

# Environment and Development

Defining and measuring  
sustainable development

## Definitions

- The World Commission on Environment and Development, 1987: Our Common Future, aka The Brundtland Report:

“development that meets the needs of the present without compromising the ability of future generations to meet their own needs”.

Future generations should be left no worse than current generations.

## What needs?

- Non-declining utility
- Measurement problems...

versus

- Stocks of critical resources
- two opposing definitions

## Weak sustainability

Objective: non-decreasing utility. An economy is sustainable if it saves more than the depreciation of its man-made and natural capital.

Critical notion: substitution possibilities.

Implies cost-benefit analysis.

Capital: man-made, human and natural.

Objections: How can we know future generations' preferences?

Substitution possibilities are limited by uncertainty and by irreversibility.

The weak sustainability criterion may be a necessary condition for sustainability, but it is not always sufficient.

## Strong sustainability

Objective: identify critical resources and safeguard those.

Underlying assumption: there exist some ecosystems services that cannot be substituted for (critical species, carbon cycle).

Implies cost-effectiveness analysis.

The strong sustainability criterion is based on a limited belief in the substitution possibilities between natural capital and man-made capital.

Life support services: the atmospheric carbon cycle, hydrological services.  
What level of stock should be maintained – not clear.

## Weak sustainability and inter-generational equity

- The Hartwick Rule:  
A constant level of consumption can be maintained perpetually if all the rents from the use of scarce natural resources are invested in capital.
- Can test whether current use is sustainable or not by examining whether the value of the natural resource stock is non-declining.

Reinvest the rents from the exploitation of a non-renewable resource.  
(Norway oil fund)

No information on future generations' preferences is needed to test whether a consumption path is sustainable according to the Solow-Hartwick rule.  
It suffices to check whether the current generation draws down upon its endowment.

Note that it is still the value of the *total* capital stock that is maintained, so it requires substitution possibilities between natural and man-made capital.

## Strong sustainability

- Has drawn attention to the concept of scale and its negative impact on the environment.
- On the other hand, most analyses are not operational.

Daly: efficiency, equity and scale.

Criteria for distributive justice:

Egalitarian

Utilitarian

Rawls's maximin principle

(veil of ignorance)

## Weak sustainability

- One of the advantages of this approach is its contributions to redefining standard economic indicators of growth.
- Resource accounts incorporated into social accounting matrices, and net national product adjusted to consumption of flows from natural resource stocks.



# Green accounting

- Net national product (NNP) can be interpreted as the rent of capital.
- If it is adjusted for changes in human capital and in natural capital, it can be used as an adjusted income measure.

There is a need for an aggregate measure. Recall:

GDP=the value of all the goods and services produced within a country (an income measure)

GNP=the value of domestic production (as above) + net factor income from abroad

NNP=GNP-depreciations

NNP is the maximum amount of produced output that can be consumed at a point in time while leaving wealth constant. Adjusted NNP, or green NNP, incorporates depreciations in natural capital, and not only human-made capital.

Need a quantitative measure to evaluate different policy options.

Repetto et al (World Resources Institute) The example of Indonesia: if include deforestation, soil erosion and the depreciation of oil reserves, Indonesia's rate of growth of NNP during the 1980s would be half the estimated growth in GNP.

## The UN Integrated Environmental and Economic Accounting (SEEA)

- Flow accounts for pollution, energy and materials
- Environmental protection and resource management expenditures accounts
- Natural resources asset accounts (m<sup>3</sup> of timber, barrels of oil)
- Valuation of non-market flow and environmentally adjusted aggregates

## Genuine savings rates

- As an income measure, the NNP cannot be used to assess the sustainability of a consumption path. For policy purposes, genuine savings rate may be a more useful indicator.
- The “genuine savings rate”
  - =investment in man-made and human capital
  - the value of depleted natural resources
  - the value of accumulated pollution.

Persistently negative rates of genuine savings must lead, eventually, to declining well-being.

For a first calculation of genuine savings rates, see

Hamilton and Clemens (1999), Genuine Savings Rates in Developing Countries, *The World Bank Economic Review* 13(2): 333-356.

Published yearly in the World Development Report.

What is the role of economic incentives for environmental policy in developing countries?

# Principles for sustainable development

## **Polluter Pays Principle**

(no subsidies to polluting activities)→  
regulation should have agents internalize  
the marginal external cost on polluting  
activities.

# Principles for sustainable development

## The Precautionary Principle

*What is safe?*

“...where there are threats of serious and irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.”

Article 15 of the Rio Declaration (1992)

Climate change damage, asbestos, GM food, cellular phones ...

Also incorporated in the Maastricht Treaty on the European Union.

Scientific uncertainty does not justify the delay of preventive action.

Basically the PP says: “Act then learn”.

Climate change example again – 2 opposite effects:

- 1) Irreversible investment in abatement capital leads to an option value of waiting with the investment.
- 2) Irreversible environmental damages argues for early investment.

The PP is rarely evoked in U.S. environmental policy. One strand in European environmental policy sees the PP as an argument for doing everything possible to reduce the risk to a minimum, no matter the cost – which is economically inefficient. (See your notes on the economics of pesticide use and on biotechnology!)

On the other hand, the PP questions arguments for delay in action and opens up for a real debate on some important issues, for example: who should judge what is an acceptable risk?