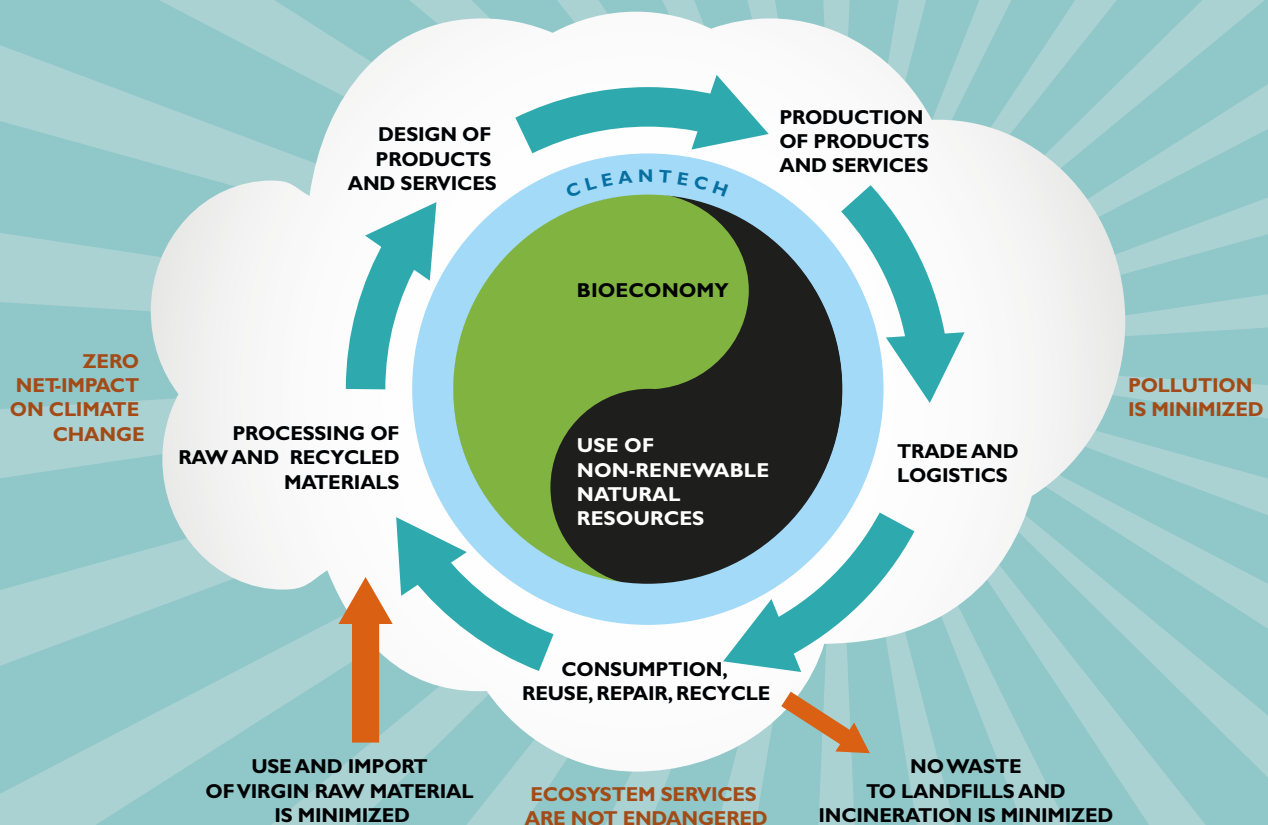


Towards a carbon neutral circular economy – research enhancing the transition

”Firstly, we need to get more value out of each ton of materials, each joule of energy, each hectare of land and each cubic meter of water. But the second thing we must do is re-use, update, repair and recycle. We need to move from a linear economic model, where we extract, produce, use and throw away, to a circular economy model, where waste from one stream becomes the raw materials for another.”

Commissioner Janez Potočnik 5.6.2014

A CARBON NEUTRAL CIRCULAR ECONOMY



Sustainable use of natural resources and mitigation of climate change require a transition to a new economic system, where wealth and well-being are created by using significantly smaller amounts of natural resources. A carbon neutral circular economy is a precondition for sustainable economic growth. It also defines the direction and boundary conditions for the development of cleantech and bioeconomy, the future foundations of Finland’s economy.

- A radical improvement of resource efficiency is a prerequisite for a carbon neutral circular economy. It includes bioeconomy as an essential element, which is particularly important for Finland, a country of forests.
- Cleantech provides solutions for more sustainable use of renewable as well as non-renewable resources. The demand for cleantech solutions is increasing all over the world.
- European and national research and innovation policies should actively strengthen the knowledge base of a carbon neutral circular economy.

MORE INFORMATION

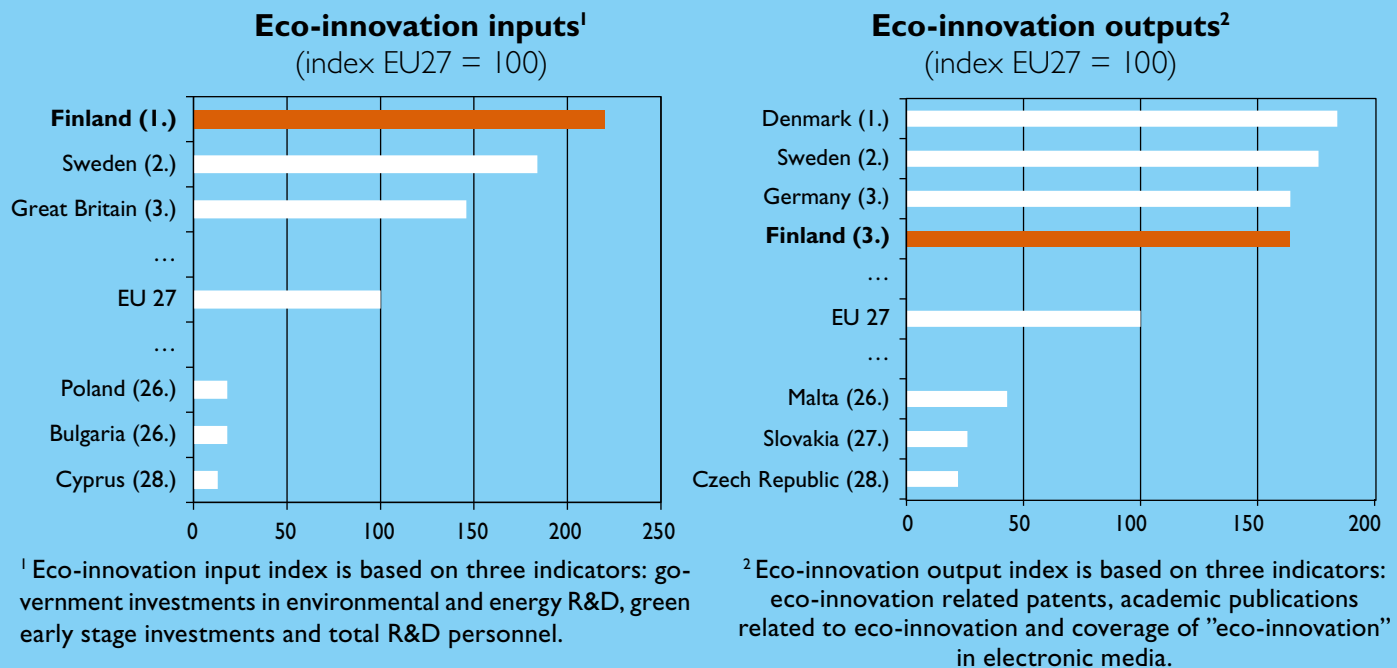
Per Mickwitz,
Jyri Seppälä, Lea Kauppi
and Mikael Hildén

SYKE

firstname.surname@
ymparisto.fi



Finland is one of the forerunners in cleantech and eco-innovations; however, we are lagging behind the average EU countries in resource efficiency and in GHG mitigation.



Source: EU Eco-Innovation Scoreboard 2013, www.eco-innovation.eu

A path towards a carbon neutral circular economy

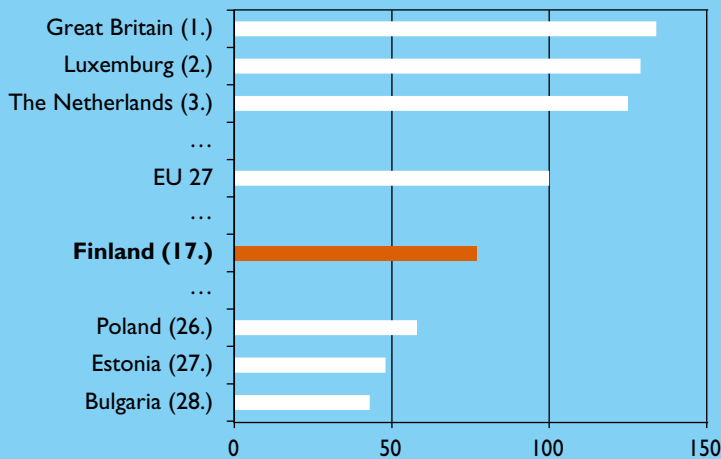
The need to find a path towards a new economic system capable of responding to the challenge of scarce resources and climate change has been widely recognized. It has been described in many strategies and action plans in the EU as well as in Finland using various concepts, which focus on different parts and dimensions of the new economy.

Finland can be proud of several early success stories of eco-efficiency. Already in the 1970's the Finnish forest industry succeeded in decoupling water discharges from production by significantly reducing water consumption, recycling process chemicals and producing energy from biomass which earlier was discharged into water. These changes also made an efficient treatment of effluents possible. Today the challenge is to learn from the success stories but instead of changing specific production processes, entire production and consumption systems have to be transformed.

These transformations imply improving resource efficiency in all activities, optimizing production processes, developing business models and improving logistics as well changing consumption patterns. In a circular economy the recycling of renewable and non-renewable resources and the use of energy are as efficient as possible. Nutrients are returned to the soil and non-renewable resources are recycled in the technosphere without harming ecosystems. The use of natural resources is sustainable and takes into account the protection of ecosystem services.

This reduces Finland's credibility and competitiveness in the fast growing global cleantech markets. The demand is huge, since the scarcity of natural resources together with changing climate call for urgent actions globally.

Resource efficiency outcomes³
(index EU27 = 100)



³ The resource efficiency outcome index is based on four indicators: countries' productivities in material consumption, energy use and water use as well as countries' intensity of GHG emissions.

"FINLAND PRETENDS TO BE A CLEANTECH COUNTRY, BUT A FOREIGNER VISITING HELSINKI SEES A HUGE PILE OF COAL. WE HAVE PLENTY OF HOMEWORK TO DO."

MATTI LIEVONEN
CEO, NESTE OIL LTD
28.11.2013

In a carbon neutral circular economy the GHG emissions do not exceed the natural carbon sinks. An essential part of a carbon neutral circular economy is a sustainable bioeconomy, which is based on the sustainable use of renewable resources for the production of food and energy as well as products and services.

Eco-innovations and cleantech solutions improve resource efficiency and sustainability of resource use while reducing the negative impacts of production and consumption on the environment. Cleantech solutions are further improved through innovations.

The industrial internet, where smart devices and objects, networked sensors, software and big data are combined and utilized to control production and logistics, will facilitate the development of resource efficiency to a new level. New digital solutions will also make cities smart. In **smart cities** resource efficiency is maximised in buildings, infrastructure and transport. Already today more than half of the global population lives in cities. Therefore smart cities are essential for a circular economy.

Research has already produced plenty of knowledge which provides a foundation for a carbon neutral circular economy. However, the transition still requires solution-oriented and holistic research on multiple issues.

In the following list a few key research themes have been identified:

TRANSITION TO A CARBON NEUTRAL SOCIETY

- Opportunities and bottlenecks in the transition to carbon neutrality
- Identifying the factors maintaining the fossil fuel based economy
- Understanding the dynamics of consumer behaviour

SUSTAINABLE BIOECONOMY

- Opportunities and bottlenecks of bioeconomy
- Social, economic and environmental criteria and boundary conditions of a sustainable bioeconomy
- Opportunities provided by the bioeconomy for ensuring the security of food and energy supply

RESOURCE EFFICIENCY AND CLEANTECH AS COMPETITIVE ADVANTAGES

- Opportunities and bottlenecks of the digital economy and industrial internet in the context of resource efficiency
- Re-use, re-manufacturing and recycling; industrial and regional symbioses
- Causal analyses of successes and failures of resource efficiency in the EU and its Member States

ADAPTATION TO CLIMATE CHANGE AND RESOURCE SCARCITY

- Alternative sustainable adaptation pathways for society
- Developing adaptive regulation for the management of extreme events
- Roles of the public and the private sector in the adaptation of society

SMART AND SUSTAINABLE URBANIZATION

- Attractive, resource efficient and low-carbon urban structures
- Relationships of urban areas to regional and global material flows
- Digital economy, smart services and urban structure

INTEGRATING THEMES AND ACTIVITIES

- Evaluation of policies and policy coherence; evaluation methodologies
- Learning from pilots and experiments, mainstreaming the best practices
- Developing interactive communication and working practices between the users and producers of research (co-design, co-creation), synthesizing assessments

AUTHORS: PER MICKWITZ, JYRI SEPPÄLÄ, LEA KAUPPI, MIKAEL HILDÉN
LAYOUT: ERIKA VÁRKONYI