HCENR Secretary General Seminar Series

Seminar1: *Understanding Sustainability: Principles and management rules*

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Structure, contents, & scope

1. General: Sustainability defined
2. Sustainability at micro/sector level: Principles, threats, & policy measures
3. Managing for sustainability at Macro/national level: Strategies & policy rules
4. Threats to and paradigms of sustainable development at the global scale: Limits to growth & planetary boundaries

- Introductory treatment – each subsection requires at least full separate lecture & may be own course

Sustainability Defined

- **Dictionary:** The ability to be maintained at a certain rate or level
  - Sustain can mean maintain, uphold, or endure
- **Wikipedia:** Capacity for Earth's biosphere & human life to co-exist constantly

➢ Change in a balanced environment, in which the exploitation of resources, the direction of investments, the orientation of technological development, & institutional change are all in ***harmony*** and *enhance both current & future potential* to meet human needs & aspirations

➢ *Concern is protecting rights of future generations*

Scales & dimensions of sustainability

- Studied & managed over many scales (levels or frames of reference) of time and space and in many contexts of environmental, social, and economic organizations
- Focus ranges from total carrying capacity of planet Earth, to sustainability of resource sectors, ecosystems, countries, municipalities, home gardens, individual lives, in the use of natural resources prudently to meet current & future needs of life on earth & people's welfare (occupations, incomes, lifestyles, etc.)

Sustainability at micro (resource sector) level 1

- Depends on the type of resource (renewable, exhaustible, quality vs quantity attributes)

1. **Renewables' quantities (biological-living resources):**

   - *Have the capacity of natural regeneration (growth)*

- Ecologists argue for the necessity of balancing the demand for and supply of the resource for sustainability

➢ Available resources must not be depleted (extracted) faster than resources are naturally regenerated (supply)

- *The principle of maximum sustainable yield (MSY) and steady state (SS) equilibrium*

➢ Widely applied in managing forests, fisheries, rangelands, wildlife, etc.

Managing with the MSY principles

- Extraction (harvesting) rates ≤ rates of natural growth
- ***Operationalized*** through allocating the biologically determined (measured) MSY through quotas of fishing licenses, timber logging concessions, game hunting permits, etc.
- ***Threats & challenges***

➢ Difficult to enforce compliance with regulation, especially in open access & common pool resources

- Poachers, communal fishing & game hunting for subsistence, firewood collection by villagers, etc.

➢ **Measures:** collective governance regimes such as community -based NRM, model forest, village committees, etc.

Sustainability at micro (resource sector) level 2

2. Renewables' qualities (environmental health):

2A. Regulating services of ecosystems: waste assimilative capacities of atmospheric, aquatic & terrestrial resources (air spaces, land, rivers, lakes, oceans, wetlands, vegetation)

- ***Polluters pay principles enforced through:***

1. *Regulation – laws & administrative monitoring*
2. *Market-based policy measures (taxing emissions, optimal pollution tradeable permits, carbon credits, incentivizing energy transition, technological innovations, climate smart agric., etc.)*

- ***Threats & challenges:*** Enforcement of regulation difficult & other challenges with the commons (local, transboundary & global) requiring cooperative collective action – climate change mitigation protocols, regional agreements, etc.

Sustainability at micro (resource sector) level 3

2. Renewables' qualities (environmental health):

2B. *Supporting services of ecosystems: Biological diversity*

- ***Precautionary measures principles (against uncertainty)*** *– total or partial protection measures through reserved (protected) areas, conservation parks, etc.*

Threats & challenges

- Primarily regulatory, hence the difficulty with enforcing compliance with regulation of illegal practices & intrusions, especially in open access & common pool resources
- **Measures:** collective governance regimes such as community-based NRM, regional & global conventions & cooperation protocols

Sustainability at micro (resource sector) level 4

3. Exhaustible (finite quantities - minerals):

- Minerals (subsoil assets) are sources of employment & income
- Liquidation deprives future generations livelihood opportunities
- Sustainability requires ***recovery & reinvestment of the Resource Rent (RR)*** in other forms of capital (industry, science & technology, human) that will provide alternative livelihoods' options to compensate future generations for liquidation

Challenges

- ❖ *What is the RR & how to measure its value?*
- ❖ *What sustainab. rules for recovery & reinvestment of the RR?*
- ➢ *Good introduction to sustainability in macroeconomic management*

Managing for sustainability at macro level

- *GDP widely used as indicator of macroeconomic performance*

- Excludes depletion/depreciation of natural (N) capital
- Accounts for income from extracted resources (minerals, fish, timber) but not the corresponding value lost of these assets (liquidation draws down/reduces future generations' wealth)

- *GDP/income wrong measures of economic performance*

- Country appears to enjoy high economic growth by liquidating its minerals, forests or fisheries, polluting its environment for current consumption, BUT it is actually descending in terms of long-term wellbeing & sustainability
- High consumption (LARGE GDP/income) financed through liquidation of natural assets is desirable – current wellbeing

- Change in total wealth (W) – ***genuine savings*** better measure of change in wellbeing – ***Environmental (Green) accounting***

Correcting measures of performance

- Sustainable income or (NDP) & consumption (C)

- NDP = C + δW

➢ *If C > NDP (consuming more than what we produce)*
►► *δW < 0 (Declining wealth – running down savings)*

➢ ***Leaving less for tomorrow – decreasing future welfare***
➢ ***Unsustainable path (consuming too much)***

➢ Non-declining NDP (δ NDP $\geq$ 0 ►► *δW > 0 building up*) better sustainability indicator

➢ **BUT** *NDP includes only δK (produced assets, i.e. W=K)*

Concept of inclusive wealth W

- Broadening the definition of capital (total wealth W) to include other assets (natural N & human H, other)
  - $W = K + N + H$
  - ***(Environmental (green) accounting, Genuine savings***
  - **Weak sustainability** (intact W ***requires*** $\delta W \geq 0$)
- Some components of W may decline (i.e. liquidating N $\delta N < 0$) but others (K, H) are increased (δK or $\delta H > 0$) by offsetting amounts (non-negative net change $\delta W \geq 0$)
  - Reinvestment of RR in alternative capital assets
  - Requires substitutability between K, N and H
- **Strong sustainability paradigm** (at least some of N to be kept intact)
  - Ecological thresholds (irreversible damages)
  - Precautionary principle of conservation – uncertainty of future collapses/irreversibility

Global dimensions of sustainability

- According to **Our Common Future (**also known as the Brundtland Report, 1987), *Sustainable Development* is defined as: "**development that meets the needs of the present without compromising the ability of future generations to meet their own needs**."
- *Our Common Future* placed environmental issues firmly on the political agenda; it aimed to discuss the environment and development as one single issue

Carrying capacity & limits to growth

At global scale, scientific data indicates that humans are living beyond the carrying capacity of planet Earth & this cannot continue indefinitely. This scientific evidence comes from many sources:

- Millennium Ecosystem Assessment, Planetary Boundaries
- The 1972 Limits to Growth book and the 2012 review in *Nature* expressing concerns that the Earth may be "approaching a state shift" in its biosphere
- The ecological footprints that measures human consumption in terms of biologically productive land & sea area needed to provide for all competing demands on nature, including provision of food, fibre, urban infrastructure & absorption of waste, including carbon from burning fossil fuel
- In 2019, it required on average 2.8 global hectares per person worldwide, ***75% more than the biological capacity*** of 1.6 global hectares available on this planet per person

Historically there has been a close correlation between economic growth & environmental degradation: as communities grow, so the environment declines. Concern that, unless resource use is checked, global civilization will collapse.

Decoupling refers to the ability of an economy to grow without harming the environment (resource depletion & associated pollution)

Sustainability studies analyse ways to reduce ***resource intensity*** (the amount of resource, e.g. water, energy, or materials, needed for the production, consumption and disposal of a unit of good or service)
Conflicting views on whether improvements in technological efficiency & innovation will enable a complete decoupling. Inherent ***thermodynamic*** & practical ***limits*** (impossible to increase resource use efficiencies indefinitely), & hence, it is equally impossible to have continued & infinite growth without a concomitant increase in depletion & pollution, i.e., growth & resource depletion can be decoupled to some degree over the short run but not the long run. Consequently, long-term sustainability requires the transition to a ***steady state*** in which total GDP remains more or less constant

Planetary Boundaries. In 2009 a group of scientists leaded by Johan Rockström from the Stockholm Resilience Centre and Will Steffen from the Australian National University described ***NINE*** planetary boundaries. ***Transgressing even one of them can be dangerous to sustainability***. In 2015, the scientists published an update. They changed the name of the boundary "Loss of biodiversity" to "Change in biosphere integrity" meaning that not only the number of species but also the functioning of the biosphere as a whole is important and "Chemical pollution" to "Introduction of novel entities," including in it not only pollution but also "organic pollutants, radioactive materials, nanomaterials, and micro-plastics". According to the update 4 of the boundaries are crossed: "climate change, loss of biosphere integrity, land-system change, altered biogeochemical cycles (phosphorus and nitrogen)". In 2019 they tried to develop a new version of the boundaries including in the boundary "Introduction of novel entities" genetically modified organisms, pesticides and even artificial intelligence.

Resilience in ecology is the capacity of an ecosystem to absorb disturbance & still retain its basic structure & viability. Resilience-thinking addresses how much planetary ecological systems can withstand assault from human disturbances and still deliver the service's current & future generations need from them. The resiliency of an ecosystem, and thereby, its sustainability, can be reasonably measured at or events where the combination of naturally occurring regenerative forces (solar energy, water, soil, atmosphere, vegetation, and biomass) interact with the energy released into the ecosystem from disturbances. In analysing systems such as urban and national parks, dams, farms and gardens, theme parks, open-pit mines, water catchments, one way to look at the relationship between sustainability and resiliency is to view the former with a long-term vision and resiliency as the capacity of human engineers to respond to immediate environmental events.

Sustainable management of the global commons

- ***Global commons*** management problems:
  - Global warming, zoonotic disease pandemics, extinction of species, desertification, collapse of marine & aquatic ecosystems, hazardous waste,

➢ ***Global cooperation*** agreements

- Climate change mitigation protocols & mechanisms (Kyoto, Paris, etc.)
- Conventions of biodiversity (CBD), Desertification (UNCCD), Hazardous waste (Stockholm, Minimata, Basel, etc.)
- Many other regional arrangements (GGW, etc.)

How about equitable distribution of benefits?

- Will non-declining total wealth ($\delta W \geq 0$) be sufficient for sustainability, regardless of distributional justice?
- Environmental justice is as important as sustainable development. The economy is a subsystem of human society, which is itself a subsystem of the biosphere, and an obtain in one sector is a loss from another. This perspective led to the nested circles' figure of 'economics' inside 'society' inside the 'environment'.
- The Earth Charter speaks of "a sustainable global society founded on respect for nature, universal human rights, economic justice, and a culture of peace". This suggested a more complex figure of sustainability, which included the importance of the domain of 'politics' & equity

➢ Development needs to be ***inclusive*** ▸▸▸▸ SDGs

The UN Sustainable Development Goals

The SDGs are the United Nations General Assembly's current harmonized set of seventeen future international development targets.[1] The seventeen goals include:

- (1) No Poverty, (2) Zero Hunger, (3) Good Health and Well-being, (4) Quality Education, (5) Gender Equality, (6) Clean Water and Sanitation, (7) Affordable and Clean Energy, (8) Decent Work and Economic Growth, (9) Industry, Innovation and Infrastructure, (10) Reducing Inequality, (11) Sustainable Cities and Communities, (12) Responsible Consumption and Production, (13) Climate Action, (14) Life Below Water, (15) Life On Land, (16) Peace, Justice, and Strong Institutions, (17) Partnerships for the Goals.
- The SDGs replaced the eight MDGs, which expired at the end of 2015. The MDGs were established in 2000 following the Millennium Summit of the United Nations.