Sustainable and Responsible Innovation

Technology Development & Impact Assessment (EPA 1132)

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Jatropha: A Sustainable Crop?

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Part 1

Sustainability notions:

1. Brundtland Report
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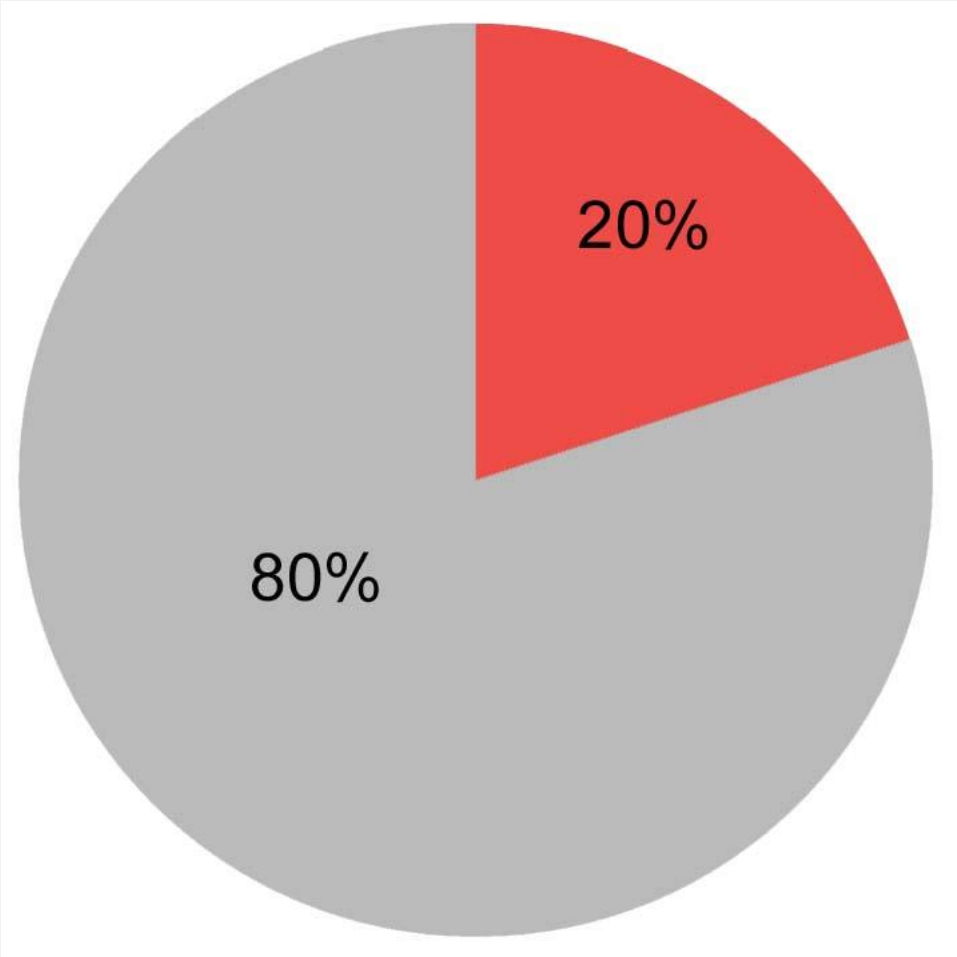
Part 2

Reflection: How to Deal with Conflicting values

Notion 1: Brundtland Definition

- the needs of the present
- the ability of future generations to meet their needs

Notion 2: East West & North South Relations


20%
80%

Notion 3: I = P*A*T

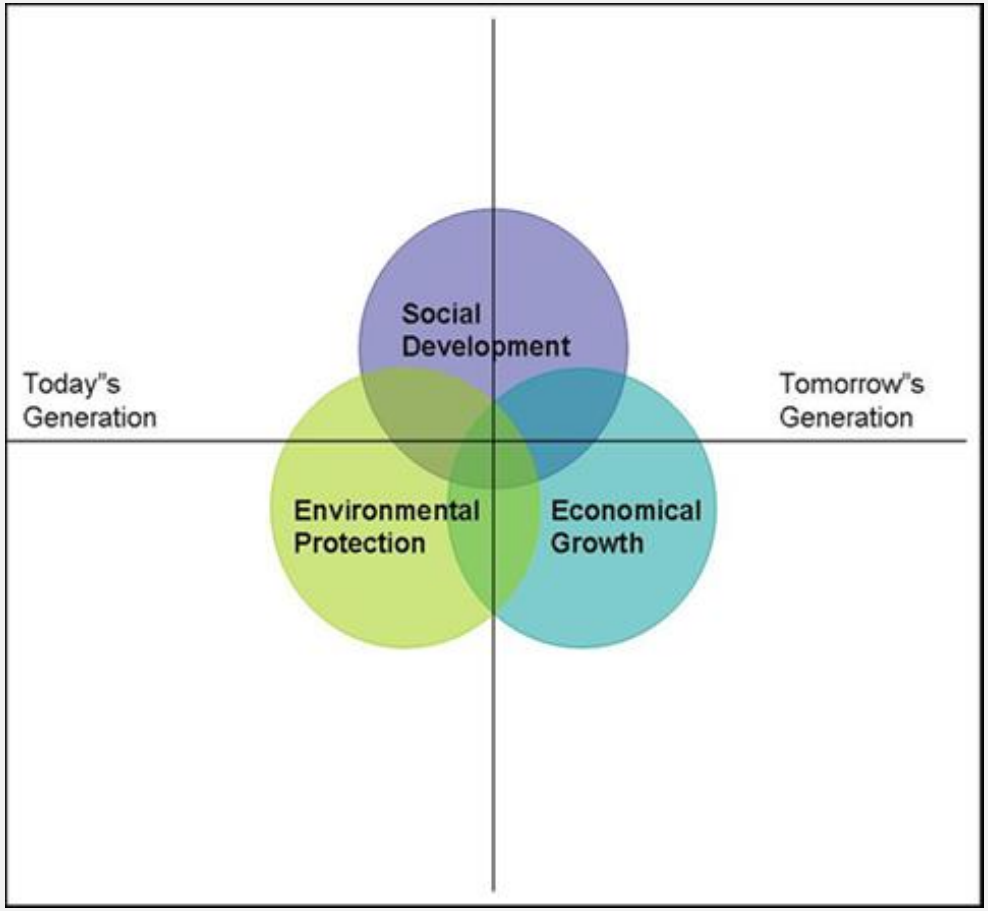
I = Impact on the environment
P = Population
A = Affluence: products & services consumed
T = Technology-efficiency: environmental impact per unit of product or service

Source: K. Mulder, *Sustainable Development for Engineers*. Sheffield: Greenleaf, 2006

Reducing the Impact by 50% in 50 years

Population	1.5 - 2.5 bigger
Affluence	4 - 8 higher
Environmental impact	0.5 less

Technology should be 12 to 40 times more efficient


Social
Development
Today"s
Generation
Tomorrow"s
Generation
Environmental
Protection
Economical
Growth

Notion 4: Three P’s

- People, Planet, Profit
- People, Planet, Prosperity
- Polluter Pays Principle
- Prevention Pays Principle
- 4 P’s: … and Politics

Sustainability themes

Source: UN World Commission on Sustainable Development (CSD) / Karel Mulder: Sustainable Development for Engineers, 2006

SOCIAL DIMENSION

Themes	Sub-themes
Justice	• Poverty • Equity
Health	• Nutritional state • Mortality • Sanitation • Drinking water • Health benefits
Education	• Educational level • Illiteracy
Housing	• Living conditions
Security	• Crime
Population	• Population dynamics

ENVIRONMENTAL DIMENSION

Themes	Sub-themes
Atmosphere	• Climate change • Ozone layer • Air quality
Land	• Agriculture • Forests • Desertification • Urbanisation
Oceans and coasts	• Coastal areas • Fisheries
Freshwater	• Water quantity • Water quality
Biodiversity	• Ecosystems • Species

INSTITUTIONAL DIMENSION

Themes	Sub-themes
Institutional framework	• Strategies for sustainable development • International co-operation
Institutional capacity	• Access to information • Communications infrastructure • Science and technology • Preparation for, and aid capacity in natural disasters

ECONOMIC DIMENSION

Themes	Sub-themes
Economic structures	• Economic development • Trade • Finance
Patterns of consumption and production	• Energy use • Production and management of waste • Transport

TABLE 6.1 CSD themes and sub-themes

Notion 5: Sustainable Entrepreneurship

Creation of value in Profit, People and Planet

Corporate Responsibility/
Environment
Abdul Latif Jameel
Community Initiatives
Coca-Cola
COMMUNITY
COOKER
JIKO YA JAMII
THE COMMUNITY COOKER
FOUNDATION
BOLDNESS
IN BUSINESS
AWARDS
Narayana
Hrudayalaya
Hospitals
patagonia
TESLA
TESLA MOT

Notion 6: Systems Thinking

Designers and decision-makers too often define problems narrowly, without identifying their causes or connections. This merely shifts or multiplies problems.

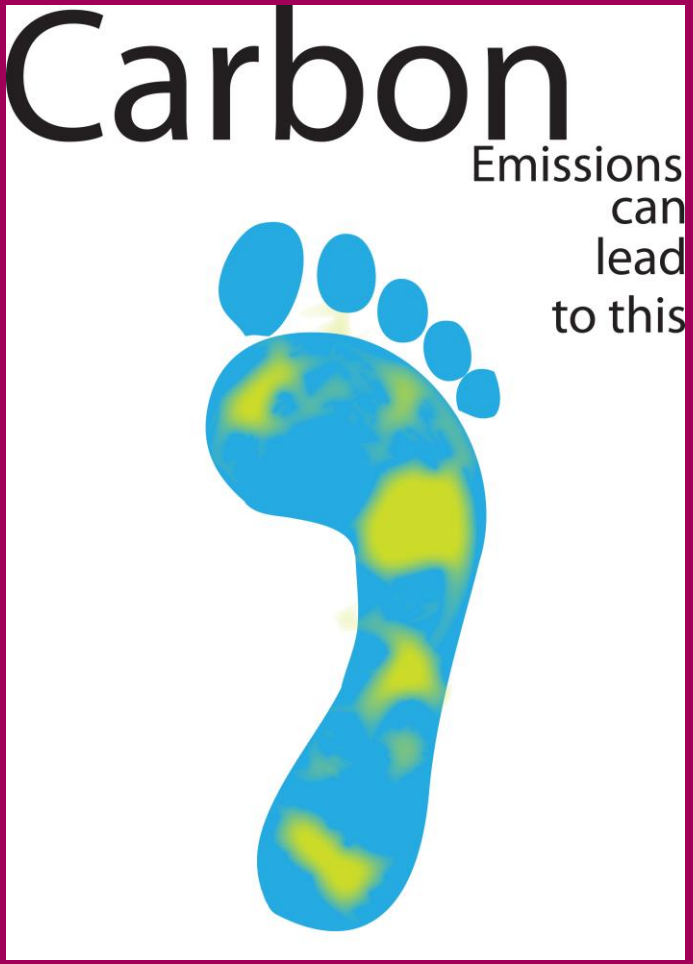
Rocky Mountains Institute

Systems thinking—the opposite of that dis-integrated approach—typically reveals lasting, elegantly frugal solutions with multiple benefits, which enable us to transcend ideological battles and unite all parties around shared goals.

Rocky Mountain Institute

Notion 7: Limited Resources and Emissions

Notion 8: Tools



- Ecological Footprint
- Life Cycle Assessment
- Lifecycle Design Strategies
- Materials, Energy & Toxicity Matrix
- Environmental & Social Impact Analysis
- Risk Analysis

Notion 9: The Human Factor

- Unintended use of technology
- Rebound effect
- “Rational” behaviour

Notion 10: Transition Management

complexity
system
organized
correlated
large
number
properties
parts
disorganized
relationships
systems
elements
simulation
Weaver's
understood
random
interactions
view
modeling
neighborhood
non-random
create
vis
gas

Innovation and Transformation

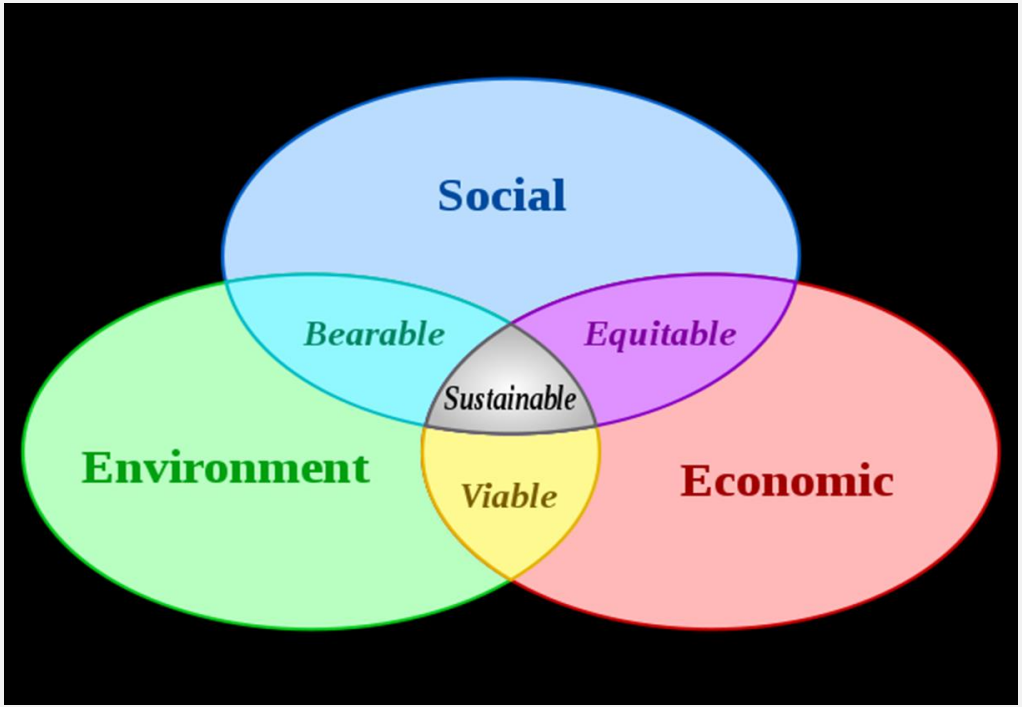
- New Socio-technical Systems development & Technological Regimes
- Multitude of actors
- Adjusting rather than steering
- Enabling conditions
- Tools for Sustainable Development

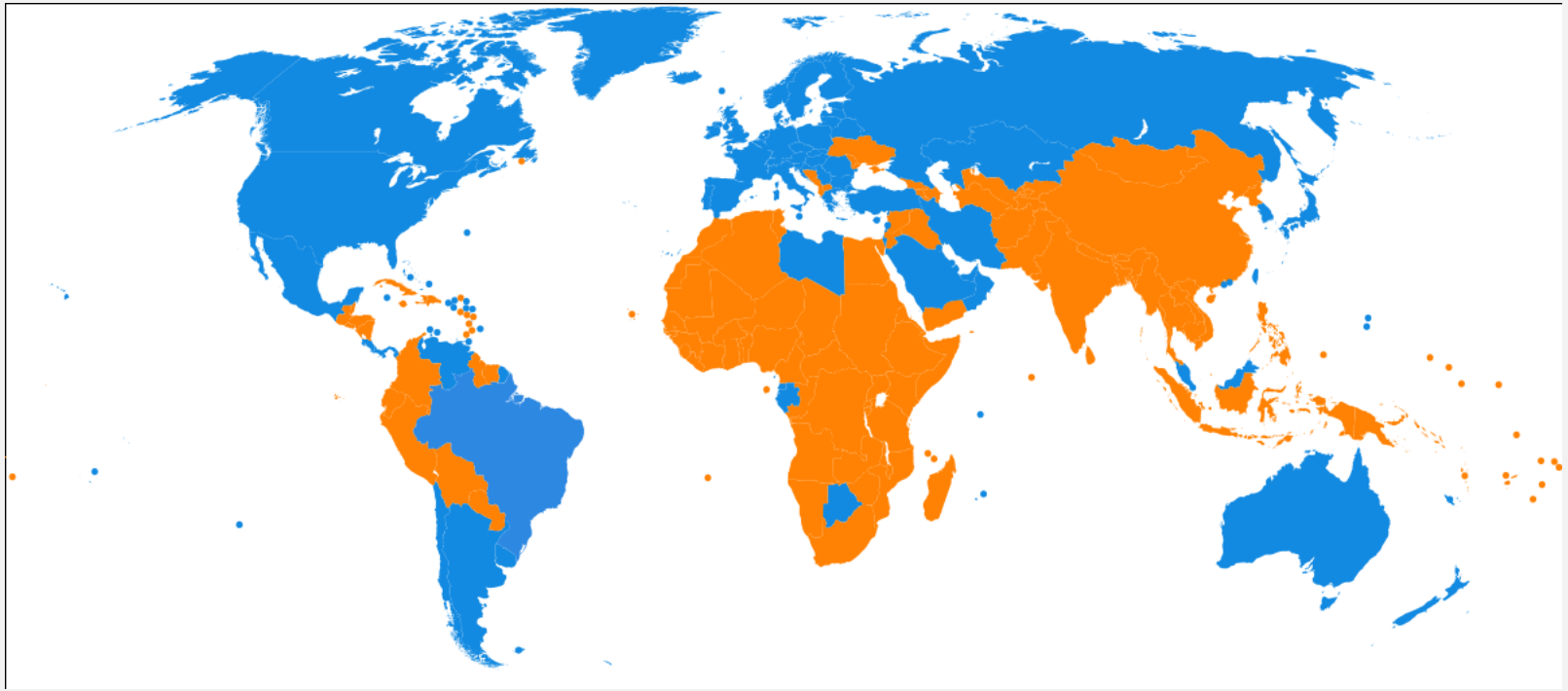
Sustainability Criteria

1. Long-term
2. Globally just (‘bottom of the pyramid’)
3. Environmentally efficient
4. Balanced economic development (multi-purpose, multi-actor)
5. Use and consider interrelations, system dynamics and cycles (‘cradle to cradle’)
6. Take unexpected consequences and uncertainty into account

Jatropha?

Values in Sustainable Development





Responsible Innovation

Methods for Reconciling Values

- Cost-Benefit Analysis
- Multi-Criteria Analysis
- Defining boundary conditions or thresholds
- Reasoning
- Considering technological alternatives or Value Sensitive Design

Process methods

- Social Impact Assessment
- Constructive Technology Assessment
- Process Management

Thank you for your attention!