

Selection Approach for Sustainable Strategies & Development Model

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Abstract—While a lot of focus and research is aimed at the implementation of the various sustainable strategies and models for a development to address the global sustainability challenges in energy use and its conservation, however the selection methodology for adopting specific sustainable strategies for the given project is often found to be not given the same leverage. Selecting the right project components and sustainable strategies is a critical aspect for the success of the project. This paper presents a case study for the selection approach in adoption of green initiatives in a large-scale redevelopment project of Rebuilding Ahmadi Township. The paper illustrates an analysis of the various approaches considered, green drivers promoting the adoption of various green initiatives, evaluation criteria etc. and highlights how the priorities of strategies adoption may be greatly affected by the Organization's inclination and commitment towards a comprehensive green agenda.

Index Terms—Evaluation criteria, selection framework sustainable strategies, smart integration.

I. INTRODUCTION

The intent was to re-structure the town and transform the existing town into a more effective modern oil town including housing and all amenities necessary for its effective functioning by incorporating the latest best practices while preserving the rich heritage. Core to the redevelopment was to incorporate sustainable strategies that not only informs and connects the residents, and visitors but also enhances the efficiency and functioning of Ahmadi town.

Furthermore, one of the prime reasons for redevelopment program was addressing the issue of high and the escalating maintenance and operation cost of the dilapidating houses of the existing township in addition to, providing better housing facilities and environment for the employees.

II. BACKGROUND REVIEW

The Company's vision and strategic objectives are outlined to support Kuwait's 2030 energy vision to reduce energy usage per capita and increase the energy supply from renewables to 15% and formulate strategies, discuss the latest case studies and benchmark against global best practices.

The Company was committed to extend its support in all its endeavors and serve as a vital platform to show case and set a positive precedent in the region for the comprehensive sustainable and inclusive growth by adopting strategic,

technical and technological solutions for energy efficiency and power generation etc. in its projects.

The following objectives were outlined for the redevelopment of the existing Ahmadi town:

- **Redevelopment Stewardship**
Company's aspirations to be an employer of choice by providing quality service to the employees in the form of a modern, safe, secured and healthy living environment.
- **Preserve Historic Heritage**
As it has been over 60 years since the inception of the township, the intent is to preserve and further enhance the outlook of the township by effectively modernizing it, being in line with the other modern cities of the world and to set a positive precedent in the region for sustainable and inclusive growth.
- **Social Commitment**
To illustrate Company's social commitment not just towards its employees by uplifting the housing integrity, but extending beyond and contributing to the communities beyond its premises and Kuwait city.
- **Support Kuwait's 2030 Vision**
To reduce energy and water usage per capita and increase the energy supply from renewables to 15%.

III. METHODOLOGY

In 2014, with the Company deciding to redevelop Ahmadi Township's future by adopting a green strategy, a green building committee was formed by the Company to look into achieving the said goals and formulate strategies and benchmark against global best practices.

An integrated approach was adopted involving several sessions with various stakeholders of the Company and consultants in order to derive goals/objectives for the proposed redevelopment program in order to fulfill the Company's vision.

The methodology included carrying out a detailed study for the project specifically aimed for the following purposes:

- To verify if a particular development model/ option with various sustainable strategies for the given project is in line with the Company's strategic objectives and vision.
- To identify the various sustainable strategies that helps in reducing energy consumption, improve the demand-side management, and provide high efficiency in terms of operation and maintenance of the subject project.
- To justify if the implementation of the proposed development model with various sustainable strategies is in line with the project objectives and is financially viable.

Following the Company's vision and objectives for the given project, various popular development models/options

for modern cities including Eco city, Sustainable city, Green city, Livable city, Digital city, Smart city, intelligent city, Future city etc. were broadly studied to check their relevance for the given project.

This approach explored the relationship of various development models (instead of comparison) to understand the degree and extent of overlap between these development models/options.

Based on this analysis, the most inclusive development model was preferred out of all the different models. This preferred model with all the components (including sustainable and smart systems) were evaluated based on the established evaluation criteria for their applicability in the given project.

The Economic/ cost analysis for financial viability of the preferred model for the given project was determined by comparing project cost from the baseline model (conventional development) with various individual cost components of various sustainable strategies evaluated. It should be noted that we encounter a problem when assessing the sustainability of a new project that the project concerned does not have a tendency. Therefore, a baseline (the simplest reference point) model is used [1].

This approach results in a comprehensive development model analysis for the given project and a more justified evaluation of the preferred option with respect to the other models/options.

During the identification stage, the research also included visits to some of the cities where the sustainable strategies are implemented. Furthermore, the Company technical analyst teams and decision makers in order to thoroughly discuss as well as agree on the approval of various sustainable and smart strategies for incorporation in the Rebuilding Ahmadi Township Project conducted several meetings & workshops.

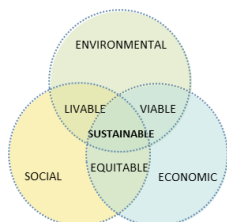


Fig. 1. Green city: Eco city: Sustainable city development model [2].

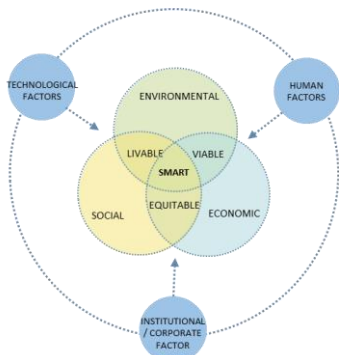


Fig. 2. Smart city development model [2].

As illustrated in Fig. 1, 2, and 3, the smart city development model interweaves the sustainable city/green city/eco city model parameters with the Technological factors (ICT) for a

holistic development process.

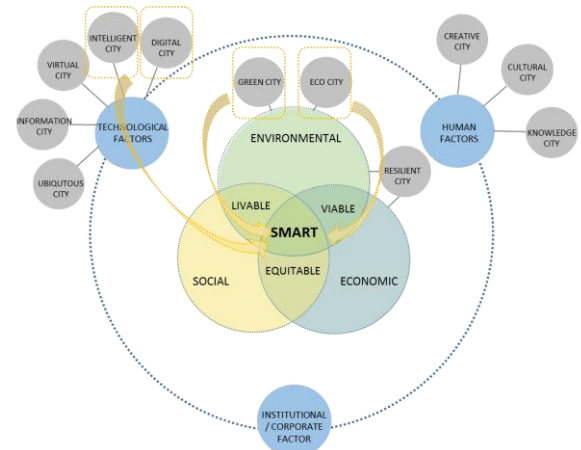


Fig. 3. Relationship diagram of various development models [2].

In light of the above, a comprehensive approach as illustrated in Fig. 4 was adopted using Sustainable & Green design principles with the Smart Technology (ICT) as an enabler to achieve a more comprehensive sustainable development that is more relatable, simpler, better, faster and smarter.

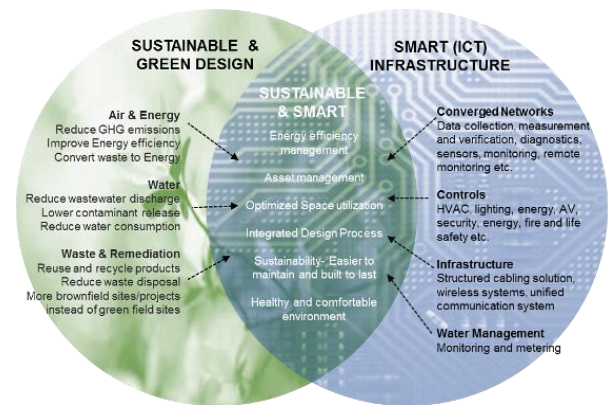


Fig. 4. Comprehensive development approach.

Following table (Fig. 5) summarizes the various sustainable and smart strategies evaluated for their applicability in the given project.

	DESIGN ELEMENTS	APPLICABLE FOR AHMADI TOWNSHIP REDEVELOPMENT	ADDITIONAL CAPEX COST FROM BASELINE MODEL
MASTER PLANNING	1. Optimization of land resource (site area)	YES	-
	2. Design to reduce travel and walking distances between facilities.	YES	-
	3. Location of buildings on site including Utilities and other facilities to optimize the infrastructure routing and energy losses.	YES	-
	4. Buildings orientation on site to reduce solar heat gain.	YES	-
	5. Re-using relevant existing elements, infrastructure on site.	YES	-
	6. Landscaping layout, trees etc. designed to improve air quality and reduce noise pollution.	YES	-
	7. Provisions for alternate mode of transport (bicycle lanes, bicycle pools etc.)	YES	YES
ARCHITECTURAL / CIVIL	1. Building designed to create microclimate and reduce heat island effect.	YES	-
	2. Envelope design (incl. architectural elements, cavity walls etc.) to reduce solar heat gain and reduce energy losses.	YES	-
	3. Building internal layout designed to reduce solar heat gain.	YES	-
	4. Optimization of U-values for the Building envelope elements including external walls, roof etc. for minimum heat gain.	YES	-
	5. Design details to reduce thermal bridging and achieve air tightness to reduce energy losses in the building.	YES	-
	6. Building layout designed to optimize space and low side building utilities in the buildings.	YES	-
	7. Design to use energy efficient and green building materials etc.	YES	-
	8. Use of Green roofs (Not applicable due to higher direct cost and maintenance cost, affects the outlook and heritage of Ahmadi township, not viable with respect to applicable energy savings)	X	-

MECHANICAL (HVAC)	1.	Design to Optimize HVAC system components (capacity and make of equipment) for energy efficiency	YES	-
	2.	Design to use energy efficient systems like centralized District cooling, as applicable	YES	-
	3.	Design to use re-cycled/grey water for the cooling system for water conservation	YES	-
DRAINAGE, PLUMBING, PIPING/FITTING ETC.	1.	Design to use water efficient devices (fixtures, fittings and equipment etc.) and systems	YES	marginal
	2.	Design to minimize surface water run-offs (for water conservation)	YES	-
	3.	Design to maximize percentage of use of re-cycled/ STP treated water for irrigation,	YES	-
	4.	Design to include provision of Storm water drainage, use of existing natural flumes etc.	YES	-
	5.	Design layout to optimize the routing for Drainage, plumbing and firefighting services infrastructure on site.	YES	-
ELECTRICAL	1.	Design systems to use energy efficient lighting (LED, LEP etc.) and other electrical devices	YES	marginal
	2.	Design layouts to optimize the routing for electrical infrastructure services on site and in the buildings.	YES	-
	3.	Use of renewable systems (i.e. Solar PV cells etc.) for power generation in buildings etc. (for approx. 15% energy requirements)	YES	YES
		(Other renewable resources such as Wind turbines etc. is not applicable and not feasible for Ahmadi Township due to the requirement of large vacant plots for the wind farms to harness the required power for the houses and facilities.	X	-
ICT AND INSTRUMENTATION CONTROLS	1.	Home Automation 1. Lighting System 2. HVAC Thermostat 3. Gas Sensors 4. Motion Detector 5. Power Meter 6. Water Meter 7. Surveillance Camera Devices 8. IPTV screen 9. Door Access (IP Video/ audio intercom) 10. Fire Detector 11. Smart phones application control 12. IP Telephony	YES	YES
	2.	Command and Control Center 1. Real time Energy Management System 2. Call / Contact Center 3. Maintenance Management System	YES	YES
	3.	Smart City Services 1. Energy Management System 2. Community Portal 3. Outdoor Signage System Integration 4. Environmental Monitoring/ Management System 5. Outdoor Traffic Monitoring Surveillance Cameras Integration 6. Street Lighting Management System 7. CCTV Security system	YES	YES

Fig. 5. Summary of strategies and its applicability in the given project.

Evaluation Criteria:

The Rebuilding Ahmadi Township Technical Task Team defined the following evaluation criteria for the various sustainable and smart strategies to be adopted in this project:

- Project objectives realization
- Design/Technology & Benefits
- Implementation areas & impact analysis
- Constraints & Issues
- Risk analysis & Management
- Critical success factors
- Operations and Maintenance
- Economic/cost analysis & financial viability

Further to the derivation of the list of strategies to be incorporated in the said project, due to changes in the financial structure affecting the project budget, a further cost optimization was required to be carried out for the said project. In view of this, it was required to evaluate any further cost optimization opportunities for the sustainable strategies scope in the Rebuilding Ahmadi Township project, without compromising the intent, benefits and goals of the project.

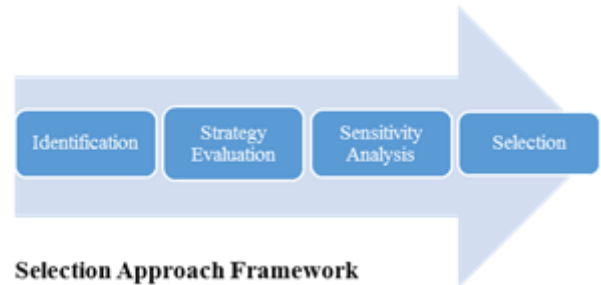
Hence, the previously selected strategies were re-evaluated considering the following selection and exclusion rationale:

- Impact on the effectiveness and efficiency of development (i.e. energy savings and cost savings etc.)
- Contribution to the achievement of the project objectives and goals.
- Impact on the delivery of a comprehensive sustainable and smart development in the near future as well as in the long run.
- Opportunity of Cost optimization within the element/ strategy.

- Possibility of incorporation of the particular strategy at a later date with less/minimal bolt-on cost and its impact on the newly constructed Township.

IV. ANALYSIS & RESULTS

The Selection Approach for Sustainable Strategies & Development Model can be structured into the following framework:



A. Identification

This step outlined and initiated the selection process for preference of a particular development model including various sustainable strategies based on broad understanding of its elements and components of the various options/ development models that are found to be relevant for addressing the project objectives and goals set by the stakeholders. Following aspects are considered during this stage:

- Determining the vital project objectives.
- Identification of the various options available.
- Broad understanding and initial investigation of these options in order to carry out further analysis.
- Identification of the most comprehensive and preferred development option that can be considered for further analysis and evaluation.

This is found to be very crucial and an important step in ensuring that the initial screening process is effective and that the most relevant options for the sustainable development were considered for further evaluation. [3] At first, the organization needs to understand the relevance of its business with sustainability, or in other words, organizations should be able to understand how sustainability can be incorporated into its systems. This understanding should then be reflected in the vision and scope of organization.

B. Strategy Evaluation

This step defines the evaluation criteria relevant to the particular project based on the expected outcomes and project objectives set in the above step. Following aspects are considered during this stage:

- Establishing the evaluation criteria
- Selection and exclusion rationale for the various elements and strategies based on other drivers, as applicable for the project.
- Detailed analysis of the preferred option and its various components /sustainable strategies based on the evaluation criteria.
- Economic analysis and financial viability of the various strategies.

This stage ensures that the expected major outcomes from the selected strategies are specific, measurable, and realistic and can be achieved in a timely manner.

The step involves assessing the applicability of the various sustainable strategies and options identified in the previous step, based on the following key evaluation criteria established for the project as discussed above:

- a) Project objectives realization
- b) Technology & Benefits
- c) Implementation areas & impact analysis
- d) Constraints & Issues
- e) Risk analysis & Management
- f) Critical success factors
- g) Operations and Maintenance
- h) Economic/cost analysis & financial viability

Instead of only relying on the conventional risk and return oriented decision making process, this framework applies multi-dimensional optimizations to various criteria [4]. The integration of corporate sustainability as proposed by Peylo [5] with a three-dimensional optimization framework controlling the project return and risk together with portfolio sustainability in an integrated approach is applied in this framework.

C. Sensitivity Analysis

Investigation of the impact of changes in the various project drivers/ variables on the most probable outcomes for each sustainable strategy. Typically, only adverse changes are considered in sensitivity analysis. The purpose of sensitivity analysis was to:

- Identify the key variables, which influence the project cost and benefit streams and critical success factors affecting the outcomes of the strategies and options.
- Investigate the consequences of likely adverse changes in these key variables.
- Consider key project uncertainties when assessing the options for technical viability.

It helps in providing a clear understanding to assess whether strategies are likely to be affected by such changes and to identify actions that could mitigate possible adverse effects on the project.

D. Results

Based on the analysis, the preferred concept alternatives and sustainable strategies are reviewed and selected with the decision-making team/ stakeholders of the project. This review is based on the results of the evaluation process for the most feasible and attractive concept alternatives with maximum sustainability benefits and the additional insights achieved through the Sensitivity Analysis.

V. CONCLUSION

Various methodologies adopted to construct composite sustainability Index for the project describes a framework including several steps, among which identification and selection of criteria and sustainable indicators is the first and vital step in this process. [6].

Thus, the structured framework derived for the selection approach and the evaluation of sustainable strategies

discussed in this paper shall provide a sound basis to initiate the first step. It has been developed to provide the technical analyst teams and decision makers with a supporting tool that will assist them with the review and decision-making process for the sustainable strategies implementation in the project.

Furthermore, the structured framework for the selection approach outlines a three -fold advantage:

1. Provides a number of key questions that will highlight the following:
 - Strategic fit of the various sustainable strategies,
 - Level of understanding of related sustainable strategies and drivers,
 - Identification of the probable Risks and Issues and their respective mitigation and resolution,
 - Quality of the outcomes from the various strategies and their deliverables for the project,
2. Provides a 'Checklist' of the key items to consider when conducting the Assessment Review to provide the technical analyst team and decision makers with a supporting tool that will assist them with the review and decision-making process.
3. Provides an understanding of the sustainable strategies that are low bearing fruits, which can be included in the project regardless of cost with maximum benefits.

Thus, the Selection approach and methodology is critical in determining various sustainable strategies, which are viable for the project in order to prioritize their incorporation in the projects and ensure resources are allocated appropriately.

REFERENCES

- [1] B. Moldan, S. Janouškova, and T. Hak, "How to understand and measure environmental sustainability: Indicators and targets," *Ecol. Indic.*, 2012.
- [2] Eiburs Program 2014, "Ascimer, assessing smart city initiatives for the mediterranean region," *The World Bank, Cities & Climate Change- An Urgent Agenda*, vol. 10, December 2010.
- [3] W. Nawaz and K. Muammer, "Review of existing approaches to manage sustainability and moving towards a sustainability management system framework," in *Proc. of the 5th ICSD*, Rome, Italy.
- [4] B. T. Peylo and S. Schaltegger, "An equation with many variables: Unhiding the relationship between sustainability and investment performance," *J. Sustain. Financ. Invest.*, 2014.
- [5] B. T. Peylo, "A Synthesis of modern portfolio theory and sustainable investment," *J. Investig.*, 2012.
- [6] M. Nardo, M. Saisana, A. Saltelli, S. Tarantola, A. Hoffman, and E. Giovannini, *Handbook on Constructing Composite Indicators: Methodology and User Guide; Organisation for Economic Co-operation and Development (OECD)*, Paris, France, 2008.



A. Khalil holds a master's degree from Ain Shams University of Egypt, Cairo, Egypt in Civil Engineering (Structure).

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Mr. Ahmed Khalil's contributions include participation in the company's various committees, task forces for special projects and assignments such as the Ahmadi Gas project task force that successfully mitigated the gas emissions in the township of Ahmadi, rebuilding Ahmadi township steering committee and technical task force; and many other investigation

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