

SUSTAINABILITY INDICATORS – AN OVERVIEW

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ABSTRACT

Sustainability indicators deliver a practical technique to supervise the advancement concerning sustainable development. Nevertheless, while there exist numerous frameworks, scopes, approaches, frequencies, stages propositioned to develop indicators, the best scheme to collect data is a very crucial decision. The purpose of this paper is to analyse the literature on development and application of sustainability indicators.

INTRODUCTION:

THE GENESIS OF SUSTAINABILITY

Pollution flourishes where industries exist. Pollution regulating strategies can be largely classified as preventive and reactive strategies. Steps applied once the waste is generated or post the contamination of the receiving environment are called Reactive strategy. Steps taken to avoid pollution are Preventive Strategy. This involves prevention & reduction, recycling and re-use, treatment, disposal.

Preventive environmental management tools may be divided as

- Management based tools – Environmental management systems, Environmental audits, law and policy
- Process based tools – Best operating practice, Cleaner technology, waste minimization
- Product based tools – Eco-labelling, Life cycle assessment (LCA)

Tools for Preventive environmental management can also be chalked around the below:

- Tools for assessment and analysis – Risk assessment, Life cycle assessment, Total cost assessment, environmental audit / statement, Environmental benchmarking, environmental indicators
- Tools for action – Environmental policy, Market based economic instruments, Innovative funding mechanism, EMS and ISO certification, Eco-efficiency, Industrial ecosystem or

metabolism, Voluntary agreements, Total environmental quality movement, Eco-labelling, Cleaner production / technologies.

- Tools for communication – State of environment, Corporate environmental reporting

INDICATORS:

Indicators are an operative and applicable way of casing and communicating performance information to relevant focused user groups. They summarize large, complex sets of performance related data into manageable quantitative or qualitative form. Indicators are needed to communicate to internal and external stakeholders, define milestones along the route to their achievements, to develop strategic targets, report the progress clearly and efficiently. The role of indicators is twofold in the management of the issue and report progress. Therefore, indicators need to be established in such a way that they produce information on which future action can be based. Typically, two types of indicators are necessary, one which is project or site specific which is for the management of issue and two is a standardized one for reporting progress.

An indicator is not the equivalent of an indication, which is largely not measureable, but just an unclear evidence. Indicators are all numeric measurements and are assessable and quantifiable. Effective indicators have four fundamental features. Indicators need to be relevant, understandable, reliable and accessible timely. Indicators can be beneficial as proxies or substitutes for measuring conditions that are so complex that there is no direct measurement. If the indicators are designed correctly, measurement can provide information on the capacity of the system to deliver performance, facilitate intervention to change key system parameters, to improve the delivery performance. Indicators can support in concrete assessment, management, monitoring of impacts, for meeting sustainable performance goals and for reporting of performance.

The sustainability framework has three pillars in the most basic form. They are social, economy and environment. While the three pillars are to be measured for the sustainability measurement, the environment sustainability is the one in focus due to the fast rate of worsening of the environment. The dictionary of environment and sustainability development defines as indicator as a substance or organism used as a measure of air or water quality or biological or ecological well-being.

One of the early definitions for Sustainability are in 1987 by the UN Brundtland Commission that defines sustainable development as meeting the needs of the present without compromising the ability of future generations to meet their own needs.

The Organization for economic co-operation and development (OECD) defines sustainability indicators as a statistical measure that gives an indication on the sustainability of social, environmental and economic development.

Sustainability indicators are important for communicating complicated data in simple means and context. They serve to summarize large or complex sets of performance related data in a manageable quantitative and qualitative form. The sustainability indicators can have many criteria, but none of the criteria are absolute, and at times a less desirable indicator may be selected when there are no reliable data sources for a better indicator. However, it is important for companies to view sustainability in a long-term concept. Sustainability indicators indicate the company's vision of the future. Before spending time in gathering and reporting data for an indicator, the indicator should be compared with the company's vision of sustainability to make sure that it is pointing in the right direction.

EFFECTIVE SUSTAINABILITY INDICATORS:

The effective environmental sustainability indicators are characterized as the ones which address the carrying capacity of the natural resources both the renewable and the nonrenewable. They should also concentrate on the carrying capacity of the ecosystem services upon which the company relies, whether local, global or from import sources. These indicators furnish a long term view of the company. The most important features of these indicators are that they are understandable and useable by the intended audience.

Balancing many different needs within a company is necessary to develop a set of sustainable indicators within that company. The appropriate number of indicators depend on many factors including the type of audience the indicator report shall cater to, the number of issues involved and any specific needs of the company. If the indicators are to be used by different departments within large organizations, 80-100 indicators should be adequate. If the indicators are to be used to update the public, a smaller number of 10 to 20 would make more sense. The ones which are used to update the public can be picked by evaluating the checklist and picking the highest scores. It is also necessary that the final set of indicators cover all the issues that are important to the company. Organizing or ranking the indicators in one of the many ways by which one can help a company evaluate the effectiveness of the entire set of indicators.

ORGANIZING SUSTAINABILITY INDICATORS:

There are many systems / frameworks available for organizing sustainability indicators. These can be listed as below:

- Category or issue lists – Category lists are simple and easy to understand. The indicator focusses to exemplify all the aspects of the company.
- Goal Indicator matrix – This matrix shows whether all the issues or goals are equally addressed. Depicts the relationship between each indicator, the issue and the set of company goals.
- Driving force-state-response tables – The connections between human activities and environmental states is shown by the Driving Force-State-Response framework. This indicator balances the measures of causes or driving forces, measures of the results and measures of programs and other human activities designed to alter the causes with the goal of refining the state of the industry /company. A secondary level of analysis mainly for use by decision-makers is also provided.

- Endowments, liabilities, current results and processes – These indicators are useful to check for an equilibrium among measures of what is being left for the future, what we have now and what is happening to create both situations. The endowments framework may depict the longer term aspects of sustainability. The most important piece about the framework is that it should work well for the envisioned purpose.

Environmental Indicators		
Traditional Indicators	Sustainability Indicators	Emphasis of Sustainability Indicators
Pollution in air and water (Ambient levels)	Use and generation of toxic materials both in production and by end user (Vehicle miles traveled)	Measuring activities causing pollution
solid waste generated (weight in tons)	Percent of products produced that are durable, repairable, or readily recyclable or compostable	Conservative and cyclical use of materials
Cost of fuel	Total energy used from all sources : Ratio of renewable energy used at renewable rate compared to nonrenewable energy	Use of resources at sustainable rate

The measurement of sustainable development is not without considerable difficulties, yet this should not detract from the positive advances that can be made in the direction. [1].

Sustainability indicators are composite index that are increasingly recognized as a useful tool for policy making and public communication in conveying information on countries and corporate performance in fields such as environment, economy, society or technological improvement. By visualizing phenomena and highlighting trends, sustainability indicators simplify, quantify, analyses and communicate otherwise complex and complicated information.

There are a number of initiatives that are working on indicators and frameworks for sustainable development policy practice. The sustainability indices are formulated with strategy, scaling, normalization, weighting and aggregation methodologies. [2]

For the wider understanding of sustainability and with an environmental focus, the categorization of sustainability assessment tools is done. A framework based on three main categories: indicators / indices, product-related assessment and integrated assessment tools. Besides this, the overarching category of monetary valuation tools can be used as a part in the three categories. The tools are also divided by their 3 dimensional focus and the level of nature-society system integration.[3]

A holistic approach for measuring progress towards sustainable development is rendered by the development and application of sustainability indicators through integration of two different paradigms namely expert-led, top down and community based, bottom up. This emphasizes the significance of participatory approaches, setting the context for sustainability assessment at local scales, but stresses the role of expert-led methods in indicators evaluation and dissemination. This process can be used to develop quantitative and qualitative indicators that are both scientifically rigorous and objective, while remaining easy to collect and interpret for communities. [4]

In the process of identification of suitable indicators, the important question is as to who identifies the indicators and on what basis. It is useful to identify two sets of indicators. The first one can be those identified by external experts, such as the project researchers and the other can be those internally identified by the different stakeholders in the system themselves. The latter group can include farmers, households, communities and local agencies, NGOs. When considering this division between the role of external researchers and local community members, it is worth noting that there is also a separation here between issues and indicators. A key issue in the success or otherwise of a system may be agreed upon by both researchers and community members. However, the indicator which each group uses to monitor the issue may differ. Alternatively, it may be the case that the key criteria on which the success or failure of the system is judged differs between researchers and community members, and hence in both cases the key issues identified are likely to be different.

Sustainability indicator sets are increasingly being discussed on the policy level as fruitful contributions to the improvement of political decision-making and to the implementation of programs oriented towards the achievement of strategic goals of sustainable development. The vast number of different indicator type tools, their varying contexts of use and their different objectives indicate that there is no simple answer to what sustainable indicator type tools should look like or could be used for. To focus and understand the production of social meaning and processes of social interaction within political-administrative systems, firstly, there is a need to identify the development, purpose and use of sustainability indicator sets, which depend on the different interests of policy actors, their relationships and existing governance structures. Secondly, one should recognize any reasons for the ineffective use of indicator sets where the goals of sustainability are concerned. The approach of interactive research understood as a research process, in which researchers and practitioners develop knowledge for solving problems in a communicative, reflexive and collaborative way, facilitates better understanding [5]

Different sustainability indicators cannot be directly compared since they lack common ground. This suggests that there is a need to develop simple local quantitative indicators in addition to the more commonly used qualitative indicators. A method outlined for the development of quantitative physical indicators as a part of an integrated approach to a more sustainable urban environment is ideal. [6]

Sustainability indices for countries provide a one-dimensional metric to evaluate country-specific information on the three dimensions of sustainable development: economic,

environmental and social conditions. At the policy level, they suggest an unambiguous yardstick against which a country's development can be measured and even a cross-country comparison can be performed. The power of various sustainability indices applied in policy practice shall also depict the strength of the indicators, if the policy makers consider them thoroughly. [7]

Conceptions of defining and measuring sustainable development can broadly be placed in two categories: weak and strong. The concept of weak sustainability is based on neo-classical economic theory and assumes that manufactured and natural capital are close substitutes. This means that the costs of environmental deterioration (forest damage) can be compensated by benefits from manufacture capital (income). Thus, environmental damages are valued in monetary units. The concepts of strong sustainability deny the degree of substitution that weak sustainability assumes, at least for some critical elements of natural capital. The usage of strong sustainability indicators, especially for critical loads and critical levels may definitely be needed. Since the costs and benefits of avoiding critical impacts have to be taken into account, a combination of strong and weak sustainability indicators, means a linkage of ecological (physical) and economic (monetary) approaches may help to work out a fine balance. [8]

The economic and financial crisis of recent times across the globe has helped to newly define economic sustainability. It has brought into focus the economic pillar and cast a question mark over the sustainability of development based on economic progress. This means it is necessary to fully address the economic issues on their own merits with no apparent connection to the environmental aspects. Environmental sustainability is correctly defined by focusing on its bio geophysical aspects, meaning maintaining or improving the integrity of the Earth's life supporting systems. The concept of sustainable development and its three pillars have evolved from a rather vague and mostly qualitative notion to more precise specifications defined many times over in quantitative terms. Hence the need for a wide array of indicators is very clear across the three pillars of sustainability. [9]

On the methods of interpretation of indicators, setting targets and then measuring the distance to a target to get the appropriate information on the current state or trend is one of the right directions of tracking progress. [9]

The notion of Environmental Space is rather an innovation concept in the sustainability indicators field and it refers to external criteria regarding resources available for human consumption. On one hand, it is a fact that the reduction of energy consumption, material flows and land use would significantly contribute to reducing the main stresses while on the other hand, the concept defines a socially motivated minimum of resources availability, permitting to lead a dignified life in the respective society. Environmental space is a tool for exploring sustainable development benchmarks on a sound scientific basis and it is helpful to derive indicators of sustainable development for different applications on the macro as well as on the micro level. However, the environmental space concept expresses no preference regarding the structure of the economic system, as long as the environmental and social benchmarks are respected, nor does it suggest specific economic sustainability indicators.

The introduction of the institutional dimension as the fourth dimension of sustainable development, can be described as one of the new developments in this field.

Using the Prism of Sustainability, the concept, although rather complex, can easily be communicated and used as a tool for gathering public support for sustainability policies. The prism simplifies matters by structuring them, but avoids the oversimplification inherent to aggregate indices.

At the macro level, the environmental space and the prism of sustainability have been applied to international, regional and national indicator development. At the micro level, systems of indicators for households, companies and local communities have been developed. [10]

Urban population has been snowballing and it is quoted to reach 70% of the total population in the world by 2050. Governments are facing larger tasks every time in providing inhabitants with a good quality of life in their cities. Many cities around the world have developed sustainable urban development plans for leading their urbanization process towards a desired status of urban sustainability. Urban sustainability indicators have been selected as main elements for communicating the status of the practice, which help to determine how successful strategies and policies imposed have been in the attainment of sustainability goals. Different practices use different indicators according to their particular needs, and these have been selected under different methods. However, whilst there are circumstances where urban sustainability indicators are effectively in use, the experiences added from each practice have not been combined and used for the development of new urban development plans and for improving the decision-making process in the selection of indicators. [11]

CONCLUSIONS:

Sustainability indicators are varied for varied industries, geographies and scale of industry. The need for a wide array of indicators across the three pillars of sustainability is seen as a need as against summing them up for the ease of understanding, working and communication. The introduction of the institutional dimension as the fourth dimension of sustainable development over and above the 3 basic pillars of social, economy and environment is definitely progressive.

Sustainability indicators cannot be compared directly as they are qualitative and local quantitative indicators with some qualitative indicators is an integrated approach. The importance of participatory approach with a fine blend of expert-led, top down and community based, bottom up for indicator evaluation is seen as a key to decide the sustainability development methodology. While the strong indicators are needed to be focused upon, a combination of strong and weak sustainability indicators, means a linkage of ecological(physical) and economic (monetary) approaches is seen to be striking the right results.

Environmental Space and the prism of sustainability are rather complex yet an innovative concept in the sustainability indicators field. Urban sustainability indicators are used by governments for major cities for attainment of sustainability goals and for communications. In the analysis of literature on sustainability indicators, it is apparent that various approaches and methodologies exist and most of them stand their ground in terms of being pertinent and valuable.

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