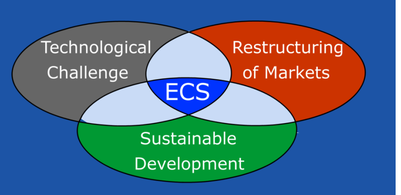
Forest and Energy:

Designing a management tool for performance assessment of forest-based bioenergy supply chains

ROYAL INSTITUTE OF TECHNOLOGY

School of Industrial Engineering and Management
Department of Energy Technology
Division of Energy and Climate Studies

The division of Energy and Climate Studies (ECS) has an interdisciplinary character with a strong systems approach, linking issues related to energy technology and policy, climate change and sustainable development.



The central research questions at ECS are:

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What solutions can be pursued globally and regionally?

Which of them will lead to sustainable development?

What are the solutions that will lead to mitigation and adaptation of climate change while also promoting sustainable development?

Currently, there are four defined research themes at ECS:

- **Bioenergy systems**
- **Rural electrification**
- **Energy efficiency**
- **Energy and climate policy**

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1) Bioenergy Systems

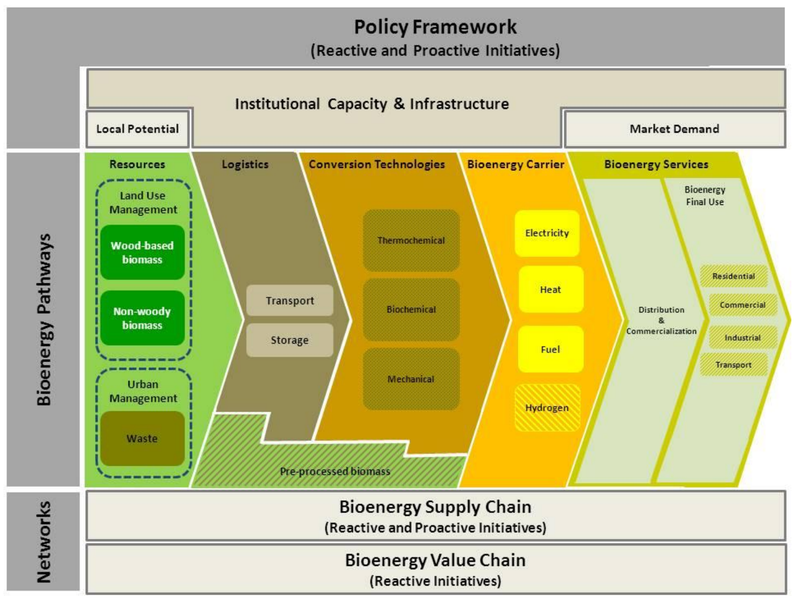
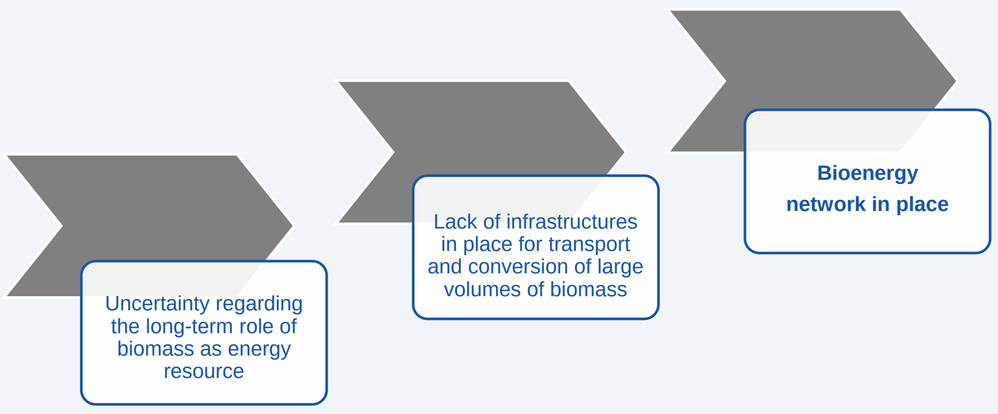


Fig. 1: Bioenergy system diagram

Bioenergy system (Figure 1) comprises both the technical aspects of bioenergy generation, such as conversion technologies and biomass resources, and overarching aspects of bioenergy development, such as policy frameworks, institutional capacities, infrastructure and actors' networks. ***One important aspect of this system is that its expansion, distribution, and diversification are based on locally available biomass resources***. Also, it relies on investments in both small-scale and large-scale conversion technologies to meet the growing market demand for energy. Hence, ***bioenergy system requires a well-organized and functioning supply chains*** with the purpose of overcoming the potential impacts – competition for biomass resources and land use conflicts **(SILVEIRA, 2005; McCORMICK, 2007; FAO, 2010).**

2) Expansion barriers in the EU



One important aspect of ***bioenergy network*** as a barrier itself is the fact that its current structure is still not able to:

a) establish robust and clear sustainability criteria that balances the interests of different stakeholders in a responsible way, at the national and international levels (e.g., value chain challenges), and

b) ensure confidence regarding quantity, quality and price of product and volume of demand across the main supply sources (e.g., supply chain challenges).

Understanding the biomass network is critical to mobilize additional resources for bioenergy expansion and avoid negative side effects of expansion such as raw material competition on food and fodder production and, in the Swedish case, on the forest products industry **(SILVEIRA, 2005; McCORMICK, 2007; ECF, 2010; SANCHES PEREIRA, 2011).**

3) Assessing performance

In an effort to develop a performance assessment tool, we combine evaluation indicators which translate competence dimensions into indexes. Also, we classified the resulting indexes as reactive and/or proactive according to the initiatives guiding them. Figure 2 portrays this integration as a performance assessment matrix. At the core, the figure presents the focal link's competence indexes classified as reactive, proactive, or both. The functional overview is rooted in the evaluation indicators related to each specific initiative.

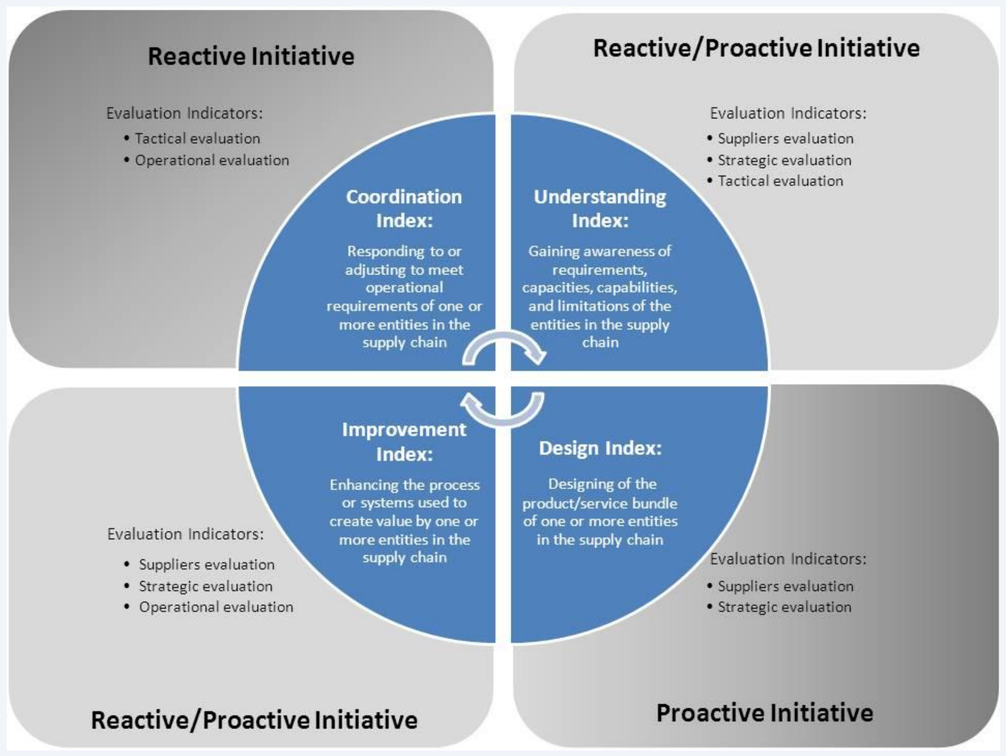


Fig. 2: Performance assessment matrix

4) Management tool for performance assessment

Most of performance assessment tools being used today establish performance indicators based strictly on financial efficiency and customer satisfaction. In this respect, the proposed tool broaden this perspective and it utilizes an ultimate question to assess the management performance. The question guiding the analysis is: *"what are the performance conditions necessary to maintain the focal link's position in the market?"*

Reliability: this category evaluates the ability to perform tasks as expected. Its parameters focus on customer satisfaction and include: on-time delivery, right quantity of products, and their right quality;

Responsiveness: it defines the process speed at which task is performed in order to meet customer satisfaction;

Agility: this category is also focused on customer satisfaction. This parameter category includes focal link's flexibility and adaptability and measures its ability to adapt or to respond to external influences such as non-forecasted changes in demand patterns;

Asset: it measures the focal link's ability to manage its assets such as inventory. Differently to the previous ones, this category focuses on financial efficiency; and

Cost: it addresses the process costs related to labor, materials, transportation, etc. In short, this category covers the supply chain overheads. This last category is based as well on financial efficiency.

Parameter	Evaluation Indicator
Agility	Tactical (TEI)
Cost	
Asset	
Reliability	Operational (OEI)
Responsiveness	
Cost	
Reliability	Suppliers (SEI)
Responsiveness	
Responsiveness	Strategic (StEI)
Cost	
Asset	

Fig. 3: Evaluation indicators composition

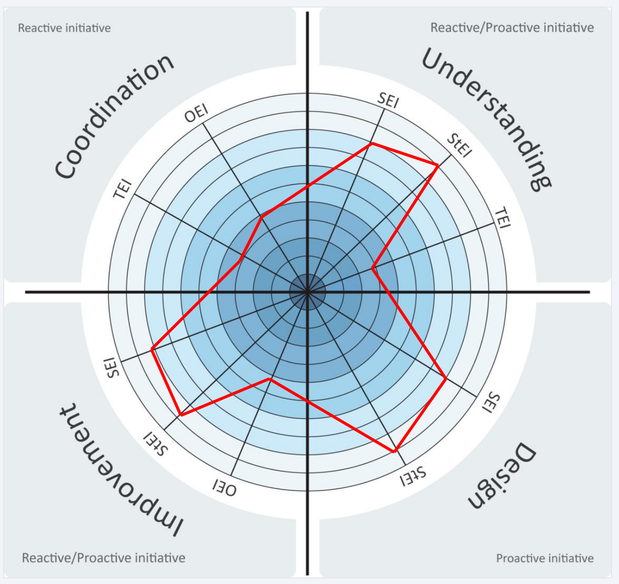


Fig. 4: Performance assessment tool

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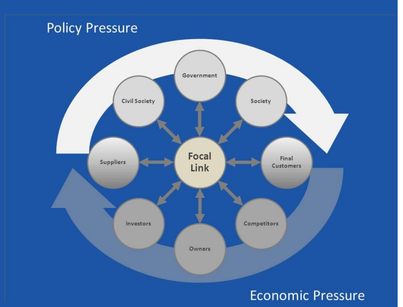
GENERAL STAKEHOLDER MAP:



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