AN ANALYSIS OF SUSTAINABILITY WITH THE ROLE OF MATHEMATICS

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Abstract: Sustainable development is termed as the economic activity which meets the needs of the generation without compromising the ability of them and utilizing the necessary resources.
The problems associated with the sustainability use different approaches. The role of mathematics plays a vital role in the concept of sustainability. The mathematical tool helps to analyse the sustainable concepts efficiently and effectively. It helps to optimize the resource management technique on the human community to develop economical, social and environmental issues with respect to sustainable development. This paper focuses on the mathematical techniques associated with the sustainability. It helps to substantiate the principles of sustainability as enhancing the ability, creating opportunities for economic prosperity and foster the environmental responsibility and to embrace design excellence.

Keywords: Sustainable development, Role of Mathematics, Mathematical tools, Applications.

1. INTRODUCTION

To meet the needs of the present without compromising the ability of future generations is termed as sustainability. The subject Mathematics has an indispensible role in the sustainable development in all fields like social, environmental and the economic situations. It utilizes the mathematical concepts and skills to solve the everyday problems or issue which gives a special challenges to the humans on Earth. It helps to study the natural phenomena on the planet by the conceptual skills on networks, transportation problems, graph theory and number system which help us to sustain the human activity on the system. The macroscopic feature of protecting the ecosystem where the organisms form from the interactions of individual organisms in the biosphere Hence a set of mathematical tools should be applied to face the challenges which produces a definite change in the sustainable development The phases of attaining the sustainability involves developing the statistical mechanics of ecological communities, socio-economic systems, modeling the pattern, to determine the indicators of problems are all subjected to the equations of linear or nonlinear systems of equations which leads to a consistent or inconsistent solutions. The mathematical models are developed to recreate, understand the process such that we can have a control over the problems which gives feasible or infeasible solutions and also helps us to alleviate their potential effects.

II. MATHEMATICAL CONCEPTS OF SUSTAINABILITY

The impact of human activities on the planet is referred by the mathematical equations involving the parameters as population, affluence and technology identified as I=P*A*T which is similar to Kaya identity

in the emission of greenhouse gas CO_2 .This establishes he comparative importance of the parameter over the environment which has the inter-relationship among the factors and to develop schemes in the level of multi scaling techniques. All the techniques are foci of the current activity using the Lagrangian and Eulerian methods which is expressed as the equations of the form for identifying the spatial position, velocity density to derive a continuum value by the scheme of closure. An alternate for the above method is the collective motion using the mathematical tool for decision making. The challenges facing the society in the aspects of economic, social and environmental issues can be solved by developing a mathematical model which describes us the prediction of understanding and control in the process of developments. It helps to understand the information for its authenticity and credibility of the key issues of the sustainability. The system has to be scaled for the microscopic and macroscopic information to obtain the pattern formation about the issues. Analysis of the real environmental problems can be done with the algebraic methods and graphical, numerical methods to explore the data quantitatively to help in objective decision making comprising of function and difference equation modeling with the elementary concepts of statistics. Verbal approach method is also used for investigation of material through synthesis. Mathematics enable the students to develop the skill needed for qualitative and quantitative measures of sustainability dealt with environmental and economic issues as the objective function.

III. CONTENT OF MATHEMATICS IN THE CONTEXT OF DEVELOPMENT

The major topics are considered as Measuring, changing, networking and risking. The concept of measuring includes numbers large and small to denote the size and significance of things measured by physical units, percentages, ratios, estimation and reliability all are focused with the concept of sustainability. Certain questions are of being able to answer with the additional questions to ask in order to the reasonable answers. The principle of counting helps in census and population growth measuring in terms of absolute and relative. Mathematics plays a vital role with the possible set equations that describe the atmosphere taking temperature, pressure and density. Global circulation models describe the average conditions for the atmosphere. Qualitative skill approach is used to get the ideas of growth, feedback, oscillation as the part of conceptual vocabulary. Mathematical simulation helps us to estimate the consequences of scenarios. The decision can be made to choose the appropriate course of action in accordance with the environmental and social conscience. Modern weather forecast involves the solutions of the complex equation and helps in simulation. Optimization of renewable energy sources is possible from the equations to get the maximization of the result. By choosing the location variables as optimal in wind and solar form which helps in designing the efficient layouts for the tidal and wind turbine arrays by utilizing the technology updates to get the maximum energy as effectively as possible. To adapt to the

changing environment we have to use the knowledge as the key to safeguard the human health and their livelihoods. The data can be collected, processed and evaluated using the tools of mathematics. The probability concept deal with the certain and uncertain events and test for its reliability. The new mathematical models are developed to reduce the carbon emissions for global warming by using logistics methods, statistical modeling, network analysis.

IV. QUANITATIVE TECHNIQUES IN SUSTAINABILITY

To understand the basic concepts, interpreting the results certain quantitative reasoning skills are used with logic sequences. The concept of algebra and geometry help to study the aspect of sustainability for its size and shape. The conversion factor helps to convert the give values to the required and necessary value in dimension and scale. The unit conversion helps to convert the individual product to fit into the picture or scenario. The values obtained so can be explained to the people by the pictorial representation like graph, charts and tables. The graph can be expressed to establish the relationship between the dependent and independent variables. The curve can be linear or exponential type. The data so obtained can be tested for its clarity, relevance and its accuracy with precision. The time series analysis will be done for the environmental impact factors. The sensitivity analysis is also done for the information obtained from the data. The method of central tendencies is applied the variables to know its convergence. For some cases the distribution may be normal at which mean, median and mode are equal. The coefficient of skewness and kurtosis are also studied to analyse the key factor of the distribution.

V. VALUES OF MATHEMATICS IN SUSTAINABLE DEVELOPMENT

Mathematics education includes its qualities in a wide range with the beauty, artistic, integrity, variety, diversity and harmony. It plays with the set of rules to estimate the power of natural resources available and its utilization optimally. The language of mathematics establishes the integrity in the universe or the world with objects and its happenings. The subject communicates with the numbers, angles, dimensions, shapes, lines, ratios and proportions, correlation, regression, probabilities, mean , median, quartiles, mode and the trend analysis to understand the seasonal fluctuations. Using the shapes like square, rectangle, triangle and circle found in nature help to describe and to predict the things around us. Measuring quantities like area, volume, length, density, temperature, velocity, pressure helps to measure the objects and to estimate the object and to study the balanced and successful human existence on earth.

VI. CONCLUSION

From the above discussion it is crucially important to use technology updated subject mathematics in a more responsible way such that it solves the problems associated with the sustainable development and not creating more for the future. The role of the Mathematics subject in sustainable

development is to make use of the resources effectively and efficiently in a smarter way to make the environment eco-friendly. This papers uses all the tools in the mathematics subject to make our world as sustainably developed. The scales are used to avoid pollution, impact caused by renewable and non-renewable resources, waste caused by techno-crash and hazardous materials which are unsafe to the environment.

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