TEQIP-III Short Course on Systems Analysis of Biofuels and Bioproducts

Module 5: Social and Policy Aspects of Sustainability

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Goals of this Lecture

Introduce the Policy and Social aspects of Sustainability

Learning Objectives

By the end of this lecture, you must be able to:

1. Understand the importance of social and policy aspects of sustainability
2. Describe various frameworks used to understand policy making
3. Describe how social aspects influence the success of technologies and policies related to biofuels and bioproducts

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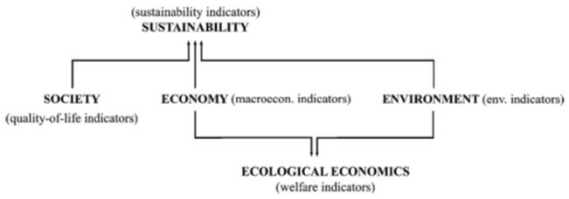
Aspects of Sustainability

- Sustainability: Metrics



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Social Aspects of Sustainability

- More than 200 Social metrics
- Often are ambiguous and are general social policy goals than indicators of social aspects of sustainability.
- Differences in metrics used by public and private sectors.
- Private sector
  - Human rights and resources
  - Performance in products
  - Production and supply chain
- Public sector
  - Safety and health
  - Population
  - Infrastructure
  - Budget and expenditure
  - Education

Governance Metrics

- Transparency
- Equality and Fairness
- Efficiency
- Corruption

Reference: SPM Metrics White paper

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Social Aspects of Sustainability

PILLARS GBEP's work on sustainability indicators was developed under the following three pillars, noting interlinkages between them:		
Environmental	**Social**	**Economic**
THEMES GBEP considers the following themes relevant, and these guided the development of indicators under these pillars:		
Greenhouse gas emissions, Productive capacity of the land and ecosystems, Air quality, Water availability, use efficiency and quality, Biological diversity, Land-use change, including indirect effects.	Price and supply of a national food basket, Access to land, water and other natural resources, Labour conditions, Rural and social development, Access to energy, Human health and safety.	Resource availability and use efficiencies in bioenergy production, conversion, distribution and end-use, Economic development, Economic viability and competitiveness of bioenergy, Access to technology and technological capabilities, Energy security/Diversification of sources and supply, Energy security/Infrastructure and logistics for distribution and use.

Reference: GBEP

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Social Aspects of Sustainability

INDICATORS		
1. Life-cycle GHG emissions	9. Allocation and tenure of land for new bioenergy production	17. Productivity
2. Soil quality	10. Price and supply of a national food basket	18. Net energy balance
3. Harvest levels of wood resources	11. Change in income	19. Gross value added
4. Emissions of non-GHG air pollutants, including air toxics	12. Jobs in the bioenergy sector	20. Change in consumption of fossil fuels and traditional use of biomass
5. Water use and efficiency	13. Change in unpaid time spent by women and children collecting biomass	21. Training and re-qualification of the workforce
6. Water quality	14. Bioenergy used to expand access to modern energy services	22. Energy diversity
7. Biological diversity in the landscape	15. Change in mortality and burden of disease attributable to indoor smoke	23. Infrastructure and logistics for distribution of bioenergy
8. Land use and land-use change related to bioenergy feedstock production	16. Incidence of occupational injury, illness and fatalities	24. Capacity and flexibility of use of bioenergy

Reference: GBEP

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Social Aspects of Sustainability

Table 1 Capital subsidy versus guaranteed power buy back

		Well-implemented capital cost subsidy	Attractive power purchase guarantee
1	Stimulus to demand for solar pumps	Strong	Strong
2	Solar pump owner operates as	ISP	Grid-connected Independent Power Producer
3	Burden of maintenance and upkeep	Equipment supplier for some initial years	Owner
4	Pump irrigation market	Highly competitive	Highly limited and monopolistic
5	Solar pump owner's incentive to invest in piped water distribution to sell irrigation service	Very high	Low
6	Water price in village water market	Very low	High, determined by guarantee price for power purchase
7	Aggregate groundwater use in the village	High	Moderate, limited to own irrigation
8	Appropriate for	Groundwater abundant areas, such as Eastern India	Western and Southern India

Reference: Shah and Kishore, A. 2012. Solar –powered pump Irrigation and India's Ground water Economy. Water Policy Research Highlight.

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Social Aspects of Sustainability

Reference: PSILCA v 1.1

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Social Aspects of Sustainability

Reference: PSILCA v 1.1

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Social Aspects of Sustainability

Reference: PSILCA v 1.1

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Social Aspects of Sustainability

Table 2: The pedigree matrix for data quality assessment of social data, used in PSILCA

Score / Indicator	1	2	3	4	5
Reliability of the source(s)	Statistical study, or verified data from primary data collection from several sources	Verified data from primary data collection from one single source or non-verified data from primary sources, or data from recognized secondary sources	Non-verified data partly based on assumptions or data from non-recognized sources	Qualified estimate (e.g. by expert)	Non-qualified estimate or unknown origin
Completeness conformance	Complete data for country-specific sector/ country	Representative selection of country-specific sector / country	Non-representative selection, low bias	Non-representative selection, unknown bias	Single data point / completeness unknown
Temporal conformance	less than 1 year of difference to the time period of the dataset	less than 2 years of difference to the time period of the dataset	less than 3 years of difference to the time period of the dataset	less than 5 years of difference to the time period of the dataset	Age of data unknown or data with more than 5 years of difference to the time period of the dataset
Geographical conformance	Data from same geography (country)	Country with similar conditions or average of countries with slightly different conditions	Average of countries with different conditions, geography under study included, with large share, or country with slightly different conditions	Average of countries with different conditions, geography under study included, with small share, or not included	Data from unknown or distinctly different regions
Further technical conformance	Data from same technology (sector)	Data from similar sector, e.g. within the same sector hierarchy, or average of sectors with similar technology	Data from slightly different sector, or average of different sectors, sector under study included, with large share	Average of different sectors, sector under study included, with small share, or not included	Data with unknown technology / sector or from distinctly different sector

PSILCA v 1.1

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Policy Perspectives of Sustainability

Commonly Used Policy Making Models

- Institutionalism:
  - Classical approach
  - Focus on structures, organization, duties and functions of Govt. institutions.
  - "What unit of Govt. is responsible for what?"
  - "What are the lines of authority and accountability?"
- Systems Theory
  - Emphasis on the environment of political systems, inputs, outputs and feedback
  - Often widely used implicitly
  - Helps understand external linkages

Reference: Hahn. Policy Making models and their role in policy education

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Policy Perspectives of Sustainability

Commonly Used Policy Making Models

- Pluralism
  - Policy making is seen as the result of influencing groups
  - Identifying groups in conflict and competition is an important aspect of this method.
- Elitism
  - Recognizes that most people are uninterested, uninvolved and uninfluential in policy making.
  - Elites have a disproportionate impact on policy making.
  - Elites act on behalf of themselves or other groups
  - Elites are not homogenous

Reference: Hahn. Policy Making models and their role in policy education

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Policy Perspectives of Sustainability

Commonly Used Policy Making Models

- Process Models
  - Generalized sequence of steps or actions that occurs as policy issues are raised, debated and resolved.
  - "Focus on what happens, when, and how than on who the participants are and why particular outcomes occur."
- Rationalism
  - Looks at policy making as a rational exercise involving clarifying and ranking goals, identifying alternatives, and predicting consequences.
- Incrementalism
  - Developed as a reaction to the rationalism model.
  - Better describes the reality and is a prescriptive model
  - Decision makers more likely to move away from the problems than towards the goals.

Reference: Hahn. Policy Making models and their role in policy education

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Policy Perspectives of Sustainability

Fig. 2. Proposed ISEDs by IAEA (modified from IAEA et al., 2005).

Reference: Meyer-Naimi and Vaez-Zadeh. 2012

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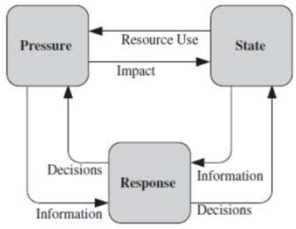
Policy Perspectives of Sustainability



Reference: Meyer-Naimi and Vaez-Zadeh. 2012

Pressure	State	Response
Population	Landscape vulnerability	Reduce influences
Social	Landscape stability	Improve states
Economy	Landscape integrity	

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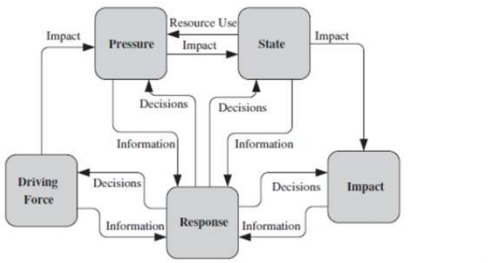
Policy Perspectives of Sustainability



Driving force	Pressure	State	Impact	Response
Population growth	Water demand	Ground water quality	Land subsidence	Consumption change
Industrialization	Ground water use Land use change Waste water discharge Oil leakage from landfill		Flooding Damages to infrastructures Human health risks Impacts on organisms	Alternative water source Control pumping area Flood control Improve water quality Waste disposal system

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Policy Perspectives of Sustainability

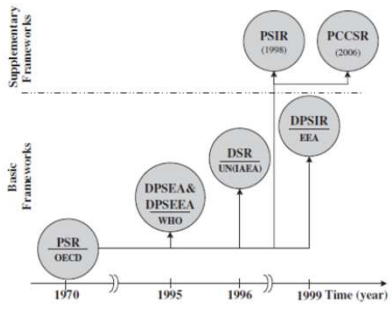

Fig. 7. Evolution of policy making frameworks.

Reference: Meyer-Naimi and Vaez-Zadeh. 2012

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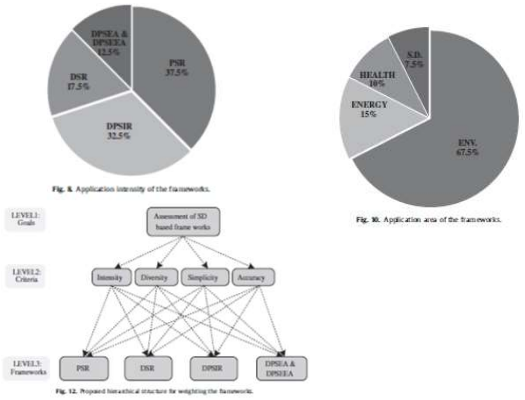
Policy Perspectives of Sustainability



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Policy Perspectives of Sustainability

What is good policy?

- Clarity of goals
- Clarity of instruments to achieve the goals
- One instrument must be used to achieve one goal

Reference: Lawrence, Robert Z. "How Good Politics Results in Bad Policy: The Case of Biofuel Mandates." Discussion Paper 2010-10, Belfer Center for Science and International Affairs; CID Working Paper No. 200, Center for International Development, Cambridge, Mass: Harvard University. September 2010.

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Social Aspects of Sustainability

Case studies

- US Biofuels Example
- India Biofuels Example
- Europe Biogas Example
- India Biogas Example
- China meat consumption Example
- Ghana Aquaculture Example
- India Solar Electricity example
- Brazil Biofuels Example

- Websites:
  - Gapminder: https://www.gapminder.org
  - Our world in data: https://ourworldindata.org
  - SDG tracker: https://sdg-tracker.org/

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Social Aspects of Sustainability

US Biofuels Example

- Impact of politics on biofuels policies

"The principles of good policymaking require precision and clarity of purpose, but the political realities of forming coalitions often benefit from ambiguity, hiding costs, accepting second-best justifications, and packaging policies together to further broaden support."

- Stated Goals of US biofuels Policies:
  - Energy Independence: Tariffs on imported oils, increased fuel efficiency
  - Reducing GHG emissions: Cap and trade
  - Reducing rural poverty: Direct benefit transfers

Reference: Lawrence, Robert Z. "How Good Politics Results in Bad Policy: The Case of Biofuel Mandates." Discussion Paper 2010-10, Belfer Center for Science and International Affairs; CID Working Paper No. 200, Center for International Development, Cambridge, Mass: Harvard University. September 2010.

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Social Aspects of Sustainability

India Biofuels Example

- National Biofuels Policy 2009
  - 20% blending target for ethanol and biodiesel by 2017
  - Any oil seed bearing plant feedstocks
  - Did we have enough feedstocks to meet the targets?
  - What about interstate restrictions on feedstock movement?
  - Pricing of biofuels?

History of ethanol blending.

2002	Non-mandatory ethanol blending with petrol on pilot basis.
2007	Blending of ethanol mandatory at 5%. Fixed procurement price of ethanol introduced.
2013	Mandatory 5% ethanol blending. Price of ethanol decided through open tenders.
2015	Fixed procurement price of ethanol re-introduced however, it is no longer linked to crude oil price. Ethanol exempted from 12.5% excise duty from 2015 to 16 sugar season.

Reference: Das, S. 2020. The national biofuels policy of India-A perspective. Energy Policy. 143:111595

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Social Aspects of Sustainability

India Biofuels Example

- National Biofuels Policy 2018
  - 20% blending target for ethanol and biodiesel
  - Import of biofuels is banned
  - Biofuels categories:
    - 1G Basic biofuels: ethanol for molasses, biodiesel from non-edible oil seeds
    - 2G Advanced biofuels: ethanol and MSG
    - 3G: Bio-CNG

Reference: Das, S. 2020. The national biofuels policy of India-A perspective. Energy Policy. 143:111595

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Social Aspects of Sustainability

India Biofuels Example

- National Biofuels Policy 2018
  - Import of biofuels is banned
  - During surplus availability, ethanol can be produced from foodgrains. "Alternate raw materials for production of ethanol such as sugar beet, sweet sorghum, corn, cassava, rotten potatoes etc. using first generation fully developed technologies will be promoted".

Reference: Das, S. 2020. The national biofuels policy of India-A perspective. Energy Policy. 143:111595

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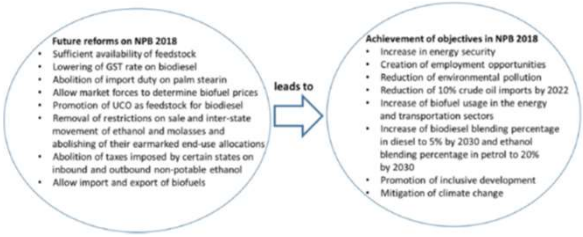
Social Aspects of Sustainability



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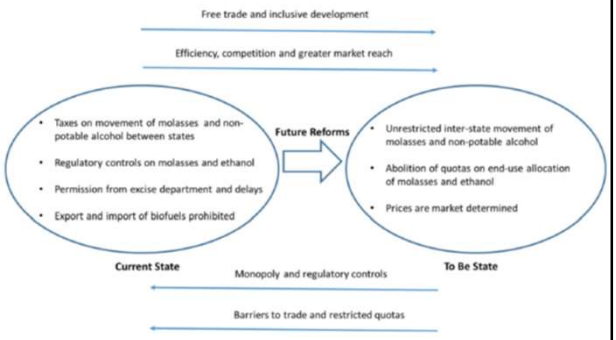
Social Aspects of Sustainability



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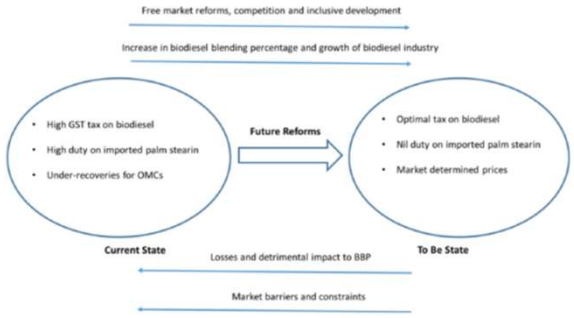

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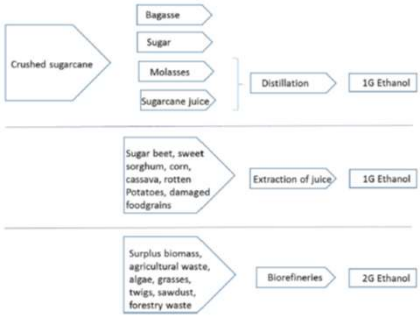
Social Aspects of Sustainability

India Biofuels value chain



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Social Aspects of Sustainability

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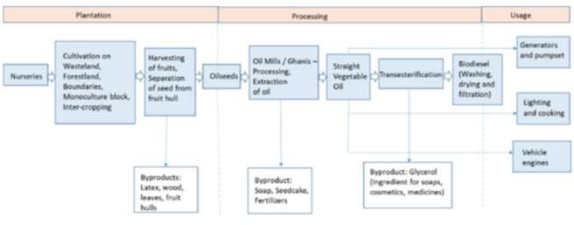

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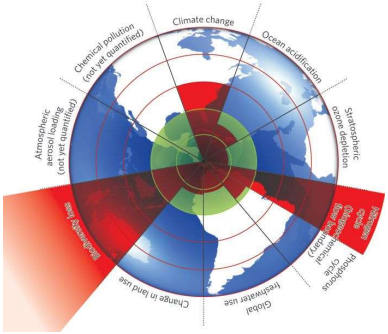
Aspects of Sustainability

- Application to Planetary Boundaries



https://www.nature.com/articles/461472a

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Aspects of Sustainability

PLANETARY BOUNDARIES

Earth-system process	Parameters	Proposed boundary	Current status	Pre-industrial value
Climate change	(i) Atmospheric carbon dioxide concentration (parts per million by volume)	350	387	280
	(ii) Change in radiative forcing (watts per metre squared)	1	1.5	0
Rate of biodiversity loss	Extinction rate (number of species per million species per year)	10	>100	0.1–1
Nitrogen cycle (part of a boundary with the phosphorus cycle)	Amount of N_2 removed from the atmosphere for human use (millions of tonnes per year)	35	121	0
Phosphorus cycle (part of a boundary with the nitrogen cycle)	Quantity of P flowing into the oceans (millions of tonnes per year)	11	8.5–9.5	~1
Stratospheric ozone depletion	Concentration of ozone (Dobson unit)	276	283	290
Ocean acidification	Global mean saturation state of aragonite in surface sea water	2.75	2.90	3.44
Global freshwater use	Consumption of freshwater by humans (km^3 per year)	4,000	2,600	415
Change in land use	Percentage of global land cover converted to cropland	15	11.7	Low
Atmospheric aerosol loading	Overall particulate concentration in the atmosphere, on a regional basis		To be determined	
Chemical pollution	For example, amount emitted to, or concentration of persistent organic pollutants, plastics, endocrine disrupters, heavy metals and nuclear waste in, the global environment, or the effects on ecosystem and functioning of Earth system thereof		To be determined	

Boundaries for processes in red have been crossed. Data sources: ref. 10 and supplementary information

https://www.nature.com/articles/461472a

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The End of Sustainability??

Society and Natural Resources, 27:777–782
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Routledge
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Policy Review

The End of Sustainability

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Goals of this Lecture

Introduce the Policy and Social aspects of Sustainability

Learning Objectives

By the end of this lecture, you must be able to:
1. Understand the importance of social and policy aspects of sustainability
2. Describe various frameworks used to understand policy making
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TEQIP-III Short Course on Systems Analysis of Biofuels and Bioproducts

Module 5: Social and Policy Aspects of Sustainability

THANK YOU

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