

Production-Consumption Model

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Sustainable Development Production-Consumption Model Description

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To understand the concept of sustainability, one must understand how our planet works, i.e., how we balance resources, consumption and carrying capacity to achieve our quality of life. To these ends we have created a model of our current production-consumption model to describe how we harvest (extract), process and use these resources to create the goods and services we enjoy. Sustainable development, as defined by Norwegian Prime Minister Gro Harlem Brundtland, is "...development that meets the needs of the present without compromising the ability of future generations to meet their own needs." This means that in order to achieve an acceptable quality of life now and for future generations, the production and consumption of goods and services and their concomitant environmental impacts must not exceed the carrying capacity of the environment. Thus it is essential that we view our harvesting, extraction and use of these resources as a mass balance, which, in order to be sustainable, must meet the following conditions: (1) the use of renewable resources must be less than their regeneration rate, (2) the use of non-renewable resources must be less than the development of renewable substitutes, and (3) pollution emissions must be less than the carrying capacity of the environment.

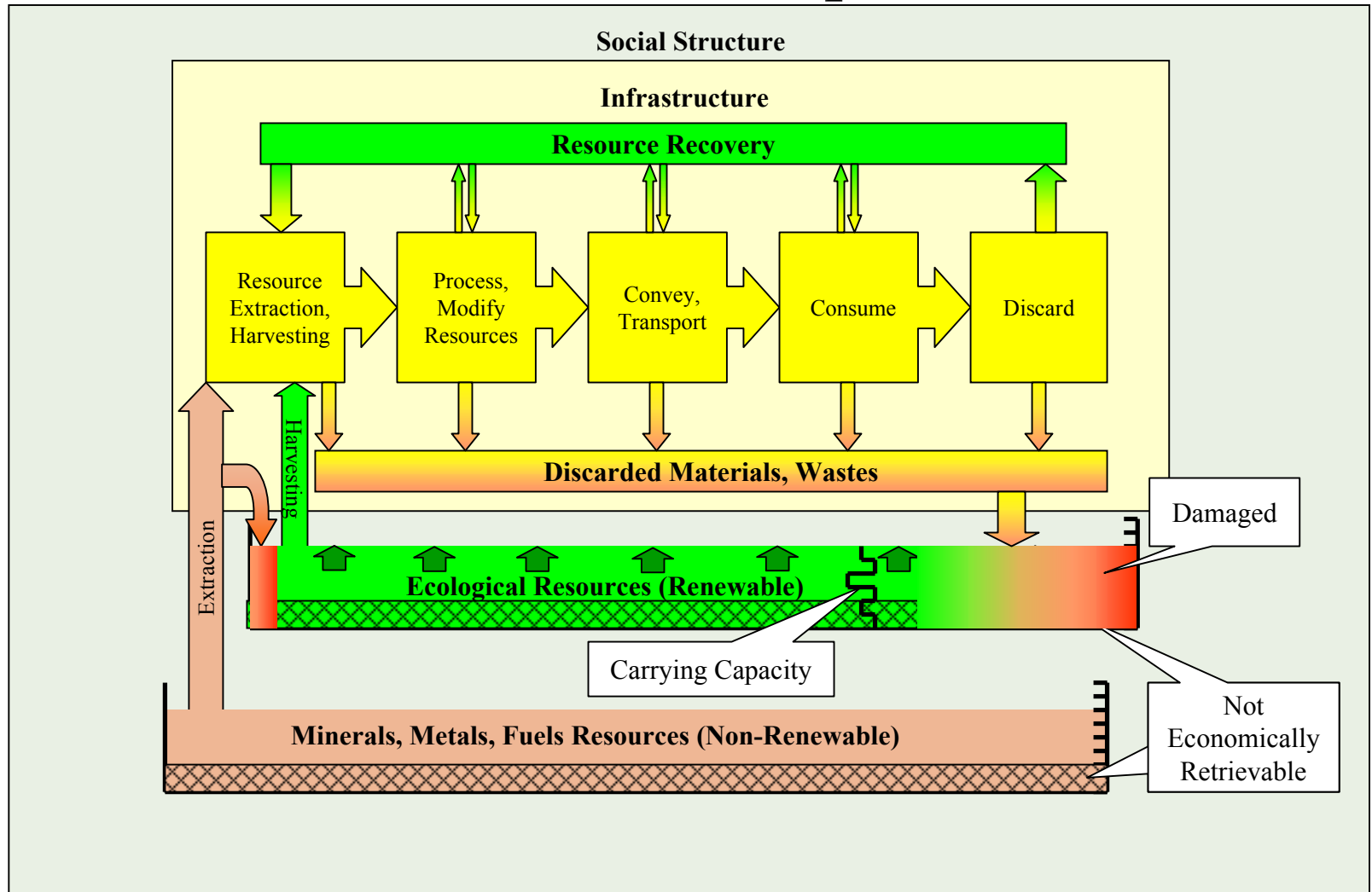
This concept of balance is presented in the model. First the earth has two types of resources: renewable and non-renewable. Renewable resources are the living, ecological resources that we can continually grow, harvest and convert into goods and services. As the size of the renewable resources rectangle in the diagram indicates, the quantities of renewable resources are finite, and some are currently not economically retrievable. However, these quantities will remain stable so long as we do not over-harvest or damage them. Wastes from our systems of extraction, harvesting, production and consumption are often improperly handled and continue to cause damage to our renewable resources. If allowed to continue, the damage will limit the quantities of renewable resources available. Worse, it may reduce these resources to such a degree as to exceed the carrying capacity of the resource, i.e., its ability to renew itself in the face of continuous harvesting and damage to the ecosystem in which it resides.

Minerals, metals, and fuel resources are classified as non-renewable. These resources are also finite and some substantial quantity is currently not economically retrievable. In our production-consumption model. Non-renewables are extracted and converted into goods and services. Waste materials created during the extraction process may be disposed and cause damage to our renewable resources.

The current production-consumption process can be described as five-steps: resource extraction or harvesting, processing or modification, transport, use, and discard. Unwanted by-products are created in each step, some of which reaches and causes damage to our renewable resources. Other by-products are recycled at each step.

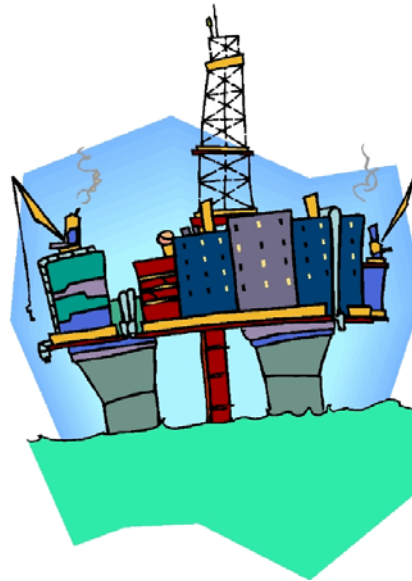
Finally, all of the production-consumption steps are incorporated in our built infrastructure. That infrastructure along with the renewables and non-renewable's are contained with in and are ultimately influenced by an overall social structure.

Production-Consumption Model



Conditions for Sustainability

- Renewable resources (ecological)
 - Use < Regeneration
- Non-renewable resources (minerals, fuels)
 - Use < Development of renewable substitutes
- Pollution emissions
 - Emissions < Carrying capacity of environment

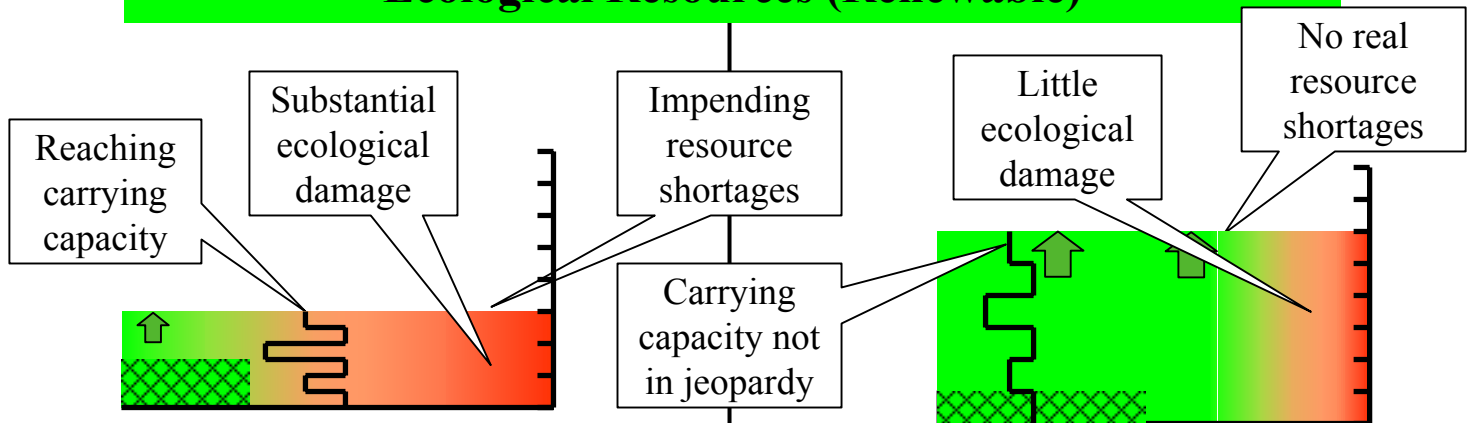


The Debate Over Sustainability

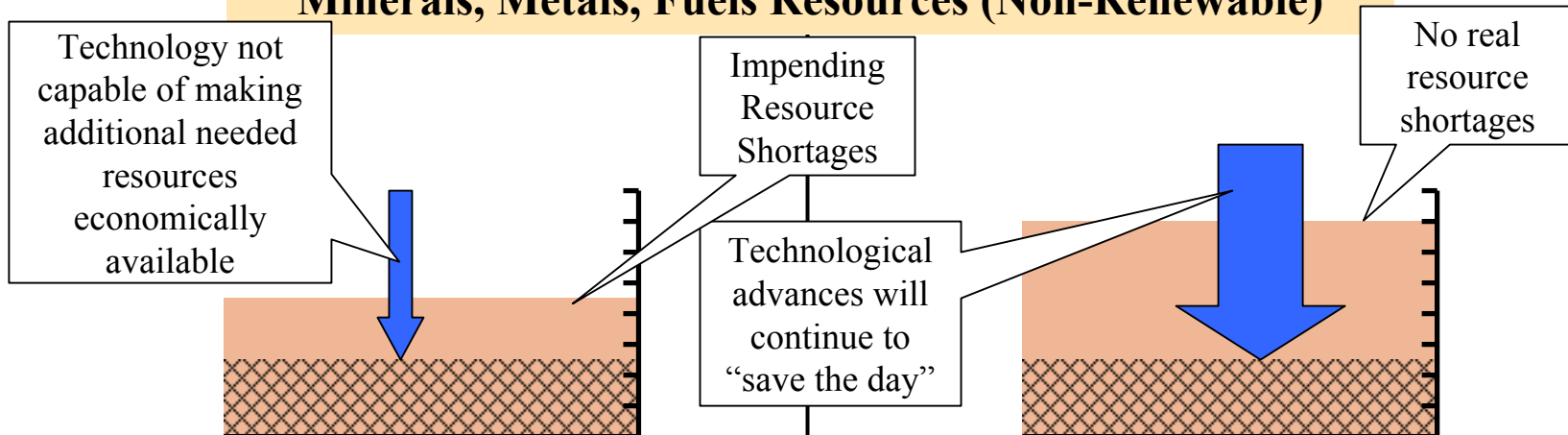
Resource Constrained

Resource Abundance

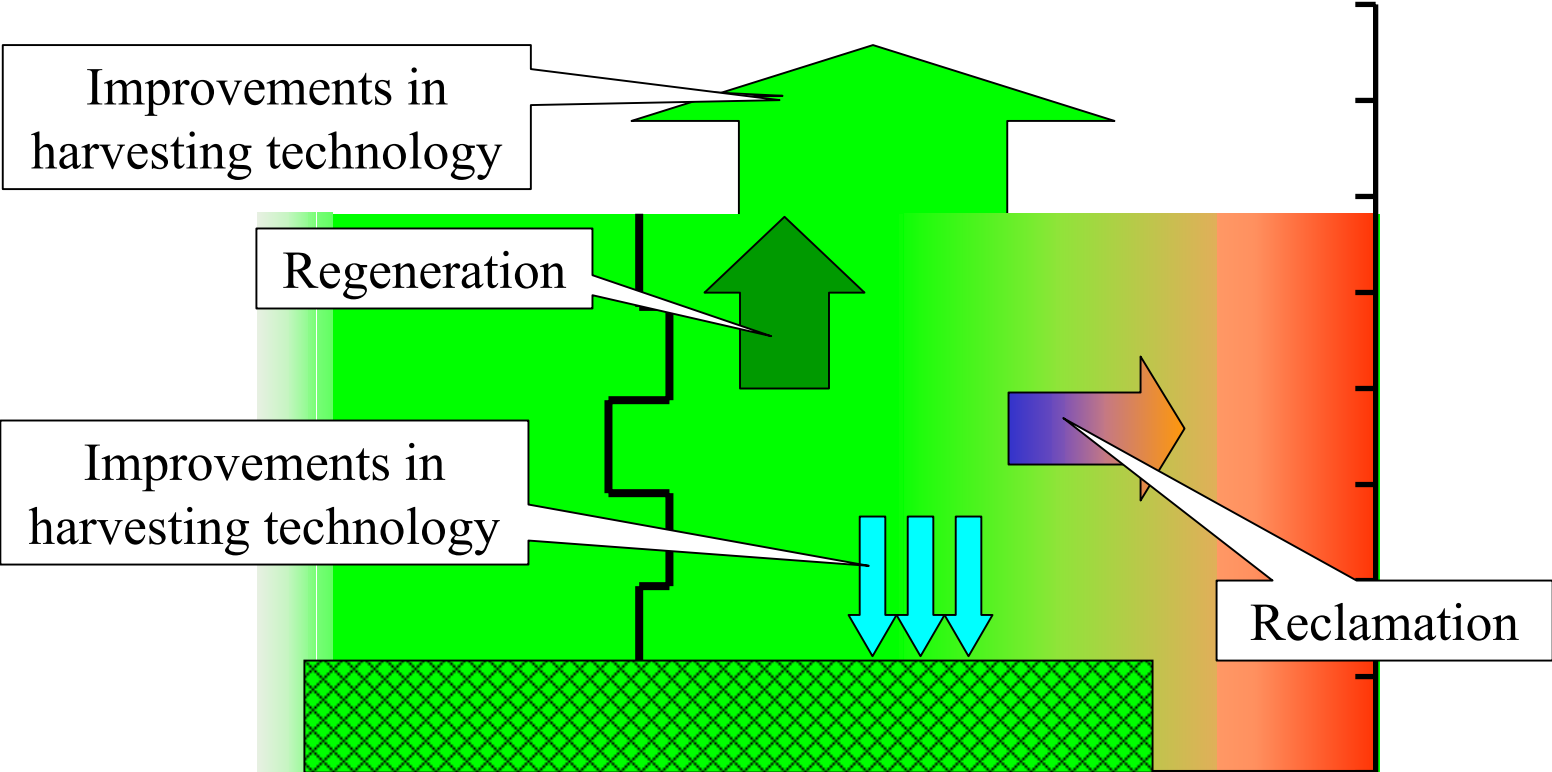
Ecological Resources (Renewable)



Minerals, Metals, Fuels Resources (Non-Renewable)



Ecological Resources: A Closer Look



Ecological Resources (Renewable)