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# Green strategy management framework towards sustainable development

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A green strategy for an enterprise – public or private, government or commercial – is one that complements the business, operations, and asset strategies that are already well understood and often well-articulated by the enterprise. In this paper, an attempt has been made to discuss various issues related to Green Management (GSM). The concept of GSM, the functional Model of an organizational supply chain with an environmental impact, differences between conventional management and GSM and models for the implementation of GSM registered in the literature have been discussed. Various approaches of GSM, implementation of a Green Management and key factors affecting GSM have been also described.The objective of this paper is to identify majorworks on green strategic management research integrating Environmental, Health and Safety (EHS) toward sustainable developing thinking into all instruments and procedure management, and thereafter, to classify them so as to identify gaps, issuesand opportunities for further study and research.Therefore, in order to implement this right and fundamental conceptual model relying on literature review of GSM on the one hand and the key elements of sustainable development other hand, the conceptual model has been proposed.We were determined 20 criteria classify the existing GSM probing into five broad categories based on the problem context in GSM; strategic management, environmental performance, green manufacturing, process management, management system,

Keywords: green strategy management, environmental health and safety, sustainable development, analytic hierarchy process

## INTRODUCTION

Economic globalization, increasing resource scarcity and environmental degradation have caused green strategic management (GSM) to become an important competitive approach for organizations involved in international trade.

The story of environmental management can be traced to the Industrial Revolutions of 18th and 19th centuries, the lack of standards for industrial products and processes in the early 20th century, the creation of environmental laws and regulations beginning in the 1970s, the emergence of voluntary codes of corporate conduct and environmental management practices over the past 30 years, international developments related to the environment management and the more recent development of international environmental management standards and guidelines to facilitate global trade. Widespread concern for environmental protection emerged dramatically with the advent of the Industrial Revolution. Public outcries over smoke pouring from the stacks of coal burning factories, along with the eventual expansion of the petroleum industry, led to an early foothold for the "Environmental Movement" [1].

Perusal of the literature shows that a broad frame of reference for Green Strategic Management (GSM) is not adequately developed.

In early environmental management frameworks, operating managers were involved only at arm's length. Separate organizational units had responsibility for ensuring environmental excellence in product development, process design, operations, logistics, marketing, regulatory compliance and waste management. Today, this has changed. As in the quality revolution of the 1980s and the supply-chain revolution of the 1990s, it has become clear that the best practices call for integration of environmental management with ongoing operations. In 1988 and the Strategies for Today's Environmental Partnership (STEP) program adopted by the American Petroleum Institute in 1990 [2].

Environmental practices have been accepted and adopted in the world of business [3]. The numbers of organizations are contemplating to integrate environmental practices into their strategic plans and daily operations [4].

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Increasing government regulations and stronger public mandates for environmental accountability have brought the green issues high on the strategic planning agenda of manufacturing firms [5].

Green strategic management (GSM) adds 'green' component to the conventional procedures by including practices like green operations, green design, green manufacturing, reverse logistics and waste management [6].

Strategic planning in GSM context means the identification of relevant goals and specification of long term plans for managing those goals [7].

## DIFFERENCE BETWEEN CONVENTIONAL STRATEGIC MANAGEMENT, ENVIRONMENTAL MANAGEMENT SYSTEM AND GREEN STRATEGIC MANAGEMENT

Strategic management involves the formulation and implementation of the major goals and initiatives taken by a company's top management on behalf of owners, based on consideration of resources and an assessment of the internal and external environments in which the organization competes [8].Conventional Strategic Management usually concentrated on economy and control of the final product but seldom considers its ecological effects [3].

Environmental management system (EMS) refers to the management of an organization's environmental programs in a comprehensive, systematic, planned and documented manner. It includes the organizational structure, planning and resources for developing, implementing and maintaining policy for environmental protection. More formally, EMS is "a system and database which integrates procedures and processes for training of personnel, monitoring, summarizing, and reporting of specialized environmental performance information to internal and external stakeholders of a firm." [9].

Green strategic management is an experimental tool, which can be used to evaluate alternative long term strategies ("what-if" analysis) using total supply chain profit as measure of strategy effectiveness [10].

### Green Strategy Management Defined

A green strategy for an enterprise – public or private, government or commercial – is one that complements the business, operations, and asset strategies that are already well understood and often well-articulated by the enterprise. A green strategy fundamentally helps an enterprise make decisions that have a positive impact on the environment. The principles that form the basis of a green strategy should lead a business to make decisions based on solid business logic and make good business sense [11].

For the purpose of this paper, GSM is defined as 'integrating environmental, health and safety (EHS) toward sustainable developing [12] thinking into all instruments and procedure management, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumers as well as end-of-life management of the product after its useful life'. We specifically focus on key performance indicators (KPI) and mathematical modelling aspects in order to facilitate further study and research.

## RESEARCH METHODOLOGY

The objective of this paper is to identify major works on green strategic management research integrating Environmental, Health and Safety (EHS) toward sustainable developing [12] thinking into all instruments and procedure management, and thereafter, to classify them so as to identify gaps, issues and opportunities for further study and research. A literature review seems to be a valid approach, as it is a necessary step in structuring a research field and forms an integral part of any research conducted [13]. This helps to identify the conceptual content of the field [14] and guides towards theory development. Therefore, in order to implement this right and fundamental conceptual model relying on literature review of GSM on the one hand and the key elements of sustainable development other hand, the conceptual model has been proposed.

The compulsory requirement for GSM conceptual selection model should be structure in a way which could be handle it with MCDM appropriately in future.

There are several MCDM methods which have been developed, such as the Elimination and Choice Translating Reality (ELECTRE), the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), Analytic Network Process (ANP) and the Analytic Hierarchy Process (AHP). But these methods do not deal with the interdependences among elements. For dealing with the interdependences among elements, the ANP as a new MCDM method was proposed by Saaty (1996) [15]. Therefore, from the viewpoint of Kinosita [16], the ANP may simply be differentiated into two practical kinds of models: the Feedback System model and the Series System model (similar to the AHP model). In the Feedback System model, clusters link one by one in turn as a

network system. This kind of model can capture effectively the complex effects of interplay in human society, especially when risk and uncertainty are involved [17].

However, it is usually hard to obviate the possibility of interactions within the criteria cluster. Thus, this paper suggests a modified Feedback System model (Fig. 1) that allows interdependences within the criteria cluster, in which the looped are signifies the inner dependences.

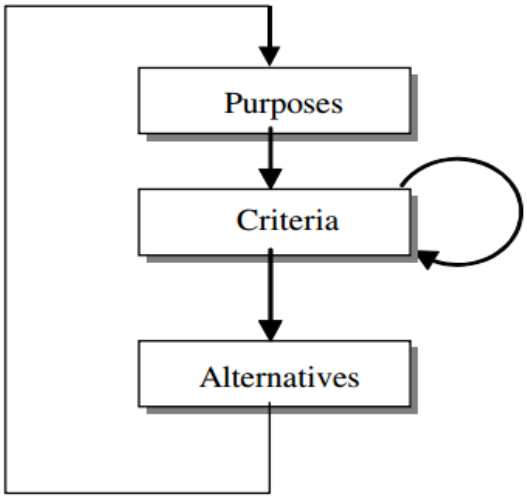


**Fig. 1.** Modified feedback system model (Proposed Model).

## DISCUSSION

### *Models of Sustainable Development in literature*

*Model 1: Sustainable Development Basic Model:* The man is the main pivot in the sustainable development. Possibility, Planning and implementation of any project should consider many aspects. Sustainable development has been described in terms of three dimensions (Fig.2), domains or pillars. In the three-dimension model, these are seen as "economic, environmental and social" or "ecology, economy and equity" [18] this has been expanded by some authors to include a fourth pillar of culture, [19-20] institutions or governance [19].

Thus, the national and international standards ought to be generated [12].

*Model 2: Sustainable Development Extended Model:* Working with a different emphasis, some researchers and institutions have pointed out that a fourth dimension should be added to the dimensions of sustainable development, since the triple-bottom-line dimensions of economic, environmental and social do not seem to be enough to reflect the complexity of contemporary society.

The Circles of Sustainability approach distinguishes the four domains (Fig.3.) of economic, ecological, political and cultural sustainability [19].

Other organizations have also supported the idea of a fourth domain of sustainable development. The Network of Excellence "Sustainable Development in a Diverse World" [21] sponsored by the European Union, integrates multidisciplinary capacities and interprets cultural diversity as a key element of a new strategy for sustainable development.

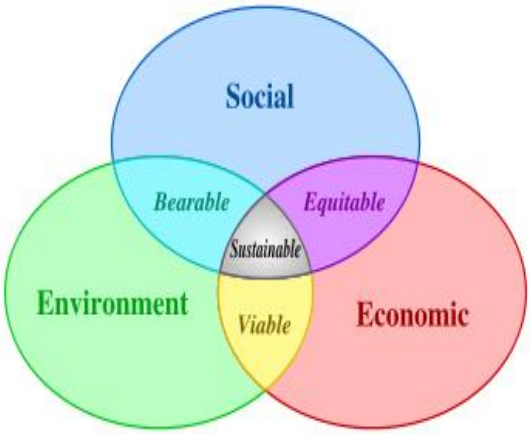


**Fig. 2.** Scheme of sustainable development: at the confluence of three constituent parts [22].

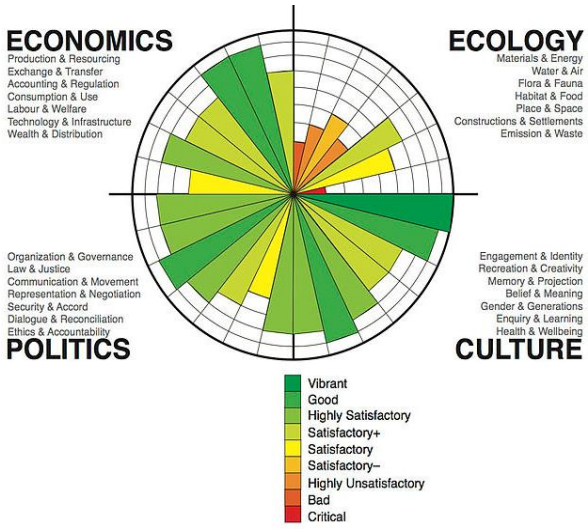


**Fig. 3.** Circles of sustainability [23]

The growing importance of GSM is driven mainly by the escalating deterioration of the environment, e.g. diminishing raw material resources, overflowing waste sites and increasing levels of pollution. However, it is not just about being environment friendly; it is about good business sense and higher profits. In fact, it is a business value driver and not a cost centre [24].

Sufficient literature exists about various aspects and facets of GSM. Comprehensive reviews on green design [25], issues in green manufacturing and product recovery [26-27], supply management capabilities [28], industrial ecology and industrial ecosystems [29-30-31-32-33] have been published. In addition, Arimura [34] indicate that facilities with environmental management systems (EMS) certified to ISO 14001 are 40% more likely to assess their suppliers' environmental performance and 50% more likely to require that their suppliers undertake specific environmental practices and Babiak and Trendafilova [35] discuss on corporate social responsibility and environmental management as a key elements of GSM.

*Models of implementation of green strategic management in literature*

Different concepts and models related to environmental issues have been suggested by different researchers. Some of them are briefly described hereunder:

*Model 1: Environmental management system (EMS) Model*

An EMS follows a Plan-Do-Check-Act, or PDCA, Cycle (Fig. 4). The diagram shows the process of first developing an environmental policy, planning the EMS, and then implementing it. The process also includes checking the system and acting on it. The model is continuous because an EMS is a process of continual improvement in which an organization is constantly reviewing and revising the system [36].

This is a model that can be used by a wide range of organizations — from manufacturing facilities to service industries to government agencies. An EMS can also be classified as:

- A system which monitors, tracks and reports emissions information, particularly with respect to the oil and gas industry. EMSs are becoming web-based in response to the EPA's mandated greenhouse gas (GHG) reporting rule, which allows for reporting GHG emissions information via the internet.

- A centrally controlled and often automated network of devices (now frequently wireless using z-wave and zigbee technologies) used to control the internal environment of a building. Such a system namely acts as an interface between end user and energy (gas/electricity) consumption.

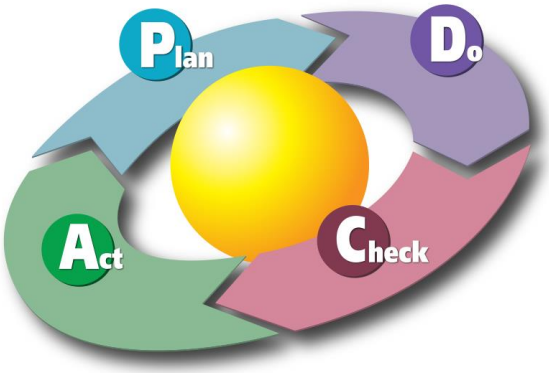


**Fig. 4.** PDCA Cycle [37].

*Model 2: ISO 14001*

ISO 14001 sets out the criteria for an Environmental Management System (EMS). It does not state requirements for environmental performance, but maps out a framework that a company or organization can follow to set up an effective EMS. It can be used by any organization that wants to improve resource efficiency, reduce waste, and drive down costs. Using ISO 14001 can provide assurance to company management and employees as well as external stakeholders that environmental impact is being measured and improved [38].

*Model 3: Eco-management and audit scheme*

The Eco-Management and Audit Scheme (EMAS) is a voluntary environmental management instrument, which was developed in 1993 by the European Commission. It enables organizations to assess, manage and continuously improve their environmental performance. The scheme is globally applicable and open to all types of private and public organizations. In order to register with EMAS, organizations must meet the requirements of the EU EMAS-Regulation [39]. Currently, more than 4,600 organizations and more than 7,900 sites are EMAS registered [39].

EMAS Key Performance Indicators (KPI): The EU Eco-Management and Audit Scheme provides core indicators or Performance Indicator (KPIs) with which registered organizations can measure their environmental performance and monitor their continual environmental improvement against set targets. Energy efficiency, Material efficiency, Water, Waste, Biodiversity and Emissions are the EMAS KPI.

*Model 4: Life cycle assessment (LCA)*

Life Cycle Assessment is a process to evaluate the environmental burdens associated with a product, process, or activity by identifying and

quantifying energy and materials used and wastes released to the environment; to assess the impact of those energy and materials used and releases to the environment; and to identify and evaluate opportunities to affect environmental improvements. The assessment includes the entire life cycle of the product, process or activity, encompassing, extracting and processing raw materials; manufacturing, transportation and distribution; use, re-use, maintenance; recycling, and final disposal [40].

According to the ISO 14040 [41] and 14044 [41] standards, a Life Cycle Assessment is carried out in four distinct phases as illustrated in the figure shown to the right. The phases are often interdependent in that the results of one phase will inform how other phases are completed (Fig. 5. Phases of Life Cycle Analysis).

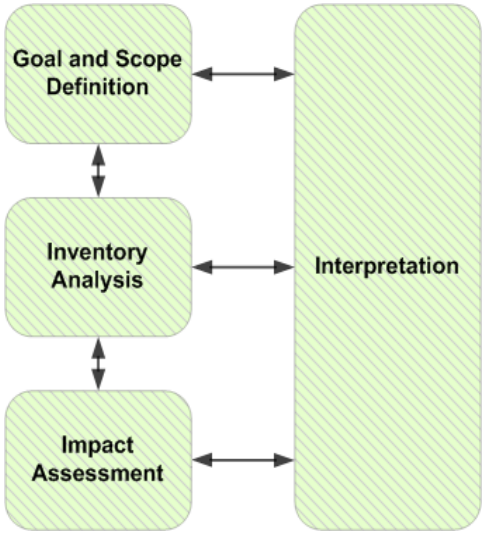


**Fig. 5.** Phases of life cycle analysis [41]

*Model 5: Health, Safety and Environmental-Management System (HSE-MS)*

A Health, Safety and Environmental Management System (HSE-MS) monitors health, safety and environmental performance, similar to the way a financial management system monitor's expenditure and income and enables regular checks of a company's financial performance. An HSE integrates health and safety requirements with environmental management into a company's daily operations, long term planning and other quality management systems (Fig.6) [42].

An HSE-MS can assist a company in the following ways:

- Minimize environmental liabilities;
- Maximize the efficient use of resources;
- Minimize the hazard risk in company;
- Maximize the safety in procedure and structure of company;
- Reduce waste;
- Demonstrate a good corporate image;
- Build awareness of environmental concern among employees;
- Gain a better understanding of the environmental impacts of business activities; and
- Increase profit, improving environmental performance, through more efficient operations.

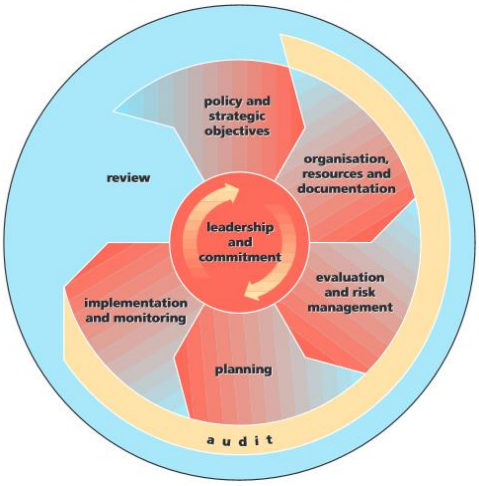


**Fig. 6.** The model of health, safety and environmental management system (HSE-MS) [43]

## RESULTS

Based on integrating the categories and criteria identified from the literature sources, a green strategic management framework was designed for incorporating environmental criteria regarding the competency of green strategy into supplier selection in GSM. The 20 criteria were determined and categorized into five main clusters as follows (see Table 1).

## CONCLUSION

We classify the existing GSM probing into five broad categories based on the problem context in GSM; strategic management, environmental performance, green manufacturing, process management, management system, as shown in Fig. 7.

**Table 1.** Criteria of supplier dimension to GSM (team study).

| Dimension (Purpose) | Criteria | SD Models | | GSM Models | | | | | References |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | EMS | 14001 | EMAS | LCA | HSE | |
| Strategic Management (D1) | Environmental Based Strategy | | | | | | | ✓ | Padash [12] |
| | Green Supply Network Design/Operation | | | | | | ✓ | | Vafadarnikjoo [53] |
| | Requirement of Green Purchasing | | | | | | ✓ | | Wu & Chang [47]; Wu & Low [48] |
| | Social Responsibility | ✓ | ✓ | | | | | | Beheshti&Padash [44] |
| Environmental Performance (D2) | Environmental Regulation (Domestic and International Agreements) | | | ✓ | ✓ | ✓ | | | Mathiyazhagan & Haq [55] |
| | Environmental Policy and Measures and Monitoring | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Turner et al. [46]; Wu et al.[49] |
| | Control and Reduction of Emission | | | | ✓ | | ✓ | ✓ | Wu & Low [54] |
| | Waste Disposal System (WDS) | | | ✓ | ✓ | | ✓ | ✓ | Wu et al.[49] |
| Green Manufacturing (D3) | Green Recycling/Reducing | | | | ✓ | ✓ | ✓ | | Dawei et al. [50] |
| | Inventory Management | | | | | | ✓ | | Xiao et al. [51] |
| | Life Cycle Assessment (LCA) | | | | | | ✓ | | UNEP/SETAC [40] |
| | Environmental Conscious Design (ECD) | ✓ | ✓ | | | | | | Madu et al.[52] |
| Process Management (D4) | Management of Failure Mode and Effect Analysis | ✓ | ✓ | | | | | ✓ | Kuo & Chu [56] |
| | Risk based Inspection (RBI) | | | | | | | ✓ | Kuo & Chu [56] |
| | Process Auditing | | | | | | | ✓ | Hsiao et al. [57] |
| | Management of Hazardous material | | | ✓ | ✓ | | | ✓ | Hu & Kaabouch [58] |
| Management System (D5) | Environmental Management System and Eco-Management Auditing System(EMAS) | | | ✓ | ✓ | ✓ | | | Jabbour et al. [59] Iraldo et al. [39] Lam et al. [69] |
| | OHSAS 18001 | | | | | | | ✓ | Padash & Darabi [45] |
| | Safety Management System(SMS) | | | | | | | ✓ | Padash & Darabi [45] Nanyunja et al. [61] |
| | Energy Management System (ISO 50001) | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | Padash & Darabi [45], Kumar & Bhimasingu [3] |

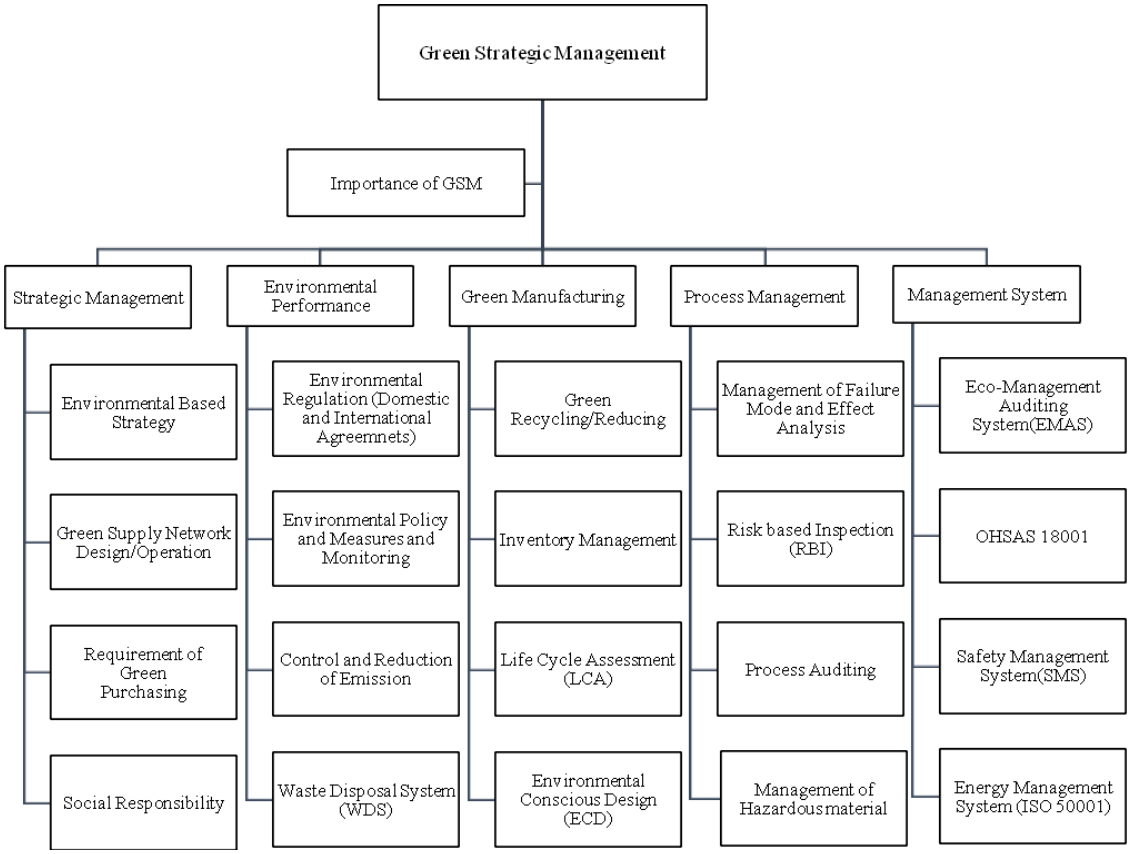


**Fig. 7.** GSM model for selecting strategies based AHP (team study).

In order to select the appropriate strategy, the basic elements and main activities of environmental strategic management can be determined with three type of strategies. These based on Johnson, Scholes and Whittington's [64] internationally-recognized book are the following:

- the strategic positioning of the company
- creating environmentally-conscious strategic alternatives
- the implementation of environmentally-conscious strategies

The conceptual model of the elements of strategies to supply GSM is illustrated in Fig.8.
The elements and activities illustrated in the model can be easily understood in environmental terms. In addition, they have a mostly positive influence on achieving the desired results. Naturally, the individual elements do not appear separately in the companies but interact simultaneously. However, in order to aid the readers' understanding and to integrate additional factors more easily, these elements are discussed as separate points below.
GSM can reduce the ecological impact of industrial activity without sacrificing quality, cost, reliability, performance or energy utilization efficiency. It involves a paradigm shift, going from end-of-pipe control to meet environmental regulations to the situation of not only minimizing ecological damage, but also leading to overall economic profit. The area throws various challenges to practitioners, academicians and researchers.

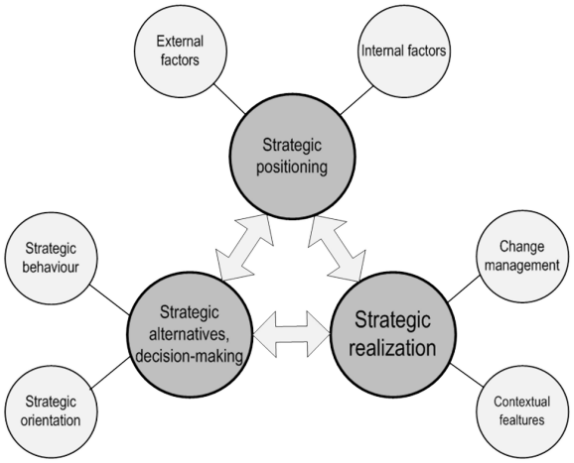


**Fig. 8.** The conceptual model of the elements of strategies to supply GSM (Team Study).

## SUGGESTIONS

This proposed framework must address the needs of various executives in developing and implementing green strategies in company along with best business. So, the strategies can start as a project which can be joined to form a cross-organizational program managing Environmental,

Health, Safety and Energy (EHSE) issues in company. However, for effectiveness successfully of building and starting the frame work, as the learnt lessons, there is some special suggestions for the company who would like to start for the best green strategic management practice.Addressing any of those ten key components of a green strategy synchronous business can tangibly lower a company's energy usage and reduce its environmental impact. Addressing them in combination, however, can dramatically amplify those effects in making a company more competitive, successful and social responsible.

*1. EHSE strategy*

The creation of an enterprise-wide EHSE strategy as part of an overarching corporate social responsibility plan can help companies address "green" issues, resulting in improved financial and EHSE outcomes. Issues to be considered include the alignment of a company's EHSE strategy into an overall business strategy and how EHSE values may be translated into an improved brand image.

*2. Define Sustainability*

Be sure everyone is working from the same definition of sustainability. When the company use the word sustainability, many customers have a very different interpretation of what the means. It's important to specifically define sustainability from the stakeholders involved.

*3. People*

The impact of employee behaviors and policies on the environment is significant. Commute time and business travel form a large part of an individual's carbon footprint. The use of online collaboration tools and policies that support reduction in commuting and traveling can also have an impact on costs. Companies also are discovering that their EHSE policies and practices can impact their ability to attract and retain top talent.

*4. Make Your Goals Green*

For each of your company existing goals, be sure to add realistic and doable actions, with outcomes that lead to sustainable outcomes. Look at company priorities through the lens of sustainability: financial, community and EHSE achievement. Perform a gap analysis to better understand where company land now, and what types of measures the company would like to achieve in the future - then set a timeline with specific and actionable steps to get there.

*5. Property*

Companies need to reduce the cost and greenhouse gas emissions of their physical assets-from office buildings to truck fleets. The process starts with determining and managing the environmental impact of physical assets and properly maintaining all property for energy-efficient operations and reduced environmental impact. Through improved maintenance and through improved tracking, deployment, location, and management of facilities and properties, reductions in environmental impact can be achieved.

*6. Use measurable targets*

To help monitor company's green strategic plan, company will want to keep score of its progress. Third party certifications are now numbered in the hundreds. Be it a green cleaning designation such as Green Seal, a corporate sustainability program such as B Corp certification (B-Corp), or a green building rating like Leadership in Energy and Environmental Design (LEED), using a third party verification is the best key.

*7. Product*

As companies begin to understand the EHSE impact of their products or services across the entire product lifecycle, they can design products in a manner that has a lower EHSE impact. Streamlining product development and manufacturing also means less material used, less waste created and less energy consumed. Concurrently, an examination of the product or service lifecycle often helps businesses find and exploit market opportunities. Finally, the need to reduce energy consumption is driving an increase in the energy-management intelligence built into certain products.

*8. Communicate and educate*

A great green plan, poorly communicated, will go nowhere, so it is very important for every company to devise a plan to communicate the goals set in the strategic plan. Obtain feedback and get buy-in from employees early on in the process - don't wait until the plan is complete to start talking about it. Make an announcement and conduct education and feedback sessions to ensure that everyone knows what's in the works - be it employees, investors, partners or vendors. On an ongoing basis, be sure to have monthly e-mail messages, announcements in newsletters, through your organizations blog, and posted on the wall in common areas. Share all or highlights of the plan and keep it forefront and center.

*9. Information*

With data compounding between 35 percent and 70 percent annually in some industries, it's critical for companies to better manage their data infrastructures. Optimized collection, analysis, tiering and storage of key information helps companies comply with reporting mandates while

minimizing their data footprints. These same information strategies improve business operations by improving information access and system response. They help reduce storage needs through sharing, elimination of redundancies and compression.

*10. Business operations*

Green strategy need to transform business processes to reduce EHSE impact for operations end-to-end. Consider energy or water consumption, as a start. Through the use of "smart" systems, dramatic efficiency improvement can take place. Any transformation plan put into place must be communicated to key stakeholders.

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