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Dr.K.Sasi Kumar
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SUSTAINABLE ECONOMIC DEVELOPMENT - INDIAN PERSPECTIVE

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Dr.K.Sasi Kumar, Assistant Professor/MBA,VICAS

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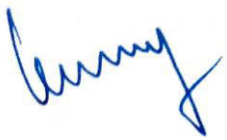
EDITORIAL MESSAGE

We take great pleasure in welcoming you to our Edited Book. The immediacy of e-based publication makes it possible for us all to be fully connected to each other and to developments in our field and to be directly involved in ongoing knowledge construction.

With several economies gearing towards the end of lockdowns, it's time for organizations to implement Post-COVID-19 business recovery strategies. Although it will let organizations restore balance to an extent, total recovery from the crisis is going to be a long and strategic battle. With these concepts in mind, we invited with scholarly discussions to facilitate new ideas for business sectors. This book also stands as a platform for Students and research scholars to express their innovative business models and solutions.

We are thankful to all academicians, research scholars and students who have contributed for this edited book. We also acknowledge the valuable suggestions and support offered by our colleagues and students. We are delighted that you are joining us as readers and hope you will also join us as contributors.



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	SOLAR POWER P.Mahalakshmi,M.Anchana, V.Sabari
18.	RELATIONSHIP BETWEEN ENVIRONMENT AND SUSTAINABLE ECONOMIC DEVELOPMENT A.TamannaKhanam, A.Athiyaveni, G.Deepalakshmi,V.Sabari
19.	ROLE OF CORPORATE SOCIAL RESPONSIBILTY IN SUSTAINABLE DEVELOPMENT OF INDIA Monashree Satheesh Babu, A.Athiyaveni, G.Deepalakshmi,V.Sabari
20.	GLOBAL ISSUES OF SUSTAINABLE DEVELOPMENT M.Kaviya, A.Athiyaveni, G.Deepalakshmi, V.Sabari
21.	SUSTAINABLE DEVELOPMENT OF ECONOMICAL GROWTH IN ELECTRONICS P.Praveena,B.Prabavathi, M.Elakia,V.Sabari
22.	Sustainable Economic Growth – India Perspective Dr M. Maruthamuthu
23.	EDUCATION AND ECONOMIC GROWTH: AN EMPIRICAL ANALYSIS OF NONLINEARITIES S.Dhivya Dharshini, A.Athiyaveni, G.Deepalakshmi, V.Sabari
24.	NUCLEAR ENERGY AS A TOOL OF SUSTAINABLE DEVELOPMENT:REALITY A.Radhika , V.Sabari
25.	Economic Growth Personification in Indian Prescription A.Kavitha
26.	India’s Economic Growth & Environmental Sustainability K.Vanmathi,A.Athiyaveni,G.Deepalakshmi,V.Sabari
27.	Cybersecurity Externalities in ICT Models Implications on Sustainable Economic Growth Dr.Vignesh Ramamoorthy, Manoj K
28.	SUSTAINABLE DEVELOPMENT OF ECONOMICAL GROWTH IN INDIAN PERSPECTIVE S.Helen, A.Ashwini,V.Sabari
29.	SUSTAINABLE ECONOMIC GROWTH – INDIAN PERSPECTIVE E.Anuja, T.Gayathri, D.Shakila, V.Sabari

DISCRETEMATHEMATICSFORSUSTAINABLEDEVELOPMENTOFECONOMICAL GROWTH ININDIAPERSCEPTIVE

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ABSTRACT

The sustainable development of economical growth in prescriptive has been in theformation of models in discrete mathematics as a mathematics in theoretical as well as realworld economic analysis. It focuses on use of different mathematical operational tools andmathematicalEconomicsisthatithelpstosolvetheoptimisation.TheframeworkofEconomic model can be mathematical and non- mathematical in nature.Mathematics allowseconomiststoformmeaningful,testablepropositionsaboutwide-rangingandcomplexsubjectswhichcouldlesseasilybeexpressedinformally.Further,thelanguageofmathematicsallowseconomiststomakespecific, positive claimsaboutcontroversialorcontentioussubjectsthatwouldbeimpossiblewithoutmathematics. Muchofeconomictheory is currently presented in terms of mathematical economic models, a set of stylized andsimplifiedmathematicalrelationships assertedtoclarifyassumptions andimplications.

BROADAPPLICATIONSINCLUDE

- Optimizationproblemsastogoalequilibrium,whetherofahousehold,businessfirm,or policymaker
- Static(orequilibrium)analysisinwhichtheeconomicunit(suchasahousehold)oreconomicsystem(suchasamarketortheeconomy) is modeled asnot changing
- Comparativestatics as toachangefromoneequilibriumto anotherinducedbyachangein one or morefactors
- Dynamicanalysis,tracingchangesinaneconomicsystemovertime, forexamplefromeconomicgrowth.

Formal economic modeling began in the 19th century with the use of differential calculus torepresent and explain economic behaviour, such as utility maximization, an early economicapplicationof mathematicaloptimization.Economicsbecamemoremathematicalasadisciplinethroughoutthefirsthalfofthe20thcentury,butintroductionofnewandgeneralized techniques in the period around the Second World War, as in game theory, wouldgreatlybroaden the useof mathematical formulations in economics.

This rapid systematizing of economics alarmed critics of the discipline as well as some notedeconomists. ***John Maynard Keynes,Robert Heilbroner, Friedrich Hayek and others havecriticized the broad use of mathematical models for human behavior, arguing that somehumanchoices are irreducible to mathematics.***

INTRODUCTION

SustainableEconomicGrowth inIndia

Sustainable economic growth is economic development that attempts to satisfy theneeds of humans but in a manner that sustains natural resources and the environment forfuture generations. An economy functions in the ecosystem. We cannot separate the economyfrom it. In fact, an economy cannot exist without it. The ecosystem provides the factors ofproduction that fuels economic growth: land, natural resources, labor, and capital (which iscreated by labor and natural resources). Sustainable economic growth is managing theseresources in a manner that they will not be depleted and will remain available for futuregenerations.

Whilemanyeconomistsandpeopledisagreeabouttheimportanceoftheenvironmentregardingeconomicactivity, the followingfacts areseldom disputed:

1. The extraction and depletion of natural resources, as well as pollution and permanentchanges made to the landscape, are caused by economic activities and can do harm to theenvironment.
2. Many of the costs of the harm created by economic activities are not borne by those whocause it but by other people who neither obtain the benefits from the economic activity oragreetopaythecostsrelatedtoit.Pollutionisaperfectexample.Businessesarepermittedtopollutetoacertaindegree(lessnowthaninthepast).Theydon'thavetopay for the pollution, but society does by dirty air, water, and contaminated soil thataffect the quality of our air, water, and food. This pollution can lead to serious healtheffects, which may reduce the quality of life and health of the population. We call a costbornebysomeonewho did not agreeto bear it an**externality**.

3. Humansliveinanecosystemandcannotsurvivewithoutit.Ifwedestroytheenvironment, wewill eventuallydestroyourselves.

The Use Graph Theory to Build a More Sustainable World in Dscrete Mathematics: Discretemathematicsisanareaofmathbasedonthestudyofformalstructureswhosenatureisfundamentallyseparateand distinct.

This means it focuses on integers and natural sets of numbers, shapes, and other objects thatyoucancount **finitely** ordistinguishfromoneanother.Itmodelsrealityinamannerspecificallysuited to certain real-world applications.

From industry and logistics to computer science and telecommunications, having a quantizedrepresentation of everything around us has led to magnificent advances in our understandingandcontrol of thephysical world.

It's important to have at least a rough idea of the main distinctions between discreteness andcontinuity to address **graph theory**. But these aren't very well-known concepts to peopleoutsidethe world ofmathematics.

At first, continuous math is the one predominantly taught in the education system due to itsversatility,usefulness,andpracticality inmostareas.It’sbasedontheanalysisofrealnumbers and functions that encapsulate mappings between these quantities, along with thenotion of the infinitesimal change of a variable. This results in a series of tools like limits orderivativesthat constitute**calculus.**

On the other hand, thediscrete paradigm is more straightforward and intuitive, with theexception of a few cases. And its finiteness is given by the primordial element constituting it**sets.**

Among the most notorious use areas are those whose main components imply algorithms anddatastructures.Althoughthe usecases ofmath are not whatmost peoplethink theyare.

In the real world, we don’t often face problems in the same way as in the education system.Indeed, discrete ways of approaching riddles and modeling the input data we need to come upwithasolutionaremoreusualthancontinuousones,especiallyregardingsystemoptimizationissues.

For this reason, we should reconsider the role of this way of doing mathematics since itinvolves the development of **critical/computational thinking**. This is crucial for the currentera in which we are surrounded by technology. It also involves the improvement of problem-solvingskills, makingit possible for us to faceanynew challenges.

By doing so, we can see how relevant it is to apply a solid mathematical foundation tocommon global threats that are increasing daily, like misinformation, lack of fluency inhandlingtechnology,geopolitical instability, andevenclimatechange.

Notwithstanding the apparent remoteness between the latter issue and graph theory itself, weshouldthink about thewayweliveand thesystem bywhichour civilization is maintained as

Fig.1.DualchannelnetworkstructureinLogistics.

SUSTAINABLEMANAGEMENTINDEVELOPMENT

Thesustainabledevelopmentdividesthecomponentsintothreeelementssocial,economican denvironmental.Socialcomponents-workershealthyandsafety,equalopportunity, quality of life, benefits to disadvantage groups. Economic components creationfor new market and opportunities for sale growth, cost reduction through efficiency andimprovements and reduces energy and raw material inputs. Environmental components areunpollutedenvironment,effluentsgeneration,andemissionintoenvironment,resourcemanage ment, habitat restoration and preservation, use of renewable raw material, eliminationoftoxic substances.

Thesustainabledevelopmentisessentialforthefollowingissues:

- ToPreventtheenvironmentaldegradation
- To ensureahuman life
- Tocheckthe exploitativetechnologyandfind alternativesources
- Tocheckthecoverexploitationandwastageof naturalresources
- Toregenerate renewableenergyresourcesetc.

Theneedmathematicalmodelling

The Mathematical modelling are recognized as effective tool that could help examineeconomic,environmentalandecologicalimpactsofalternativepollutioncontrolandresources- conservation actions, and thus aid planners or decision makers in formulating costeffective management policies. Managing for sustainability raises a suite of mathematicalproblems,fromthedynamicsofpopulationgrowthandpopulationinteractions,tothedevelopment of sustainable energy sources, to the creation of management strategies fordealing with public goods and common-pool resources. Most of the problems can be resolvedwith the mathematical methods that are likely to stimulate much research which will help oursocietiesachieveasustainable futureweknow it.

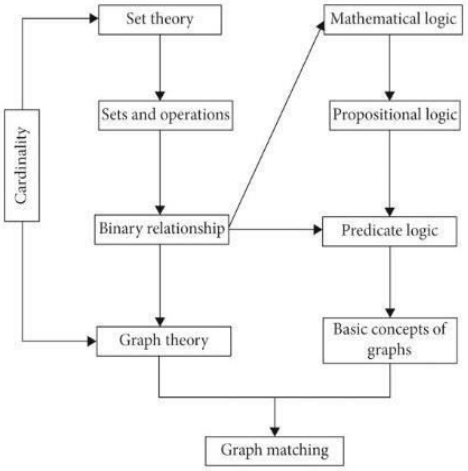

Fig.2.Mathematicalmodellin

Mathematicalmodelsustainthemajorityofhumanactivityontheplanetandusedtosolvemanyreallifesituations like:

- Mathematicalmodellingoflaunchingasatellite.
- Mathematicalmodellingofurbancityplanning.
- Mathematicalmodellingofcontrollingpollutionduetovehicles.
- Mathematicalmodelling ofthetrafficflowon highwaysor thestockmarket options.
- Mathematicalmodelstounderstandtheworkingofheart,brain,lungs,kidneys,andtheEndocrinesystem.
- Mathematicalmodelstoestimatethepopulationof Indiaintheyear2050AD
- Mathematicalmodelstodemonstratetheactionof medicineinthehuman system.
- Mathematicalmodelsforglobalwarming.
- Mathematicalmodelstounderstandthefluidflowindrains,lakes,rivers,spillwaysetc.

MathematicalversusNon-mathematicalEconomics

Thereisnofundamentaldifferencebetweenmathematicalandnon-mathematicalapproachtoeconomicanalysis.Theobjectiveofanyeconomicanalysis,whetheritismathematical or non- mathematical in nature, is to obtain set of conclusion from the set of ofeconomicanalysisare:Firstly,inmathematicaleconomicanalysisassumptionsandconclusions are expressed in mathematical symbols or operations and equations rather thanwords and sentences respectively. Secondly, literary logic is replaced with mathematicaltheorems which aids to draw upon abundance of reasoning in the process. words, so it doesnot matter much what is chosen over the other. Mathematics forces the analyst to stateassumptions explicitly at every stage just because mathematical theorems are usually stated inthe 'if-then' form, so to get the then (result) part of theorem for their analysis, they should seethat'if'or conditionalpart doesconform totheassumptions mentioned.

Fig.3.MathematicalversusNon-mathematical Economics

1. **QUANTIFICATION**

In economic analysis forecast are made with the help of diagram. For example, in acompetitive market if supply is increased then the price of a good falls.However, there isverycommon economicintuition behind it whichanymarketplayer can analyse.

Sometimes the economic analysis that are non-mathematical in nature can also be usefulfropredictingthe direction ofexpectedchangewhich arenon quantitative innature.

2. **SIMPLIFICATION**

Algebraic expressions make some economic concept or relationships much easier tounderstand than iftheywereexpressed in words.

CONCLUSION:

Mathematical modelling plays a vital role in sustainable managementpractice orprocessinallaspectssuchassocial,environmentalandeconomicalstudies.Manydevelopmental challenges could be solved by mathematical models that could describe them.Thesustainabilityofplanetearthdependsonmathematicalscience.Thusthediscrete

mathematics plays a major role in the development of sustainable development of economicalgrowthit mayhelps for thefuturedevelopment ofour countryIndia and also theWorld.

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