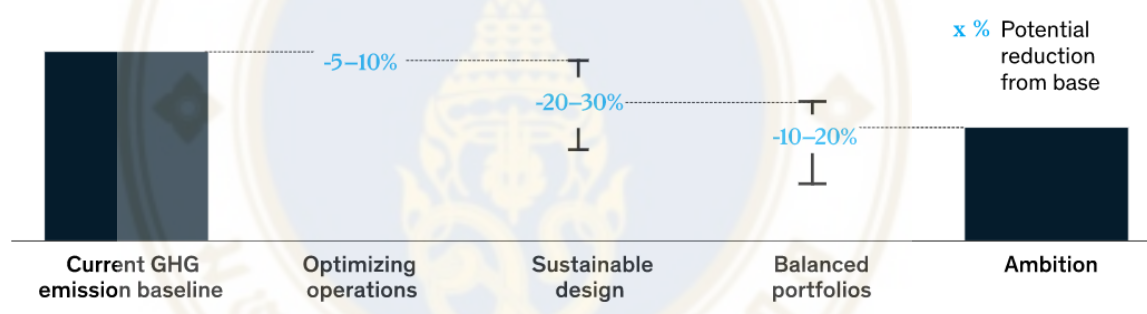


Figure 5.3: The strategy adaptation of oil and gas upstream company in response to GHG emissions-reduction ambition

Source: Gargett, 2019

5.2 Discussions

The discussions will be focused on the methodology's implementation in the overview, the practicality for oil and gas exploration and production business, and the limitations or challenges of the methodology.

5.2.1 Implementation in Overview

For the most efficient implementation, the company should consider two main factors; proper preparation and the application's context.

As the net impact valuation is the methodology for business's strategies and future actions, it is essential to be well-prepared and organize in every step.

Starting with people, the company should consider assigning the expert or concerned people to support and run the methodology. It requires the selected group or team support from various fields and knowledge, such as financial, health and safety, environment, and social development. The variety of backgrounds is essential as it can provide data and key insights in each dimension of the company's performance, which most fit and apply to the methodology. Moreover, those people should have a strong understanding of the net impact valuation concept and process to drive the methodology efficiently. Social and Human Capital Protocol also stated that skills and expertise in many areas, such as change management, communication, and technical, are essential resources that the company should prioritize for net impact valuation implementation. *"You may consider additional support from change management professionals, communication professionals, stakeholder engagement teams, and technical professionals in order to determine reporting opportunities and provide reliable data. (Social and Human Capital Protocol, 2019)".*

Time and data are the vital resources that the company should be well-prepared and allocated. Since the net impact valuation consumes tremendous data support, it should consider allocating enough time and attention to gather raw data for each dimension; economic, environmental, and social performance. Also, they should pay attention to internal sources, such as financial, production, safety, environment, and social department, as well as external sources, including stakeholder engagement results, to analyze and apply it to the methodology.

When resources - people, time, and data - are well prepared, the next step is to consider applying the data and implementing the methodology. There are several practices that the company should consider when implementing the methodology for its most effectiveness. First, scopes, objectives, and boundaries should be clarified, so the committed team has an idea of what to expect and do in the same direction. This step will enhance the result of impact valuation to be more accurate and reliable. For

example, when the company plans to run a new business unit, it should clearly define the objective mentioned in the new business unit, e.g., "to analyze the opportunities and risk of new business." The implementation scope should also be focused on this new business, such as production or operation cost, human resource input, an environmental and social impact from a new business. The scope should exclude the impact of existing business projects and any irrelevant data. However, setting a small study scope in an initial implementation could help the company understand the methodology and reduce the confusion in data preparation (EY Limited, 2016). Furthermore, stakeholder engagement has to be considered as a critical factor to conduct in the early stage of the methodology implementation since creating involvement and support from both internal and external stakeholders could make the company gain insight and extensive information for the impact valuation process.

The net impact valuation methodology can be applied in any business in a different scope, including all three main aspects of economic, environmental, and social, or one of either. The scale also differs upon the company focus and objectives, such as value chain level, product level, and project level. The sample of best practices is demonstrated in the following case of studies.

Nestlé, the world's largest food and beverage company, applied the net impact model to value social impact related to employment and skills. They set the study scope through a value chain, starting with farmers, intermediate suppliers, and finally, the Nestlé factor by determining the study period of a one-year production. After the completion of the valuation, outcomes show the relations between health and income impact of employees. The key assumption shows that income inequality has an important influence over the employee's health condition. (Social and Human Capital Protocol, 2019).

Hewlett-Packard or HP, the global technology in hardware and software development company, implemented the Total Impact Measurement and Management methodology of PWC to support their decision-making for investment in West China and their logistics strategy. The result showed the benefits gains to HP, covering business advantage as the cost reduction, environmental positive by reducing the carbon footprint, and increasing the local employment rate and economic growth for the communities (PricewaterhouseCoopers LLP., 2014). On the other hand, an event-based

or project-based strategy can also apply this methodology. The 2014 Brazil World Cup organizer adopted the EY's Total Value approach to value the social and economic impact of the event to ensure benefits to Brazilian and Brazil country as a whole (EY Limited, 2016).

5.2.2 Practicality for Oil and Gas Exploration and Production

Business

Focusing on the practicality for oil and gas exploration and production industry which is specific and has a complexity of value chains (MCCLAY, 2020), the conceptual model of net impact valuation in figure 4.4 and the Integrated model of Integrated Reporting framework and monetization in figure 4.6 could help the company to get a sight on the overall impacts. Also, the company could draw the relations between inputs and outcomes, and finally, present the net monetary values in the triple bottom line concept. These two models are a combination of existing methodology-analysis results and international sustainability frameworks. It could fill the gaps found in the current methodologies, such as the materiality coverage, based on six forms of capitals, and impact linkage.

However, to make it more practical for the business, the company should consider several factors for the implementation.

1) At the beginning stage of implementation, applying all six capital forms may not be easy since it consumes a vast and full range of information support and time allocation. Therefore, starting with a limited scope and capitalize on the valuable outcomes will make it more practical (EY Limited, 2016). Once the company is ready - having an execution team who understands and has knowledge of net impact valuation method, having a sufficient time allocation for data preparation, and having data from both internal and external sources - they can gradually build momentum and leverage for a full form of methodology.

2) Materiality identification is vital. Hence, careful consideration of materiality coverage is also essential. Oil and gas upstream business involve various stakeholders upon their activities. The industry's life cycle and activities are illustrated in figure 2.2. The exploration and the production stage involves a variety of contractors and supplies, such as seismic survey services, drilling rig, and service

companies. When oil and gas are produced, it will be carried through a pipeline to the storage tank. This stage concerns with pipeline company, transportation, and logistics services companies (Paulauskiene, 2018). Moreover, in every activity of operations, it is highly concerned with the health, safety, and security of people, environmental and social impacts such as people's accidents and health conditions, greenhouse emissions from the operation, water, and waste problems to the community nearby. Therefore, the upstream companies have to carefully conduct the materiality assessment to ensure that all critical issues and impacts occur in each activity and covering all main dimensions (economic, environmental and social) are included.

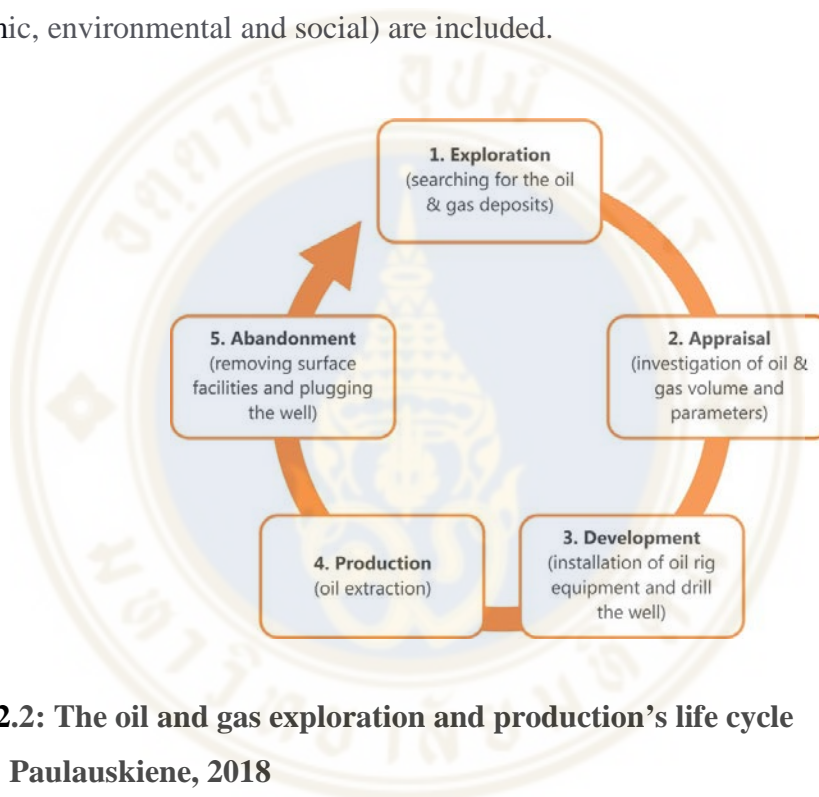


Figure 2.2: The oil and gas exploration and production's life cycle

Source: Paulauskiene, 2018

3) Measurement is not valuation, and it is a prerequisite for valuation (EY Limited, 2016). Therefore, the impact should be calculated step by step, not jump in the last step of valuating in monetary units. Measurement is the method of gathering data and quantifying them in their standard units, such as barrels of oil production, number of patents, number of people involved with the operations, and a ton of CO₂ equivalent. All these quantified impacts will be monetized and valued, including translating oil production to the amount of sales values, numbers of the

employee to cost of employment and carbon dioxide emission in tons of CO₂ equivalent to the social cost of carbon⁴.

4) The alignment of business interests and stakeholder's expectations are also considered. To make the methodology implementation more realistic, the company should apply it in line with the business plan and direction. For example, when the company plans to expand its operations to the new area, they have to evaluate the impacts specifically in the target location, covering three main aspects; supporting their decision-making for the business plan and adequately responding to environmental concerns and stakeholders' expectations. As an illustration, Tullow Kenya is the oil and gas exploration and production operator of several exploration blocks in Kenya. They did the impact assessment to evaluate the impacts of newly discovered resource locations by conducting commercialized feasibility to evaluate the economic impacts. For environmental and social impact, they did the impact measurement under the Environmental & Social Impact Assessment (ESIA) practice to see the key environmental issues that may cause the operations, including any social issues affecting the stakeholders (Tullow Oil PLC., 2020). These practices can make the company know issues that may cause risk to operations and find further proper mitigations.

5) The collaboration and communication are required. The company should get involvement with expertise from key sectors to support the methodology (Social & Human Capital Protocol, 2019) such as technical operations, change management team, environmental experts, and community development team, to provide the relevant and accurate data for impact measurement and valuation process. Not only the internal stakeholders mentioned above, the company should collaborate and get involvement from the external stakeholders such as related government agencies, suppliers, and communities, to obtain their perspectives and insight information. These will make the company receive the data more coverage in all aspects and to have an impact valuation result more reliable.

⁴ "The Social Cost of Carbon is usually estimated as the net present value of climate change impacts over the next 100 years (or longer) of one additional tonne of carbon emitted to the atmosphere today. It is the marginal global damage costs of carbon emissions." (Watkiss, n.d.)

5.2.3 Limitations and Challenges of Methodology

Although the methodology and conceptual model have been designed for the most practicable implementation, the limitations and challenges remain.

First, the methodology and conceptual model did not clearly state the measurement or quantified technique in each type of impact and how it turns to monetary values, especially the intangible impacts, including environmental and societal aspects. Each impact has an individual characteristic, and the global measurement standards are not entirely in line with each of them, exceptionally on the greenhouse gas emissions. Greenhouse gas emissions issue is the global agenda and significant impact on a wide range of industries, including the oil and gas business. For this reason, the greenhouse gas protocol has been developed by the World Resources Institute and WBCSD to provides standards and guidance for companies in preparing greenhouse gas emissions measurement and inventory. (World Resource Institute, 2004). However, the other issues still need to be standardized for measuring and converting methods to international practice, such as waste management, air emissions, land use, human capability, health and safety, and social value creation.

Even some current approaches are explicit, coefficients, and proxies of each impact types are doubtfully reminded. Although a company is measuring impacts in the same way another company does, the valuation coefficients used is different. This will lead to the incomparable results. In the illustration, investments in employee training has a wide range of multiplier, 15 to 250 percent, depended on a different approach. Absolutely, the results show the big differences, even if the companies are measuring the same indicators (Singer, 2018). Aligning with PWC's survey conducted with the business leaders responding to incorporate the Total Impact Measurement Management into their business, the result found that the significant barrier factor for methodology application is the lack of data or information to access the measurement and valuation process. The following factor is the absence of a robust measurement framework (PricewaterhouseCoopers LLP., 2014). The survey result is illustrated in figure 5.4.

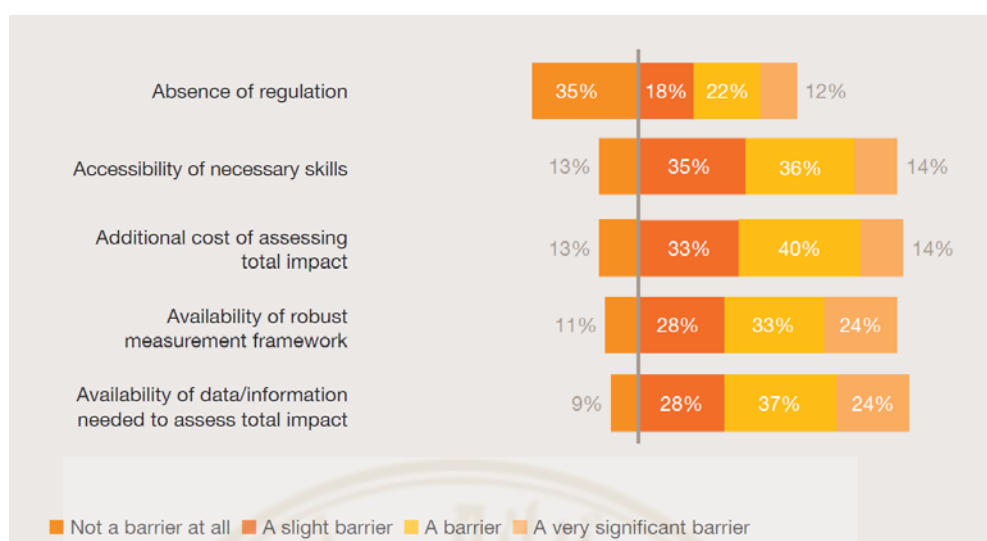


Figure 5.4: Potential barriers to adoption of TIMM

Source: PricewaterhouseCoopers LLP., 2014

To support the mitigation of the above issues, the integrated model of the Integrated Reporting framework and monetization (figure 4.6) might help the company frame what impact should be quantified. The model will also guide the company about what kind of data should be collected to align with the six capital forms and how to set the scope for the most proper measurement approaches on the same impact types in the same industry. However, the model does not recommend the exact measurement approach and proxies of each impact type. Therefore, the standard of each impact measurement approach is essential to study further.

Secondly, monetization cannot fully express the ethical aspects of externalities, including the issues concerned with human beings, such as an accident, a fatal rate, and human rights issues. Monetization is well-representing the impacts with specific monetary figures, e.g., revenue, cost, production volume, and technology cost. At the same time, some social and relationship impacts and ethical issues are inappropriate to translate into economic values such as human rights, fatal accidents, and community well-being (KMPG International Cooperative, 2013). Furthermore, the monetization of nonfinancial impacts can facilitate the “greenwashing.” The company may use the monetization to cover up its lousy performance by putting a low conversion fact to the negative impacts (EY Limited, 2016) or promoting their products or services

as green or sustainability claims through advertising campaigns without adequate support proof (RobecoSAM AG., 2019). For example, in the mid-1980s, Chevron - a well-known oil producer company in the United States, was involved with greenwashing because they launched an expensive advertising campaign to convince the public of its environmental and social responsibilities (Corcione A., 2020). In fact, many environmental and social issues occurred from its operations, such as toxic wastewater in Ecuador, air pollutions in Kazakhstan, and human rights issues in Burma (Schwietert J., 2009). The impacts of those issues were not disclosed. On the contrary, it was covered by a considerable amount of spending on environmental projects and the advertising campaigns. Consequently, Chevron was in prosecution and penalty. They were fined in a huge amount of US dollars (Mattera, 2014).

However, the standardization on impact measurement and compliance with international sustainability reporting standard and benchmarking such as Global Reporting Initiative (GRI), and Dow Jones Sustainability Indices (DJSI) have the transparency practice and verification standard in data disclosure could lead the company to be more transparent, without overclaiming the positive impacts or covering the negative. These also help to decrease the risk of greenwashing.

Lastly, there is currently no agreed standard methodology for impact valuation. The setting assumption for impact assessment should be accepted from all concerned stakeholders. Also, the data and information used for this methodology have to be as transparent as possible. While the standard methodology is still in need of further development, the integrated model of the Integrated Reporting framework and monetization (figure 4.6) could visualize the impacts that occurred from what activities according to six forms of capital. Furthermore, the stakeholder engagement and data disclosure, following the global sustainability reporting standards and benchmarking (e.g., Global Reporting Initiative (GRI), AA1000 AccountAbility Principles Standard and Dow Jones Sustainability Indices (DJSI)) could guide the company of what data or issues that need to be put in the impact valuation process to ensure that the impact has been accepted from concerned stakeholders.

5.3 Recommendations

The recommendations given in this chapter are based on the methodology analysis result and the potential to apply for oil and gas exploration and production business, the application of Sustainable Development Goals (SDGs) with impact valuation, and the sustainable development trend on net impact valuation.

For the most efficient methodology application, the researcher recommends the company applying the new integrated model of the Integrated Reporting framework and monetization, as proposed in figure 4.6. It is well-present a holistic view of impact valuation process according to the six forms of capitals that help guide the company to consider the key focus areas of impact valuation and what kind of data should be collected. Unfortunately, from the explicit case study in oil and gas upstream business in this research, the full implementation of impact measurement and monetization in all six forms of capital has not been found. The best practices in other businesses and the most likely application in oil and gas upstream business exist.

The sample of best practices can be found in EY Total Value case study. Formula E Holdings, the organizer of the electric racing competition in Europe, conducted the net impact valuation by adopting the Integrated Reporting Framework as a guideline to forecast what the impacts are concerned with its business. They then use the monetization technique to measure the potential “sustainability value” generated by supporting the electric vehicle (EV) market. Figure 5.5 shows the monetized impacts in monetary value, covering business growth, social, and environmental dimension (EY Ernst & Young LLP., 2016). The result helped the company foresee the opportunity in EV market growth while creating social and environmental values. Consequently, the business plan for the EV market has been introduced in the company strategy.

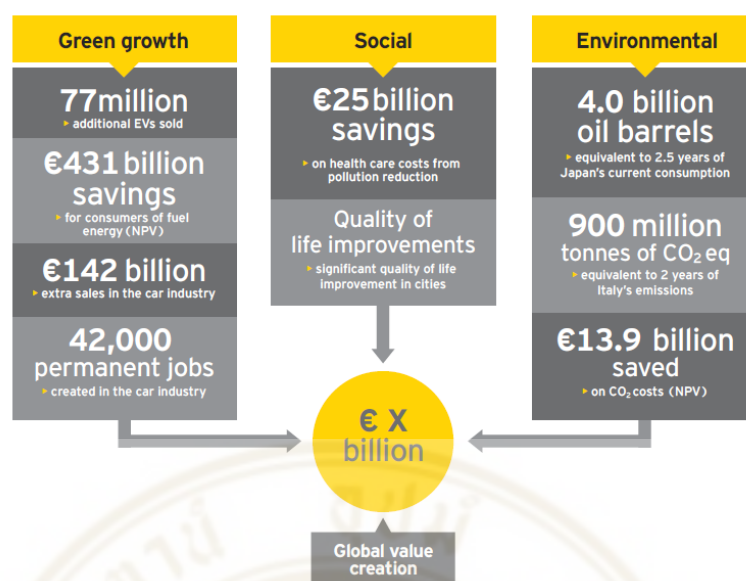


Figure 5.5: Sample case – A monetization of the company’s total value

Source: Ernst & Young LLP., 2016

For oil and gas upstream companies, the most likely case study can be found in PTTEP, Thailand's national petroleum exploration and production company. PTTEP applied the Integrated Reporting Framework to report its sustainability performance along with the six forms of capital to explain the stakeholders' value creation (PTT Exploration and Production Public Company Limited, 2020). However, only the financial and tangible impacts, such as the social value on community income, are monetized. The rest remain still. Therefore, to implement the monetization to all impact dimensions, both financial and non-financial, it would be better to help the company foresee the impacts in the same unit and benefit future company planning in managing both positive and negative impacts. A full explanation of PTTEP stakeholder value creation can be found in 2019 PTTEP sustainability report.

Another sample case study is ConocoPhillips, an American multinational oil and gas exploration and production company. They reported its sustainability performances (figure 5.6) align with the Integrated Reporting Framework: the number of employees, production volume, GHG emissions, safety performance, capital expenditures, total spend with suppliers, and dividends paid (ConocoPhillips, 2018). However, some monetary unit performances are reported, but some are not, especially the intangible impacts, including GHG emission and safety performance. Accordingly, to make all performances reported on the same ground in monetary value, the company should apply the reliable and accountable standards to monetize the impact. It would support the company to have a standard impact measurement unit.



Figure 5.6: Modified from 2017 ConocoPhillips Sustainability Performance Report

Source: ConocoPhillips, 2018

From the above case studies in oil and gas upstream business, the common challenge can be found. The monetization approach, especially on intangible assets, including people's development, community or social value, health, and safety, still needs the reliable and accountable standard to interpret the impact values at the same understanding. Therefore, to make the net impact valuation approach completer and more applicable, the standard monetization approach for doubtful impacts has to be standardized. These such doubt impacts are in monetary and proxy conversion, such as people's capability enhancement, safety performance, air pollution, and other environmental impacts.

While the future study of impact measurement and monetization approach standard is on the way, integrating the Sustainable Development Goals or SDGs in the core business and be a part of net impact valuation methodology will enable the company to focus on creating visible shared values and have a common language for sustainable development (EY Limited, 2016). SDGs can be incorporated in the net impact valuation methodology and each step as follows;

1. Objective: Determine the objective aligned with the target of SDGs
2. Identify materiality: Focus on most material SDGs by mapping the company's positive and negative material issues with SDGs. Applying the Impact Pathway approach could help the company better understand which activities most effectively contribute to the SDGs.
3. Collect data: Gather the data from various sources to perform impact measurement.
4. Measure and valuate: Set Key Performance Indicators (KPIs) of measurement and valuation to align with SDGs impact indicators identified by the UN.
5. Apply: Integrate SDGs into the core business. This step will enable the company to have effective decision-making for business and reach the standard goals on the global agenda at once

Nowadays, the sustainable development trend focusing on net impact valuation is significantly increasing. This trend is indicated by the sustainability assessment of Dow Jones Sustainability Indices or DJSI, the world indices of sustainability performance evaluation (RobecoSAM AG., 2019). In the Sustainability Yearbook 2020, impact valuation is in global focus across sectors, especially the resource-intensive sectors, for instance, energy, materials, and customer discretionary sectors. The percentage of companies who are paying attention to implementing impact valuations are shown in figure 5.7.

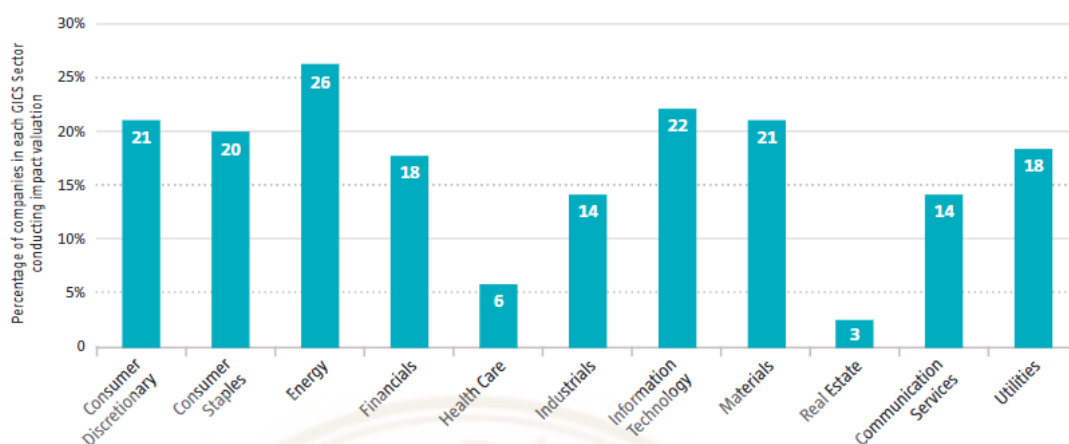


Figure 5.7: An overview of impact valuation across sectors

Source: S&P Global Switzerland SA, 2020

In figure 5.7, top of the companies is in the energy sector that performs leadership roles to lead the way of implementing impact valuations. Therefore, oil and gas exploration and production industry – one of the leading business in the energy sector, must take the impact valuation into account seriously and closely monitor and study the trend and methodology in response to the global trend. Moreover, the efficient methodology implementation will enable the company to reach the ultimate goal for sustainability.

5.4 Limitation and Suggestions for Future Research

With the limitations of net impact valuation methodology and a new conceptual model mentioned above, the suggestions for further research would emphasize examining the measurement approaches and monetary conversion methods in each specific impact, e.g., water use, labor skills, and community well-being. Moreover, the study should be extended to cover each key's valuation coefficients to develop the approach more concrete. The firm quantification and conversion techniques will help the net impact valuation methodology be more mature, consistent, and comparable. These points are also mentioned in other net impact valuation studies. For example, The White Paper – Operationalizing Impact Valuation recommended that the

next step of methodology should be developed on measurement and valuation techniques covered in methods, scope, and valuation coefficients (Participants of the Impact Valuation Roundtable, 2017). Another study has the same objective: to examine the standard and specific ways to use the methodology in the next phase of the study (Singer, 2018).

Besides, the selected methodologies for this research are from three key international consulting firms, who extended their study and consulting services on sustainable development, namely; EY, KPMG, and PWC. However, several other net impact valuation approaches were developed by other organizations such as Redefining Value by WBCSD, and True Price by True Price – a social enterprise. Therefore, it would be better to extend future research on the other relevant methodologies of net impact valuation to expand the comparative pros and cons, and applicability of each methodology. It will be useful for the company to consider the most proper methodology for their business.

Although the limitations and challenges of net impact valuation are needed for a further examination and standard setting, this methodology's current practice helps businesses foresee the impacts of the economic, environmental, and social dimensions, both positive and negative ways. It helps the businesses to have a clear understanding of their material issues and lead to better decision-making, strategy design and implementation, and improvement of an execution plan. Therefore, the net impact valuation is a tool that allows businesses to improve their overall value creation in business growth and carry out a more significant environmental and societal purpose, responding to the sustainable development context.

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Appendix A

**Certificated of Exemption, the Institutional Review Board, Institute
for Population and Social Research, Mahidol University**



Institutional Review Board, Institute for Population and Social Research, Mahidol University (IPSR-IRB)

Established 1985

COE. No. 2019/12-489

Certificate of Exemption

This is to certify that the Institutional Review Board, Institute for Population and Social Research, Mahidol University, has granted an Exemption to the research project entitled "*Net Impact Valuation for Oil and Gas Exploration and Production Industry*" submitted by Ms. Montarat Panyadee from the College of Management. The duration of this project is from October 2019 to May 2020.

This COE is given on 26 December 2019.

Signature

(Professor Emeritus Pramote Prasartkul)

Chairman, IPSR-IRB



IORG Number: IORG0002101; FWA Number: FWA00002882; IRB Number: IRB0001007

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