

Development of model for sustainable development

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Abstract: Modeling plays a vital role for knowing the status of 'Ecological viability' in relation to development phenomenon. However, the sustainability reflects the philosophy of adaptive eco-system management of the natural and man-made resources from the point of sustainability in accordance with changing scenario. The present paper throw an adequate light on the mechanism of model which has developed to show the different position of sustainability of development phenomenon in relation to existing and future environment, so that a equilibrium position of sustainable development may be attained. In this paper, it is a graphical representation of model which indicates different positions of un-sustainability and sustainability of development phenomenon in relation to existing and future environment in accordance with haphazard growth of development activities in different regions of the world. The model may render its significant services to evaluate different environmental status in accordance with the development activities undertaken in an area. The model may be utilized for finding solution for natural resources management in relation to evaluating the existing and prospective environment which is being disrupted due to haphazard growth of development activities. The model may be proved conducive to managing the natural disasters in a judicious ways. In addition, the model may benefitted to formulate eco-tourism, waste land management, wild-life parks, reducing chronic pressure on land resource and increasing the carrying capacity of the land in land scarcity regions.

Keywords: Modeling, ecological viability, sustainable development, haphazard growth, natural resource management, changing scenario.

INTRODUCTION

A Model is an idealized, abstract and structural representation of real phenomena. Models may manifest as verbal descriptions, physical objects, and diagram's representations, maps, mathematical formulas, and computer programmers', representation of complex dynamic systems increasingly involve Computer simulation of alternative model out comes based on specified input parameters, variables and relationship. These models link a system's structure to behavior for changing for the purpose of changing a structure to improve behavior. The purpose of a model provide the basis on which its utility must be judged, as all models are by definition simply fictions of reality. The entry discusses the modeling paradigms. There are numerous of individual based modeling which has been developed for showing the changing levels of natural resources exploitation in accordance with development scenario. How the eco-system is maintained with the change of pace of development (Grimm, W & Rails back, S.2005). In order to review the agent-based models are 'Central Place Theory'; Complexity Theory'-Central Systems Models, 'Digital Terrain Models' GIS Sciences, GIS in environmental Management'; Gravity Models, Input-output models, Location Theory, Maps, Regional sciences, Spatial Data Models, Von Thune Model, Weber Alfred Model.

Models and Modeling for graphical studies have a vital significant for showing the development phenomenon in relation to prevailing eco-system, exist in a particular region, as it was illustrated by Sara Metcalf (2010). In this context, Anne But timer (2006) has focused on integrated models for the issues of sustainable development. The models has developed new-ways to use empirical and simulation data that information over the wide range of spatial and temporal scales. The case studies are advancing over understanding environment and provide insights that support sustainable development policy. Time-Geography considers human as creative agents, operating within the constraints of a continuous space-time. The Tigress (Time-Geographic approach to emerging and sustainable societies and Chorley,R.J and Haggat.P(1971) has strongly recommended for developing Models for showing the socio-economic development phenomenon in some of geographic regions. He has also insisted for shifting paradigm in accordance with changing scenario, so that a 'sustainable development' position may be maintained in the various regions of the world. Maulik, Barna (2012) has tried to correlate the economic development and existing and future environment in the changing scenario. On the basis of his study, the author has drawn some of significant inferences of both the variables for some of projects, undertaken in some of provinces of India. On the

other hand, Prashad, Laxam (2008) has highlighted the management aspects of environment and economic relations of development activities. Prashad has analysed the product pricing and trend of taxation shifting in accordance steadily increasing environmental cost. He has focused on formulating problem solving models. Similarly, Sharma, Shubhash (2012) has reviewed the implications of development sector in relation to existing and prospective environment. He has also reviewed the world development scenario in relation to deteriorating environment. On the basis of some of quantitative and qualitative parameters, he has critically examined both variables under changing local conditions. In order to evaluate the strength and the weakness of sustainability in relation to existing and future environment, Thatta, Lina (2012) has reviewed the ecological modernization and drawn some of vital inferences from changing scenario of Corporate Social Responsibility of Indian corporate houses.

He has also highlighted the role, played by NGOs to maintain the sustainable development position in accordance with changing scenario. Singh.S.Singh (2006) has also emphasized on formulating the models, before executing the development projects. The models play a significant role to managing the practical problematic areas of development and disaster management (Das S.K, Kumar Arun Kumar, 2009). Similarly, Rawat, M.S, Goswami, D.C, Vijay Bahuguna (2011) have insisted on formulating the 'Sustainable Models' so that a development strategy may be chalked out for the hilly region of Uttarakhand for sustainable development. On the other hand, Govt. of Himachal Pradesh has also identified the vulnerable areas of the state. EMP (Environmental Master Plan) recently prepared by the Department of Environment and Scientific Technology and approved by the vulnerable areas of the state, where future planning will have to be done with utmost care. The EMP has been adapted to main stream environment concerned into state's development planning in sectors of economy for next 30 years. In this, there is need to mitigate the likely impact on rivers, flora and fauna and resulting change in livelihood because of multi-purpose river valley projects, power plants and industries. (Report on Infrastructure, Natural Resources Management and services, Department of Forest and Environment, Govt. of Himachal Pradesh, 2013)

Before formulation of models on sustainable development, it becomes essential to identify the areas, which are more vulnerable and prerequisite for sustainable health, water and food, economic stability and the community. Healthy environment sustainability is a lasting dynamic balance these factors, healthy individual thriving communities organizations in economic balance. Jerry Talfor (2009), has highlighted some of salient features of sustainable development models of China. He has focused on protecting the human health & environment which act as a 'core areas' to protect the market remains as free from the government intervention as possible and protect the resulting engine of economic growth since poverty is also a major cause of environmental destruction, economic growth serves both a social and ecological function. Thorsten Bayinder – upmann (1998), examines the link between environment, trade and industrial policies within an inter-regional setting. He models how regional governments using tax rates on real capital and pollutant omissions, determine policies to favour their residents in terms of the provisions of public goods and reducing the environmental degradation. Similarly, Sylvie Fauchevx, David Pearce, John, L.R.(1998) have highlighted the relation between dynamic ecological economics and its economic system, ecosystem and equilibrium of a region.

In order to measuring sustainable development performance of different states of United States of America, the executive council of govt. of Manitoba (1995) has presented a paper on the Alberta's sustainable development. By taking the sustainable development indicators (850 indicators), a benchmark has been demarcated for different states like Alberta and Colorado. They have projected the future probabilities and also highlighted some of common weakness of presented models. Hence, it is obvious that the authors belonged to different streams who have given insights of sustainable development models and their formulation, applicability and significance in relation to changing scenario of development taken place during different periods. They have also highlighted its necessity for striking a balance between the development phenomena in relation to its sustainability in the changing scenario. They are of strong opinion to develop models on sustainable development, so that a judicious use of natural resources may take place with least decay of ecosystem in an area.

METHODOLOGY

The present study is based on Model which was developed for showing the sustainability of development activities in relation to existing and future environment. The natural resources exploitation and the levels of development have been taken on X-Axis. On the other hand, level of environment on the Y-Axis. The graphical presentation of Model shows the different levels of sustainability of the development phenomenon in relation to existing and prospective levels of environment. It is quite obvious from the graphical figure which shows different positions of sustainability of development phenomenon in relation to existing and fast changing environmental conditions in different regions of the world. In this figure, various meeting and intersecting points indicate a different position of sustainability of development phenomena under different environment conditions.

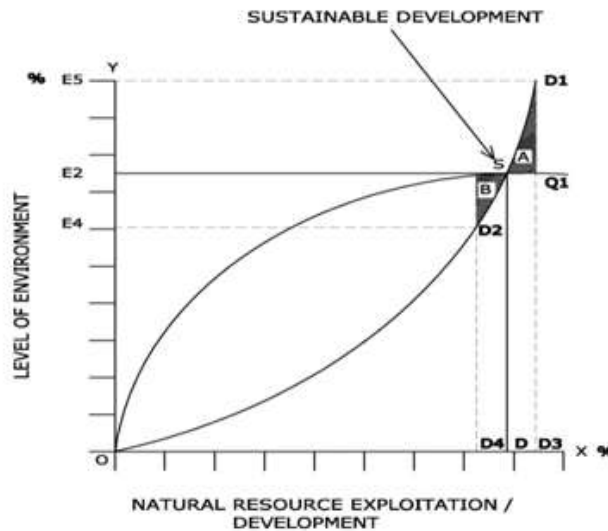
OBJECTIVES OF THE STUDY

- ❖ To present the model by graphical presentation;
- ❖ To show the mechanism of sustainability of development activities in relation to existing and future environment;
- ❖ To highlight the theatrical and practical significance of the Model.

RESULTS & DISCUSSION

Keeping in view the objectives of the model developed for different positions, the following steps have been taken for drawing the inferences from the graphical presentation of the model as follows:

GRAPHICAL MODEL OF SUSTAINABLE DEVELOPMENT



The graphical model of sustainable development shows the equilibrium and disequilibrium positions of development phenomenon in relation to existing and future environmental positions. A position of disequilibrium position of development phenomenon has been indicated by the shaded area of 'A' triangle, i.e. $D_1 S Q_1$. In this situation, the natural resources are exploited through different development activities, have been taken. In this position, the **development curve** is higher than **environmental curve**.

$$\text{Or} \\ E > D_1$$

Hence, it is obvious that there will be '**Economic viability**' by execution of development works and exploiting natural resources, but it will lead to '**Ecological un-viability**'. On the other hand, the shaded area of 'B' position also indicates a 'Disequilibrium of Development' in relation to existing environmental position, as indicated by the shaded area of $S E D_2$. In this position, the natural resources are exploited for execution of development projects as: $E < D^2$.

Thus, there will be '**Environmental Viability**', but not the '**Economic Viability**' by exploiting the natural resources and implementing the development works. It is therefore, obvious that the development up to D point will lead to 'Sustainable Development' position which will be intersect at the point 'S', as shown in the figure. Similarly, E, D2, S2 (The shaded area of B) is not a sustainable position of the development, undertaken in a region. Similarly, $D_1 Q_1 D_3$ (Perpendicular on X-axis) also does not indicate a 'Sustainable position' of 'development' in relation to environment. Keeping in view the different positions of 'Equilibrium & Disequilibrium', the 'Equilibrium position' of at intersecting point 'S' is the best position which indicate an 'OPTIMUM' position of 'sustainable development', where the 'Economic and Ecological viability' give a synchronizing position of 'Sustainable Development' in the changing scenario of different regions of the world.

THEORITICAL AND PRACTICAL SIGNIFICANCE OF THE STRUCTURED MODEL

- ❖ The model may give a theoretical and practical significance for managing natural resource management in relation to changing environmental scenario.
- ❖ It is expected to pave the way for judicious planning and management of natural and man-made resources in accordance with demand-derived principle.
- ❖ It is also expected to pave the way to 'Regional Planning' in relation to existing and future environment of a region.
- ❖ The model may provide a great potential for 'Development sector' for having a 'constant vigil' on their development works undertaken.
- ❖ The 'Model' may provide a theoretical and practical framework for the 'corporate houses' for developing a sense of responsibility as 'Corporate Social Responsibility' in the changing scenario.
- ❖ The model may be proved conducive to mitigate the natural disasters such as developing 'Hot spots' in the rich bio-diversity regions, developing wild-life parks, bird's sanctuaries, eco-tourism, managing waste lands, land-slides in the hilly area, sustainable-agriculture, sustainable urban development and sustainable rural development etc.

In addition, the Model is expected to throw an adequate light on urban development particularly in the hilly and mountainous areas, where the ecological system is relatively sensitive. It is therefore it becomes imperative to conduct a ecological survey, before switching on any development project e.g. Hydro-power based electric generating power station, nuclear-based power plants, and thermal based power plants. Keeping in view the environment issues various power plants like power plant in 'silent valley' In northern part of Kerala, a Reliance Power plant in eco-sensitive zone in Maharashtra and some of sand extracted works had to stop due to vulnerable areas of ecological disaster within these areas. It is therefore, it becomes very essential to have a periodic look on various aspects of 'sustainable development' in relation to existing and future environment in the changing scenario. It is also essential to have a fresh look on the developing a 'Model' which may suits to the prevailing local conditions so that the existing and prospective development activities may be undertaken in accordance with changing environment conditions of the environment. It is also essential to take a periodic feedback from the people so that the development activities may not affect the local people. If they are affected, then it become the duty of the government and the corporate social responsibility to re-settle them in accordance with their original and sustainable living condition at the maximum extent.

CONCLUSION

The graphical 'Model' developed for 'sustainable development' indicates two different positions of 'Development' i.e. 'Equilibrium' and 'Disequilibrium' in relation to existing and future environment. In order to develop the sustainable development, it becomes imperative to execute the strategy measures in accordance with existing and future environment. The structured model shows the different positions of 'Economic viability' as well as 'Ecological viability' in relation to different degree of sustainability in accordance with changing environmental scenario. The structured 'Model' may provide a theoretical and practical framework to the planners; administrators, environment policy makers, and the professional belong to development sectors. The 'Model' is expected to pave the way to assess the development activities for the professional and the researchers so that the concept of 'sustainable development' may be hold good in accordance with their requisite standard, laid down by the experts of respective areas. The 'Model' may be utilized in a multiple ways which includes rural development, urban development, environmental planning, mitigating natural disasters, prevention of waste land development, judicious use of natural resource, development of eco-tourism, wild-life areas development and execution of hydro and thermal power projects in ecological vulnerable areas. It is therefore, it become imperative to consider such type of 'Models' which can be proved conducive to measure the 'Economic viability' and 'Ecological' in accordance with existing and future environmental conditions of a region.

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