

PTTEP Net Impact Valuation Summary



Introduction

Background



PTT Exploration and Production Public Company Limited ('PTTEP') seeks to gain a more comprehensive and concrete understanding of the value of their impacts on society. As such, PTTEP have commissioned third party expert to develop and apply a Net Impact Evaluation strategy (hereto referred to as "the Project" or "the NIE") to measure the material environmental and social impacts of PTTEP's operational projects and mitigation measures in monetary term (where applicable) and develop an action plan to achieve NPI for a PTTEP operational project. The Project will measure and value the all-in net present value of projects, which accounts for the benefits and costs of mitigation measures for PTTEP's operational assets from both a corporate and social perspective.

Methodology

Overall Framework

The NIE Methodology provides a framework for a variety of CSR and environmental projects using a broadly comparable method to measure and value the environmental, social, and health impacts. The Methodology customizes key features of the Natural Capital Protocol (NCP), which is an internationally recognized framework for helping companies integrate environmental and social impacts in their internal decision-making processes, including for capital expenditures. These Protocols are applicable for this Methodology because they provide the following advantages:

- International acceptance;
- Guidance and best practices that can be tailored to the needs of a wide-variety of projects;
- Portions of the Protocols can be integrated into current processes;
- Clearly distinguishes between the value to the company and the value to the environment/society;
- Provides results that can be linked to sustainability goals and sustainable development goals (SDGs);
- Proven track record in providing business-relevant results.

Methodology

Overall Framework

The Natural Capital Protocol is a publication of the Natural Capital Coalition, which is a unique global multi-stakeholder collaboration of over 200 organizations that is committed to mainstreaming the natural capital analysis. Natural capital is the stock of natural resources that combine to provide benefits to people, including clean air, food, water, energy, climate resilience and outdoor recreation. Because every business impacts and depends on natural capital to some degree there are risks and/or opportunities associated with these relationships. Explicitly measuring and valuing these relationships can lead to better decisions for companies and the environment.

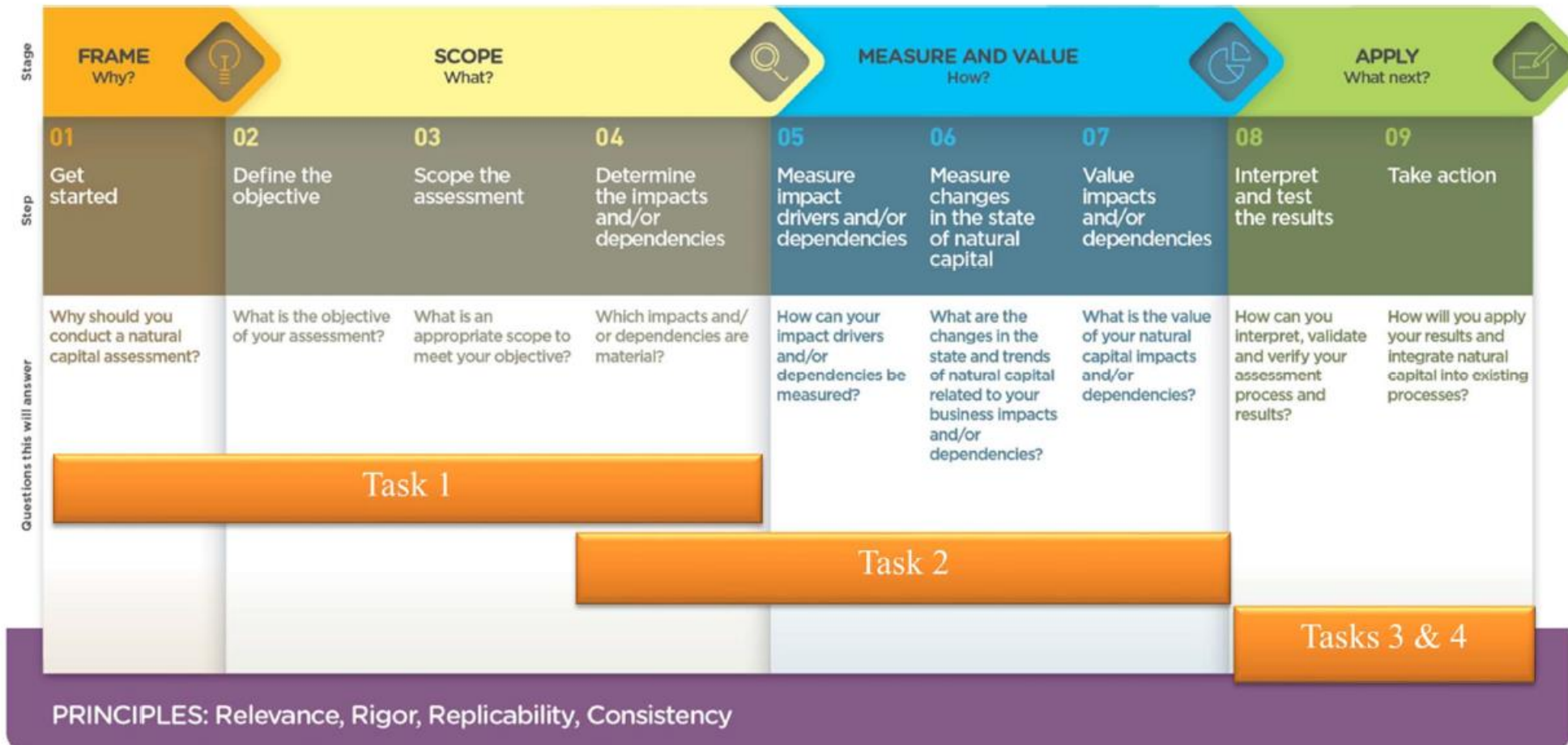
Shown in Figure 2.1 is a diagram of how the Project tasks aligned to the stages of the Natural Capital Protocol. As shown in the diagram, Task 1 of the Project comprises the scoping stage, in which the objective and scope of the assessment are defined, including the:

- value perspective,
- scenarios, and
- preliminary material environmental and social impacts.

Methodology

Overall Framework

Figure 2.1: Project Tasks Aligned with the Natural Capital Protocol Steps



Methodology

Value Perspective

Measuring and valuing environmental impacts requires determining which value perspectives to include. Value perspectives refer to whose values are considered in the analysis. Applications of the Protocols can include the corporate value perspective and/or the social value perspective, which are explained below:

- **The corporate value perspective measures** the costs and benefits that directly affect the company and arise from the implementation of the projects. Examples of costs include capital expenditures, operations and maintenance and business interruptions, as well as expenditures on social investment projects/CSR projects, and examples of benefits include the cost savings, increased revenue, and reduced risk.
- **The social value perspective measures** the costs and benefits for non-corporate stakeholders, including local communities (e.g., income and health impacts), and global communities (e.g., greenhouse gas emissions).

In order to measure and value the “All-in NPV” of PTTEP’s projects, the NIE includes both value perspectives.

Methodology

Scenario Approach

The NIE will use a “With Project” and “Without Project” scenario approach. In other words, the analysis compares the benefits and costs if the project is implemented versus not implemented. Each scenario measures the benefits and costs from both the corporate and social value perspectives. The primary metric in the NIE is the All-in Net Present Value (All-in NPV). The All-in NPV is more comprehensive than the traditional benefit cost approach and provides decision makers with more in-depth information about the business value of a project and its impact on natural capital. The All-in NPV considers the impact on the company and communities and evaluates the impact of implementing the project versus not.

$$\text{All-in NPV} = \text{With Project NPV} - \text{Without Project NPV}$$

For the Without Project NVP, impacts from 2012¹ to end of asset life and impacts to the environmental social aspects that resulted from not having projects in place (e.g., health impact from increased GHG emission due to not having GHG mitigation projects implemented) are included. The With Project NPV considers impacts throughout the study period (2012-end of life) and impacts to the environmental and social aspects which resulted from the implementation of projects (e.g., health improvement from a reduction GHG emission due to having GHG mitigation projects implemented). Projects to be included in the With Project NPV are those implemented in 2019 and the projects in action plans.

¹ The year 2012 was selected as the baseline year because most of the relevant data e.g., Environmental Performance records, became available from 2012 onwards.

Methodology

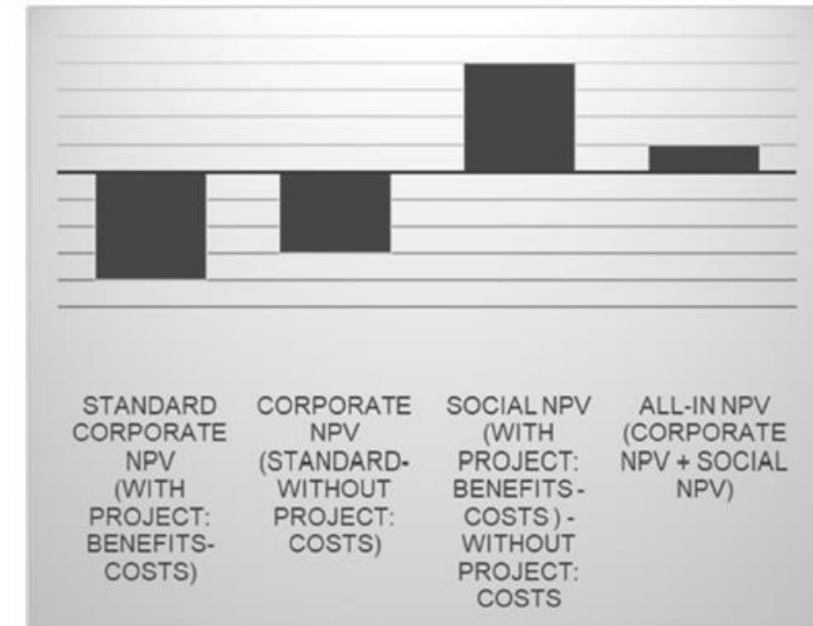
Overview of Net Present Value Calculations

The NIE is more inclusive than the traditional benefit cost approach and provides decision makers with more in-depth information about the business value of a project and its impact on natural and social capital.

Figure 2.4 compares different measures of net present value, each bar can be explained as follows:

- The first bar shows the **Standard Corporate Present Value** that is typically used for traditional benefit cost analysis. This approach only includes the direct corporate benefits and costs that occur with the project. It does not consider the Without Project corporate costs that will be avoided or the social benefits and costs;
- The second bar is the **Net Corporate Present Value**. This perspective takes the standard net present value from the traditional approach and includes the corporate costs from the Without Project scenario. This approach accounts for any regulatory fines, reputational costs, internal fees, or business interruptions that would occur without the project and provides a more complete view of the potential risks and opportunities of a CapEx project. Including the Without Project corporate costs will increase the present value of the project from a corporate perspective.
- The third bar shows the **Net Social Value** of the project, which includes both the With Project and Without Project benefits and costs and will often show the positive value of implementing compliance projects from a public perspective. For instance, social cost includes health impacts as a results of not having mitigation projects in place (Without Project scenario). Social benefits include benefits that the communities or society gains from CSR projects (e.g., generate or increase community income) and health benefits from implementation of environmental projects such as GHG reduction projects; and waste reduction projects (With Project scenario); and
- The last bar shows **All-In Net Present Value** which combines the corporate and social net present values and provides an overall assessment of the project.

Figure 2.2: Comparison of Net Present Values



Environmental and Social Aspects

List of preliminary material environmental and social aspects (Table 2.1) to potentially scope into the NIE.

Table 2.1: Potential Material Environmental and Social Aspects

Environmental Aspects	Social Aspects
GHG emissions	Number of jobs created – the study considers the total wages, salaries and benefits paid
Air pollutants (NO _x , SO _x , and VOCs)	Contribution to GDP
Water withdrawal	Tax revenue
Spills	Social investment
Biodiversity (habitat loss and gain)	Community health benefit (from reduced VOC, NO _x , SO _x , CO, PM _{2.5})
Waste disposal	

Impact Valuation: Environmental Aspect

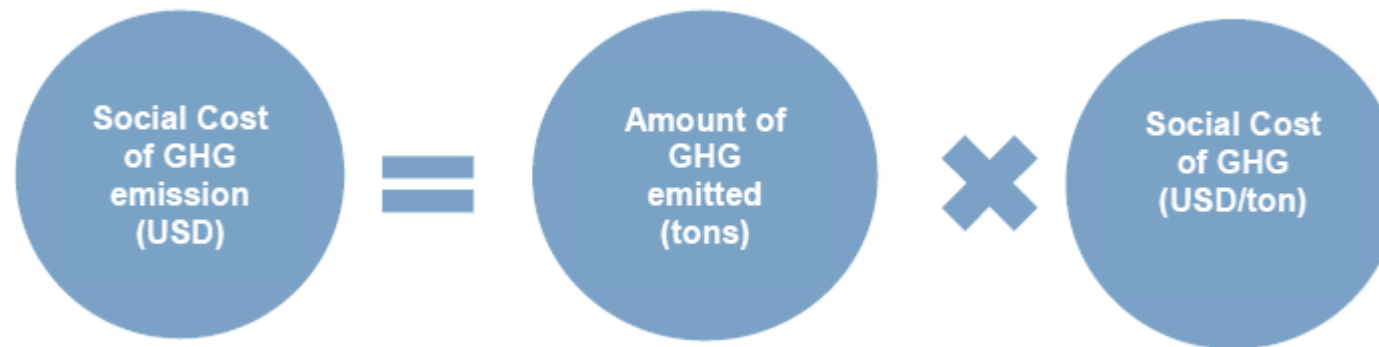
Material Topic	Input Metric and Description Of Business Activity	Output	External Impact
<p>Energy Transition towards Net Zero</p>	<p>Part of Net Impact Evaluation for Environmental & Social Sustainability, we forecast social cost of carbon total impact from 2012-2046 based on actual scope 1 GHG emission, baseline year 2012. Economic input: Investments to reduce company's environmental footprint as GHG reduction project Natural input: Fossil fuel consumption Natural input: Energy consumption</p>	<p>GHG emissions from 2012 - 2046 as negative impacts on global climate. Total Emission = emission from the production (Scope 1) and energy consumption (Scope 2) - avoided emission from GHG reduction project.</p>	<p>We used EPA's social cost of carbon to quantify the social impacts from our GHG emissions in monetary terms. The monetary terms here are negative. Our impact range is from 2012 to 2046 with 9 years of actual emissions from 2012 to 2020 and forecasted emissions from 2021 to 2046. The forecast emissions are based on our Business-as-usual performance. The monetary value is in EPA Social cost of carbon (42\$/metric ton CO2 for 3% average discount rate in 2020).</p>

Environmental Impacts

GHG Emissions

- The Social Cost of Carbon (SCC) is an estimate of the present value of damages caused by a one-ton change in CO₂ equivalent emissions. The damages from an emission can persist for many years, which necessitates the use of present values. Different countries use different approaches, but the goal is to estimate damages from lost output, healthcare costs, property damages from sea-level rise and increased flood risk, and the value of ecosystem services lost due to climate change. The choice of discount rate can have a significant impact on the present value of estimated damages. For example, the U.S. SCC ranges from \$13 (5% discount rate) to \$69 (2.5% discount rate) in 2020.
- For this Study, the value estimated by the United States Environmental Protection Agency (EPA) is used, for discount rate of 3% average in 2020, the social cost of carbon is estimated at 42 \$/ton. The calculation of social cost of GHG emission is shown below

Estimating the Social Cost of GHG Emission Impacts



Environmental Impacts

Air Pollution Emissions

- The societal cost of air emission impacts is derived from an assessment of the cost of damage to health in monetary terms from each ton of pollutant emitted.
- The TruCost Natural Capital at Risk study considers the impacts for SO_x, NO_x and VOC: negative health effects; reduced crop yields; material corrosion; effects on timber; and acidification of waterways. The numbers are based on global assumptions, using global averages for emission factors, without taking into account the varied dispersion of air pollutants, differences in ambient air pollution levels or local specific factors. The social cost used in the study is 1,352 \$/ton for NO_x; 1,455 \$/ton for SO_x and 845 \$/ton for VOCs (Trucost Plc, 2013). The calculation of social cost of air pollutant emission is shown below

Estimating the Social Cost of Air Pollutant Emission Impacts



Environmental Impacts

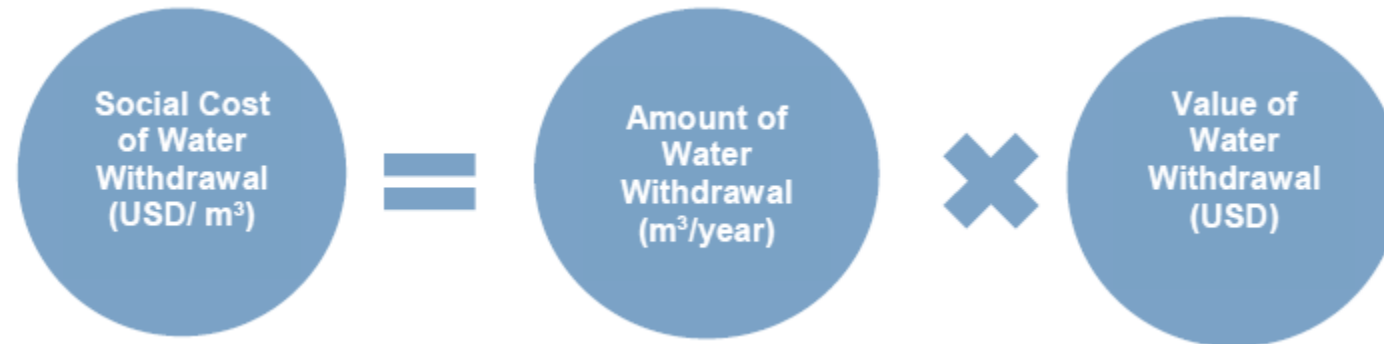
Water Withdrawal

- The societal cost of water withdrawal is expressed by a shadow water price, which is based on the environmental economics concept of total economic value (TEV). The shadow water price used to determine the societal cost of PTTEP's water consumption was derived from the NCD-VfU-GIZ Water Scarcity Valuation Tool. This total calculates country-specific shadow water price by summing the four dependent variables below:

$$TEV \text{ (Shadow price of water)} = \text{Agricultural value} + \text{Domestic supply value} + \text{Human health impacts} + \text{Environmental impacts}$$

- Each variable is valued in terms of US\$/m³. All four variables are a function of baseline water stress, as determined by the World Resource Institute's Aqueduct Water Risk Atlas. Three of the variables (domestic water supply, human health impacts, and environmental impacts) are a function of population. This study uses a value of 4 \$/m³ for Thailand based on the NCD-VfU-GIZ Water Scarcity Valuation Tool. Calculation of the societal cost calculation of water withdrawal is shown below.

Estimating the Societal Cost of Water Withdrawal

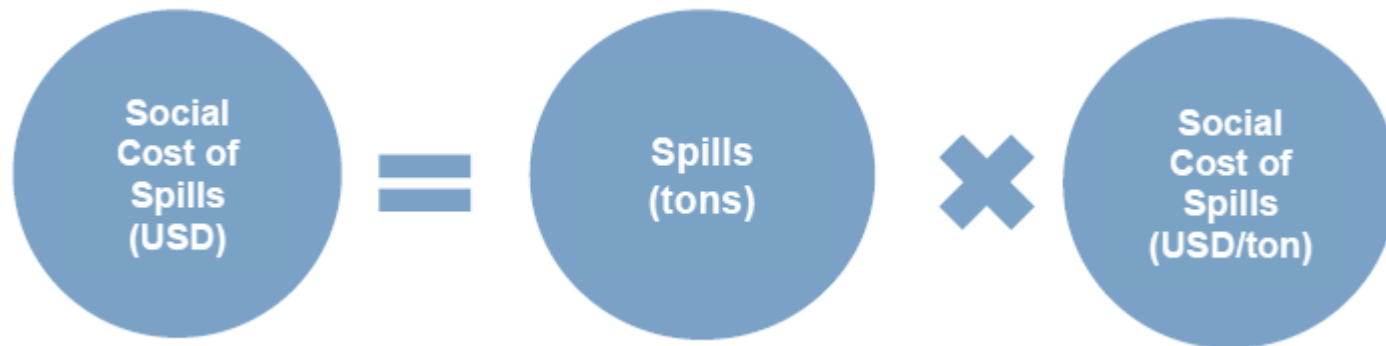


Environmental Impacts

Spill

- The cost of oil spills (and other hydrocarbons) in monetary terms may serve different purposes, include to establish level of compensation, and serve as a key figure in development of preventive measure limiting the risks of pollution. Therefore the damage valuation thus appear as the key foundation for estimation for, both in debates on the proper compensation of victims in any particular accident, and in discussions related to the definition of appropriate pollution prevention policies. Calculation of estimation of the societal cost of spills is shown below.

Estimating the Societal Cost of Spills



Environmental Impacts

Waste

- The cost of waste to the Corporate comes from the waste disposal fee and fine from e.g., hazardous waste violations. However, positive cost may incur to the Corporate in case of waste generation saving and therefore cost saving for the waste disposal. Calculation below provides an overview of estimation of cost due to waste disposal that incurred to the Corporate, the value of 19.65 USD/ton and 27.23 USD/ton are used for hazardous and non-hazardous waste, respectively.

Estimating the Cost of Waste Disposal



Environmental Impacts

Ecosystem Service

- Ecosystem services are the benefits that people obtain from ecosystems in terms of goods, services, and cultural services. Ecosystem service values are calculated based on habitat types (e.g. forest, grassland, mangrove, coral reefs, open ocean, etc.) and benefits that people obtain from that habitat type. For instance, the oceans and seas provide habitat for fish stocks, coastal ecosystems reduce damage from storm surges, ocean regulate the climate and store excess GHG emissions, and marine environments provide many recreational opportunities for people.
- The ecosystem service values are estimated based on the gains and losses from the asset's operation. For example, an asset acquired Open Ocean for the asset establishment (loss) and the jacket of the wellhead platforms acts as artificial reef (gains). Note that this study only includes direct impact to ecosystem service (habitat loss and gains), it does not take into account the increased biodiversity in terms of numbers and diversity of species. An overview of estimation of value of ecosystem services and the Ecosystem Service Values which have been considered is shown below.

Estimating Value of Ecosystem Service Loss/Gain



Overview of Ecosystem Service Values

Ecosystem Service	Description	Value in 2019 (USD/ha/year)
Forest	Based on direct values for the Mekong Basin – including average community income from non-timber products (e.g., edible plants, firewood, fodder, etc.), and indirect values such as carbon sequestration, and watershed protection.	1,458.03 ¹
Coral reef	Estimated from direct values for the Mekong Basin – including recreational activities such as diving, snorkeling, and boating, and indirect values are estimated from their support to coastal protection and offshore fisheries.	389.26 ¹
Open ocean	Global estimated value which includes provisioning services, raw materials, climate regulation, genetic diversity, and recreational services.	192.48 ²
Artificial reef	Estimated based on the assumption that standing offshore structures produce 22% of the ecosystem services provided by coral reef ⁶ .	85.64 ³

Impact Valuation: Social Aspect

Material Topic	Input Metric and Description Of Business Activity	Output	External Impact
<p>Contribution to Communities and Society</p>	<p>Part of Net Impact Evaluation for Environmental & Social Sustainability, we forecast Social Return on Investment (SROI) from CSR investment from 2012 - 2046. Note that for this study only direct impacts are taken into account, this means that the community benefitting from the Projects must be the affected community by asset's operation. For this study, the SROI value which has been studied earlier has been used for estimating the Social benefits based on the investment cost for corporate social responsibility (CSR) which focuses on basic needs, education, environment and culture & sport projects. Economic input: Investments in corporate social responsibility</p>	<p>Investment in CSR projects created positive impacts on the communities from 2012 - 2046. Total investment = sum of CSR projects from 2012 – 2046</p>	<p>We measure benefit from CSR investment by conducting SROI, by collect the social benefit data (e.g. community's income) due to our CSR projects and comparing the ration between the social benefit per investment. Overall, our CSR projects create positive SROI (range between 1 – 8.13), which mean USD 1 that we invest is able to create the benefit for USD 1 – 8.13. To calculate the social benefit is the CSR investment multiply by SROI.</p>

Social Impacts

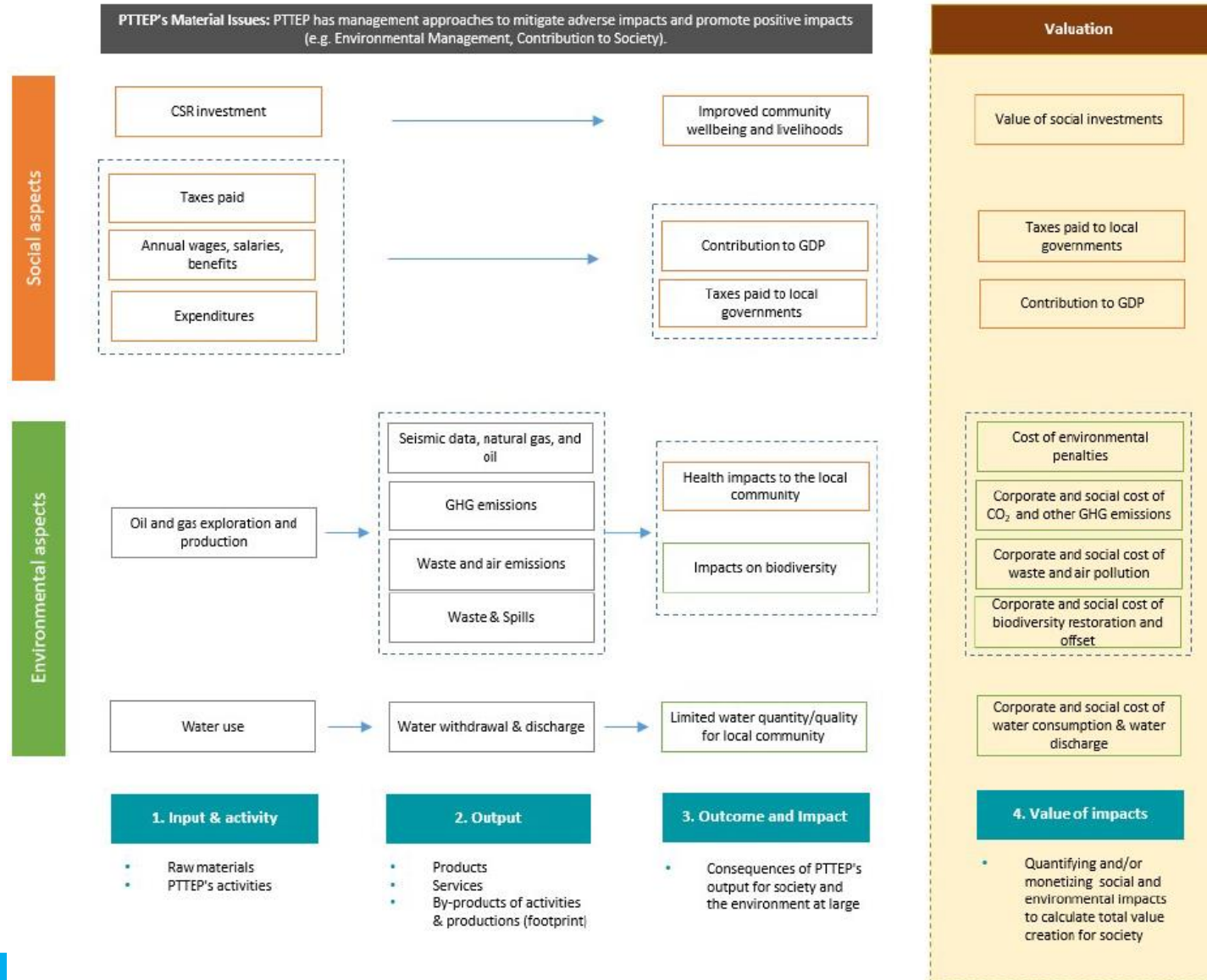
CSR Investment and Benefits

- The societal benefits of PTTEP's CSR projects are estimated from CSR investments and SROI studies which were previously conducted for PTTEP. The CSR projects are categorized into four main categories: Basic Need, Environment, Community Income, and Cultural. Where possible the direct values of SROI for the CSR projects are applied. However, in cases in which the SROI values are not available, the average SROI value for that CSR project category are applied. Calculation of societal benefits from CRS projects is shown below.

Estimating the value of societal benefits from CSR projects



Impact Valuation Pathway



NIE Results

Overall Net Present Values with Projects (2012-2046)

- Between 2012 and 2046, the overall Corporate NPV, Social NPV and Corporate-Social NPV are shown in figure 2.3

Figure 2.3: Net Present Value 2012-2046

