Microgrid Sustainability - A New Business Model for Oman

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ABSTRACT

The role expectations from the "for profit-oriented" business organizations in society have changed from simple Corporate Social Responsibility (CSR) initiatives to being part of sustainable development goals of the society. Businesses with only economic viability focus will be the institutions of the past. The term Sustainability that incorporates the discussion into the capacity of the Human Civilization to co-exist with the Earth's Biosphere will be the only future. The United Nations, by consensus, of all the 193-member countries has given performance targets for fulfillment of the Sustainability Development Goals (SDG's). The sustainability components of a business model have thus become a functional requirement for the stakeholders to consider a business opportunity to be successful. The question here is, Can the business opportunity identification move from the paradigms of cost-benefit analysis of new ideas to the very "raison-de-etre`" of the businesses to contribute to the society? The exploratory framework of various stakeholders starts with defining the interaction between business opportunity environments. The case of Micro-Grids as a sustainability Business Model serves as a relevant discussion point for similar instances for decision-makers. This paper proposes a new Sustainable Development model under the UN SDG framework in the context of Smart microgrid for the country of Sultanate of Oman.

1. INTRODUCTION

The concept of sustainable development has been evolving as a well-defined concept in the last thirty years. In the context of climate change and the other mitigation issues especially in the energy sector, the concept is being set as the highest priority. The governmental and intergovernmental support systems play a vital role currently in introducing the concept of sustainability in all business transactions. The evolution of the new terminology and identification as a business model must be considered as a challenging term. One of the key aspects to addressing the global sustainable issues in the energy sector is the permeation of the smart microgrid through the renewable energy penetration for which there is wide scope of various business models. The same can be utilized in building up the national policies for the national and international regulatory institutions to achieve the global sustainability energy targets. On a broader perspective, the current study is aimed at throwing some light on the following.

- The formulation of various business opportunities identification exercise that maps the traditional dependence on the environmental impact on businesses link paradigm to the evolving requirement of institutions to contribute to the national and international agendas of sustainable development.
- To identify the various challenges of decision makers and planners in a broader context as actors in the energy sustainability ecosystem leading the smart microgrid architecture for enhancing the renewable energy penetration limits, that is one the key area of the energy sustainability.
- To limit the practicability and viability of the decision makers, "the businesspeople" about the role of the new evolving business models that take in to account the sustainability factors

2. LITERATURE REVIEWS

Mc Neill et. al. had pointed out how after, the *World Commission on Environment and Development, WCED's* tabling of the Brundtland Report by the special commission, the term "Sustainable Development" has become not just an

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academic pursuit of meaning but taken up by the policymakers and hence was put on the political agenda of nations [1]. The word "Sustainable" as per the dictionary just means "capable of lasting over time" has now came into the purview of usage of resources that would be available for the future generations as well [2-4]. The key framework pertaining to the scope of the papers is illustrated as four points given below.

2.1 Resources and Sustainability

Resources under the context of an economic perspective have long been seen by the stakeholders as a depletable resource. ("*A resource, the stock of which decreases whenever the resource is being used and does not increase over the timescale* relevant *for economic decision-making as per Oxford Dictionary of Economics*"). The mathematical modelling of the same for that "golden mean" or the ideal production rate of exploitation of the resources has been there since the publication of article "The Economics of Exhaustible Resources", [5] in 1930's. Only that, the perspective of such discussions has had the focus on better control regimes for the usage of the resources only. This has further given more impetus to the "Economic Policy" dimensions and hence the necessary roles of various regulatory bodies.

2.2 Resources and Economic Policies

The regulatory bodies' focus has been for a long period on financial recouping only, that the economic activity can support after the estimated process of viable exploitation of the resources. This has evolved however due to drastic dynamic changes around the environments of the decision-makers and all other actors. Hence the concept of the natural ecosystem's evolution and its impact on an interconnected system as model is the focus. This is available directly in the last thirty or so years with inter-governmental bodies taking a leading role beyond local environments but with impact on the local the environment.

2.3 The Economics and the Ecosystem

It is common knowledge that for any ecosystem to completely evolve as a vibrant one with the required checks and balances, the role of all the actors is crucial. The actors in this case of translating the "concept" namely sustainable development in to "action" are in play not just by the involvement of some private members or a selected few but by the evolving & keen role of many more stakeholders that set in to motion, the discussion and subsequent actions in a large scale by the United Nations General Assembly resolution 38/161 of 19 December 1983 that welcomed the setting up of Special Commission on the subject. The Special Commission by name the "World Commission on Environment and Development's" (WCED) main objective being adoption of prime materials for the practice to face the environmental challenges of the year 2000 and beyond [6].

2.4 Economics and Systems Thinking

The "Systems Thinking" a key foundation of the influential "Learning Organizations" models and related to a clearer understanding of an ecosystem propounded by Peter Senge [7], spoke about the individual being a main part of the change and effective practice of it too. In the book "Presence" Senge et al.,2004 [8] have highlighted the individuals' growing awareness towards the dire requirements of living a sustainable lifestyle. The Individual is a key factor in the process hence is worth the look when it comes to the identification and nurturing a business opportunity that is sustainable at the core of its very existence.

2.5 The Business Opportunities Meta-Analysis Review

One of the best Business Opportunities identification meta-analyses that would help us in this discussion about the business opportunity identification exercise is by Filser et al., 2020 [9] about the clustering of the approaches of the Business Opportunity Identification. This study has broadly thematized the business opportunity identification literature into three major clusters namely:

- Economic Theories of Entrepreneurship (The traditional theories dominance from management thinkers from Schumpeter to Peter Drucker).
- Role of Opportunities in the entrepreneurial process (The process of the opportunity recognition as different approaches like one, the opportunity presenting itself or another creation of such an opportunity by the individual himself.)
- Antecedents of Opportunity Recognition
  - Individual Antecedents (Prior knowledge, Experience, Cognitive processes, Personality traits, Genetics)
  - Social Antecedents
  - Hybrid.

The challenges for a practitioner in the Business Opportunity Identification process in the traditional context has had the focus on the presentation of the opportunity as the need of the eco-system and in that context the environment perspective has traditionally been from a regulatory perspective and never moved as yet in to the "raison-de-etre" of a business idea. The need recognition question of a practitioner or entrepreneur-decision maker could be more under a theme of an antecedent of the opportunity and specifically on a hybrid category of the above theme.

From a "Phenomenon" perspective of such an opportunity presenting itself for a practitioner-decision-maker entrepreneur, it is valid to be looking at a specific environment in the manufacturing sector of "green-manufacturing" in Micro-Grid implementation as the case of implementation. George et al., 2018 [10] have identified

"Digitalization, electrification and automation" as important milestones for the implementation of the "Phenomenon" of Green Energy consciousness among entrepreneur-decision-makers to take the green path to sustainability models in the business eco-system beyond the cost-benefit economic models.

Hence for an entrepreneur-decision-maker to consider an opportunity identification (OI), Josmael et al., 2020 [11] have opined the requirement of a dialogue between different areas of knowledge, whether it be to develop new offerings (Products, services, experiences) or a new business model or a combination of both.

2.6 The Novel or New Business Model framework:

What is a new or novel business model? This question has been under discussion since the Schumpeter's theory of innovation of 1912, and a dominant theory in the field of innovation that set the stage for further developments in the field of innovation [12].

The five themes of innovation as given by the summing up of a Schumpeterian Innovation framework for an entrepreneur is that:

- He takes risks and reaps profits
- He turns technology and ideas into innovations in the market
- He enables new combinations
- He faces uncertainty about current choices in relation to future outcomes
- He creates opportunities by both driving and adapting to change in the external environment [13].

The role of small businesses in evolving on each of the above dimensions is a cycle of perpetuity as hypothesized by the leading theorist, and the path of "creative destruction" in spite of the dominant large businesses in the economy. When the old components of an economy are abandoned and replaced giving way to a new order then there is a widespread diffusion of the invention that is adapted as an innovation [14-15]. The following case of microgrid is a leading case study in that direction.

2.7 The Case of Micro-Grids as Omani Business

What is in it for an entrepreneur for considering the business opportunity? Are there some businesses opportunities that are already there that can be capitalized upon are questions that are there for every entrepreneur who keeps scouting for opportunities?

The Micro-Grid is one area that can give this opportunity for both existing and new businesses and the potential for just this one business environmental change will see more business opportunities worth pursuing.

Applying the anatomy of the opportunity hypothesis that is proposed for the adaptation by the entrepreneur for analyzing the opportunity, the following conceptual model could explain the scenario:

- Who cares? the community and the ecosystem has started caring for the same and this has been included in the plans & the vision has been declared for the adaptation by all the stakeholders-
  - The next stage of the evolution will be the public-private partnership that can evolve as a base for an industry with all its groups of suppliers-manufacturers and allied service partners.
- Why they care? Needs addressing, the evidence of Pain, The Evidence of Accommodation, The Evidence of possible benefits.
  - The requirements of nations to be competitively capable of delivering results according to global parameters set by inter-government agencies.
- Related Evidence: The solutions, the current activity, the future potential, and the technologies.
  - It is in this context that the Micro-grid as a business solution model & the opportunities it provides for a green sustainable future is worth pursuing by an entrepreneur-decision-maker.

2.8 Future expansion plan for RE in Oman

The Sultanate of Oman has committed to net zero carbon emissions by 2050. The government is looking for expansion of its electricity generation capacities through renewable based independent power projects (IPP). The government has plans to derive at least 30 % of electricity from renewables by 2030, mainly through onshore wind and solar projects. State-owned Petroleum Development Oman (PDO) which aims to slash its emissions to 50 % of 2019 levels by 2030, is an early pioneer in large-scale solar power projects in Oman. Commercial operations of Oman's largest utility-scale solar photovoltaic, independent power project, Ibri 2, started in January 2022. Oman has embarked on several other projects in line with targets for 2030, including a wind farm in Dhofar, a solar IPP in Manah, and the initiative to install small-scale solar panels on residential and commercial buildings are also under consideration [16],[17].

3. METHODOLOGY

This study employed systematic reviews of published secondary data that were in line with the key words that the of the research objectives (Viz)

1. Business Opportunity Identification for businesses ideas that will have an environmental impact and sustainable development.

2. Challenges of decision makers and planners in the energy sustainability ecosystem with specific focus on smart microgrid as energy sustainability pathway.

3. Novel and evolving business models business models that take in to account the sustainability factors

The inclusion and exclusion criteria for the key descriptions of the secondary data were as in Table 1.

Table 1. Inclusion and Exclusion Criteria for the Selection of Socially Responsible and Sustainable Business Models

Inclusion Criteria	Exclusion Criteria
Business Opportunities: To include data about socially responsible businesses	Generic Business Ideas
Challenges of decision-makers: To ensure adherence to socially responsible frameworks and models	General Challenges and obstacles of business owners
Novel Business Models: Business models that a novel and cover the sustainability dimensions	All business models

The accessed research was then thematized. The generic themes that were classified according to the most common occurrences as keywords are as presented in Fig 1. Below as the sustainability literature, the Business Opportunity literature, and the economic policies literature frameworks of the national and international governmental regulators. A preliminary meta-analysis on the Sustainability Development Goals was carried out to map them against the relevant Oman vision 2040 goals, presented as results in the Table 2.

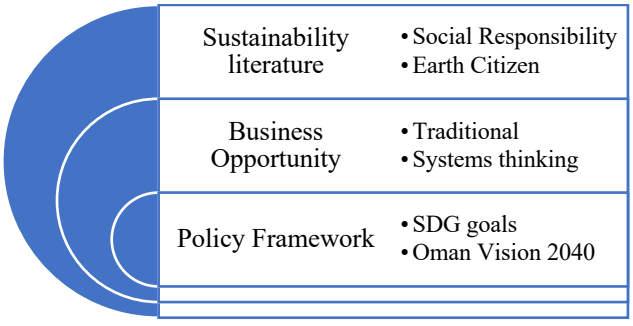

Fig. 1. Pictorial Representation of some of the literature groups that were depended on for the study.

4. RESULTS AND DISCUSSION:

The synthesis of the literature on a sustainable future in line with the policy framework of the Vision 2040 was preliminarily mapped against the overall generic business opportunity frameworks (Table 1. An Exploratory map of the PEST - the business opportunities themes for the thesis development.) Each of the suggested business opportunity's main propositions may further be looked at using the conceptual model in the figure below (figure 2. is showing the adaptation of "the Anatomy of an Opportunity Hypothesis" tool of Inovo group LLC.).

Fig. 1. An Adaptation of "The Anatomy of an Opportunity Hypothesis" tool of Inovo Group LLC.

4.1 The Scouting for Opportunities

The business opportunity identification done as a systematic "scouting" for opportunities by the decision maker or an entrepreneur is relevant and easy in a highly networked scenario that has routine tasks of a traditional approach of the environment scanning (Political, Economic, Socio-cultural and Techno-legal- PESTL analysis) but the same is not true for the newly evolved paradigm of a networked but co-evolving business opportunity scenario.

Table 2. An Exploratory map of the PESTL - the business opportunities themes for the thesis development

S No.	Relevant SDG Goal	National Priorities-closest priority	Business Opportunities-Themes
1	No Poverty	SDG4- Education, Learning, Scientific Research and National Talents	Job opportunities in newer sectors for the trained
2	Zero Hunger	SDG3-Health	Medical care and support- training and workforce development
3	Good Health and Well-Being	Citizenship, Identity, National Heritage, and Culture	Protection and preservation of national heritage sites and ecosystems and employments based on the same.
4	Quality Education	SDG3,8,9Welfare and Social Protection	Capacity building by consolidation and expansion of education frameworks.
5	Gender	SDG8,9Economic	Opportunities for all.

	Equality	Leadership and Management	
6	Clean Water and Sanitation	SDG8,9Economic Diversification and Fiscal Sustainability	Technology for clean water and sanitation - recycling-focus.
7	Affordable and Clean Energy	SDG8,9Labor Market and Employment	The research focus and encouragement on alternate energy sources of energy
8	Decent Work and Economic Growth	SDG8,9The Private Sector, Investment, and International Cooperation	The diversification plans into other sectors
9	Industry Innovation and Infrastructure	SDG11Sustainable Development in Governorates and Cities	The support to the National Innovation Framework
10	Reduced inequalities	SDG7Natural Resources and Environmental Sustainability	Opportunities for all.
11	Sustainable cities and communities	SDG10Legislative, Judicial and Audit System	From compliance to partnership (PPP)
12	Responsible Consumption and Production	SDG17Partnership and Integration of Roles	Research on food waste as an example
13	Climate Action	SDG10, SDG16Governance of the Administrative Apparatus, Resources and Projects	Raised awareness – national days for specific action on international commemoration
14	Life Below Water	SDG7Natural Resources and Environmental Sustainability	Protection and preservation of national heritage sites and ecosystems and employments based on the same.
15	Life On Land	SDG7Natural Resources and Environmental Sustainability	Opportunities for all.
16	Peace Justice and Strong Institutions	SDG17Partnership and Integration of Roles	From compliance to partnership (PPP)
17	Partnership for the goals	SDG10Legislative, Judicial and Audit System	From compliance to partnership (PPP)

4.2 The Alignment with the Policy Frameworks

The suggested themes that roll out of the policy frameworks of both the SDG Goals and the Oman Vision2040 document can become the starting point for the hypotheses development of sustainable opportunities. Summarily, the case of Micro-Grids suggested here can serve as the foundation for the fulfillment of one focus area of the building of a strong Public-Private-Partnership (PPP) throughout the different stages right from conceptualization to final implementation and commercialization as in Table 3.

Table 3. Inclusion and Exclusion Criteria for Business Opportunities, Decision-Making Challenges, and Novel Business Models

SDG10	Legislative, Judicial and Audit System	PPP (Public Private Partnership)
SDG7	Natural Resources and Environmental Sustainability	
SDG17	Partnership and Integration of Roles	
SDG10	Legislative, Judicial and Audit System	

5. CONCLUSION

The entrepreneur or the decision-maker needs to look for clear segments and the “creation of value” inside the map of the following:

- People-to focus on the fulfilling of the Basic Human rights,
- Policy- that requires collaboration among policymakers for a fair and equitable global society,
- Planet- an acceptable state of the planet and its natural resources & environment, and not to ignore the prime
- Human Condition, that includes the societal and health issues” and this is the prime takeaway for us from the pandemic that has made some institutions irrelevant and other far more inevitable.

This could be the starting point for a “Sustainable Future” and even a “Sustainable Century” since the events and opportunities have created for us an understanding of what could be the future. As far the learning archetypes go and the discussion about it, if we are talking about a single loop learning or a double loop learning for an effective decision, it is very clear that the need for looking at the “intuitive self”, mentioned in the model that has both relevance and currency to the current scenario [18]. The Economics, the environmental economics, the health and nutrition of individuals and the institutional and cultural bases, each of which to be regarded as a type of “Capital” as explained in

[19-22] is a framework for the decision-makers looking for opportunities in the environment.

The Voluntary National Review of 2019 highlighted the national achievements of focus on the diversification of the economy which by itself is a "Sustainable Business Opportunity".

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