Technology Assessment in South Africa

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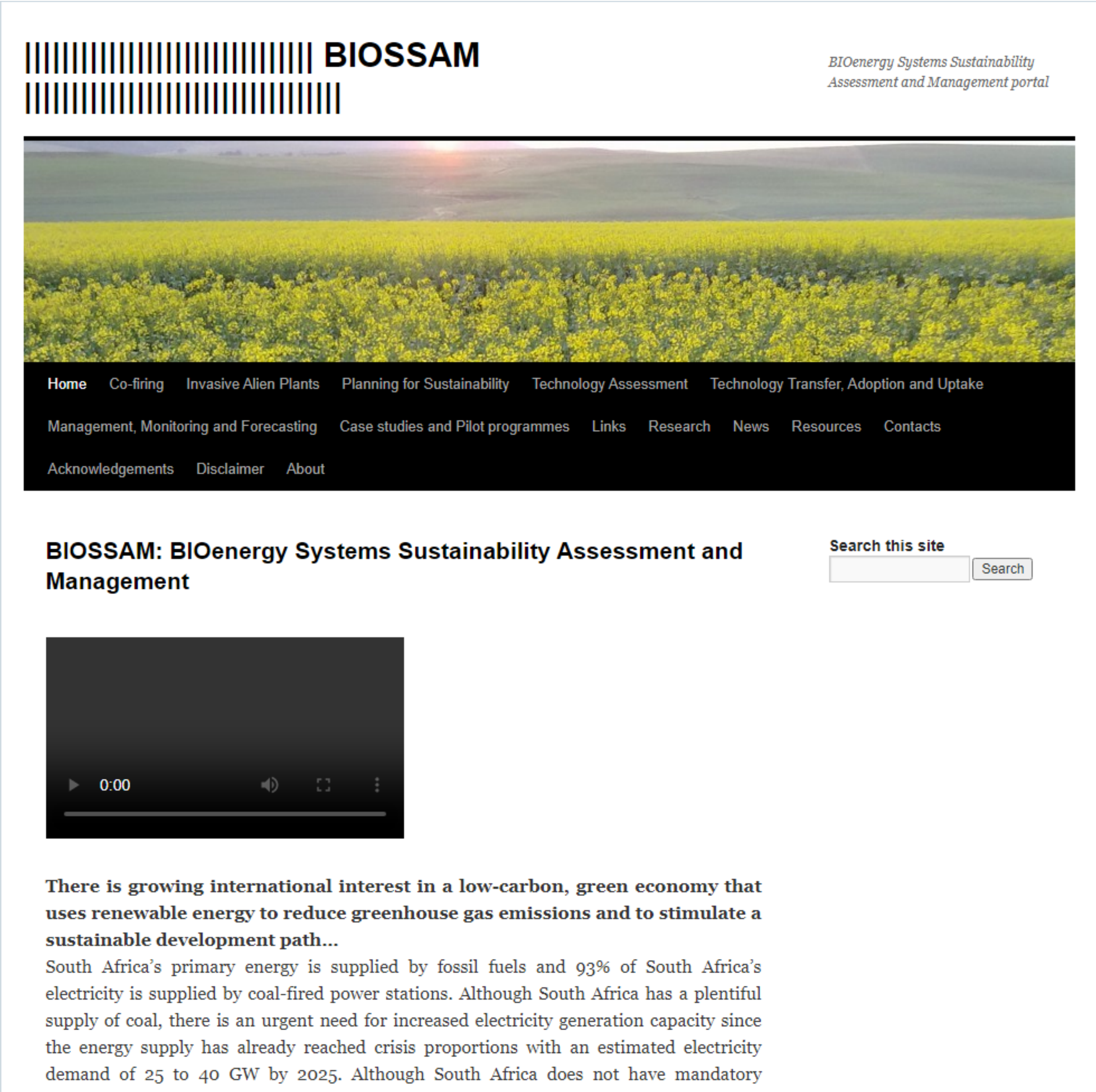
Regional Technology Assessment Pilot Project Meeting

10 MAY 2023 @ 9:30-10:30

Content

1. Energy technology assessment Project
2. Methodology and process
3. Key results and challenges
4. Uptake in policy and practice
5. Lessons learned

1. Energy technology assessment project



Motivation for technology sustainability assessment

1. Lack of clear criteria for conducting proper assessment

2. TA concept treated as universal – strongly tied with western world

3. TA focuses mainly on impacts or outcomes of the technology

4. TA has relatively poor coordination and integration

5. Most TA do not take account of holistic view – static in nature

6. No formal TA practice to support energy policy formulation

7. Application of sustainability-based criteria is not common in TA or decision-making

Source: Musango, 2012

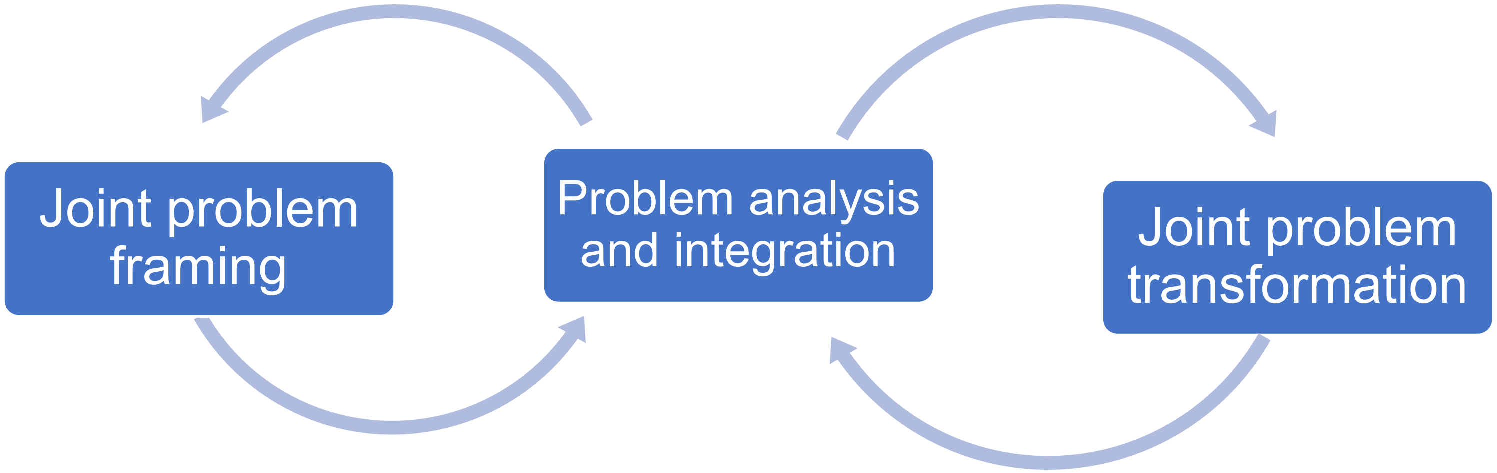
2. Methodology: Transdisciplinary

Joint problem-solving of issues that concern science-technology-society in a consultative manner

- Integrating actors outside academia
- Participatory
- Addressing real-world problems
- Research *with* society, not *for* society

Source: Pohl 2007

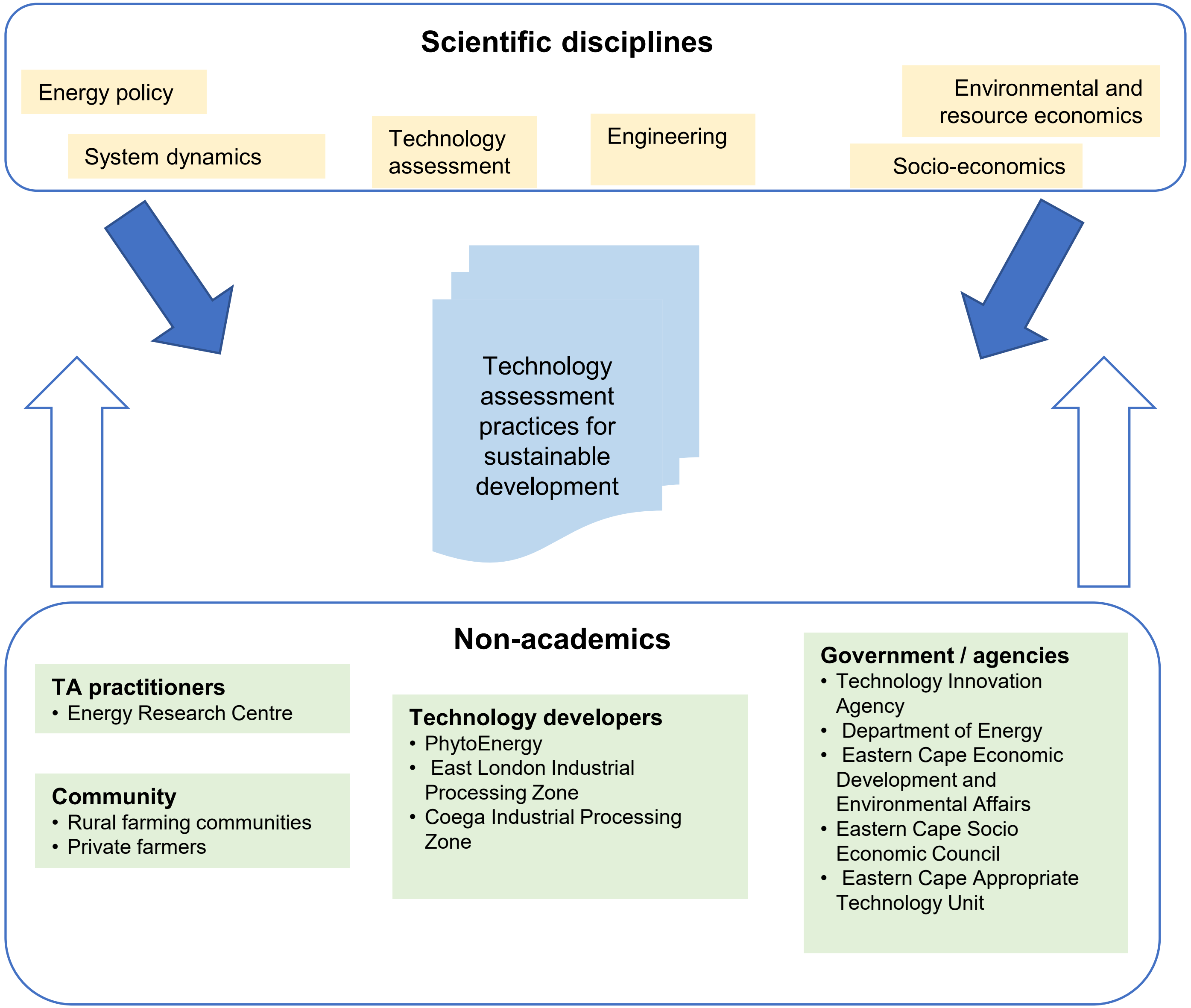
Transdisciplinary process



BIOSSAM transdisciplinary process

Process	Description	Tools/approach	Participants involved	Technology assessment method
Joint problem framing	• Identify, map and contact key stakeholders • Identify case study technology and context • Define the objective for technology assessment • Collect information about the technology assessed	• Literature review • Discussion meetings • Focus group • Interactive workshops • Survey • In-depth interviews • Case study	• BIOSSAM project team (> 10 team members) • 8 community members in a focus group • 303 interview participants • 3 technology developers	• Information monitoring • Social acceptance • Market analysis • Systems analysis
Problem analysis and integration	• Explore existing technology sustainability assessment practices in Southern Africa • Developed a **conceptual framework** for guiding technology sustainability assessment practices • Developed a **methodological framework** for technology sustainability assessment • Define sustainability indicators and develop model	• Literature review • Case study • System dynamics • Life-cycle perspective	• BIOSSAM project team • Informal meetings • Conference participants	• Systems analysis • Market analysis
Joint problem transformation	Develop a shared and integral vision for improving assessment practices to foster technology development and adoption from research and development to market	• Repeated feedback on all kind of results • Interactive workshops	All identified project stakeholders	• Systems analysis • Risk assessment • Externalities / impact assessment

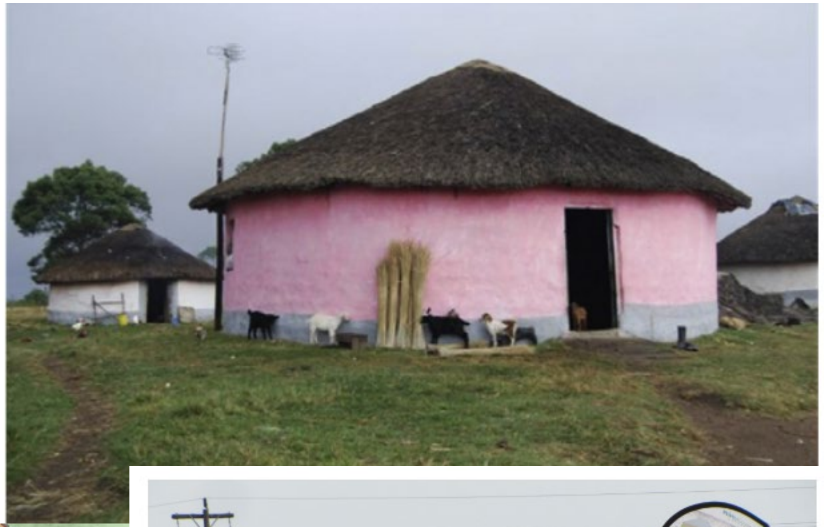
Joint problem framing:
actors & disciplines / expertise

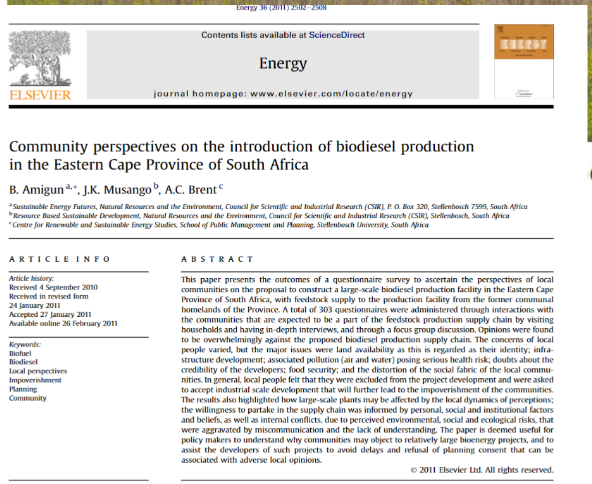


Source: Musango, 2012

Joint problem framing:

Case study: Eastern Cape province





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Community perspectives on the introduction of biodiesel production in the Eastern Cape Province of South Africa

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ABSTRACT

This paper presents the outcomes of a questionnaire survey to ascertain the perspectives of local communities on the proposal to construct a large-scale biodiesel production facility in the Eastern Cape Province of South Africa, with feedstock supply to the production facility from the former communal homelands of the Province. A total of 303 questionnaires were administered through interactions with the communities that are expected to be a part of the feedstock production supply chain by visiting households and having in-depth interviews, and through a focus group discussion. Opinions were found to be overwhelmingly against the proposed biodiesel production supply chain. The concerns of local people varied, but the major issues were land availability as this is regarded as their identity; infrastructure development; associated pollution (air and water) posing serious health risk; doubts about the credibility of the developers; food security; and the distortion of the social fabric of the local communities. In general, local people felt that they were excluded from the project development and were asked to accept industrial scale development that will further lead to the impoverishment of the communities. The results also highlighted how large-scale plants may be affected by the local dynamics of perceptions; the willingness to partake in the supply chain was informed by personal, social and institutional factors and beliefs, as well as internal conflicts, due to perceived environmental, social and ecological risks, that were aggravated by miscommunication and the lack of understanding. The paper is deemed useful for policy makers to understand why communities may object to relatively large bioenergy projects, and to assist the developers of such projects to avoid delays and refusal of planning consent that can be associated with adverse local opinions.

Image sources: Musango, 2012; Amigun, Musango & Brent, 2012

Problem analysis and integration:
Systems Approach to Technology Sustainability Assessment (SATSA)

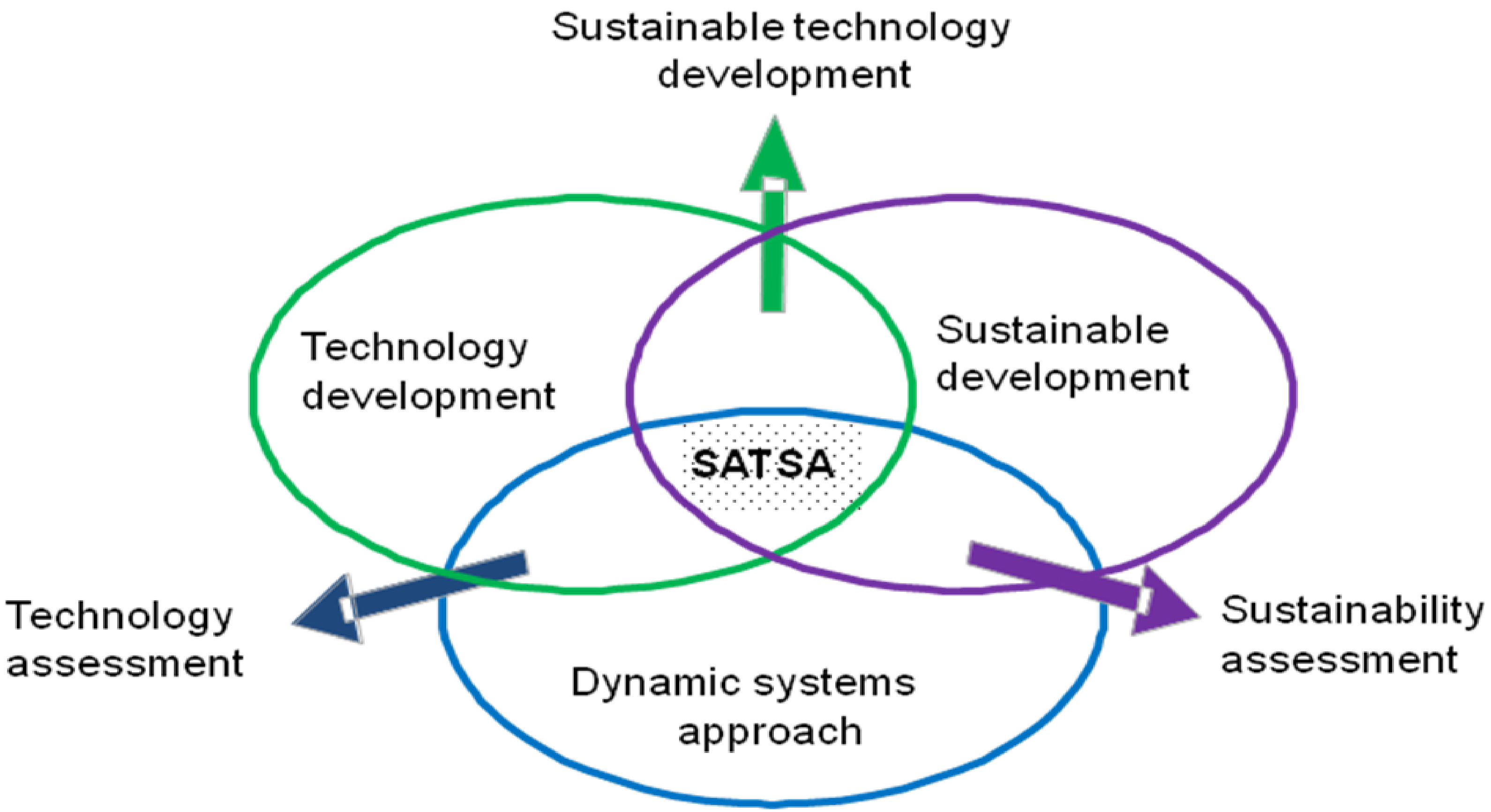
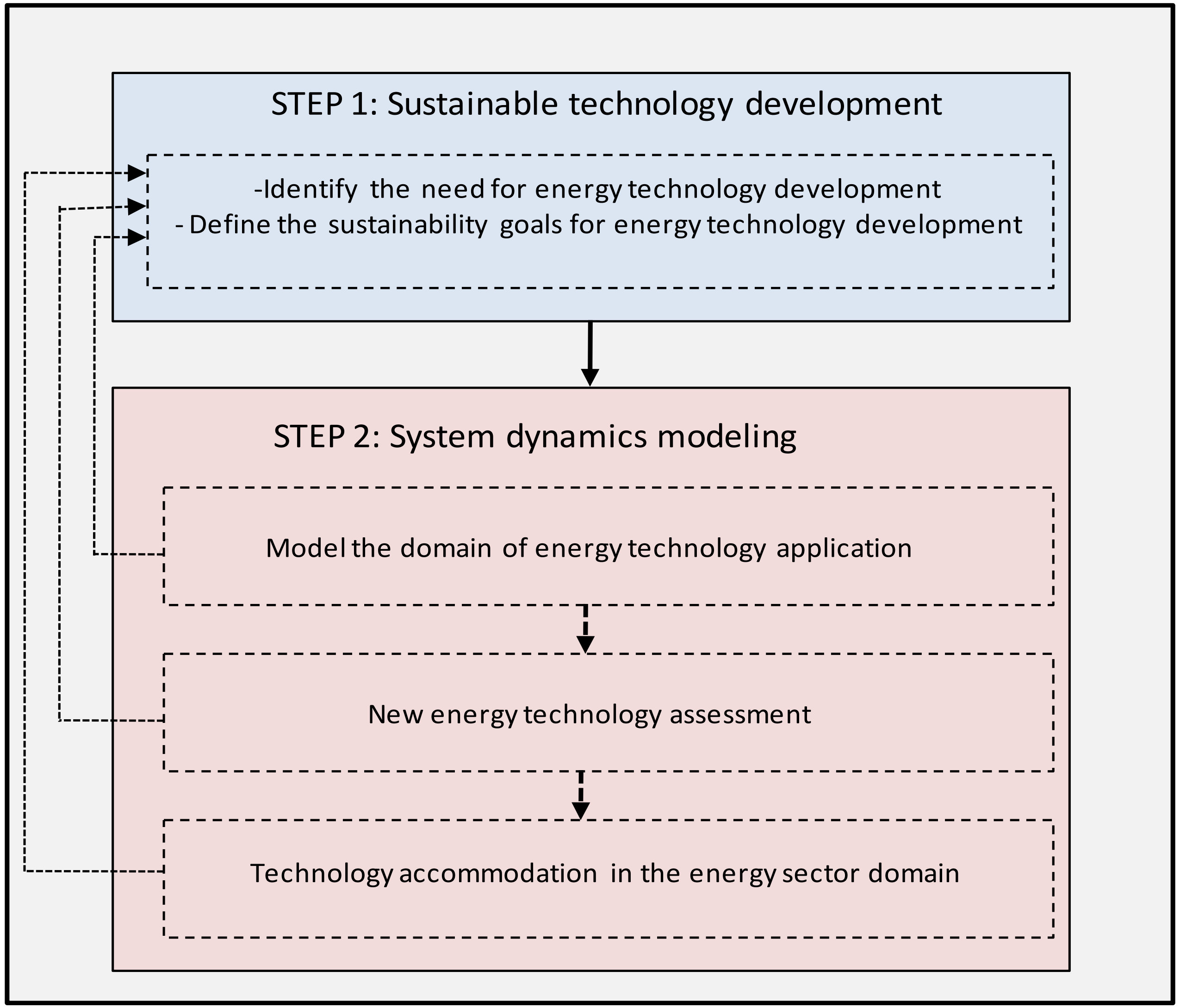


Image Source: Musango & Brent, 2011

Problem analysis and integration:
SATSA methodological framework



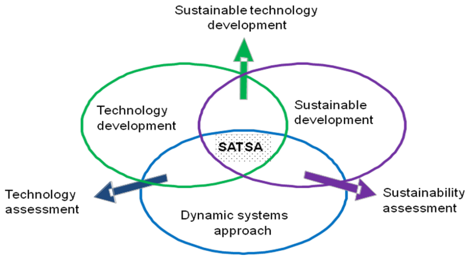


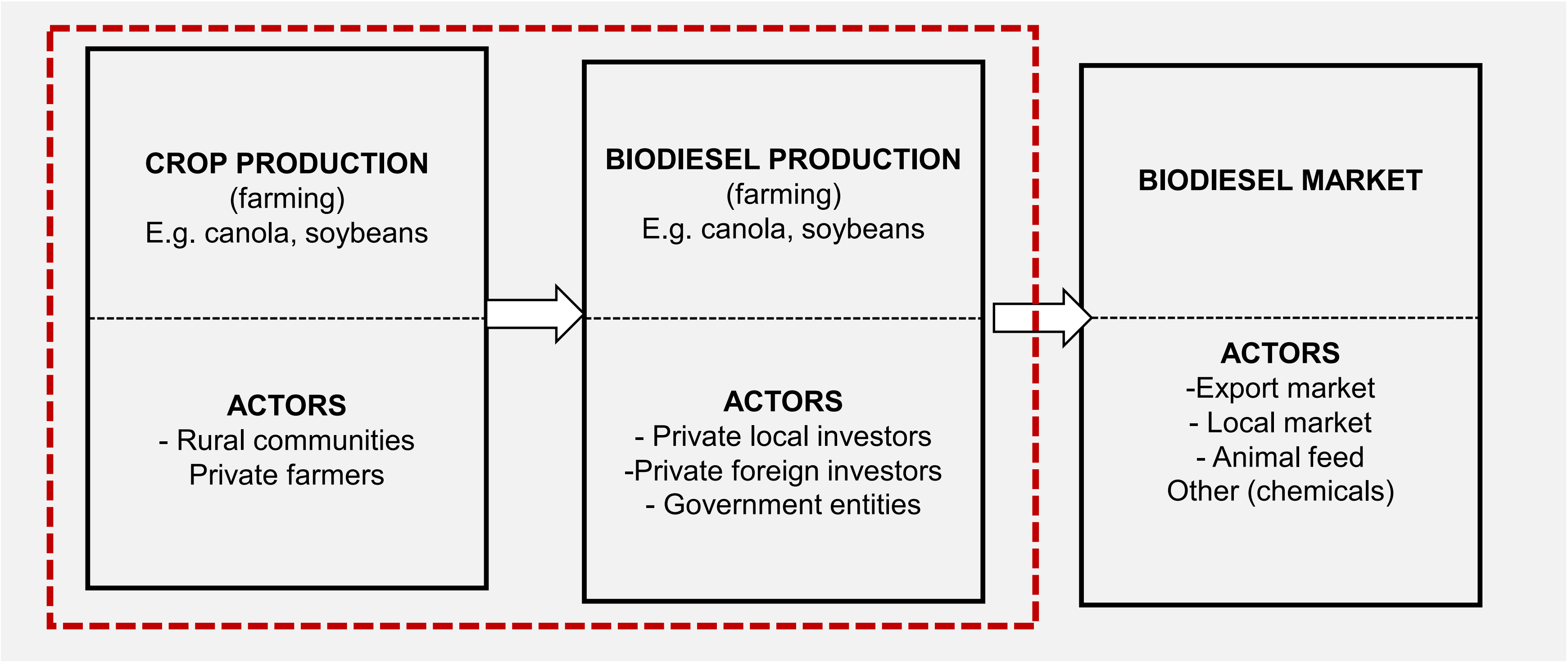
Image source: Musango & Brent, 2011

Step 1: Identified needs for biodiesel development



- Addressing rural poverty
- Rural development and black economic empowerment
- Job creation particularly in the feedstock production

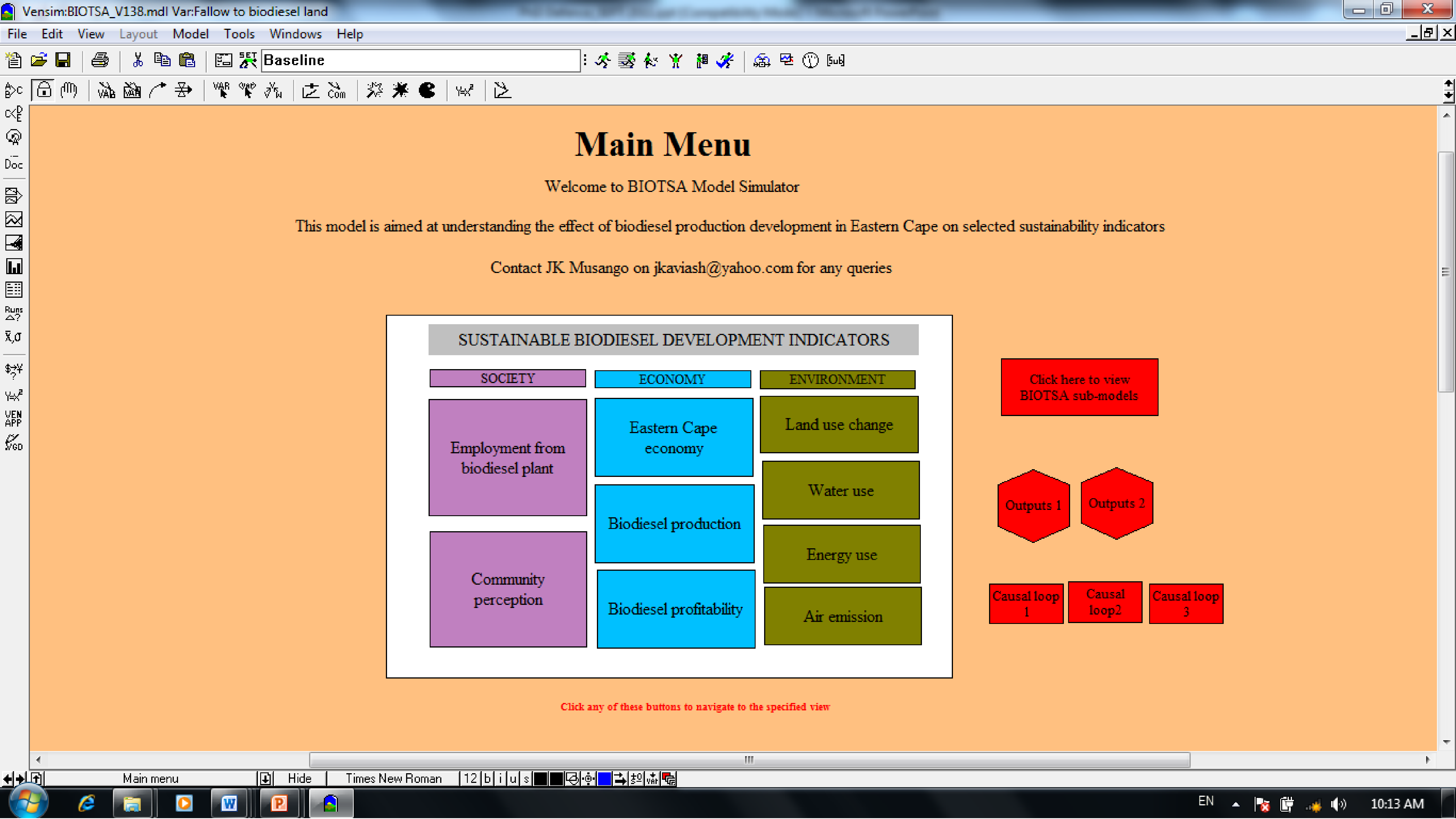
Scope of assessment



Source: Musango et al 2012

Step 1. Identified sustainability indicators

	Indicator	Symbol	Description	Units
Economic	Biodiesel production	ECO_1	This measures the quantity of biodiesel production	Litre/year
	Biodiesel profitability	ECO_2	This measures the profitability from biodiesel production	Rand/year
	Eastern Cape GDP	ECO_3	This measures the per capita GDP in the Eastern Cape Province	Rand/person/ year
Social	Employment	SOC_1	This measures the labour force participation due to the investment in the biodiesel plant capacity	Person
	Community perception	SOC_2	This is represented by the effect of community perception on land conversion for biodiesel production crops and measures the community acceptance to grow these crops	Dimensionless
Environmental	Land use change	ENV_1	This measure the changes in land use due to the introduction of biodiesel production. This includes changes in fallow land, agricultural land, biodiesel crop land and livestock land.	Ha
	Air emission	ENV_2	This measures the total avoided air emissions due to investment in biodiesel production	kg CO_2/year
	Biodiesel by-product	ENV_3	This measures the amount of accumulated glycerol resulting from biodiesel production.	Litre/year
	Water use	ENV_4	This measures water use as a result of biodiesel production	Litre/year
	Energy use	ENV_5	This measures energy use as a result of biodiesel production	kWh/year


Vensim:BIOTSA_V138.mdl Var:Fallow to biodiesel land
File Edit View Layout Model Tools Windows Help
Baseline
Main Menu
Welcome to BIOTSA Model Simulator
This model is aimed at understanding the effect of biodiesel production development in Eastern Cape on selected sustainability indicators
Contact JK Musango on jkaviash@yahoo.com for any queries
SUSTAINABLE BIODIESEL DEVELOPMENT INDICATORS
SOCIETY
ECONOMY
ENVIRONMENT
Employment from biodiesel plant
Community perception
Eastern Cape economy
Biodiesel production
Biodiesel profitability
Land use change
Water use
Energy use
Air emission
Click here to view BIOTSA sub-models
Outputs 1
Outputs 2
Causal loop 1
Causal loop2
Causal loop 3
Click any of these buttons to navigate to the specified view
Main menu
Hide
Times New Roman
12
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3. Results: example of scenarios assessed

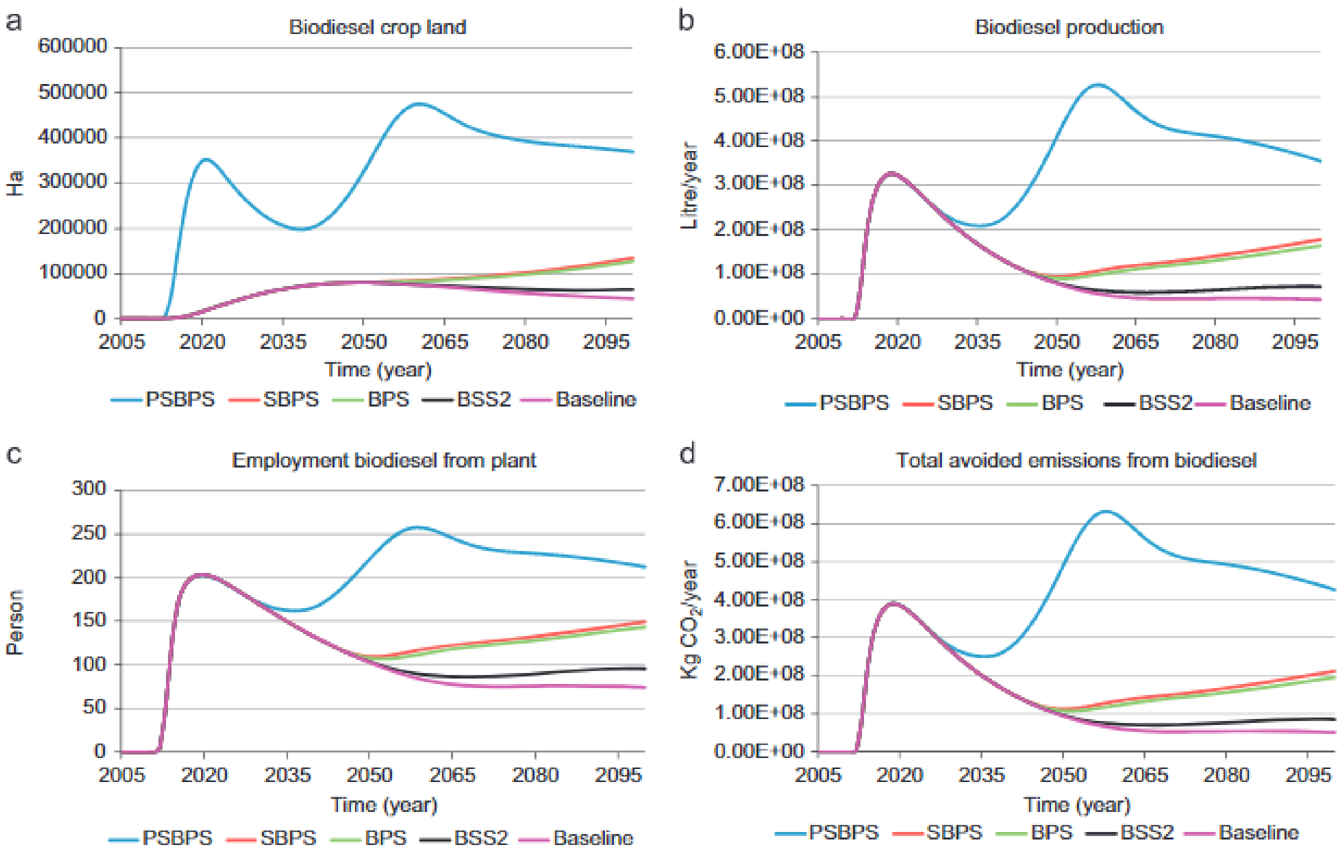


Fig. 17. Effect of perception, support and by-product use scenario on selected indicators.

Image source: Musango et al 2012

Joint problem transformation:

Identified pinches along the biodiesel technology life cycle

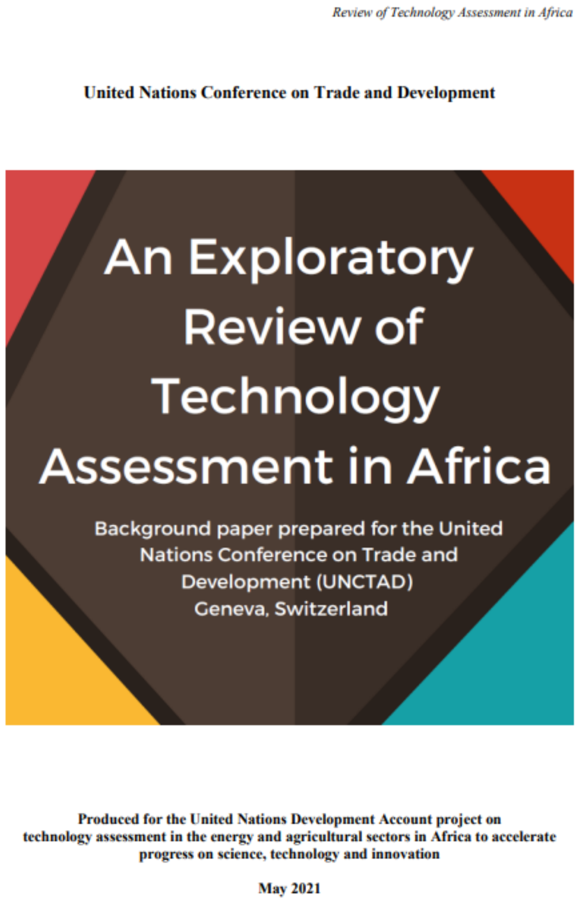
Research and development	Business gate			
Pre-feasibility study/ Feasibility study	Development piloting	Hardware / Business design	Implementation, Operation, Product	Phase out
• Coordination of stakeholders' different objectives • Lack of experience and knowledge		• Risk of sourcing feedstock from imports • Risk of losing fertile land • Uncertainty on the enabling policy and regulatory framework • Uncertainty on the profitability of the investment from the investor's perspective • Uncertainty on the benefits of new crop venture from the community's perspective		

Joint problem transformation:
Key messages from technology sustainability assessment results

Crop production	Biodiesel production
• Improve community perception of biodiesel crops benefits	• Create local jobs at biodiesel plant level
• Promote local feedstock production	• Use by-products as part of income-generation outputs
• Utilise non-food land for biodiesel crop production	• Government support in the biodiesel production
	• Reduce feedstock costs by sourcing locally

4. Uptake in policy and practice

- No formal technology assessment and still ad-hoc
- UNCTAD report proposal for an Africa Network for Technology Assessment
- Spillover effect in the National Strategy for Sustainable Development (NSSD) and green economy


Review of Technology Assessment in Africa

United Nations Conference on Trade and Development

An Exploratory Review of Technology Assessment in Africa

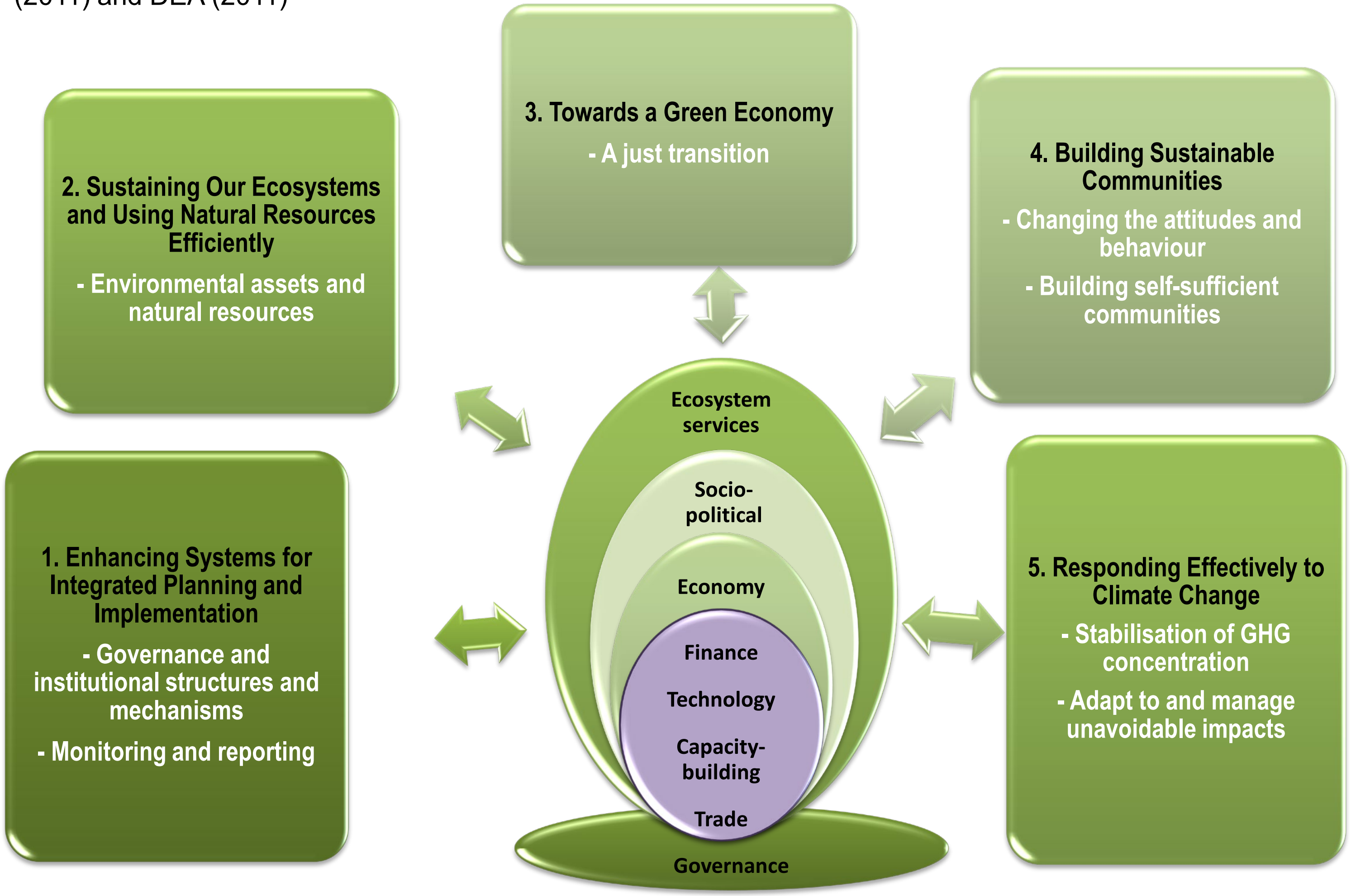
Background paper prepared for the United Nations Conference on Trade and Development (UNCTAD)
Geneva, Switzerland

Produced for the United Nations Development Account project on technology assessment in the energy and agricultural sectors in Africa to accelerate progress on science, technology and innovation

May 2021

Adapted from Stafford and Brent (2011), Musango and Brent (2011) and DEA (2011)

NSSD systems approach to sustainability, five strategic priorities and means of implementation



GREEN economy
Modelling Report of South Africa

Focus on Natural Resource Management, Agriculture, Transport and Energy Sectors

CENTRE FOR RENEWABLE AND SUSTAINABLE ENERGY STUDIES

Green economy sector study on energy in Rwanda

October 2013

Dr JK Musango
Prof AC Brent

Centre for Renewable and Sustainable Energy Studies (CRSES), Stellenbosch University

5. Lessons learned

Context is key in determining the form and methods of technology assessment

The relevance of technology sustainability assessment in the energy sector due to diverse goals and **multiple stakeholders** along value chain

Formalising the technology assessment is important to enabling coordination and uptake in policy and practice

Questions?

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