

A Natural Resource Management Framework for Sustainable Development

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Abstract

Natural resources in the form of oil, gas, minerals and forests are an asset in the countries where they are found. A number of countries depend largely on exports of their natural resources, earning major portion of their foreign exchange from these exports. It is very easy for the countries to exhaust their natural resources by over utilization of these resources. Policy makers may overlook sustainability aspect of the natural assets and resultantly, design policies to obtain short term gains while ignoring long term implications. Another problem faced by countries depending heavily on export of natural resources is that their revenue generation capacities from service sector or export of other items is overlooked in policy decisions.

The paper presents a framework that may be used by policymakers for visualizing country's natural resources as assets and developing policies for gaining maximum economic benefits from these assets, but at the same time, taking care that these assets are developed and preserved for the next generations. The paper suggests that the countries should view natural resources as critical asset and secondly, asset specific strategies should be formed for their development. It is emphasized that these asset specific strategies should be designed in such a manner as they do not work against one another and are aligned with the overall economic plan of the country.

Keywords: natural resources, natural resource management framework, sustainable development.

1. Introduction

Importance of Natural Resource Management (NRM) for the survival of societies is not new, Barrera-Bassols et, al. (2005) write about the natural resource management practices of Yucatec Maya society during the period 250 – 900 A.D; and establish that Mayan society was well aware of the importance of natural resources and was successfully managing the natural resources for its growth. The Mayas were particularly careful in managing their agriculture and water resources.

The role of NRM in national strategic planning is gaining importance and government policy makers are exploring new ways to improve their planning processes (Bruyninckx, 2004). This has been possible due to the efforts of international bodies like United

Nations highlighting the threat posed to world food production by desertification and soil degradation. Dubale (2001) in discussing Agro-Ecosystems has pointed out that the soil and water resources of Ethiopia are degrading due to the action of human population. The population has tripled in last 50 years and has during this time caused deforestation by overgrazing. Droughts have made the situation worst, and as a result of this, Ethiopia had to face cycles of famines. Dubale gives three types of land degrading taking place and reducing productivity. These are biological, chemical and physical degradation of soil.

Breman and Debrah (2003) have also urged critical importance of food security and production in Africa, bringing to focus that the food production is not keeping pace with population growth of the region, resulting in a very low level of food production per capita. The political and socioeconomic environment in Africa is further worsening the situation and as a result, the living condition of the inhabitants is also deteriorating. They further discuss the need for combining technology with enabling environment for the farmers and suggest integrating economic feasibility in farming sector, in order to improve the situation. The natural resource policy should not be planned in isolation, as it is related and has a direct impact on development policy of the country. Lodhi and Munir (2007) have argued that a major reason behind policy failures in developing countries is the weakness in policy development process in these countries. The policy makers do not adopt a balance approach and focus on one or two perspectives resultantly; policies are developed with a very narrow strategic vision.

Many researchers advocate for the public right on Natural Resources and argue that the efficient use of a country's natural resources is important for its sustainable development. Solow (1999) explains that natural resources are an asset for a country and belong to its people. Therefore, the financial benefits obtained from the use of its natural resources should be re-invested in its people. This reinvestment can be in the form of educational programs, health care or development of infrastructure like electricity, water, sewage etc. In this way opportunities can be preserved for the future generations.

1.1 The Need for Natural Resource Management

The argument that many countries have vast natural resources that can be used for economic advantage would not be difficult to support with data. Oil rich Arabian Peninsula is an example, where countries have built their economies on oil extraction. Almost all countries have one or other natural resource gift given to it by nature, and if an estimate of its economic value is made, it would be seen that natural assets have a great economic value for these countries. It would, therefore, be rational to manage these assets and gain maximum value from them.

The globalization and its consequences which resulted in highly competitive, business environment has made it mandatory for economic planners to discover new resources for capital generation. The energy hungry industrial economies have further exaggerated the situation; countries are extracting oil, gas, minerals at a higher rate to meet the global demand and it appears that the increasing trend is going to continue for some time now, at least unto the limit when the climate changes due to global warming start hitting us directly, but then it might be too late. The research focus on discovery of renewable energy resources, which are eco-friendly, does not appear to be on priority list of the decision makers.

The economists have been focusing on gaining maximum benefits from the natural resources, while ignoring the long term consequences of their actions. While focusing on economic gains alone, a country could easily exhaust its mineral resources, or cut down its forests and as a result, lose its fertile soil. Industries could pollute air and drinking water reserves in the name of gaining economic benefit. Others can hunt wild life to extinction without releasing the cost of losing these natural assets. Policy makers should start viewing the environment as an eco-system, in which each natural resource has a specific part to play and the very existence of human beings is dependent on the continuity of this eco-system. Natural resources are indeed a gift of nature, but their value must not be underestimated and the resources be extracted hurriedly for gaining a short time advantage. These natural resources should be viewed as assets of a country and likewise should be managed rather than spent.

A system for showing natural resources was started by US in 1942. The purpose was to provide information to the policy makers for better economic planning and analysis of the economic condition of the country. Proper accounting of natural assets is the first step towards its efficient management. It is through keeping accounts of natural assets that managers would be able to ensure its sustainability. Depreciation in accounts will indicate that unless the capital stock is maintained or replaced, the future consumption possibilities are bound to decrease.

There are many who worry (Craig and Glasser, 1994) that governments are following a path of destruction by consuming irreplaceable resources and resultantly, creating adverse side-effects in the system, but there are those who believe that the technology is not that bad. It is improving our daily life style, and it will provide substitute for us, and that there is really no need to worry. Whatever the point of view, all agree that, in order to address sustainability of natural resources, new tools are needed. The concept of sustainability as promoted by IUCN (1980) states that sustainable utilization of resources should be viewed as being analogous to spending the interest of money kept in a bank while keeping the original capital saved, meaning that all utilization of natural resources be sustainable, ensuring that the resources will be benefited by coming generations indefinitely.

In a similar reasoning, the economist Daly (1990) provides two basic principles for the management of renewable resources. First that the harvest rates of the natural resources should be equal or lower than the regeneration rate to maintain sustainability and second, that waste emission rate should be lower or at the most equal to the natural assimilative capacities of the eco-system under consideration. He states further that regenerative and assimilative should be considered as natural capital, meaning that a failure to maintain these capacities must be considered as capital consumption, and making the system unsustainable.

In this aspect Repetto (1994) narrates the classical tale of a small town near Solomon Islands, called Kiribati. The town depended on its phosphate mines for its income and government revenue. As long as the mines were running, the gross domestic product was high and rising. The mines proceeds were treated by economists as current asset and not as capital consumption, as it must have been done. The mineral deposits ended in 1970's and as a result of this, income and government revenue declined drastically, as too little of the previous income was invested in other assets that could be developed to replace the lost income, the economic structure of the town collapsed.

Keeping an account of natural assets has turned out to be extremely difficult, mainly due to the variety of assets. While considering the wood in a forest, it is seen that different tree species have different economic value or similarly, the mineral ores present in a region will have different economic value depending on the grade of the ore and its recovery costs. And even if separate data is to be maintained, the amount of data will be huge. Secondly, it is extremely difficult to determine the economic value of each natural asset present in the country. The accountants would like to report each asset in dollar terms as long as possible, but all assets can not be converted into dollar value. It would be very difficult to attach dollar value to fresh water lakes in a country, but still it is very valuable asset for a country. In this aspect it is indeed needed that the present accounting system be enhanced to include newer heads of accounts that may not necessarily be giving dollar value.

2. Evolution of management system

The resources available to a system are always limited and managers are concerned for utilizing the available resources to the best efficient level. Over the years a number of frameworks have been developed by managers for this purpose. An umbrella term that may be used for these frameworks is performance management systems. Literal definition of Performance Measurement can be “the process of quantifying action, where measurement is the process of quantifying and action leads to performance (Neely, Gregory and Platts, 1995). Viewing from marketing perspective, organizations achieve goals, when they are able to satisfy customers with greater effectiveness than their competitors (Kotler, 1984). Performance can also be defined as a metric used to quantify the efficiency and / or effectiveness of an action (Neely, 1994)

The problem of organizations implementing performance measurement systems has been in focus for some time now, financial measures have been generally used to evaluate performance of commercial organizations by early 1980's there was however, a realization that complexity in organizations and the environment in which they compete had increased and it was no longer appropriate to use financial measures as the sole criteria for assessing success. Johnson and Kaplan (Johnson and Kaplan -1987) brought to focus many deficiencies in the performance system. The emerging view was that cost focused measurement systems provided a historical view and giving little or no indication of future performance of the system. (Bruns, 1998). It is true that profit remains an over riding goal for profit organizations, but the new environment requires that the management measures should reflect what organizations have to manage in order to gain profit. (Bruns, 1998). Balance Score Card (Kaplan/Norton, 1996) the performance prism (Neely et al., 2002) and Skandia's Navigator (Edvinsson/ Marlone, 1997) may be considered as comprehensive measurement frameworks, but still they form the “First Generation of Balanced Measurement Systems” analysis Neely (Neely et al., 2003). They were based on the assumption that the financial biased measurement systems should be supplemented with non-financial indicators. The problem with these was that they were static and failed to illustrate the linkages between different performance measures.

The Second Generation of management systems started to address the dynamics of value creation by monitoring transformation of resources as well as the stocks of the resources. The emphasis in second generation is on the transformation rather than the individual stock measures (Pike and Roos, 2001). Examples of second generation include “Strategy

Maps” developed by Kaplan and Norton (2000), success and risk maps developed by Neely and Colleagues (2002), and the IC- Navigator model developed by Goran Roos and Colleagues. The agenda for the Third Generation Measures is “Linking Financial to non-Financial and intangible dimensions of an organization”, for such a model three criteria are given by Pike & Roos, (2001). Firstly, the model must reflect the static and dynamic realities of the organization and at the same time it must be appropriately designed to be used as a managerial tool. Secondly the information adequacy, that is right information must be provided at the right time. The information must be presented in a form so as to aid better decision-making. And thirdly practicality and organizational alignment, meaning that the system designed must be aligned with other organizational processes so that the outcomes must bring practical insights into the organization and must enable action. Fundamentally the objectives are to develop a system for demonstrating cash flow implications of non-financial and intangible organizational drivers.

Sveiby (1997) presented a management framework for measuring total wealth of an organization, the Intangible Asset Monitor (IAM) was later further developed into a strategic management tool by Sveiby (2001). The Intangible Assets Monitor presents a method, in which the choice of indicators used depends on the organizational strategy. The Intangible Assets Monitor can be integrated in the management information system and cascaded to different organizational levels. Sveiby recommends that IAM itself should not exceed one page, but it should be accompanied by an explanatory text. As a strategic management tool, it covers critical areas for an organization like growth/renewal, efficiency and stability.

It is essential for an organization to monitor its assets for growth, renewal and efficiency and at the same time, the organization should try to minimize risk of losing these assets. The indicators must be adjusted to the reality of each organization. It is seen that we cannot have a set of indicators to fit all organizations or all circumstances. IAM recommends only the important indicators for monitoring; in most organizations. Public Sector Organizations can use other stakeholders, such as community members and many companies have valuable alliances with their suppliers that they must be included in external structure too. Internal departments will have internal 'customers', which will form their 'external structure'. Employee competence class, the most important component of IAM includes professionals working in an organization. The term professional refers to the people who plan, produce or process the products or solutions for the clients. The term includes all employees directly involved with the client's work, whether or not they are professionals in the field of competence. The blue-collar workers in the manufacturing organization can also be included in this category. The term as used in IAM excludes the employees that work in support functions of a company like accounting, administration, or reception, as they are part of the internal structure and should be monitored under that category. The indicators must be designed to correlate with the each one of the four modes of value creation the growth of the asset in question, its renewal rate, how efficiently we are utilizing it, and the risk of losing it.

In 1993 the Balanced Score Card (BSC) was developed by Norton & Kaplan (Guthrie 2001). It is a conceptual framework for translating an organization's strategic objectives into a set of performance indicators. The framework has four perspectives: Financial, Customer, Internal Business Processes, and Learning and Growth. The selection of

indicators for each perspective depends on the choice of BSC developer. Some indicators are maintained to measure an organization's progress toward achieving its vision; other indicators are maintained to measure the long term drivers of success. Through the balance scorecard, an organization monitors both its current performance (finance, customer satisfaction, and business process results) and its efforts to improve processes, motivate and educate employees, enhance information systems and its ability to learn and improve.

The perspective, "customer" means the end-user. It can be another organization, government, including direct internal customers and direct or external customers. The indicators could include %age of customers satisfied with timeliness. That is the customer's degree of satisfaction with the timeliness of the delivery of products or services and other factors affecting the acquisition schedule. The timeliness category may include an assessment of the products and services delivered on time consistently, communication consistency and effectiveness. The Finance perspective indicators may include different spending to cost ratios. It may show the elements representing the cost for each office to spend one dollar of their customer's funds. Internal business processes perspective monitors the internal functioning of the organization to ensure that they are in-line with the strategy. The indicators in this category could be %age of actions using Electronic Commerce or %age achievement of socio-economic goals of the organization. Finally, the Learning and Growth perspective monitors the extent to which an organization is working on learning and growth perspective. It could have indicators on %age of employees meeting mandatory qualification standards, training and experience requirements as identified by the law or %age of employees satisfied with the work environment. In order to retain high quality acquisition professionals, and enhance worker's performance, the work environment must be pleasant and include the necessary resources for accomplishment of work. This measure represents the employees' degree of satisfaction with items, such as tools provided, (e.g., information technology, reference material, etc.) working conditions, reward mechanisms, and %age of employees satisfied with the professionalism, culture, values and empowerment. The measurement information used in the BSC comes from an appropriate survey instrument; the information must be updated periodically. Analyzing the data with the help of the framework enables policy makers to adjust their policies to increase performance.

3. Emerging frameworks for measuring national assets

Researchers are modifying management frameworks discussed above for use at national level. These frameworks can be modified and converted into excellent management tools for development and implementation of strategic plans. Economists are realizing that the financial assets or trade balance alone, does not determine the wealth of a country (Malhotra, 2003). The traditional view of recording national assets is evolving to include a number of non-traditional heads for recording assets. New frameworks include intangible assets of a nation, Skandia Navigator (Edvinsson and Malone, 1997) is one such framework used by some researchers for measuring and developing national policy initiatives. It is important to see national assets in a holistic picture, as it is seen that investing in intangibles helps in promoting country's trade. In one such study Rembe (1999) has investigated the increase in foreign investment in Sweden with relation to its intangible assets. The study uses metrics to measure its human capital (quality of life, life expectation, education, etc.), market capital (tourism, service balance, etc.), process

capital (management quality, information and communication technologies, etc.), and renewal capital (research & development, rate of young people, etc.) and develops a strategic plan for the future development in Sweden. Similar studies include, report on O.E.C.D countries (O.E.C.D 2000), Malaysia (Bontis et al., 2000), the Arab Region (Bontis, 2002, Bontis, 2004). Malhotra (2003) has also discussed methods for measuring intangible assets of nations extensively, by modifying Balance Scorecard (Kaplan and Norton, 1992).

Intangible Asset Monitor, (Sveiby, 1997) can also be modified to measure national assets in a comprehensive manner (for details see Lodhi and Ahmad, 2008). IAM framework gives planners an advantage of not only recording the asset, but at the same time also viewing their utilization, minimizing risks and sustainability of the assets. IAM framework when modified and applied at the national level; measures total assets of a country as a sum of its tangible and intangible assets. The tangible assets of a nation would include forests, mineral resources, oil, factories, roads network, communication infrastructure, agricultural and other material products. But the wealth of a nation is not limited to tangible assets only. The holistic picture of country's assets now include new assets like quality of life, life expectation, education level, tourism attractiveness, management quality, use of information and communication technologies, research & development spending and ratio of young population (O.E.C.D, 2000, Bontis et al., 2000, Bontis, 2002, Bontis, 2004 and Malhotra, 2003). Therefore a comprehensive account of nation's wealth would be the sum of nation's tangible and intangible assets (Lodhi and Ahmad, 2008).

Keeping in view the above frameworks and advocating Solow (1999) view that financial benefits from natural resources must be reinvested it in its people, it is seen that reinvestment in the form of educational programs, health care or development of infrastructure would in fact, be actual reinvestment, as it would be directly adding to a nation's wealth. The overall wealth of a nation depends on how intelligently the assets are utilized. Natural resources of a country are potential assets, which a country may market to obtain financial benefits.

3.1 Natural resource management (NRM) framework

The rationale behind the design of management frameworks developed for efficient management of business organizations can be extended to develop a framework for management of natural resources of a country. A framework designed on the rationale of IAM is proposed that can be used for comprehensive management of natural resources at country level. The framework can facilitate development as well as implementation of a natural resource management policy, it also facilitates for viewing policy as a live document. Policy makers can amend their policies or give new directives in the light of the updated indicators of the framework. The indicators must be updated every six months periodically, so that the policy can be revisited for a review. This will ensure that the policy developed remains effective.

The framework shown figure (1) is designed to cater for four facets regarding natural resource management in a country. Firstly, it records the status of all categorized natural assets present in the country. It is suggested that each natural asset is recorded in appropriate unit. This measurement unit needs not to be in a dollar value, it can be in any other appropriate quantifying unit for the asset being accounted. Information on the quantity of specific asset that is being marketed or exploited is recorded, giving total

stocks picture of the resource. The information on utilization of the asset is also recorded, which gives a flow picture of the asset. Policy makers can have basic information about the country's status regarding its natural assets from this data. They can decide which assets are untouched and which are nearing their end.

The second facet of the framework is future oriented, and ensures that the policy makers are aware of utilization efficiency, risk minimization and sustainability aspects of specific natural resource. Information on these will be deduced from the indicators under each head and these indicators will be asset specific. A review of this section will give policy makers knowledge about how efficiently the country is utilizing its marketed natural resources, and monitor the risks to the natural resources. The section will also provide knowledge on the sustainability of the natural resources. The indicators developed for the section will warn, if the sustainability of the asset is low.

Thirdly, the framework allows the policy initiatives, proposed in the national development plan, as well as natural resource plan to be placed in parallel to one another. This arrangement helps in aligning the natural resource plan with the over all national development plan. Fourthly, the framework acts as a performance management tool and provides information to policy makers on the progress and effectiveness of their policies.

In order to implement the framework, indicators are developed for measuring each policy perspective. Generally, three to four indicators may be needed for each policy perspective. The indicators developed must be measurable, so that a comparison can be made in future for determining performance against each indicator. The figure (1) shows imaginary values for assessing forests as natural asset in a country. The column reading Natural Assets firstly, records forest as natural asset. The second column shows the total forest area in the country, showing the availability of the particular asset, followed by the utilization figure, by giving the amount of the asset under utilization.

Figure 1: Policy Matrix Framework for Natural Resource Management (NRM)
(Based on IAM Sveiby, 1997 and Lodhi & Ahmad, 2008)

National Accounts for Natural Assets					
		Account #. _____ Name asset : - <u>Forests</u>	Policy Initiatives NRM	Progress Monitoring	
				Targets Dec 2008	Progress Sep 08
Available Assets		Total Forest area 10664 hectares	<i>Guideline from National Development Plan</i> • Increased in area under forest	15% increase	12%
Utilization		Area managed - hectares	<i>Guideline from National Development Plan</i> • Increase in wooden furniture exports	7%	6%
Policy Perspectives	Utilization Efficiency	<ul style="list-style-type: none"> • Cost per unit • Reinvestment for risk minimization and sustainability /Revenue earned 	• Increase in Utilization efficiency	60%	60%
	Risk Minimization	• Water available for forest development	• Develop and increase the Water resources	11%	9 %
	Sustainability	<ul style="list-style-type: none"> • Minimum forest area that must be kept as national reserve • Ratio of new trees planted to trees cut 	• Improvement in sustainability ratio	5%	5%

Following the column downwards, policy perspective indicators for the asset under consideration are recorded. The first policy perspective is “Utilization efficiency indicators”. It is ideal to develop three to four indicators for each perspective. Second perspective is “Risk minimization”, which focuses on reducing the risk of depletion of the asset. In case of forest, availability of water can be a good indicator for monitoring risk for the asset. The last column shows indicators for the “sustainability” perspective. The purpose of the column is to ensure that the policy makers are continuously observing the sustainability of the asset. The indicators developed for this section could be the rate at which the trees are being cut to the number of new trees planted.

The Natural Resource Management policy of a country must be drawn in the light of the National Development Plan of the country. The framework ensures it with the help of Policy initiatives column. This column does not contain numerical indicators, but gives a short description of the policy directives regarding the natural asset. The first box of the Policy Initiative column shows the policy directive from the National Development Plan regarding the particular natural asset. The National Policy directives for both, available asset as well as its utilization are recorded. The second box gives the policy directive regarding the ‘utilization’ of the same asset as directed by the National Development Plan. In the case of the example given, National directives could be to increase the forest area and National directives for utilization could be to increase wooden furniture exports of the country.

The columns following these are the actual directives for the Natural Resource Management Plan, when viewed under the perspectives in the NRM framework. These directives must also be aligned with the directives of the National Development Plan. The policy initiative column corresponding to the utilization efficiency row contains the policy directives on utilization of natural assets under NRM plan and in the light of NDP.

Next row under the same column contains policy directives for “Risk minimization” for the NRM policy. The NRM policy directives could be to develop and increase the water resources. It can be seen that this directive is not opposing any directive of the NDP, but it is designed to help implementing the NDP. Finally, the last row contains NRM directives for ensuring “sustainability” of the asset. General NRM directives in this case could be to improve sustainability ratio. Again it is seen that the NRM directive in this section is not opposing NDP, but helping its implementation.

An important part of a policy is its implementation; it is very easy for a policy to lose focus and become redundant if its progress is not monitored continuously. The general practice is that a monitoring and evaluation framework is developed separately for the purpose, but this approach has a few drawbacks. Most importantly, policy development and monitoring framework is developed by different teams, therefore the system could lack alignment. The framework provides performance management indicators in the same tool for better integration. The last two columns of the framework provide this performance monitoring mechanism. The columns give targets and reports progress on each target against the policy directives. It is best that the targets are developed in a quantitative format, but the choice of the format would depend on the type of asset being monitored.

Progress reviews can be conducted by using the data presented in the columns. The columns need to be updated on six-month cycle for conducting regular reviews. The

NRM policy initiatives can be revisited in the light of the review meeting to improve the policy implementation process, or to give new directives to improve the implementation.

Natural resource management issues are deeply connected with the socio-economic environment of the society living in the area. Therefore participation of the local population is crucial not only for the understanding of the issue, but also for developing sustainable solution to a problem. This participation can be achieved by forming local committees and educating these committees on the issues.

The framework developed must be cascaded for maintaining records at regional level. The cascading will allow better policy monitoring and implementation at the local level. Progress review meeting should also be held at the regional centers, so that local knowledge can be used for solving the issues. The data for policy review will flow upwards from the regional level where data is generated, to the country level, where the data will be summarized for policy decisions.

4. Conclusion

Developing and the under developed countries need to implement best practices in management domain, but unfortunately, these countries follow obsolete procedures in their planning and management practices. The stakeholders' interests are not mapped and policies are made with very narrow perspectives and background research.

Aligning policy directives and the vision is another weak area in the planning process, as it is not surprising to see that the policy initiatives are not linked with the vision statement. The policy document turns out to be an issue based document, which is more concern with short term measures rather than a plan to overcome the challenges.

The paper presents a framework that can be converted into a management tool for NRM (Natural Resource Management) of a country. The framework transforms into a tool when indicators are developed. The policy makers can use the tool for performing three basic management tasks of recording natural assets, developing natural resource management policy in the light of national development plan and lastly, use the framework for natural resource management policy monitoring. The framework integrates the above aspects into a single tool and provides an edge to the management. If the indicators are updated periodically, every six months and the policy initiatives are adjusted to achieve the target results, the framework can act as a strategic management tool.

The paper does not present the final tool and restricts itself to framework level, because general indicators, that would fit all natural assets, can not be developed. And secondly, because each country has its own national development vision, resources and environmental constraints. The policy makers would have to view each country in its own perspective and decide on its strategic directions. The indicators and policy initiatives would later emerge from these strategic directions.

The framework would be useful in developing policies to face the emerging challenges, like soil degradation in Africa, management of agriculture land produce and water shortages. Similarly deforestation and oil exploration are issues which need to be monitored carefully, as these natural assets have great economic value for the societies, but at the same time if their utilization is not managed, the societies may be losing a lot more than they can imagine.

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