Sustainable Development: Concept, Measurement & Strategies

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Presentation

- The concept of Sustainable Development
- Estimation of Green GDP
- Operationalising Sustainable Development
- Policy Framework
- Globalisation, Technological Efforts and Sustainable Development
- Policy Implications

Sustainable Development

- Sustainable Development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations.

Sustainable Development

- It is a process which links exploitation of resources, investments, technology and institutions with human needs and aspirations.

- Limitations of GDP as a measure of development.

Eco-Domestic Product: Green GDP

- Green GDP = NDP – Imputed Environmental Costs
- Where NDP = GDP – the depreciation of man-made capital
- The imputed Environmental Costs = the degradation and depletion of natural assets.

IEC

- The imputed environmental costs comprised of the economic costs induced by:
- natural resource depletion
- destruction of the ecosystem
- degradation of natural assets, as well as air and water pollution.

Resource depletion

- For resource depletion, calculate the rate of depletion, and for produced natural assets such as forests, the cost of depletion is set equal to the reproduction cost of the net reduction of the resources.

Non-renewable Resources

- Consumption of non-renewable resources may eventually require a substitute to be found for them at some future date.

- The lost benefit due to future use are known as ***user cost*** or depletion premium

User Cost

- The user cost is defined as the difference between the rent of the current resource exploitation and the external rent if we could exploit the resource forever.
- i.e. UC = R c - R e; where R c is current annual rent of the resource exploitation and R e represents the annual rent if we could exploit the resource infinitely.

Calculation of User cost:

- Assuming that the resource is depleted at the current rate and the rent is constant over time, the total rent from the resource is:

$$TR_c = \sum_{i=1}^{N} R_c (1 + r)^i$$

- Where r is the discount rate and n is the number of years we could exploit the resource at the current depletion rate.

Calculation of user cost:

- If we do not run out of the resource in a finite time, n years, but allocate the resource into infinite flow, the total rent from the resource would be:

$$TR_e = \sum_{i=1}^{\infty} R_e (1 + r)^{i}$$

- For the same resource, the total rent from either of the exploitation plan should be equal.

  i.e. $TR_e = TR_c$.

User Cost

- By substitution equation 2 and 3 in 4, we derive

$$UC = R\, c\, (1 + r)^{-n}$$

Other components of IEC

- Another component of IEC is the losses caused by the degradation of natural assets.
- Two vital things are:
- economic asset including forests, grasslands and cultivated lands, and
- non-economic assets, primarily air and water.
- To quantify the degradation cost in monetary terms, use recovery costs as a proxy for the degradation damage.

Air and Water

- The degradation of air and water is mainly attributed to the increase in air and water pollution.

- The rising emissions of SO2 and TSP, Nox [oxides of nitrogen] and other residuals impair air quality, especially in urban areas.

IEC for air and water:

- Using abatement and control costs as the measure for the damage incurred by air pollution, one can find the loss.

- For water, apply the marginal abatement cost as a proxy of the cost of water pollution.

The relation between Green GDP and Damage Estimates:

- The imputed environmental costs and the environmental damage represent two different approaches to determining the social costs of environmental degradation.

For instance:

- In the case of air and water pollution, the imputed environmental cost evaluates the social costs in terms of expenditures to prevent pollution emission.
- On the other hand, the environmental damage method measures them on the basis of actual losses in production and the medical expenditures or social costs that the society has to bear due to pollution [like loss of human lives and workdays lost due to health problems].

Include social losses?

- If we include all these social losses, the acceptance of environmental damages is much more expensive than the cost required to eliminate environmental pollution.
- What are the alternatives?
- How do we operationalise Sustainable Development?

Operationalising sustainable development

- Operationalising sustainable development within this framework is the responsibility of the policy makers and administrators.

- How?

- Can Modeling be the answer?

Modeling

- A proper short and long term trade-off between economic objectives and changes in the natural resource base, information on economic and environmental variables has to be comparable and the interactions between these variables correctly identified.

Environmental degradation can manifest itself as:

- [1] rising concentrations of pollutants
- [2] resource depletion and
- [3] intrusion intro or modification of ecosystems [example: by building physical infrastructures into or through them]

Linkages of Environmental degradation:

- Environmental degradation is linked with a range of features, processes and agents in the natural environment and society.
- They can be characterised in five different ways.

Characterization:

1. Source of environmental pressure [increase in economic activity like automobiles and chemicals]
2. Receptors of environmental degradation [ecosystems (e.g., wetlands), cultural objects (e.g. Ancient temples), and people (e.g., slum dwellers).
3. Intermediate environmental processes linking sources to receptors [e.g. rag-pickers, incinerators, waste treatment plants].

Characterization – cont.

4. Feedbacks, or response by social agents, to environmental degradation.
5. The social determinants of economic activities [e.g., population, livestock growth, etc].

Indicators of changes in the environment:

- To capture the various aspects of changes in the environment caused by economic activities, three types of indicators have been proposed:
- [a] pressure indicators
- [b] impact indicators
- [c] sustainability indicators.

Pressure Indicators

- Flow Variables.
- Development over time of amounts or levels of emissions, discharges, depositions, extractions, and interventions originating from a set of economic activities.
- They express the burden placed on stocks of environmental goods and resources.

Pressure indicators:

- They can be defined in terms of economic activity or sector
- With a spatial or geographical dimension.
- Emissions could also be imported or exported by the direction of the wind.

Impact Indicators

- They reflect the impact of this pressure on the receptors, usually in a predetermined region.
- They include imported trans-boundary pressures.
- They show the development over time of the stocks and qualities of environmental goods and resources.

Sustainability Indicators

- Both pressure and impact indicators can be transformed into sustainability indicators by relating pressure or impact with predetermined reference values.
- These references try to indicate what is considered to be a sustainable level of extractions – quantity as well as quality.

Normative Valuation in Sustainability indicator

- Sustainability indicators contain normative valuations in three respects:
- [1] They picture a distance between current and reference values that should be bridged.
- [2] Although reference values are of course based on scientific insights, they are inevitably the outcome of personal and societal risk assessments and preferences.
- [3] The problem of valuation in aggregation.

Approaches to Economic-Ecological Modeling

- Modeling is to give substance to the notion of sustainable development.

- Distinction between formal or analytical models [that typically provide abstract representation of the systems studied] and empirical or applied models [that relate to specific concrete realities].

Other Models:

- Evaluative Models [prescriptive or normative models].

- Examples: Cost benefit analysis, cost effectiveness, environmental impact analysis].

Other Models:

- Descriptive Models [analytical or predictive].

- Examples: Computable General Equilibrium Models or input-output models or econometric models.

Environment-cum-Economy Models:

- They describe the intensity of abatement or remedial activities necessary to comply with some standard of environmental quality, in relation to the costs of such activities.

- They are also partial impact models.

These models can be grouped as:

- 1. Substance and Materials Flows Models
- 2. Resource Regeneration and Carrying Capacity Models
- 3. Life support and ecosystems models.

Operationalising Sustainability:

- There are four steps involved:

- Firstly:
- [a] Identifying appropriate existing abatement technologies and investing in research and development for the emergence of more appropriate technology in areas where it does not exist.

Steps:

- [b] Recycling to decrease waste generation and reducing the use of inputs such as energy per unit of output.

- Secondly: creating a climate for the adoption of appropriate technology by different industries through the use of market based intervention including fiscal interventions.

Steps:

- Thirdly: identifying situations in which development and preservation are complementary through consumer awareness, eco-friendly products and eco-industries.
- Fourthly: encouraging in all areas where it implies preservation.

Policy Framework

- Pre and Post Rio Meeting.
- Awareness about Global Warming and depletion of Resources.
- Leading up to the 1992 Earth Summit, several regional comprehensive economic and environmental plans were prepared.

Regional Sustainable Development Plans

- Our Own Agenda – Latin America and Caribbean (1990).
- Economic Policies for Sustainable Development – Southeast Asia (1990).
- Environment and Development: A Pacific Perspective, and The Pacific Way – Pacific Islands (1991).

Policy Perspectives

- Differences in the perspective between developed and developing countries.
- Environmental degradation as an inevitable consequence of development, but reversible after certain threshold levels.
- Attractive Research agenda for developed countries.

Major threats to sustainability in India

- Energy – Demand and Supply
  - Mismatch, conservation and energy poverty
- Running out of water – both normal and clean water.
- Land degradation – unable to feed ourselves and biodiversity
- Urban Squalor
- Choking on polluted air

Policies and Actions

A rapid growth for India is possible.

The resources also exist.

Technological efforts need to be promoted.

To preserve the quality of the environment, India has to give special attention to policies for sustainable development.

Thank you Very Much

- for your attention