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TÉCNICO

Doctoral Program and Advanced Degree in Sustainable Energy Systems  
Doctoral Program in Climate Change and Sustainable Development Policies  
Doctoral Program in Mechanical Engineering  
Doctoral Program in Environmental Engineering

# Sustainable Development, Energy and Environment

## Lecture 01

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Department of Mechanical Engineering



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## Course Staff

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  - Manuel Gameiro
- **FCUL**
  - **Miguel Brito**
- **FEUP**
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## Evaluation

- Final Exam, at a date to be defined
- “Open book”, i.e., all course material may be consulted

## Course Material

- Student class notes
- Powerpoint presentations
- Papers, book chapters, etc.



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# Syllabus I

- **Energy**
  - 1<sup>st</sup> and 2<sup>nd</sup> Laws of Thermodynamics
  - Exergy
  - Energy flows: primary (resources), final, useful, services
  - Efficiency
  - World energy resources
  - Renewable energy resources
- **Environment & Energy**
  - Planetary Boundaries
  - Climate
  - Biodiversity and Ecosystem Services



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## Syllabus II

- **Energy, Environment and Sustainability**
  - Sustainable development: environmental, economics and social pillars
  - Economic growth
  - Energy and economic growth
  - Efficiency and rebound
  - Social indicators of sustainability
- **Solutions**
  - Sustainable buildings



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# What is Sustainable Development?

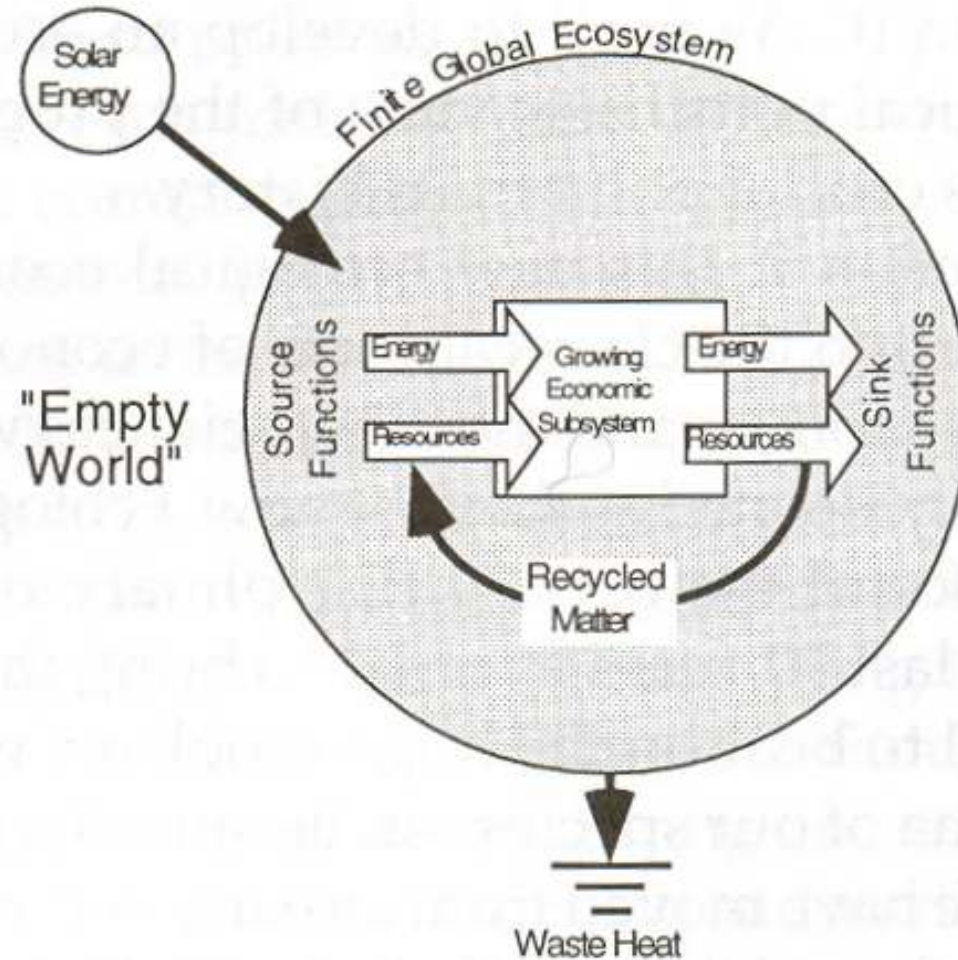
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- Brundtland report (1987) – “Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”
  - Intra- and inter-generational equity
  - Anthropocentric
- Techno-optimists vs. eco-pessimists



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## “Empty World”

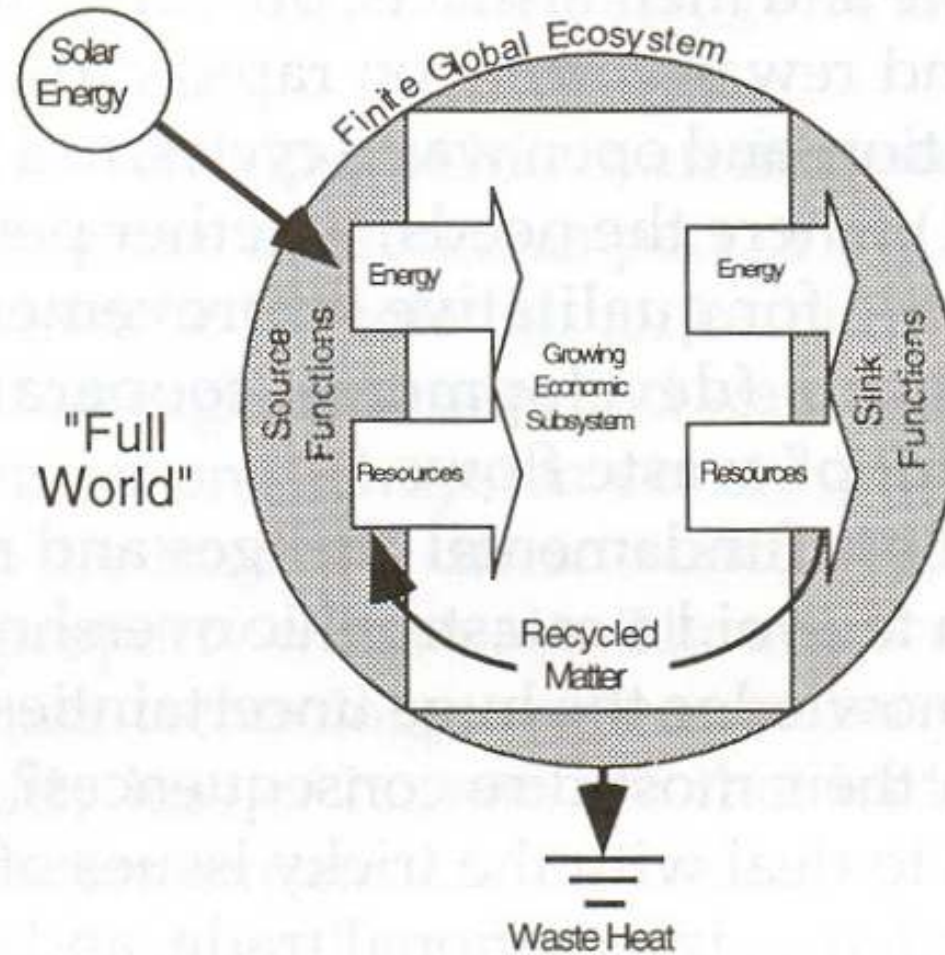


Costanza, R., J. Cumberland, H. Daly, R. Goodland, R. Norgaard (1997). *An Introduction to Ecological Economics*. St. Lucie Press, Boca Raton, FL, USA.



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## “Full World”



Costanza, R., J. Cumberland, H. Daly, R. Goodland, R. Norgaard (1997). *An Introduction to Ecological Economics*. St. Lucie Press, Boca Raton, FL, USA.