

Management Tool for Sustainable Decision-Making at the Board Level – Oil & Gas Transport Chain

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Abstract: The relationship between business management and environmental, social, and economic challenges is historically significant, highlighting the need for robust decision-making tools for sustainability, especially for boards of directors when evaluating projects. In the transportation infrastructure of the oil sector, disasters like the Exxon Valdez spill, the Kuwait oil fires, the Gulf of Mexico spill, and the recent oil spill near Lima demonstrate the consequences of poorly informed decisions. This study aims to develop a managerial tool that provides stronger support for boards of directors in the oil sector to make decisions about the sustainability impacts of their projects, aligning them with the Sustainable Development Goals. Following a thorough literature review, the proposed tool was structured. This managerial tool is based on a four-stage process: analysis of the impacts on the value chain of storage, transportation, and reception of oil and gas; measurement of the project's effects on sustainability; definition of success indicators; and development of a specific sustainability management plan. The research provides practical, scalable, and adaptable solutions to the changing needs of companies, delving into the relationship between organizations and environmental, social, and economic challenges, and emphasizing the importance of structured and scalable processes to address these challenges.

Keywords: project management; management tool; decision making; sustainability; Oil & Gas sector.

Herramienta de gestión para la toma de decisiones de sostenibilidad a nivel directivo – cadena de transporte de petróleo y gas

Resumen: La relación entre la gestión empresarial y los desafíos ambientales, sociales y económicos es históricamente significativa, destacando la necesidad de herramientas sólidas para la toma de decisiones en sostenibilidad, especialmente en las juntas directivas al evaluar proyectos. En la infraestructura de transporte del sector petrolero, desastres como el vertido del Exxon Valdez, los incendios de los pozos de Kuwait, el derrame en el golfo de México y el reciente derrame de petróleo cerca de Lima evidencian las consecuencias de decisiones mal informadas. Este estudio tiene como objetivo desarrollar una herramienta gerencial que proporcione a las juntas directivas del sector petrolero un soporte más sólido para tomar decisiones sobre los impactos de sus proyectos en la sostenibilidad, alineándolos con los Objetivos de Desarrollo Sostenible. Tras una exhaustiva revisión de literatura se estructuró la herramienta propuesta en el estudio. Esta herramienta gerencial se basa en un proceso de cuatro etapas: análisis de los impactos de la cadena de valor de almacenamiento, transporte y recepción de petróleo y gas, medición de los efectos del proyecto en la sostenibilidad, definición de indicadores de éxito y elaboración de un plan de gestión de la sostenibilidad específico. La investigación proporciona soluciones prácticas, escalables y adaptables a las necesidades cambiantes de las empresas, profundizando en la relación entre las organizaciones y los desafíos ambientales, sociales y económicos, y subrayando la importancia de procesos estructurados y escalables para enfrentar estos retos.

Palabras clave: gestión de proyectos; herramienta gerencial; toma de decisiones; sostenibilidad; sector de petróleo y gas.



Introduction

A socially responsible enterprise aims not only for profitability but also acknowledges its impact on environmental and social ecosystems. It undertakes actions that demonstrate responsibility towards the environment, thereby supporting environmental sustainability [1,2]. The importance of having robust tools for managerial decision-making on sustainability lies in the significant impact that corporations have historically had on the challenges facing humanity, such as biodiversity loss, deforestation, human-induced global warming, soil erosion, water and air pollution, water scarcity, natural resource depletion, population growth, difficulties in accessing quality health and education services, large social, economic, and gender inequalities, such as hunger and extreme poverty, as well as geopolitical conflicts and modern slavery [3,4,5,6,7,8]. Therefore, it is crucial for boards of directors to have effective instruments for making decisions that create value while minimizing negative impacts during project execution and throughout the product's lifecycle on environmental and social ecosystems. Examples such as the Exxon Valdez spill [9], the Kuwait oil fires [10], the Gulf of Mexico spill [11], the controversy sparked by Shell Oil's decision to sink the Brent Spar platform in 1995, or more recently, the spill of at least 6000 barrels of oil near the shores of Lima [12], highlight the importance of informed managerial decisions regarding potential sustainability impacts during project development and lifecycle. Additionally, in the current context, publicly traded companies are required to disclose ethical, social, and environmental risks in their annual reports, underscoring the need for adequate tools to manage these aspects [13].

Evolution of the managerial decision-making process associated with sustainable development

Peter F. Drucker emphasizes the necessity of a systematic, analytical approach to decision-making, beginning with a clear definition of the problem at hand [14]. Herbert A. Simon elaborates on how decision support systems and information technology can mitigate the limitations of human cognitive capacity by providing relevant data and analytical tools, thus enhancing decision-making [15]. Daniel Kahneman and Amos Tversky extensively researched cognitive biases and decision-making, focusing on counteracting biases and improving decision-making. Their work supports the implementation of structured processes such as checklists and decision trees [16,17]. The work of these scholars underscores the need for a managerial tool to assist Oil & Gas boards in making more informed sustainability decisions.

Managerial decision-making in sustainability development is undergoing an evolution process that ranges from what is defined as the primary responsibility of the financial manager, which is nothing but maximizing business profitability at all costs for shareholders [18,19,20], to nowadays where managerial decisions not only consider profitability for shareholders, but have also been complemented with the so-called Triple Bottom Line (3BL) - economic, environmental, and social facets - redirecting their strategies towards sustainable innovation processes [21,22,23,24].

There is currently a recognized mutual dependence between corporations and society, which means that managerial decision-making for the benefit of a company also seeks social benefits, under the principle of shared value [25,26]. Decision-making in the corporate realm often involves finding a balance between different values, interests, and conflicting costs [19]. Therefore, it is crucial for companies to operate with a long-term vision that ensures sustainable economic performance, avoiding short-term practices that may have negative impacts on society or the environment. Thus, to promote CSR, it is necessary to understand the interaction between the company and society at large, integrating this understanding into strategic decision-making and specific activities of each company [3,25]. Therefore, each company must identify the social issues in which it can make a significant difference while seeking a competitive advantage. The key to driving CSR lies not so much in the merit of a cause, but in its ability to generate shared value, meaning benefits for both society and the business [25].

Tool for managerial decision-making on sustainability

This study aims to create a managerial tool designed to offer boards of directors in the Oil & Gas sector enhanced, well-informed support for making decisions regarding the sustainability impacts of their projects. The proposed tool combines and adapts key concepts such as Michael Porter's value chain [27], shared value theory [25,26], impact diagnosis tool for project execution and lifecycle on sustainability, or The GPM P5 Standard - People, Planet, Prosperity, Product and Process - the structure of the Sustainability Management Plan (SMP) proposed by Green Project Management GLOBAL [3], and the Sustainable Development Goals (SDGs) [7]. The features of the tool for managerial decision-making on sustainability include ease of use, scalability to new threats identified in the project, and support for data-driven decision-making, making it particularly relevant. In summary, the tool identifies the sustainability impacts that an Oil & Gas storage, transportation, and reception project can have on its value chain during its execution and the lifecycle of its products. It then classifies the identified impacts using the shared value concept, followed by an analysis and evaluation of these impacts using indicators and The GPM P5 Standard, concluding with the structuring of the sustainability management plan. This is to enable top management to make more informed decisions regarding project sustainability and value generation for the company.

The following sections of this document will present the methodology, results, conclusions, and references.

Methodology

The purpose of this study focuses on developing a managerial tool that provides boards of directors in the Oil & Gas sector with stronger, more informed support for making decisions about the impacts of their projects on sustainability. To achieve this, as shown in Figure 1, a literature review was conducted on strategic decision-making aligned with sustainability and management best practices, as well as the impact of the Oil & Gas storage, transportation, and reception chain on the SDGs. Based on the results of the literature review, a managerial decision-making tool for sustainability at the executive level was structured for the Oil & Gas transportation chain. This tool considers the mutual dependence between corporations and society, integrating concepts of corporate social responsibility (CSR) [25], shared value [26], and a value chain [27] aligned with the United Nations SDGs [7], thereby balancing corporate values, stakeholder interests, and conflicting costs in decision-making. Additionally, this tool incorporates The GPM P5 Standard — People, Planet, Prosperity, Product and Process — [28] for diagnosing the project's impact on sustainability, which serves as an input for the economic, environmental, and social SMP proposed by Green Project Management GLOBAL [3] of the project under analysis.

The stages of this research include the identification and evaluation of the need, the review of background information, the preliminary search for solutions, the identification of knowledge areas related to the identified problem, the literature review, the analysis of the literature review results, and the structuring of the proposed tool in this research. This research is distinguished by its theoretical focus, based on the logical and coherent combination of theories and concepts identified through a detailed and critical review of the relevant literature. During this review, gaps and limitations in existing research are identified, allowing for the development of a robust conceptual framework as the foundation for structuring a new methodology. This methodology addresses the needs of the Oil & Gas transportation industry by providing practical analysis and management for sustainability decision-making at the executive level. The research is characterized by the integration of knowledge and approaches from different disciplines, such as sustainable development and business strategy. The primary outcome is a detailed methodological proposal that offers a more comprehensive and effective solution to the identified industry need.

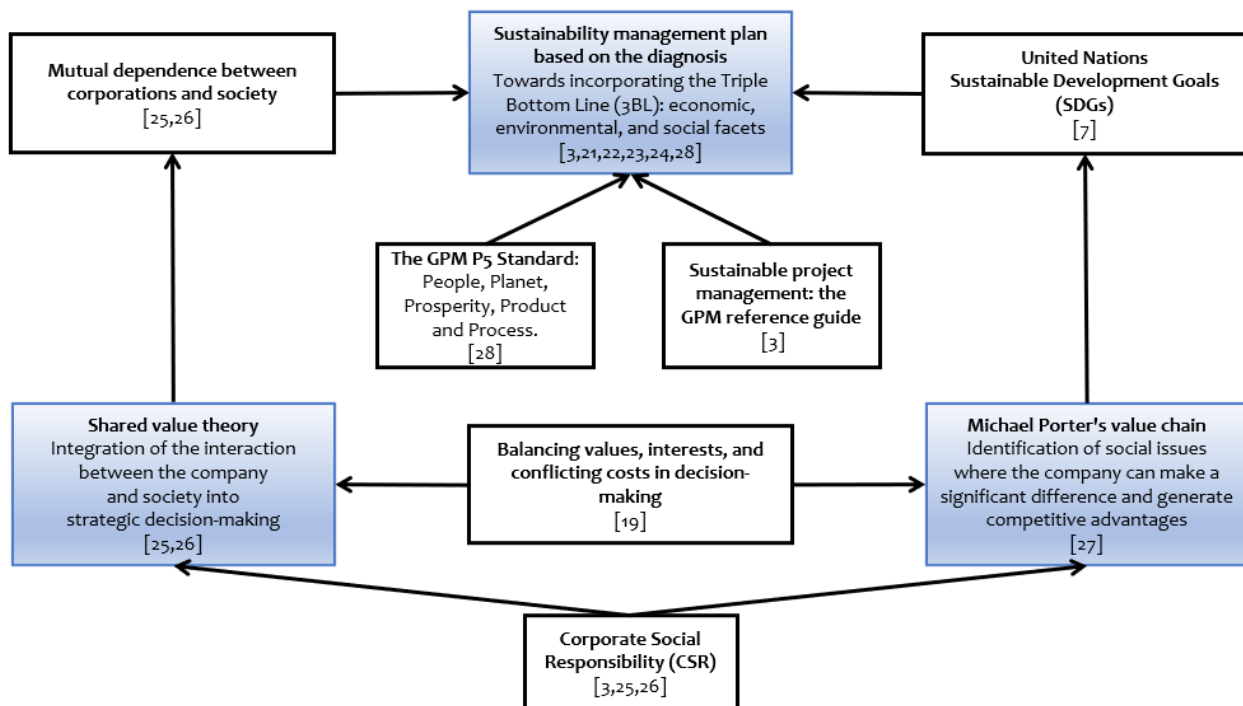
Results

Literature review

Corporate social responsibility (CSR) [3,25,26]

Porter and Kramer argue that CSR should be integrated into a company's core strategy, identifying intersections between business activities and social needs to create mutual value. They introduce "shared value," which expands connections between economic and social progress beyond philanthropy. Companies can generate shared value by redesigning products and markets, redefining productivity in the value chain, and building supportive local clusters. CSR should be seen as a source of innovation and efficiency, such as reducing costs and opening new markets through improved environmental practices. Integrating CSR into business strategy enhances competitiveness by addressing social issues in ways that benefit both society and the business, like improving working conditions, reducing environmental impact, or engaging in community development. Figure 1 represents the literature review map of this research.

Figure 1. Management decisions aligned with sustainable development - Literature review map



Source: Own authorship

Companies must evaluate and prioritize their CSR initiatives based on their potential impact on society and business, focusing on areas where they can make a significant difference. Collaboration with governments, NGOs, and other organizations can enhance the effectiveness of CSR efforts by providing additional resources and perspectives. Porter and Kramer emphasize the importance of measuring CSR performance through clear metrics and tracking systems to assess progress, demonstrate impact, and adjust strategies. In summary, Porter and Kramer advocate for a strategic vision of CSR, where companies create value for both society and themselves by addressing social issues through their business models. The strategy proposed by Porter and

Kramer for achieving CSR is consistent with the comprehensive needs of the system formed by organizations and other stakeholders, as well as with the SDGs essential for planetary sustainability.

Michael Porter's value chain [27]

Porter introduces the value chain as a tool to break down a company into its strategically relevant activities to understand costs and sources of differentiation. The value chain encompasses all activities a company undertakes to create value for its customers and is divided into primary and support activities. Primary activities include inbound logistics, operations, outbound logistics, marketing and sales, and services, all directly involved in creating and delivering a product or service. Support activities include firm infrastructure, human resource management, technology development, and procurement, which sustain and facilitate the primary activities.

The value chain analysis helps companies identify activities responsible for significant costs and find ways to reduce them, improving efficiency. It also aids in identifying sources of differentiation by examining how each activity contributes to the value proposition and customer perception. Activities within the value chain are interconnected; improving efficiency in one activity can positively impact others, reducing costs and enhancing quality. Understanding the value chain is crucial for creating competitive advantage, allowing companies to develop strategies that enhance their market position by analyzing each activity's contribution to total costs and differentiation.

Porter introduces the extended value chain concept, which includes the activities of suppliers and distributors. By optimizing both internal activities and those of business partners, companies can achieve sustainable competitive advantage. Implementing value chain strategies requires a deep understanding of each activity's contribution to overall performance, involving process reengineering, technology investment, and employee training to enhance efficiency and effectiveness. In summary, Porter's value chain provides a comprehensive framework for analyzing and optimizing a company's internal and external activities, identifying opportunities to reduce costs, improve differentiation, and ultimately gain competitive advantage.

Sustainable Development Goals (SDGs) [7]

The SDGs are a set of 17 interconnected targets established by the United Nations to address global challenges and promote a sustainable future for all. These goals encompass areas such as poverty eradication, gender equality, climate action, health and well-being, quality education, decent work and economic growth, among others. They aim to ensure the protection of the planet and equitable and collaborative social, economic, and environmental progress worldwide. "Transforming our world: the 2030 Agenda for Sustainable Development" highlights the global commitment to addressing urgent challenges and advancing towards a sustainable future. The SDGs represent a comprehensive action plan aimed at eradicating poverty, protecting the planet, and ensuring prosperity for all, while promoting peace and collaboration among nations.

Sustainability Impact of the Oil & Gas Sector

As observed in Figure 2, the analysis of the Oil & Gas sector's storage, transportation, and reception chain, Figure 3, regarding sustainability highlights its impact on SDG 7 - Affordable and Clean Energy, SDG 9 - Industry, Innovation, and Infrastructure, SDG 11 - Sustainable Cities and Communities, SDG 13 - Climate Action, SDG 14 - Life Below Water, SDG 15 - Life on Land, and SDG 17 - Partnerships for the Goals [29,30,31].

Regarding SDG 7 - Affordable and Clean Energy, the Oil & Gas sector's storage, transportation, and reception chain can influence the availability and accessibility of affordable energy, either through the provision of fossil fuels for transportation or through investment in renewable energies and cleaner technologies. It's important to note that the Oil & Gas sector is one of the main emitters of greenhouse gases and air pollutants, contributing to carbon emissions and other pollutants, thus affecting air quality and climate change [29,32].

Figure 2. Key SDGs Impacted by the Oil & Gas Sector



Source: Own authorship

Additionally, from the perspective of SDG 9 - Innovation, Industry, and Infrastructure, investments in transportation infrastructure in the Oil & Gas sector can contribute to the development of more efficient and sustainable systems, such as improved transportation networks and the implementation of cleaner, more efficient technologies in the logistics chain. However, it is important to recognize that the sector's storage, transportation, and reception chain requires significant infrastructure, including pipelines, seaports, and storage terminals, which can lead to negative environmental impacts such as deforestation, water pollution, and ecosystem degradation, as well as social impacts like community displacement and land use conflicts [31,32].

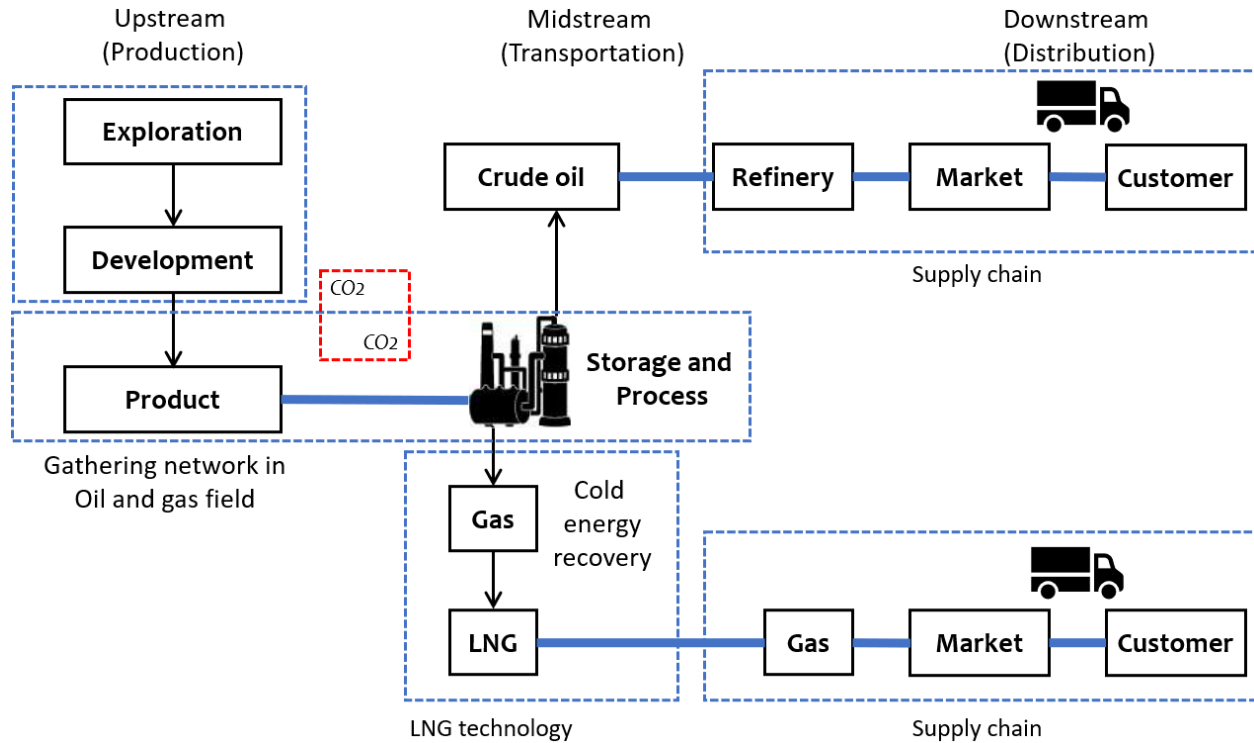
Regarding the impact of the Oil & Gas sector's storage, transportation, and reception chain on SDG 11 - Sustainable Cities and Communities, the transportation of Oil & Gas products can affect air quality and the environment in urban areas, thereby influencing the quality of life of local communities, especially where critical infrastructure such as ports and refineries are located. Adopting more sustainable transportation practices can mitigate these negative impacts. However, oil transportation also increases the risk of industrial accidents and spills, which can have serious consequences for the health and safety of communities [31,32].

The Oil & Gas sector's storage, transportation, and reception chain significantly impacts SDG 13 - Climate Action by contributing to greenhouse gas emissions and climate change. Transitioning to cleaner transportation and reducing emissions is crucial. The burning of fossil fuels like oil and gas is a major source of these emissions, exacerbating global warming and its effects, such as sea-level rise, extreme weather events, and ocean acidification [29,30,33].

Regarding SDGs 14 - Life below water and 15 - Life on land, there are clear examples of the impact of the Oil & Gas sector on sustainability, such as the Exxon Valdez oil tanker spill [9], Kuwait oil well fires [10], the Gulf of Mexico oil spill [11], as well as the controversy sparked by Shell Oil's decision to sink the Brent Spar platform in 1995, or more recently, the spill of at least 6000 barrels of oil near the shores of Lima [12].

Finally, the Oil & Gas sector's storage, transportation, and reception chain also relate to SDG 17 - Partnerships for the goals, as collaboration between actors in the Oil & Gas sector, governments, international organizations, and civil society is crucial to addressing transportation-related challenges in the Oil & Gas supply chain and working towards sustainable solutions.

Figure 3. Oil & Gas sector's storage, transportation, and reception chain



Source: Chen et al. (2023)

The GPM P5 Standard: People, Planet, Prosperity, Product and Process [28]

The GPM P5 Standard in sustainable project management integrates five fundamental pillars: People, Planet, Prosperity, Product and Process. Each of these pillars addresses crucial aspects to ensure that projects are not only successful in economic terms but also beneficial for society and the environment. By applying these principles, the aim is to achieve a balance between economic progress, social equity, and environmental sustainability, promoting holistic and responsible development.

- **People:** This emphasizes how projects affect both communities and individuals, aiming to enhance their overall quality of life, health, and well-being. It advocates for providing safe, fair, and equitable working conditions for all involved, promoting inclusion and equality to ensure that no one is marginalized or left behind.
- **Planet:** This emphasizes a focus on environmental protection and preservation, proposing sustainable practices to mitigate negative impacts on ecosystems. It encourages the efficient use of resources and the reduction of emissions and waste. Additionally, it advocates for environmental responsibility and compliance with ecological regulations.
- **Prosperity:** This aims to create lasting economic benefits for both communities and organizations, focusing on inclusive economic growth and job creation. It advocates for fostering innovation and responsible technological advancements. Additionally, it encourages fiscal responsibility and efficient management of financial resources.
- **Product:** The product lifespan lens examines the P5 elements to evaluate the sustainability of the project product throughout its life cycle. By using this lens, the project team can identify areas where

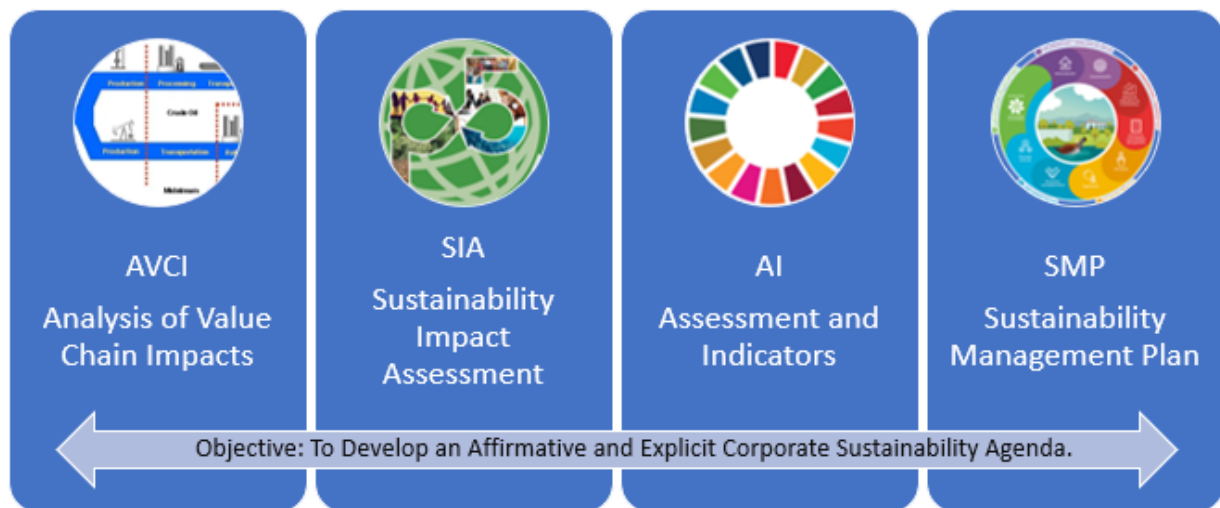
improvements are needed to increase the overall sustainability of the project product. The product maintenance lens examines the P5 elements to evaluate the sustainability of the product's maintenance activities during its life cycle. By using this lens, the project team can identify areas where improvements are needed to enhance the overall sustainability of the product's operation and maintenance activities.

- **Process:** The process efficiency lens examines the P5 elements to assess whether project processes are designed to use resources optimally. This involves evaluating project processes against industry standards and best practice frameworks to determine their efficiency. Similarly, the process effectiveness lens evaluates whether project processes are designed to use resources effectively, assessing their performance against industry standards and best practices to identify areas for improvement. Additionally, the process fairness lens examines the P5 elements to ensure that all affected individuals, including project team members, clients, suppliers, and other stakeholders, are treated fairly and respectfully.

Management Tool for Sustainability Decision-Making

The sustainability decision-making management tool should be intuitive and user-friendly, enabling managers to interact with it without extensive training. It must be scalable and adaptable to the evolving needs of Oil & Gas sector companies, ensuring it remains effective. Additionally, it should function as a data-driven decision-making tool (see Figure 4).

Figure 4. Management Tool for Sustainable Decision-Making at the Board Level



Source: Own authorship

Stage 1: Analysis of Impacts on the Oil & Gas Value Chain, AVCI

The tool resulting from this research consists of a process that begins with the analysis of the impact a transportation project in the Oil & Gas sector may have on its value chain, during its execution or throughout the project product's lifecycle, identifying sensitive points susceptible to sustainability impacts and conducting an assessment of potential risks. For this purpose, the participation of sector experts within the analysis team is required.

Stage 2: Sustainability impact assessment, SIA

The second stage of the process receives, as one of its main inputs, the project's impact analysis on the value chain, developed by sector experts in the first stage. With this information, the process continues by classifying the impacts of the project under analysis on sustainability, applying the concept of shared value from [25,26], followed by diagnosing the project's impact using the tool called The GPM P5 Standard [28].

The concept of shared value from [25,26] seeks to ensure that companies' strategic decisions are aligned with a clear understanding of the company's value chain and its relationship with project stakeholders, so that the maximum opportunities for value creation are configured and operationalized in both directions, both for the corporation and for the stakeholders. For this purpose, the impacts of the project under analysis on sustainability are classified into three broad groups, as depicted in Figure 5 [25].

Figure 5. Sustainability impacts categories



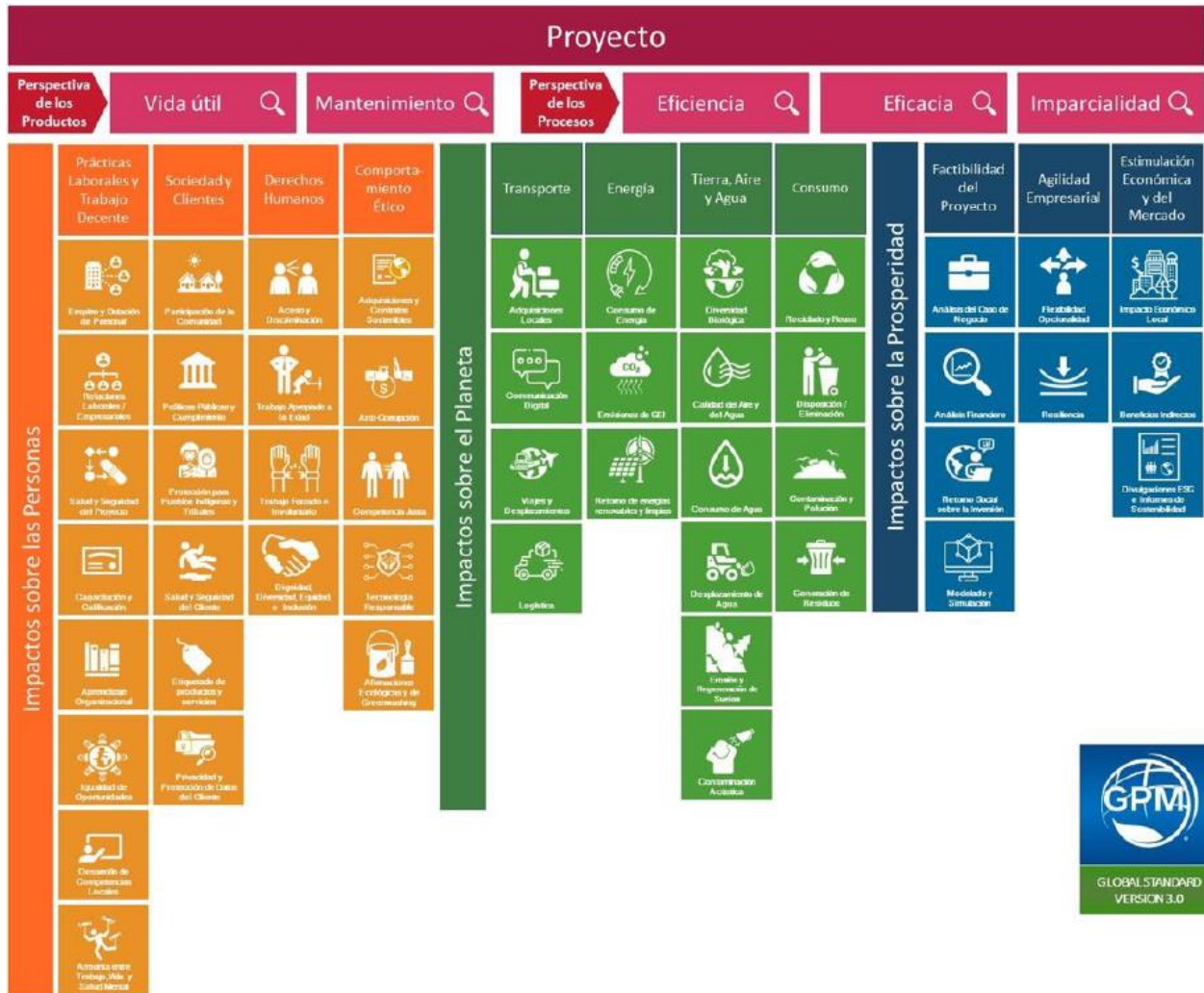
Source: Porter & Kramer (2006)

After classifying the impacts of the project under analysis on sustainability, applying the concept of shared value, the project's impact diagnosis during its execution or throughout the project's product life cycle is carried out. For this purpose, the classification of impacts is used as input, and the tool called The GPM P5 Standard - Planet, People, Prosperity, Product and Process [3,28,34], designed by Green Project Management GLOBAL, is utilized. With The GPM P5 Standard, an analysis of the project's impacts is conducted from three perspectives: environmental, social, and economic, and across 49 specific fields. This ensures a thorough and detailed analysis of sustainability impacts, as depicted in Figure 6.

Stage 3: Assessment and indicators, AI

Using the impact analyses from stage 2 as inputs, identify the potential internal and external events or impacts that may occur during the project or the product's lifecycle for each element presented in Figure 6. Describe the cause(s) of each event and the potential impacts on the sustainability of each element presented in Figure 6.

Figure 6. The GPM P5 Standard - P5 Ontology



Source: GPM Global (2023)

Next, evaluate the impacts based on the magnitude of their effect on sustainability according to Table 1, using a scale of 1 to 5, where 1 indicates a severe worsening of project outcomes from a sustainability perspective, and 5 indicates a significant enhancement of project outcomes from a sustainability perspective. Next, identify possible responses or solutions for each event or potential impact to minimize negative impacts and maximize positive ones. Finally, using Table 1 as a reference, re-evaluate the impacts, but this time considering the implementation of actions or solutions for each event identified in the previous step. The results of this second evaluation represent reductions in the negative impacts that the project has on sustainability. The difference between the first and second evaluations of the events represents the extent of the improvement due to the implementation of the improvement actions [28].

Table 1. Impact Assessment Score Guide for the Oil & Gas sector's storage, transportation, and reception chain

Score	Description	Meaning
5	Strong Positive Impact	Indicates that this impact will significantly enhance project outcomes from a sustainability perspective.
4	Positive Impact	Indicates that this impact will improve project outcomes from a sustainability perspective.
3	Neutral	Indicates that this impact is not expected to affect project outcomes from a sustainability perspective.
2	Negative Impact	Indicates that this impact will worsen project outcomes from a sustainability perspective.
1	Severe Negative Impact	Indicates that this impact will severely worsen project outcomes from a sustainability perspective.

Source: GPM Global (2023)

Stage 4: Sustainability Management Plan, SMP

The SMP outlines how sustainability will be addressed during a project. This plan includes the purpose, approach, roles and responsibilities of the project manager and team, as well as the owners of sustainability responses, budget, key performance indicators, potential impact on sustainability of scope exclusions, reviews, and reports aligned with the Organization's Sustainability Reporting strategy with support from the Sustainability Director and results of The GPM P5 Standard impact assessment [28].

The following documents, depicted in Figure 7, should be prepared for presentation to the board of directors:

Figure 7. Board meeting documents



Source: Own authorship

- **SMP High-Level Report:** High-level Critical Information on the Sustainability Management Plan for the Specific Project, Providing the Board with a Comprehensive Project Overview.
- **Sustainability Strategy:** Explanation of the main strategies or actions to be taken to manage sustainability impacts in terms of shared value, benefits for the company, and stakeholders.

- **Success Indicators Design:** Design of key success indicators in the performance of the strategies or actions to be taken to manage sustainability impacts.
- **Sustainability Strategy Budget:** The budget for the execution of the strategies or actions to be taken to manage sustainability impacts, and the benefits that the organization would achieve.

Conclusions

This applied research has highlighted the critical need for organizations, especially boards of directors, to have robust tools for making informed decisions regarding sustainable development. Practical, scalable, and adaptable solutions were developed, integrating powerful concepts like value chain and shared value, international standards such as The GPM P5 Standard, and best practices from diverse fields including business strategy, project management, and sustainability. Thus, one of the conclusions of this project is that, just as organizational needs are multidimensional, so are the solutions. The importance of robust tools for managerial decision-making on sustainability lies in the significant impact corporations have on challenges like biodiversity loss, deforestation, and global warming. Therefore, it is crucial for boards to have effective instruments to make decisions that create value and minimize negative impacts during project execution and product lifecycle. Incidents like the Exxon Valdez spill, Kuwait oil fires, Gulf of Mexico spill, Brent Spar controversy, and the recent oil spill near Lima highlight the need for informed managerial decisions on sustainability impacts.

The literature review highlighted the significant relationship between organizations and the environmental, social, and economic challenges facing humanity, particularly in the Oil & Gas storage, transportation, and reception sector. This sector impacts several SDGs, including affordable and clean energy, innovation and infrastructure, sustainable cities, climate action, life below water and on land, and global partnerships. These impacts highlight the sector's role in greenhouse gas emissions, deforestation, water pollution, and social issues such as community displacement. In conclusion, there is a mutual dependence between corporations and society, making it essential for managerial decisions to seek both business and social benefits under the principle of shared value. Effective corporate decision-making involves balancing different values, interests, and conflicting costs, with a long-term vision that ensures sustainable economic performance. Companies should integrate an understanding of their interaction with society into their strategic decisions and activities, identifying social and environmental issues where they can make a significant impact while gaining a competitive advantage. The key to promoting CSR is generating shared value that benefits both society and the business.

This research concluded that effective sustainability management requires structured, replicable processes that are flexible enough to adapt to evolving needs. In conclusion, managerial decision-making in sustainability has evolved from focusing solely on maximizing profitability for shareholders to incorporating the Triple Bottom Line (economic, environmental, and social facets). This shift has redirected strategies towards sustainable innovation processes. These processes must include metrics for monitoring and control, supported by international best practices to facilitate technology transfer and communication across diverse teams. Sustainability management plans, despite the extensive work required, must be clear and concise for approval by boards of directors, containing essential information on strategies, success indicators, and budgets.

Given the increasing importance of sustainable development and the urgent need to meet SDGs and the Paris Agreement, ongoing research is essential. The next phase of this research involves validation with an actual project in the Oil & Gas sector, as well as the development of a sustainability case study to be analyzed, enhanced, and replicated. Additionally, these types of investigations should be extended to all business sectors, incorporating the benefits of the latest advancements in fields such as artificial intelligence, in the quest to minimize the impacts that projects have on sustainability.

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