Original Research Article

Create a road map to sustainable construction with facility and asset management

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Abstract: This paper develops an SFM roadmap using the UNDP results-based framework to guide construction firms toward long-term ESG alignment. By mapping strategic planning, impact, outcome, and output stages, it illustrates how SFM adds value through energy transition, intelligent maintenance, stakeholder collaboration, and employee well-being. The paper contrasts SFM with traditional FM, demonstrating its long-term economic and environmental benefits despite implementation challenges. It concludes that SFM is essential for sustainable transformation and competitiveness in the construction industry.

Keywords: Facility management (FM); Sustainable facility management (SFM); Life cycle management

1. Introduction

In recent years, investors have been increasingly funding businesses with better sustainability credentials. In the field of construction, firms face serious scrutiny from stakeholders, as they hugely influence society and the environment[1]. Facing the pressure, the construction business needs to transform into a more sustainable operational model to minimise its negative impact on the environment and wider society. As pointed out by Hodges[2] FMer's ability to connect all the important stages of a building's life cycle—from planning, design, and construction to operations and maintenance, capital renewal, and eventual disposal or extensive renovation—makes them an innate leader in promoting this transformation. The purpose of this paper is to develop a sustainable roadmap based on the UNPD framework for facility managers to minimise the building's negative effects during its lifecycle while adding value to the entire business. In the first part, the roadmap will be created. Then, the differences in added value of structuring facilities will be discussed in the second part.

2. Roadmap to sustainable construction with FM

2.1. UNDP framework

The UNDP results-based approach of measuring capacity, including four components: strategic planning, impact, outcome and output, will be adopted to analyse and create a roadmap of the added value from FM in an organisation. Although it was originally designed for assessing capacity in developmental contexts, it can be adapted to an approach for profit-driven construction organisations.

2.2. Strategic planning

Generally, planning aims to balance immediate needs and long-term benefits, allocating resources to optimise performance and promote stability and adaptability[3]. For a profit-driven construction organisation, the ultimate goal is to maximise the shareholders' long-term benefits. However, with the increasing focus on environmental and social impacts from stakeholders, businesses must reconcile their financial objectives with environmental, social, and governance (ESG) concerns (**Figure 1**) to establish a long-term, sustainable value-creation goal. Consequently, FM needs to align with this objective, establishing a clear vision of its role in

enhancing operational efficiency, reducing costs, and contributing to profitability while not imperilling the survival of future generations. The concept of sustainable facility management (SFM) unifies the ideas of facilities management and sustainable development by embracing technology and creative business practices that balance the ESG effects of business decisions, which meet the new requirements of FM[5]. The United Nations' 17 Sustainable Development Goals (SDGs) approximately align with the three components of ESG (**Figure 2**) and can serve as more specific targets for ESG segments to help FM build roadmaps.

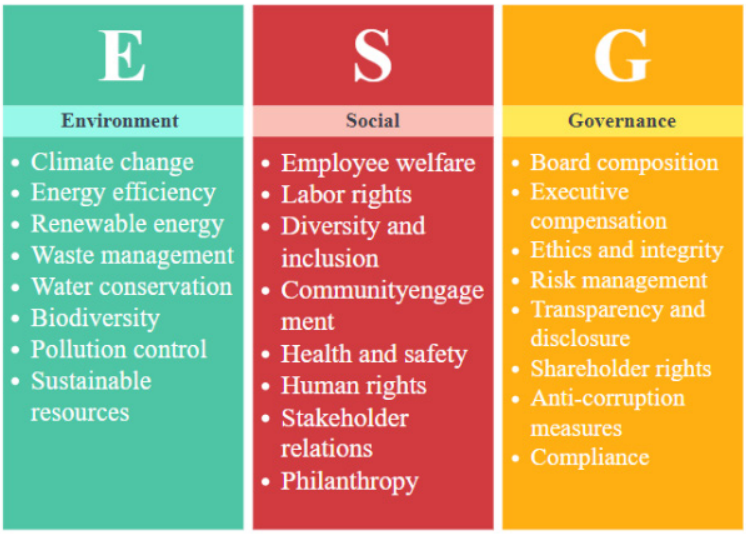

Figure 1. Components of ESG (Source: Wang and Xue, 2024).

Figure 2. The correlation between ESG and UN SDGs (Source: Muigua, 2022).

Specifically, the SFM strategic planning involves steps shown in **Figure 3,** 1) Conduct a capacity assessment of existing FM processes using SWOT analysis or other models to identify problems with sustainable facilities operating 2) Based on those identified issues, group them into related ESG factors, then prioritise them according to their importance and emergency of achieving sustainable goals so that the limited resources can be

allocated appropriately. Finally, SFM strategic planning is creating a foundation for FM to function as a strategic enabler, ensuring alignment with business priorities.

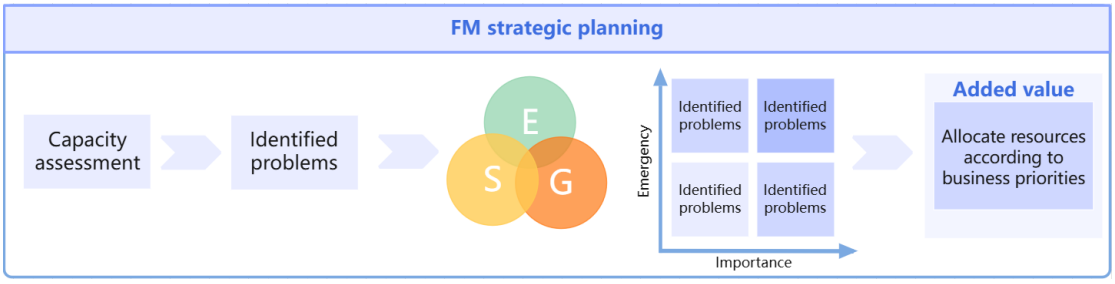

Figure 3. SFM strategic planning.

2.3. Impacts

Regarding SFM, "impacts" are the long-term benefits and value SFM delivers to the whole organisation. For the environmental aspect, SFM is suggested to reduce negative environmental impacts during daily operations, including carbon emissions (SDG 7 and 13), energy consumption and waste generation (SDG 11). Moreover, given that the construction industry employs a diverse workforce that is subject to health risks, occupational hazards, and precarious working conditions, FM must ensure safe and fair working environments (SDG 3) and embrace diversity and inclusion (SDG 10) to assist the organisation in fostering a positive social impact[6]. Finally, FM should work with stakeholders (SDG 17) to support regulatory compliance, reduce operational risks, and enhance safety (SDG 16). By setting a clear impact that SFM intends to have on the segments of ESG, it creates a foundation to ensure that the buildings and their operations are socially just, environmentally friendly, and economically feasible[7].

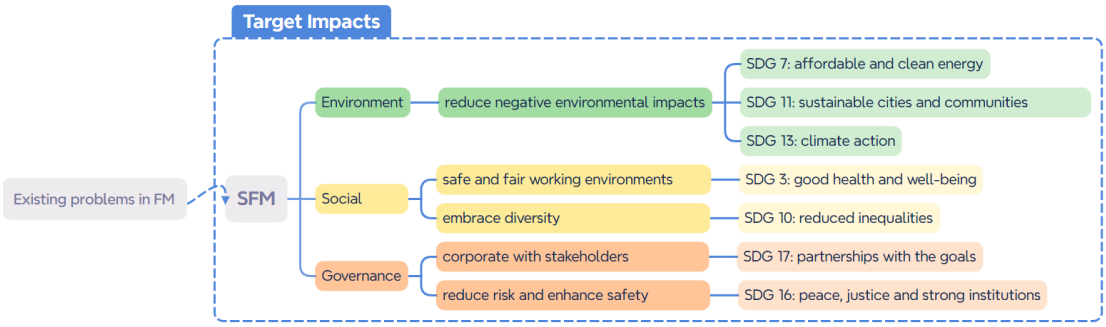

Figure 4. SFM desired impacts.

2.4. Outcomes

The outcome usually relates to the changes in an organisation's ability to work better. For SFM, it means something must occur within the FM sector to achieve the above desired sustainable impacts (shown in **Figure 5**). In detail, Buser et al.[8] argue that globally, the built environment alone is responsible for 40–50% of greenhouse gas emissions, over 33% of energy use, and 40% of material use. Thus, the green energy transition is essential for FM to achieve SDGs 7 and 13. Besides, FM can contribute to sustainable growth (SDG 11) by maintaining buildings more intelligently. Moreover, FM is responsible for ensuring that every employee feels valued within the organisation (SDG 10) and maintaining a suitable indoor climate, catering and facilities that influence employees' health (SDG 3). SDG 16 requires FM to promote safety and security and SDG 17 indicates the importance of forming partnerships to have an integral approach to achieve all the SDGs.

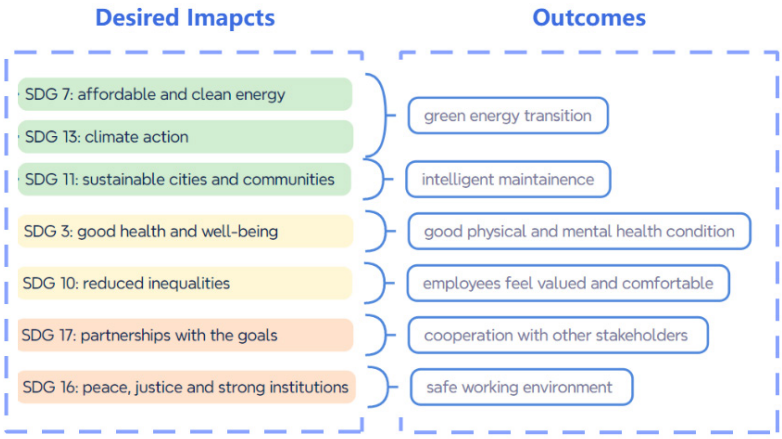

Figure 5. SFM outcomes based on impacts.

2.5. Outputs

Output was defined as a specific action that can contribute to the outcomes. To transform to green energy, FM has to pay more attention to existing facilities like building stock than delivering new sustainable construction projects, as the former can promote energy savings, waste reduction and carbon footprints[5]. For example, set strict waste management practices on the construction site, recycling materials like steel, concrete and timber. As for intelligent maintenance, emerging technologies like IoT sensors can monitor energy use, lighting, temperature and equipment performance in real-time, helping FMers maintain buildings effectively. Ensuring safety is critical to construction organisations. FMers can work closely with BIM engineers to create detailed 3D models of the sites, detect potential hazards and then incorporate real-time data from sensors into BIM to identify risks during daily operation. Safe and healthy food also plays a big role in employees' well-being. To guarantee that only eco-friendly and healthful items that cause minimal or no harm to the environment and human health would be used, FMers can advocate for policies and practices that obtain food and other resources through sustainable and circular procurement procedures[5]. Finally, FMers can ensure well-lit, ventilated and clean rest areas equipped with amenities like comfortable sofas, charging stations, and coffee machines to create comfortable workspaces.

3. The differences in added value between SFM and traditional FM

Sustainable strategic planning plays a critical role in identifying existing challenges within the FM and aligning resources with business priorities to optimise their usage effectively. Besides, businesses are more likely to beat their competitors in terms of financial success if they prioritise ESG issues in strategic planning[9]. In contrast, organisations that lack comprehensive strategic planning may struggle with resource allocation, like financial, human, and operational hindering their ability to support core business functions and long-term objectives. This lack of foresight can result in inefficiencies, misaligned priorities, and missed opportunities in a competitive market. Furthermore, sustainable strategic planning enables organisations to establish clear impacts and outcomes that FM aims to achieve. These defined goals provide a framework for tracking and evaluating FM performance over time. This process fosters continuous improvement, ensures accountability, and highlights FM's contribution to achieving broader organisational sustainability objectives. However, thorough strategic planning requires a long-term perspective, patience, and professional expertise, emphasising the need for a forward-thinking facility management team[2].

Moving to the environmental dimension, SFM advocates for adopting innovative solutions like recycled

building materials, rainwater harvesting systems, and green roofs. While the initial cost of implementing these environmentally friendly technologies is high, and the return on investment (ROI) can be uncertain, their long-term benefits are compelling. SFM's emphasis on sustainable whole-life cycle management creates additional opportunities for construction waste management, sustainable demolition, and adaptive reuse, thereby further enhancing resource efficiency[6]. Conversely, conservative businesses may avoid upfront investments but face considerable long-term drawbacks. The increasing costs of maintaining traditional buildings relying on fossil fuels, coupled with rising energy prices, often exceed the costs associated with SFM practices. Moreover, such organisations face reputational damage and legal penalties from governments and environmental agencies, especially in an era of serious climate regulations. Thus, while the transition to SFM requires careful planning and resource allocation, its ability to balance ecological responsibility with economic benefits makes it a wise choice for forward-thinking organisations.

SFM also emphasises employees' well-being, which improves working efficiency and productivity to deliver the construction project on time. For instance, by upgrading the mechanical systems, adding daylight, lowering volatile organic compounds (VOCs), and adding ergonomic furniture, Verifone was able to improve employee productivity by 5%, lower energy consumption by 59%, and decrease employee absenteeism by 47% in their Southern California distribution centre renovation[2]. Indeed, the upfront financial costs can strain budgets, and the surveys and planning required to implement sustainable measures demand significant time and labour. Nevertheless, the long-term payoffs, such as increased operational efficiency, enhanced employee well-being, and improved brand equity, outweigh the initial investment.

Regarding cooperation, SFM emphasises multi-stakeholder collaboration, requiring effective coordination with construction companies, suppliers, customers, government agencies, and community organisations. When implemented successfully, SFM fosters robust social networks that not only enhance operational capabilities but also strengthen the organisation's profitability as well as long-term strategic position by embedding it within a supportive ecosystem. However, such collaborative efforts often face significant challenges. Divergent stakeholder priorities, competing objectives, and immature cooperation frameworks can hinder SFM practices[6]. For instance, suppliers may prioritise cost reductions over environmental goals, while community organisations might focus on socio-environmental impacts rather than business profitability. These misaligned interests can result in conflicts, delays, and even resistance to SFM initiatives. Addressing these challenges requires robust stakeholder engagement strategies, clear communication, and the establishment of shared objectives to align diverse interests under a unified vision.

4. Conclusion

In conclusion, SFM plays a significant role in transforming the construction industry towards sustainable practices. Using the UNDP results-based approach, SFM establishes a clear roadmap that aligns strategic planning with desired impacts, outcomes, and outputs, addressing critical challenges in achieving sustainability. The contrast with traditional facility management highlights SFM's long-term benefits, including cost savings, improved productivity, and strengthened brand reputation. However, its implementation requires overcoming high initial costs, stakeholder resistance, and complex coordination. Despite these obstacles, SFM's ability to align construction businesses with sustainable goals ensures its critical contribution to the industry's future, making it an essential component for financial success and environmental management.

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