

Bioeconomy Benchmarking Study: International Experiences in Eco-industrial parks



Leverage from
the EU
2014–2020



About this report: main features



- ✓ Target: Posintra and its associates consultants
- ✓ Comprises different visions from different sources in Bioeconomy
- ✓ Includes a critical analysis of the situation in Finland (through transition analysis framework)
- ✓ Shows trends towards growth and dev. opportunities
- ✓ Displays worldwide experiences in bioeconomy
- ✓ Contains practical suggestions & recommendations

About this report: approach



Contextualize the global Bioeconomy: overview

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graph TD; A[Contextualize the global Bioeconomy: overview] --> B[Look from a Finnish perspective]; B --> C[Benchmarking: common enabling and disabling factors]; C --> D[Pobi Assessment analysis]; D --> E[Suggestions / recommendations];
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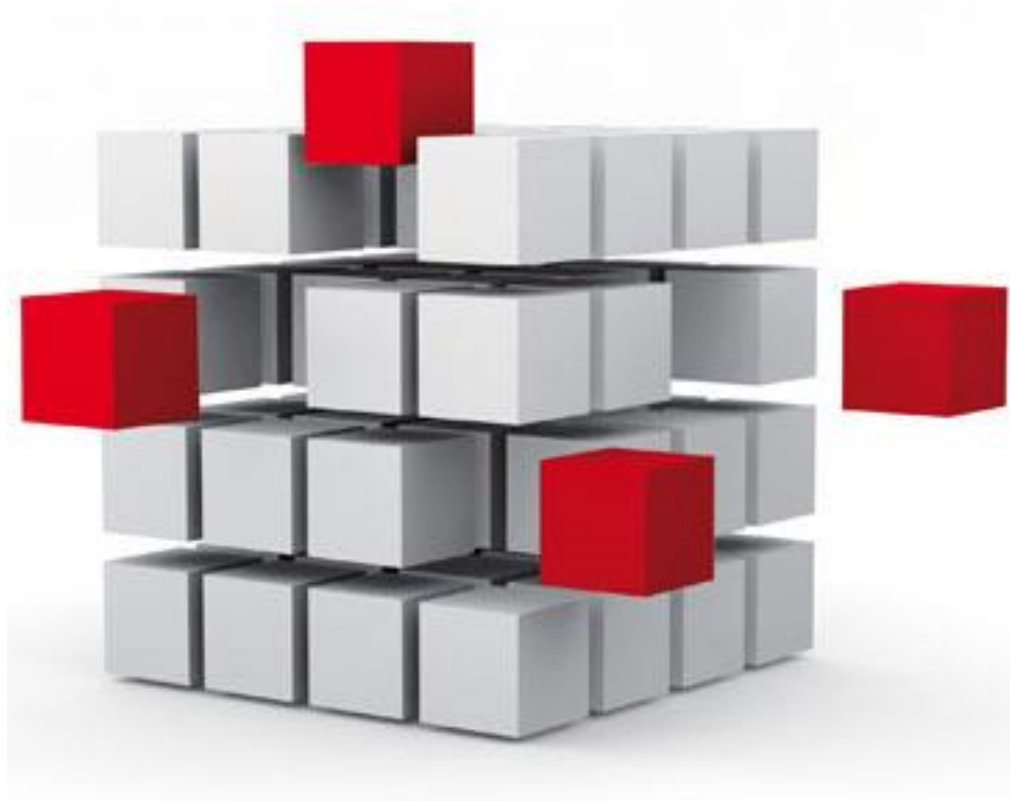
Look from a Finnish perspective

Benchmarking: common enabling and disabling factors

Pobi Assessment analysis

Suggestions / recommendations

About this report: structure



Part I: Conceptual



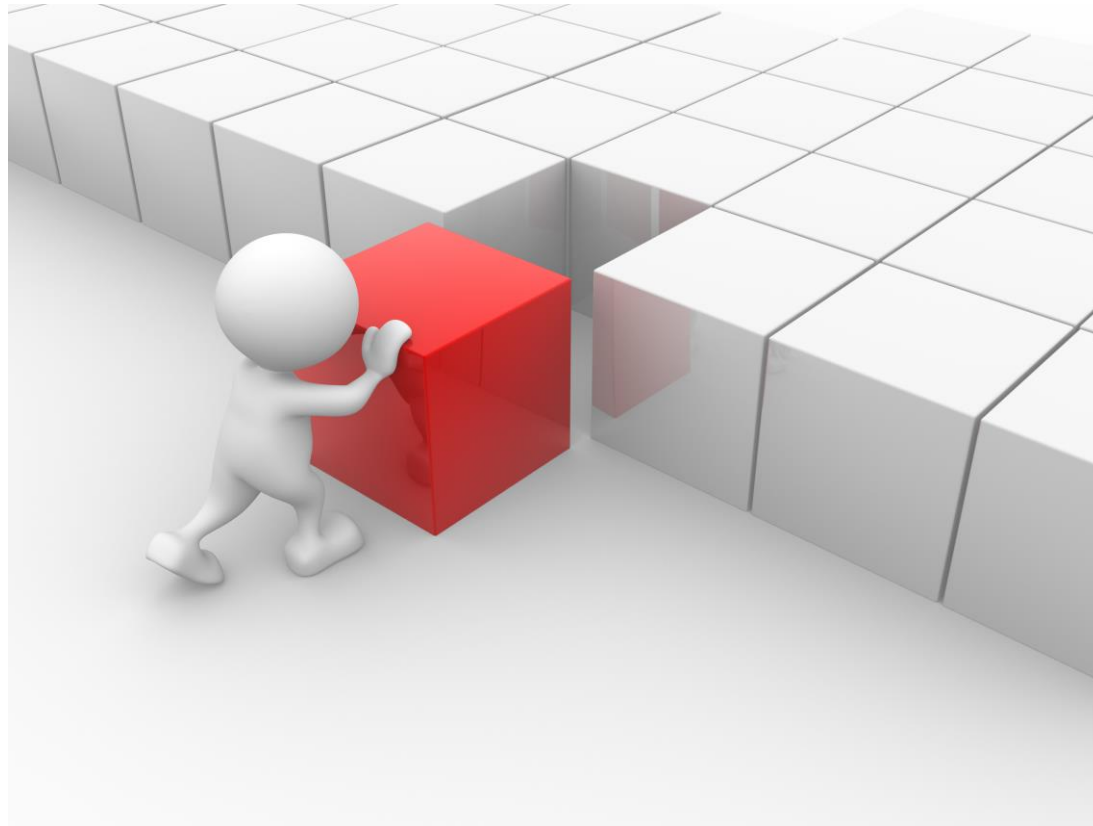
Part II Case studies



Part III Assessing Pobi



Deliverables



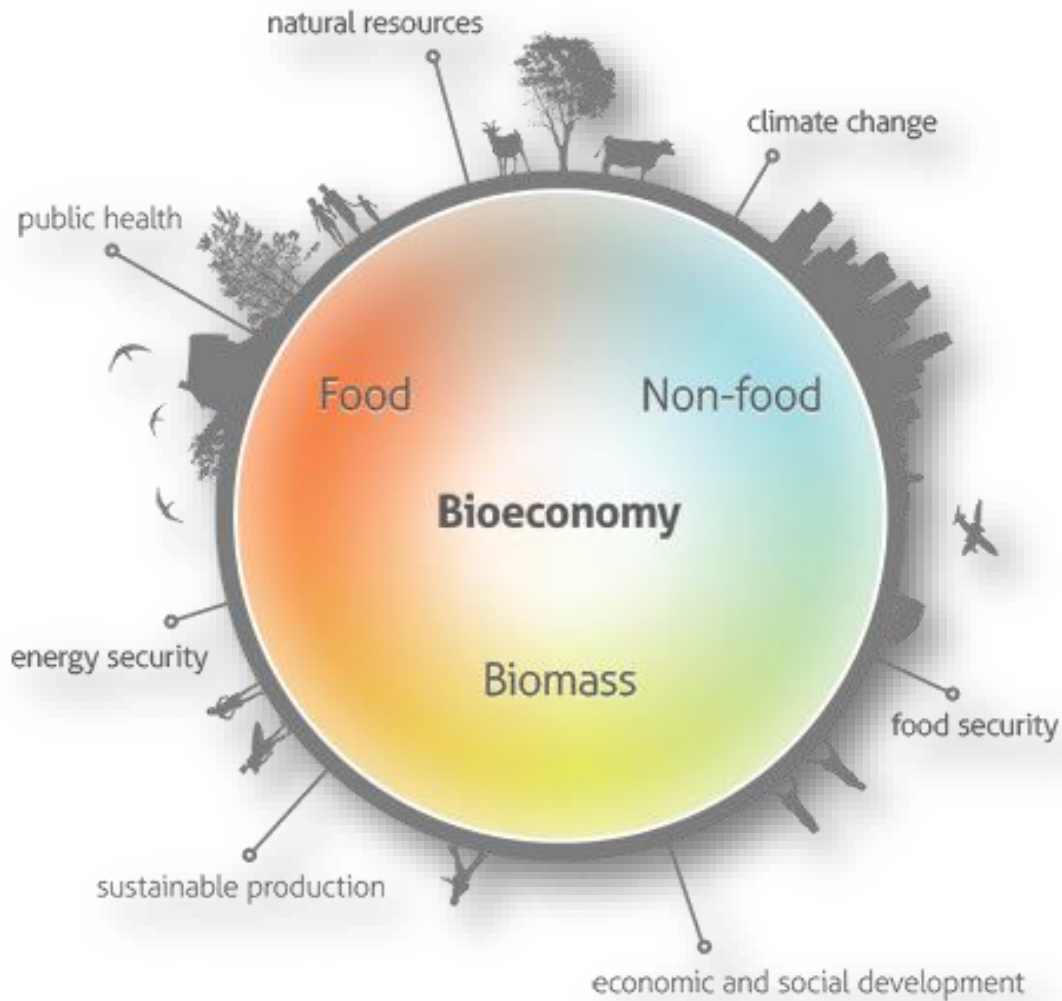
Resume of Bioeconomy in Finland
Benchmarking
Pobi Assessment analysis
Suggestions / recommendations

1st level deliverables

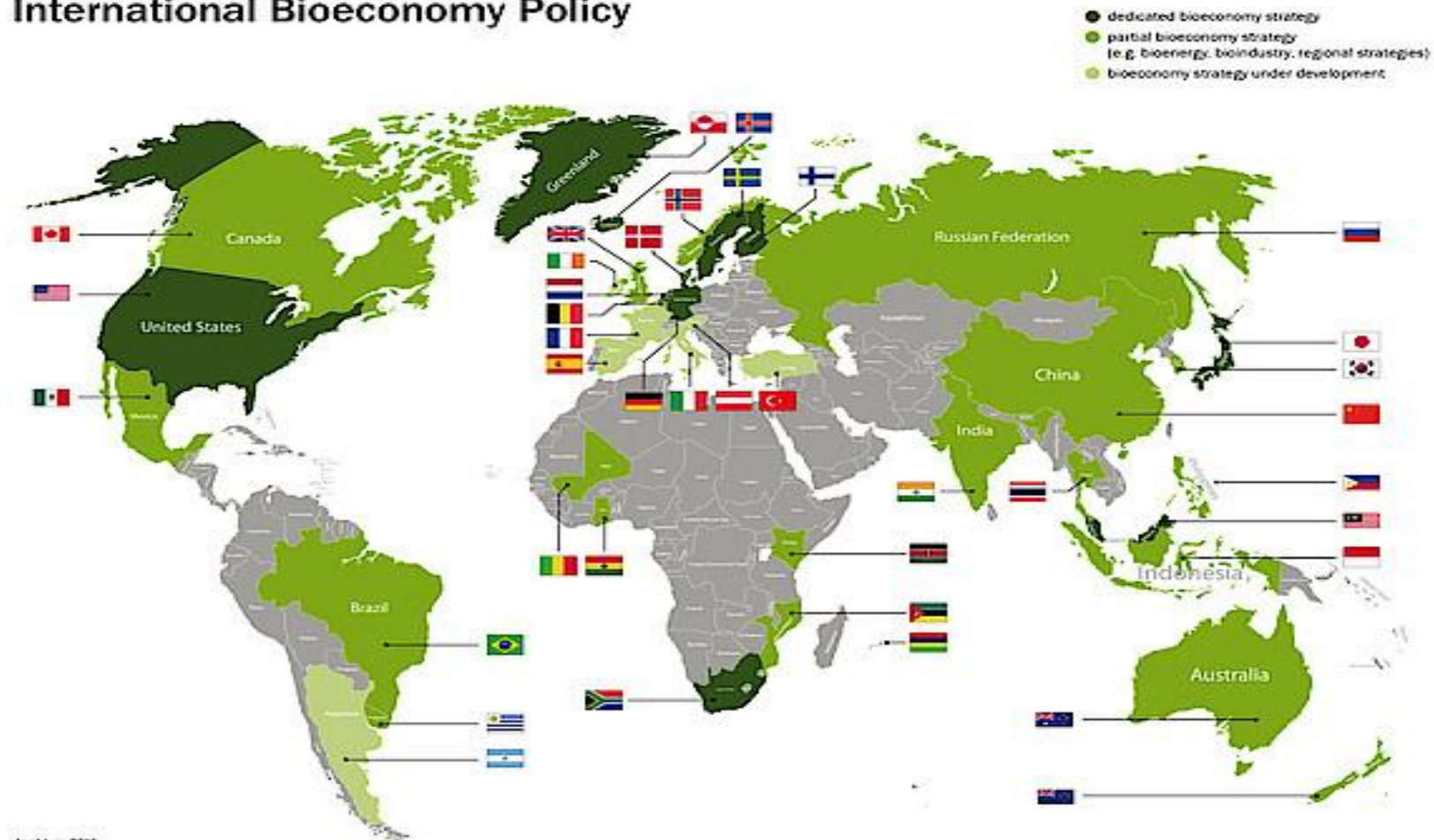
Survey questionnaires
Multi Level Perspective approach
Advanced SWOT analysis
Stakeholder management

2st level deliverables

Bioeconomy



International Bioeconomy Policy





Finland

Potential for growing

2. Coated paper and paperboard
4,0 billion €



5. Uncoated paper and
paperboard 1,4 billion €



1. Dieselfuel
6,1 billion €



3. Stainless steel
2,1 billion €



4. Mobile phones
and other
communication
equipment
1,5 billion €



6. Sawn goods 1,2 billion €



7. Pulp 1,2 billion €



8. Electricity
transformers
and frequency
changers
1,0 billion €



9. Medication
0,9 billion €



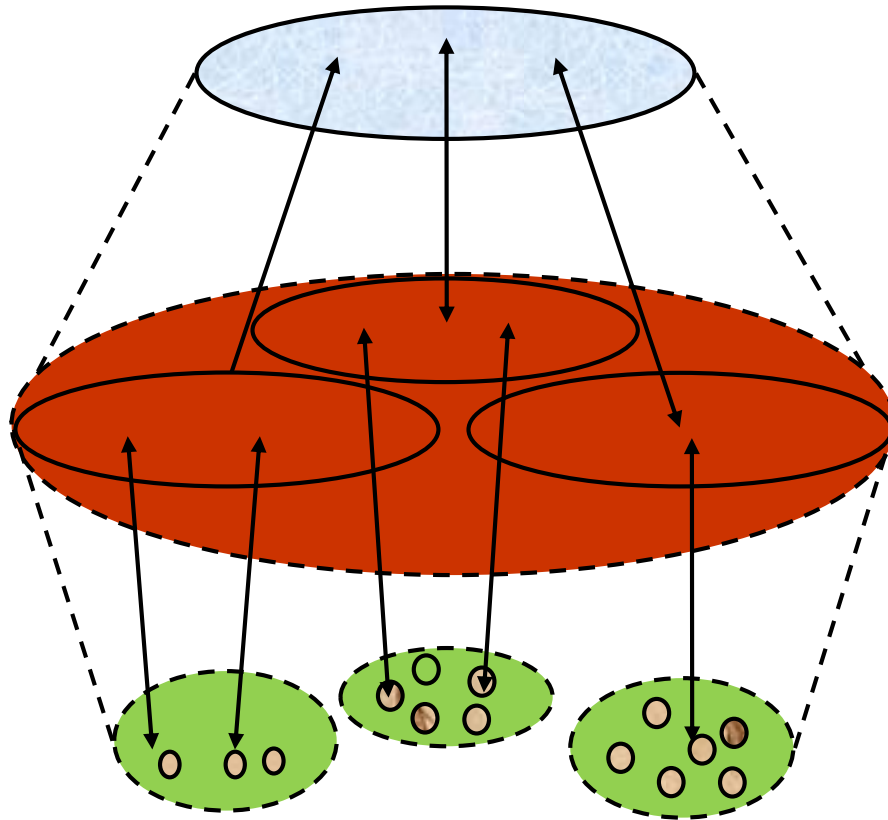
10. Medical
instruments
0,8 billion €



The Finnish moment: Transition factor analysis

- Interviews with a variety of Finnish stakeholders. (Benchmark study Finland and Dutch, 2014)
- The following findings in a national level allow Posintra to proceed a preliminary examination of critical factors that can empower and restrict Pobi further steps if they are coincident with the opinions of stakeholders in a local level.

MLP – Multi Level Perspective

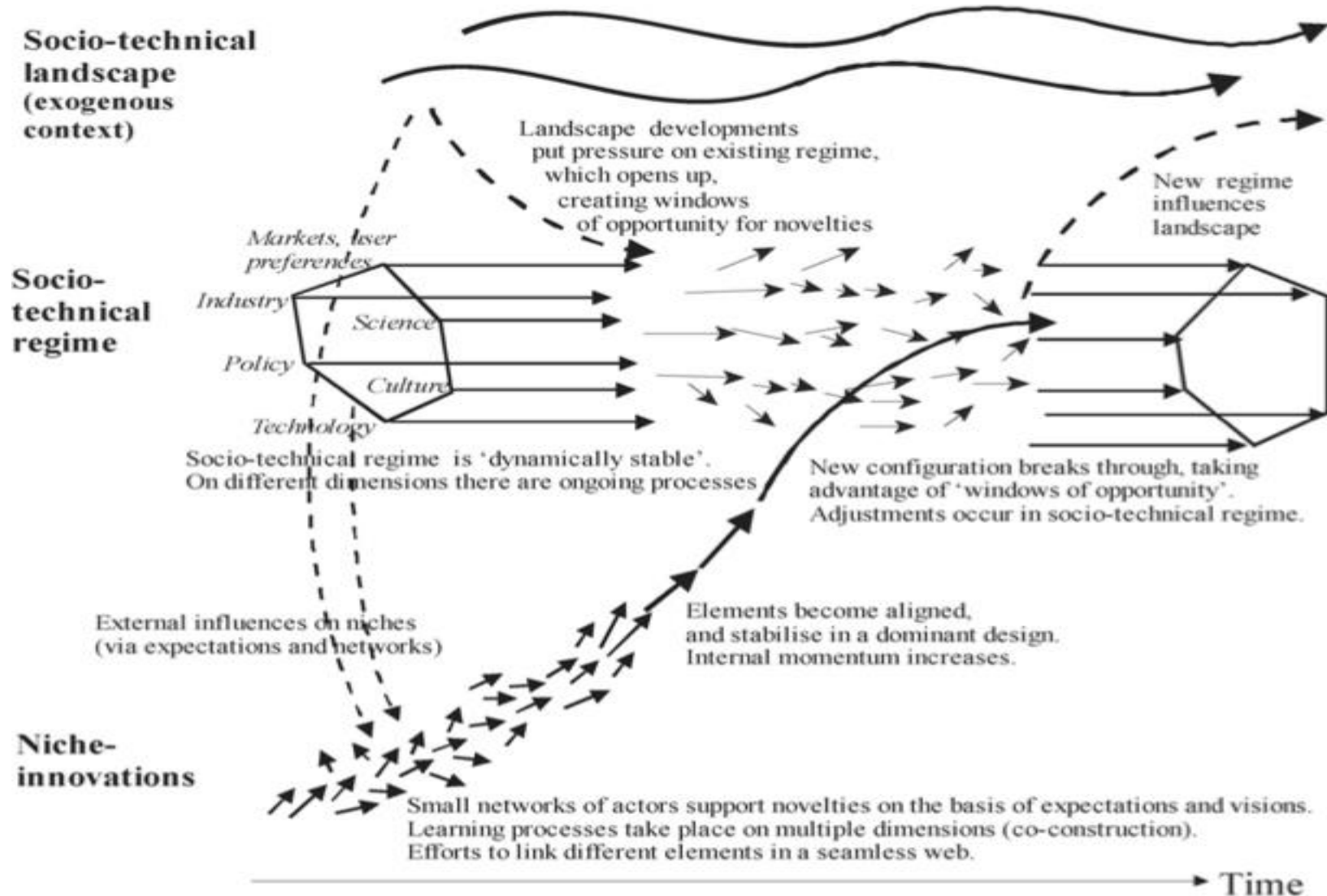


Landscape
(macro-level
Exogenous
context)

Regimes
(established
systems and
structures)

Niches
(micro-level)

Multi-level Dynamics



Findings detected in the national stakeholder survey

- Urgency
- Ownership
- Silos structure
- Industrial regime
- Cultural drawback
- Implementation gap



Lack of sense of urgency

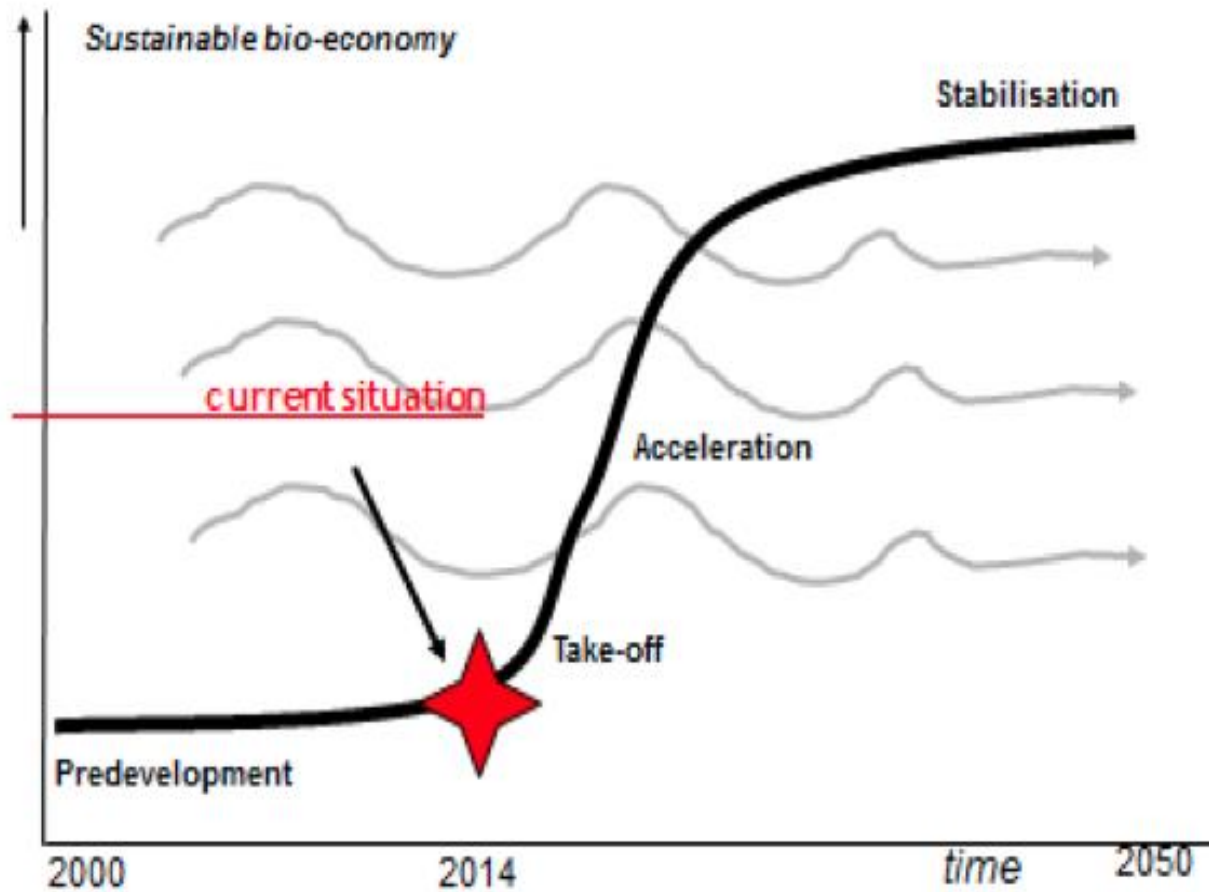
Lack of involvement towards ownership

Top down leadership approach

Lack of explicitly on the players' roles

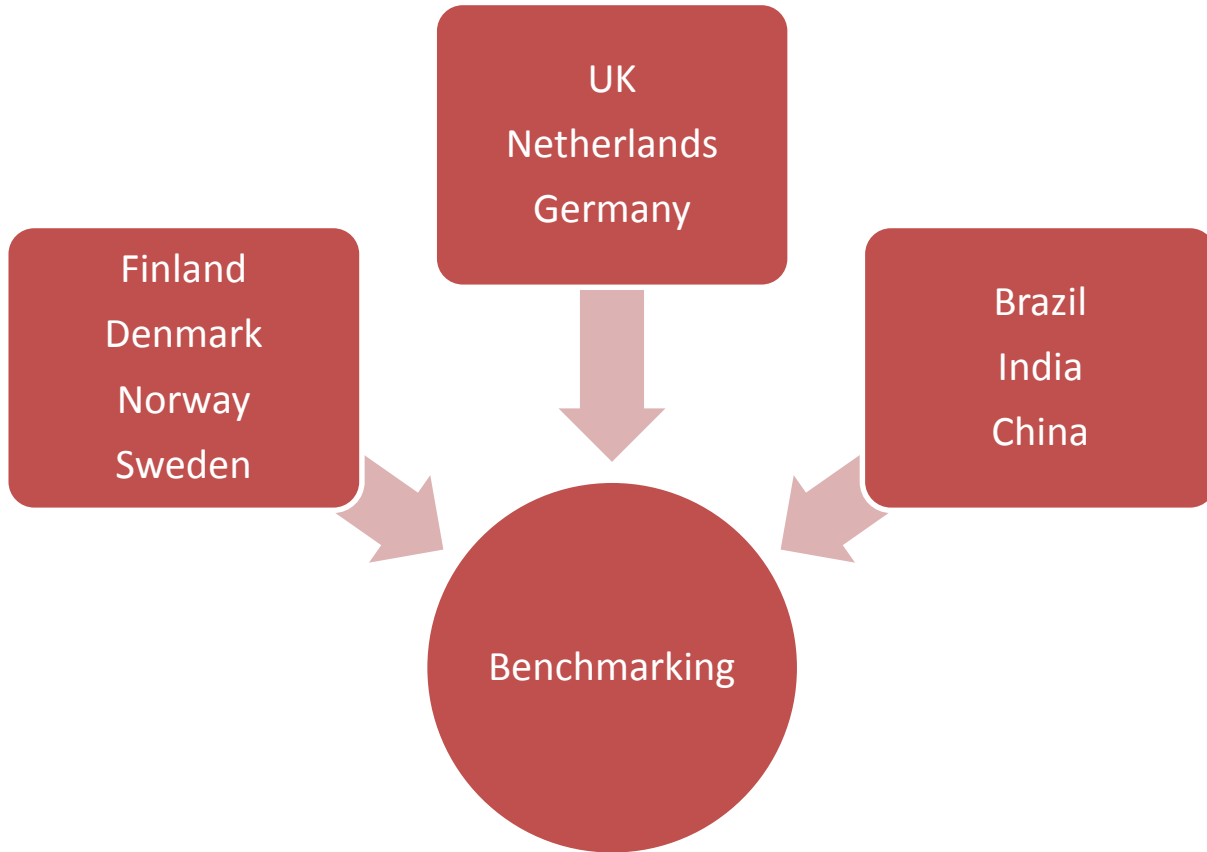
Slow transition pace

Phase of Finnish Bioeconomy

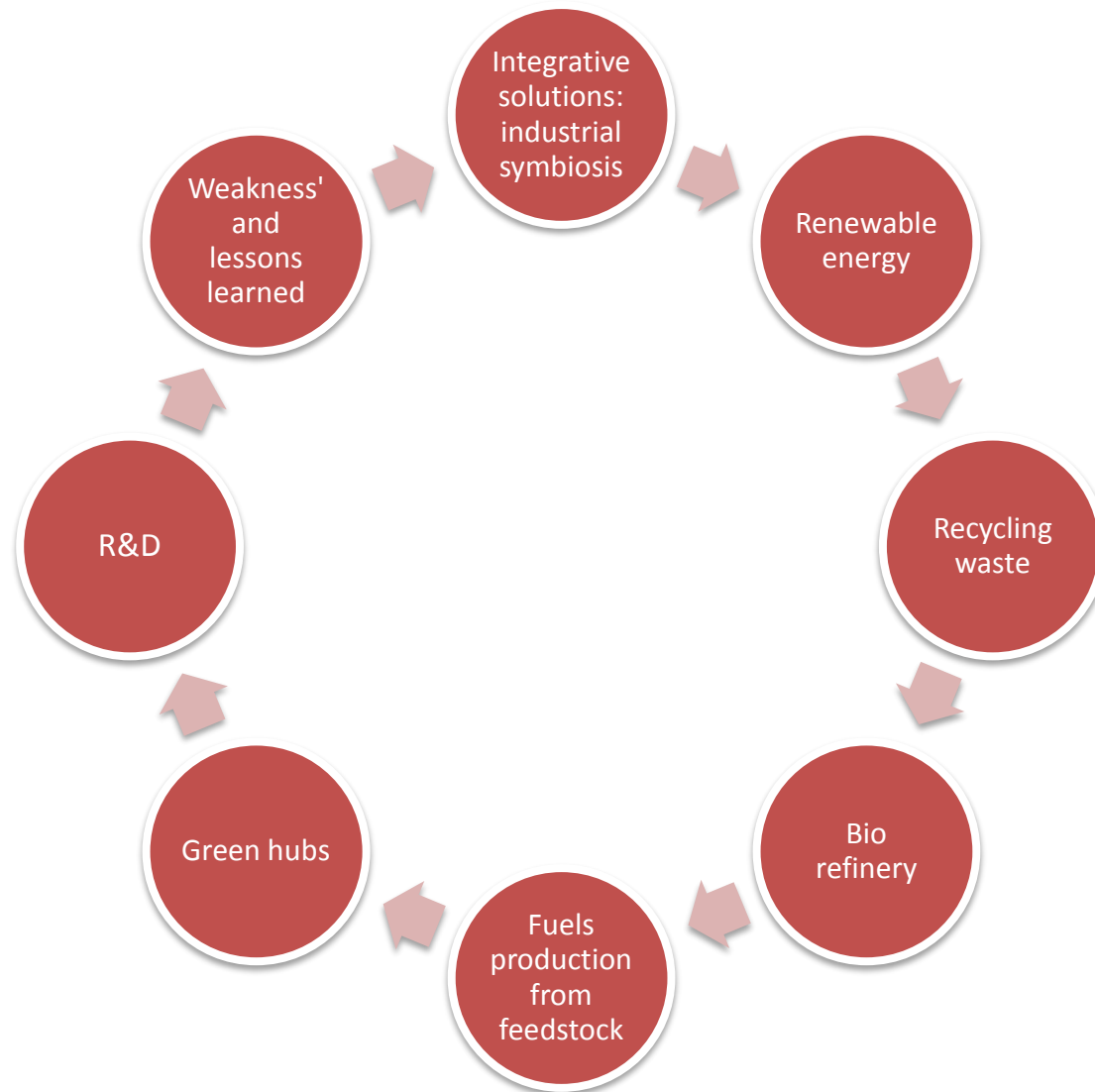


Cases studies





Focus on

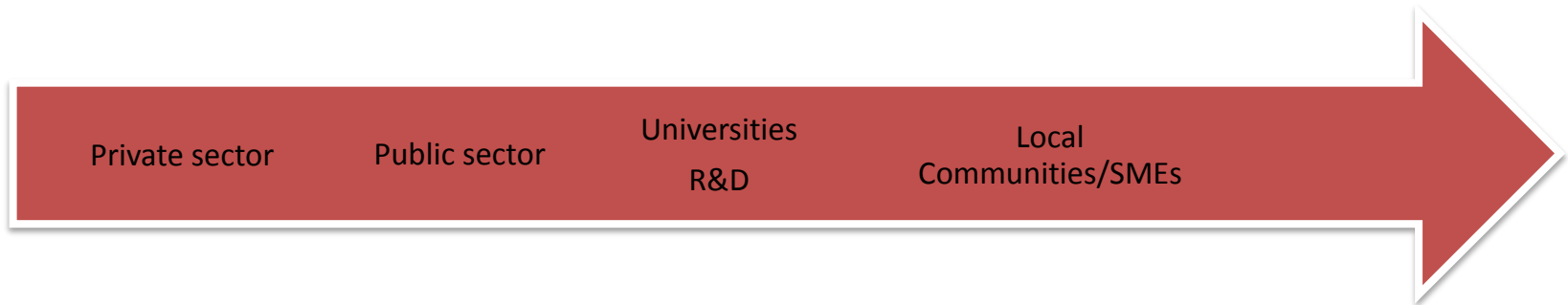


Group 1: Nordic Countries

- **Finland: Envi Grow**, an eco-industrial park is an efficient zone of green solutions –orientated to fuel from renewable sources
- **Denmark: Green Center**, a business and research unit working together with agriculture, agribusiness and eco-technology industries (energy generation)
- **Norway: Borregaard**, a biorefinery producing sustainable products from wood: cellulose, lignin, fine chemicals and food additive industries.
- **Sweden: Biorefinery of the Future**, a cluster in biorefining woody biomass.

Group 1: Nordic Countries

**Triple / Quadruple
helix approach**



Group 2: Western European

- **UK: Bio Vale**, an innovation cluster for the bioeconomy, a region's unique combination of world-class science, innovative agriculture, and bio-based industry.
- **The Netherlands: Tomatoes Plant**, orientated to waste recycling, methods to test for valuable bio-active compounds in the tomato plant waste.
- **Germany: Sunliquid Technology** a bio-cluster for the Production of Cellulosic Ethanol from Agricultural Residues

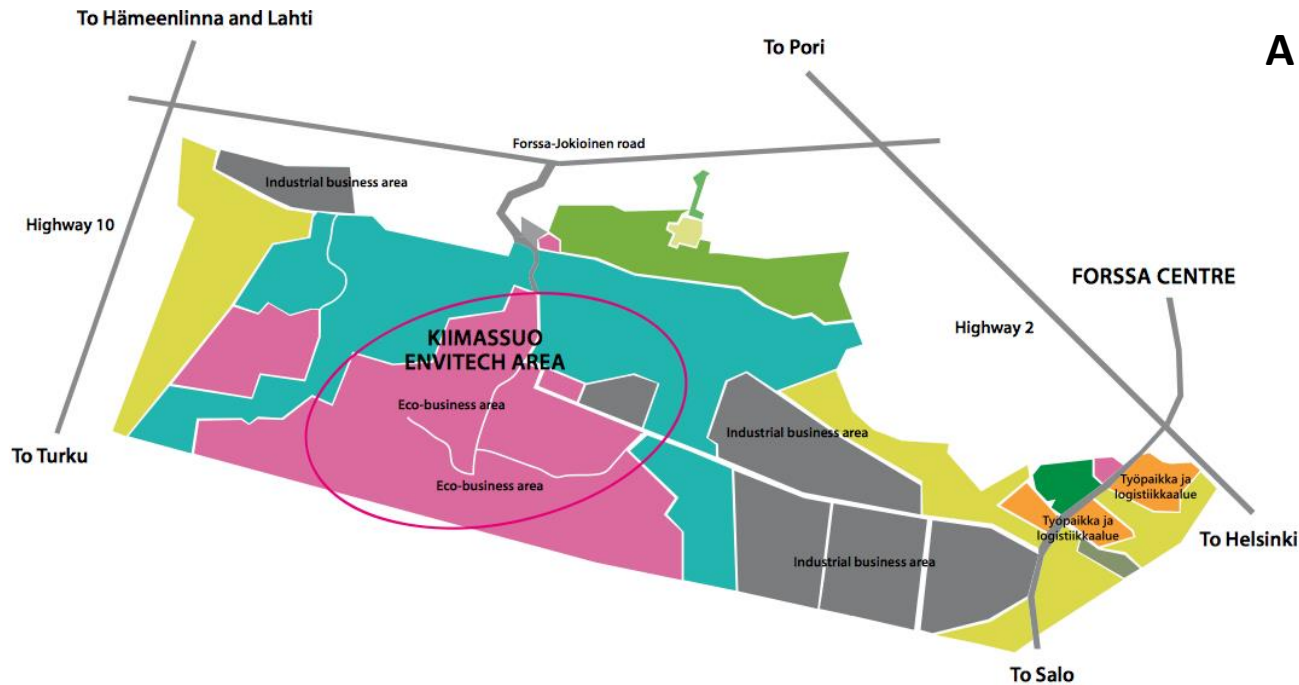
Group 3: Developing Countries

- **Brazil: Santa Cruz eco-industrial park**, an industrial symbiosis model providing byproduct and waste exchange; energy efficiency; water reuse; and sharing of information, human resources and services.
- **China: The Guitang Group and Guigang Eco-Industrial City**, producing fertilizers, cement, paper and fuel from sugar cane
- **India: Naroda Industrial Estate** is an industrial ecology networking project seeking a cooperative approach to achieve pollution prevention.

Finland



A Green Hub



20 companies, employing 200 experts

- Production of local organic food in large modern greenhouses;
- Production of green covers
- Bio-fertilizers; biogas, bioethanol and synthetic diesel for use as transport fuel;
- Industrial aquaculture using bioenergy;
- Innovative recovery and reuse of by-products from the food industry.



Policy in place

Key public and private actors have succeeded in preparing a common vision.

Long tradition of bioeconomy-related know-how and expertise, especially in agriculture.

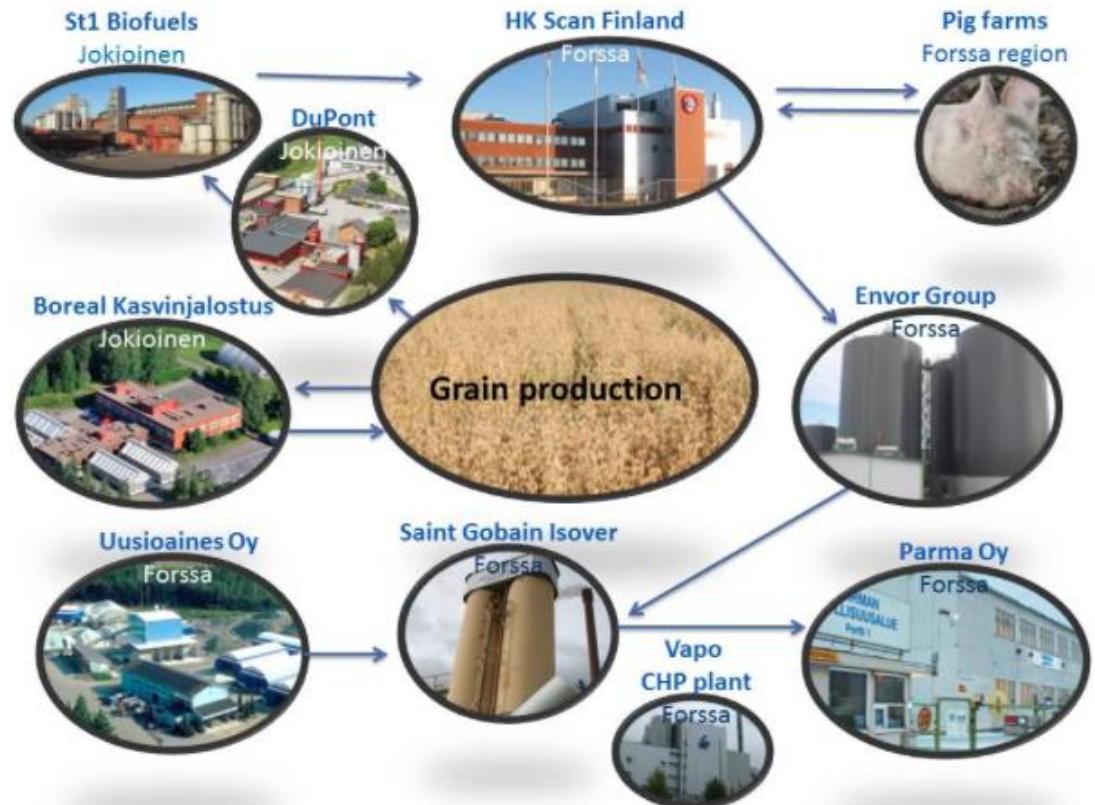
Investment from public and private sectors
EUR 150 000 000



Diversifying its limited financial and human resources into too many development fields and programs threatens the sustainability (long-term)

It relies upon the private sector initiatives.

(Public sector actors can and should provide development platforms, but in the long run, they cannot act as key locomotives of regional bioeconomy initiatives.)



Brazil: Santa Cruz eco-industrial park



Industry/industrial sector	Byproducts	Jobs	Environmental achievements
Aciquimica industrial Ltda/recycling of non-metal scrap	Manganese sulfate; zinc, copper oxide; steam, wastewater	60	Air monitoring system, effluent treatment station (ETS), underground water monitoring system
Basf S.A. transnational/chemical industry	Solvents, acids, desiccants	277	Responsible care program, emergency control system, ETS, waste sorting and recycling
Casa da Moeda do Brasil/Brazilian banknote printing and coin minting	Ink sludge, galvanic sludge, plastic, paper, metal plates/dies	1975	ETS, plastic, paper, metal plate/die recycling, environmental training program
Ecolab chemical Inc/hygiene, sanitary products	Acetone, ethanol, acids, paper, cardboard, packing	125	Paper recycling, emergency control system, solid and liquid effluent treatment
Fabrica Carioca de.Catalisadores S.A/ petrochemical	Contaminated gas emission, effluents with ammonia and sodium compounds, sludge	220	Environmental, health and safety program, gas emission control system, ISO 9001, 14,001 certified, emergency control system
Gerdau – Cosigua S/A/steel mill	Iron scrap, metal slag, air particulates, oil	1700	Metal scrap recycling and reuse, 97.2% water reuse, ETS, environmental management system (EMS), air quality monitoring system
Usina Termoelétrica de Santa Cruz/electricity (natural gas power generator)	Solid waste, sludge, solid, gas and liquid effluents, ash, sulfur particulates	230	Air quality monitoring system, EMS, environmental, health and safety program, energy cascading
Latasa Ltda/aluminum – metallurgy	Aluminum slabs, other byproducts, VOCs emission, liquid effluents	136	Environmental, health and safety program, ISO 9001, 14,001, OHSAS 18,001, water reuse, aluminum slabs 100% recycled
Morganite do Brasil Ltda electronic equipment	Solvent, metal scraps	78	ISO 9001 certified, waste recycling program
Novartis Biocências S.A/pharmaceutical, baby accessories and food products	Solvents, hydraulic fluids, chemicals, plastics, paper, cardboard, glass	365	Solvent reuse; plastic, paper, cardboard, glass recycling; ETS, EMS
NUCLEP S.A/heavy nuclear-electric equipment, components	Grease, oil, sludge	530	ISO 9001, ASME, CENEN NE 1.16 certified, ETS
Pan Americana chemical S/A/chemical products	Aluminum, cardboard packing	58	Bureau Veritas QS, Responsible Care, ISO 9001/14,001 certified, ETS
SICPA chemical Brasil Ltda/paints and varnishes	VOC (volatile organic compound), effluents	240	Bureau Veritas QS, ISO 9,001 certified, EMS, VOC reduction system
Valesul Alumínio S.A./metallurgical (aluminum and aluminum alloy metallurgy)	SO particulates, dust, water with oil, spent pot lining (SPL), aluminum dregs	616	ISO 9,001, 14,001, BS 8800, OHSAS 18,001, aluminum recycling, air quality MS, SPL reuse as a energy generator

Enabling organisation's capacities towards environmental outcomes

- ✓ Byproduct and waste management program
- ✓ Development of waste inventory;
- ✓ Identification of possible synergies, reuse and recycling possibilities.
- ✓ Recruitment of new industries, to achieve the right mix to facilitate industrial synergies.
- ✓ Air quality monitoring system
- ✓ Rainwater and surface runoff monitoring system.
- ✓ Development of an environmental management plan.
- ✓ Incentives to environmental initiatives in the park's surrounding area.
- ✓ Information, training and service sharing.
- ✓ Community socio-environmental initiatives
- ✓ Educational programs.

Main outcomes



Positive economic, environmental and social returns. Improved: economic efficiency, higher return on investment (ROI), environmental performance and reduced costs production

Why did it succeed?



Predominance of private sector in the planning and implementation of EIPs.

The existing organizational relationship in the Santa Cruz (ADIN)

The extant industrial sector diversity in the Santa Cruz

Human resources availability

Drawbacks



The lack of public and institutional commitment because of changes in the political scenario.

The lack of knowledge and familiarity with the EIP concept and the possible benefits resulting from its implementation is also making the process slow.

The lack of interaction among the parts led to lack of cooperation







1. Distrito Industrial de Santa Cruz



Pobi's assessment







Pobi Assessment framework

Enabling Factors	Disabling factors	Pobi	
Availability of Natural resources or raw materials	Difficult access or high cost of raw material resources	Available biomass from forest and feedstock in Porvoo area	
Cross-sector co-operation and synergies (PPP) Enabling leadership of private sector and co-creation	Lack of co-operation or difficulty of connecting partners acting in a more “isolated environment”	Good history of cooperation with local actors. However, it has also a lack of private ownership as per the top-down approach from the public sector	 
Industrial symbiosis		Solid experiences in Kilpilahti can add knowhow value to future practices	

Enabling Factors	Disabling factors	Pobi
Communication, branding with the concept of bioeconomy added to business strategies		Advanced in some cases, such as in Neste and in the public sector, but not generalized
Good access to economic activities and infrastructure	Location disadvantages: lack of accessibility to economic	Kilpilahti has appropriate infrastructure and is a strong advantage
Presence of qualified workforce	Lack of human resources Out-migration (particularly of young people)	Presence of local work force, however it might be insufficient for future complex challenges.



Enabling Factors	Disabling factors	Pobi	
Policy framework and governance in place	Lack of a legal framework and weak governance	The Bioeconomy National Strategy is one of the great incentives of Pobi to succeed	
Funding	Absence of funding	The EU Regional Fund is a main source of resources as a kick off of Bioeconomy.	
Academic community / R&D	Absense of R&D Lack of intelectual support to implement and succeed in initiatives.	R&D from Aalto University in clean tech and Social applied sciences from Haga-Helia business school could create a pool of professionals , but future challenges would require more investments	 

Recommendations and suggestions





- (1) To build a strong network among relevant stakeholders to enable co-creations** and therefore a conducive environment for Bioindustrial park in Porvoo-Kilipilahti
- (2) To defined and communicate properly the clear objectives guiding principles and vision of bioeconomy in Kilpilahti** therefore to enable understanding and long-term partnerships.
- (3) To have a robust background on research and development and enable knowledge exchange** and promote a wider understanding of emerging aspects of the bioeconomy.

Suggestion of tools for implementation

Multi-level Perspective & Stakeholder Management



Stakeholder Management

Explore each actor network around the project offering the a customized relationship and a value proposition



Stakeholder Management

Step

1

*Identify stakeholders
network*

Step

2

*Assess and map out their
position*

Step

3

*Summarize who are the
Key actors?*

Step

4

Adopt a strategy

Identifying and accessing positions

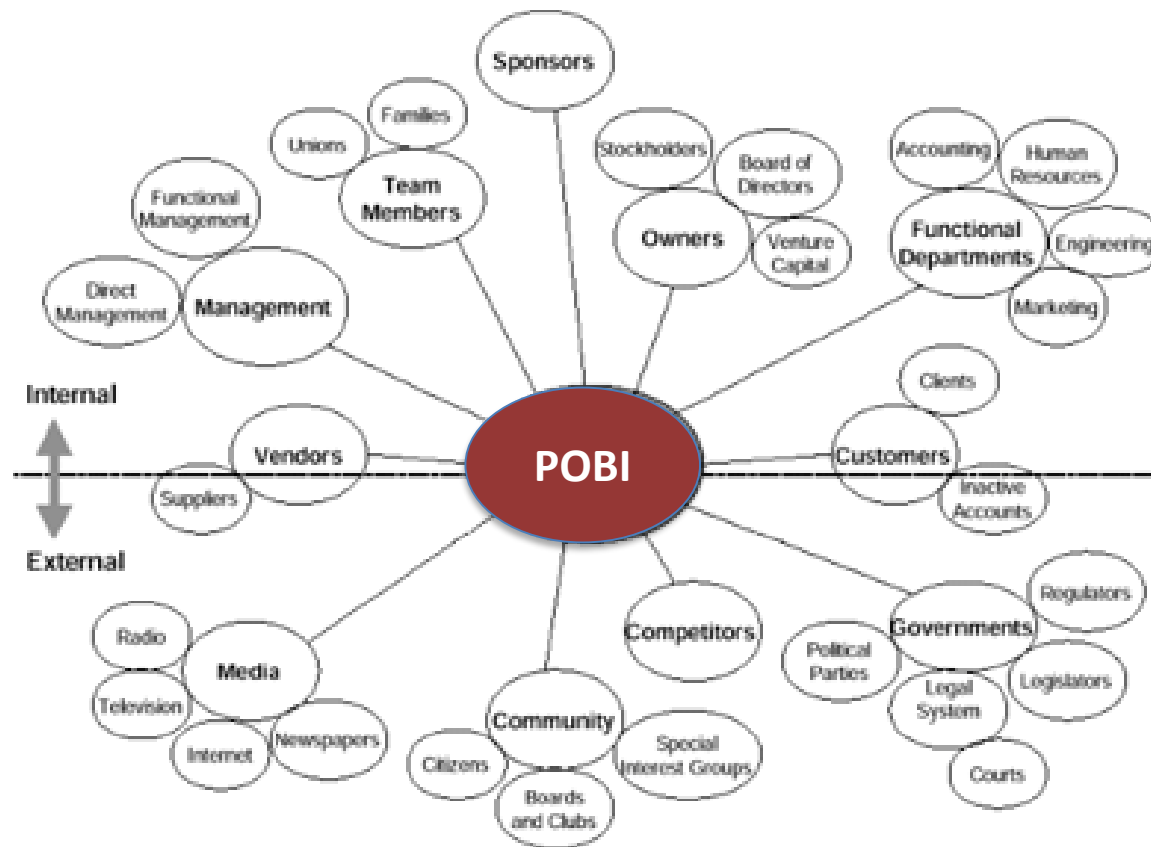
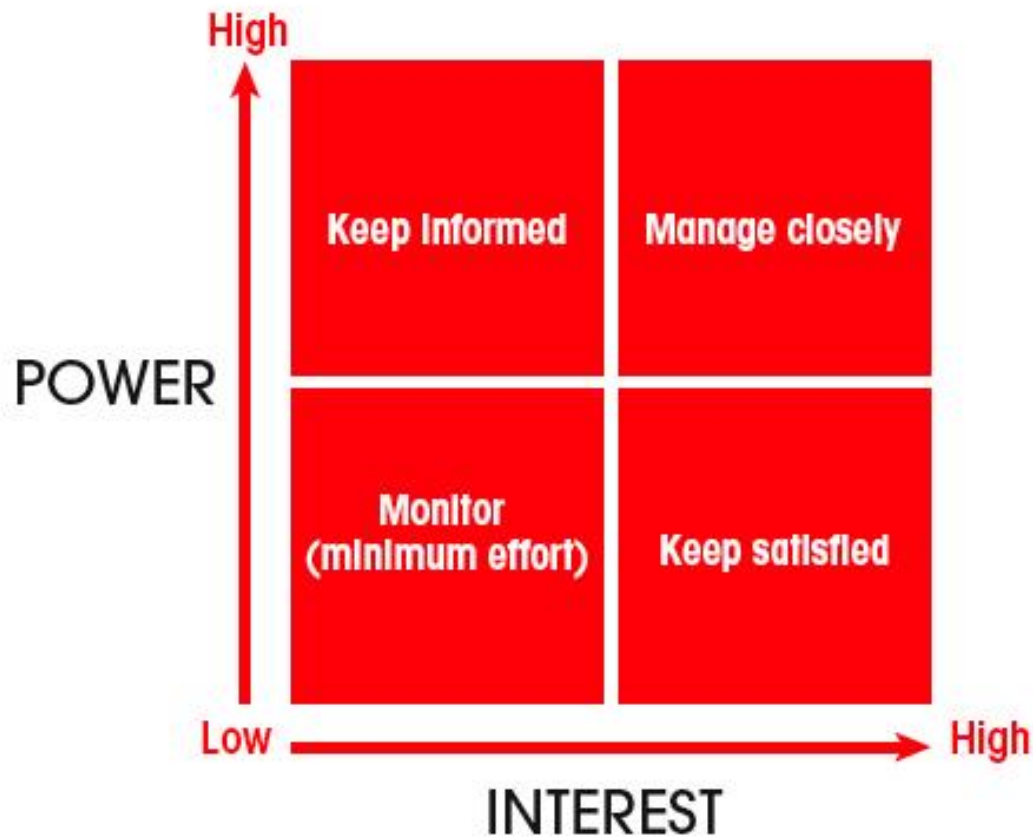


Figure 1. Example of a stakeholder analysis context diagram.

Defining tactics, monitoring and evaluating





Kiitos!



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