

Opportunities and challenges in implementing a bio-economy strategy – university perspective

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Foto: I.Saabas, Maaleht



Global challenges

- Growth of global population, 2030 – 8 billions; 2050 - more than 9 billions
 - **All need food!** Global food production should increase by 3% annually (Watts, C. Agriculture in High Growth Markets, Economist Intelligence Unit., London), 50-100% by year 2050
 - 94% of food is produced on land
 - Finite amount of land!
 - 74% water
 - 26% land
 - 13% habitable land
 - 3% arable land
- (Professor R Jane Rickson, Cranfield Soil and AgriFood Institute, 2015)



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Global challenges

- Climate change – increase of average temperature, droughts and floodings, storms and hurricanes, water level rise in oceans, melting of ice on polar regions...



Climate change 'most existential crisis civilisation has known', says DiCaprio (The Guardian, 29th February, 2016)

During last 150 years the average temperature has increased nearly by 0,8 °C and in Europe, nearly 1 °C (European Environment Agency)

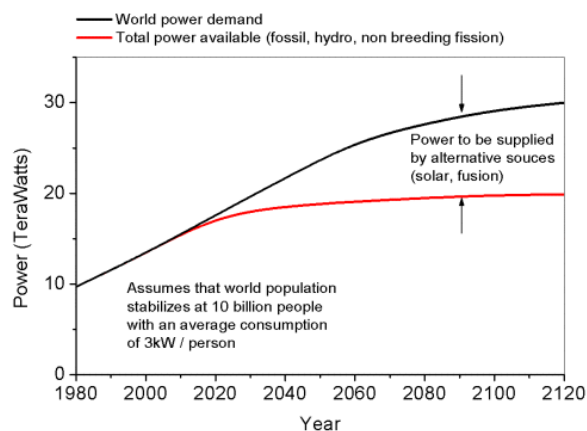
We all know that reversing the course of climate change will not be easy, but the tools are in our hands - if we apply them before it is too late.

DiCaprio 's Speech in United Nations, April 22, 2016

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Global challenges

- Energy crisis – need for alternative energy sources



<http://www.plasma.inpe.br/>

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2015 monitoring report of the EU Sustainable Development Strategy

- Economic development: real GDP per capita and resource productivity (the ratio between GDP and the total amount of materials directly used to produce it) in the EU have improved over the long term
- Improvements in public health and demographic change, but poverty increased sharply since the start of the economic crisis
- Environmental development: weak economic activity in the short term has reduced some pressure on the environment, but overall progress is mixed
 - Greenhouse gas (GHG) emissions have steadily decreased in the long run
 - Since 2008, primary energy consumption has declined
 - Biodiversity within the EU has been under continuous pressure

Sustainable development in the European Union, EUROSTAT
26.09.2016, EURAGRI, Tartu, Estonia
2015, ISSN 2443-8480

Bioeconomy



- Innovative and low-emissions economy, reconciling demands for sustainable agriculture and fisheries, food security, and the sustainable use of renewable biological resources for industrial purposes, while ensuring biodiversity and environmental protection.
<https://ec.europa.eu/research/bioeconomy/index.cfm?pg=policy>
- 13 February 2012, Europe's Bioeconomy Strategy
- Three pillars:
 - Investments in research, innovation and skills;
 - Reinforced policy interaction and stakeholder engagement;
 - Enhancement of markets and competitiveness.

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We aim to move towards efficient bioeconomy -



Biobased Industries Consortium

bridging between the pillars is necessary!



The future is a circular bioeconomy (European Bioeconomy Manifesto, 2016)

Bioeconomy strategies



- 13 February 2012, European Commission, Bioeconomy Strategy
- Review and updating of the Strategy by 2017
- National Bioeconomy Strategies – Germany 2013, Sweden 2012, Finland 2014, Austria Bioeconomy Background Paper (2013), Australia Bioenergy – Strategic Plan 2012–2015, Canada Blueprint beyond Moose and Mountains (2011), Denmark Agreement on Green Growth (2009), Great Britain UK Bioenergy Strategy (2011), Netherlands Bio-based Economy 2010–2015, South Africa Bioeconomy Strategy (2013), USA National Bioeconomy Blueprint (2012)....
- Regional bioeconomy strategies – Flandria (Belgium), Drenthe, Zeeland, South-Holland (Holland), Baden-Württemberg, North-Rein-Westfaal (Germany) etc

What do we need for the realization of the bioeconomy?

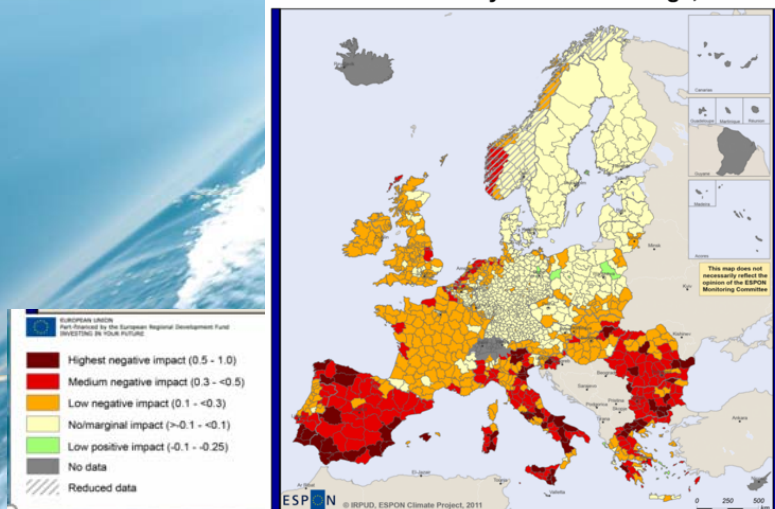
- We have the biological resources
- We need:
 - Technologies
 - Education
 - Collaboration
 - Countries
 - Ministries
 - Regional governments
 - Enterprises
 - Universities, vocational schools
 - Research
 - Networks and clusters



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Region are key actors in developing European bioeconomy
Global challenges with regional differences

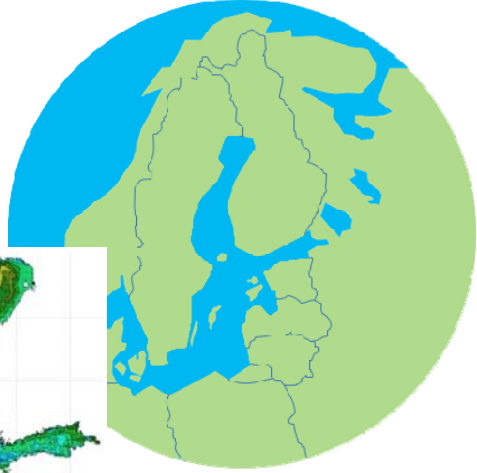
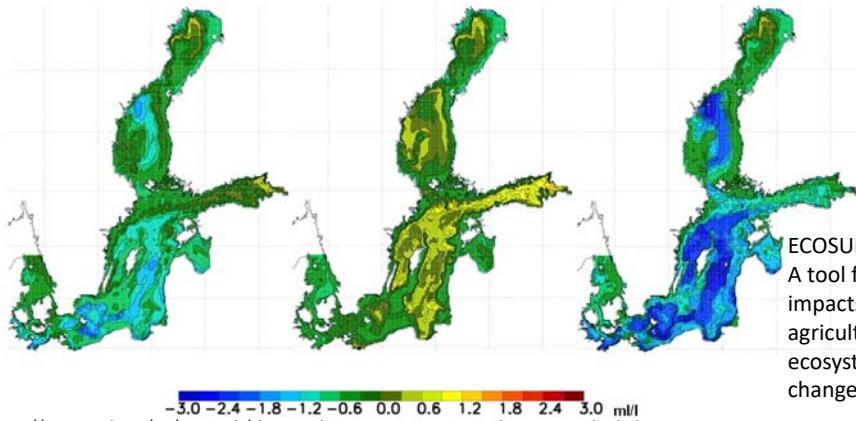
Potential vulnerability to climate change, 2009



First ESPON 2013 Scientific Report

Baltic sea

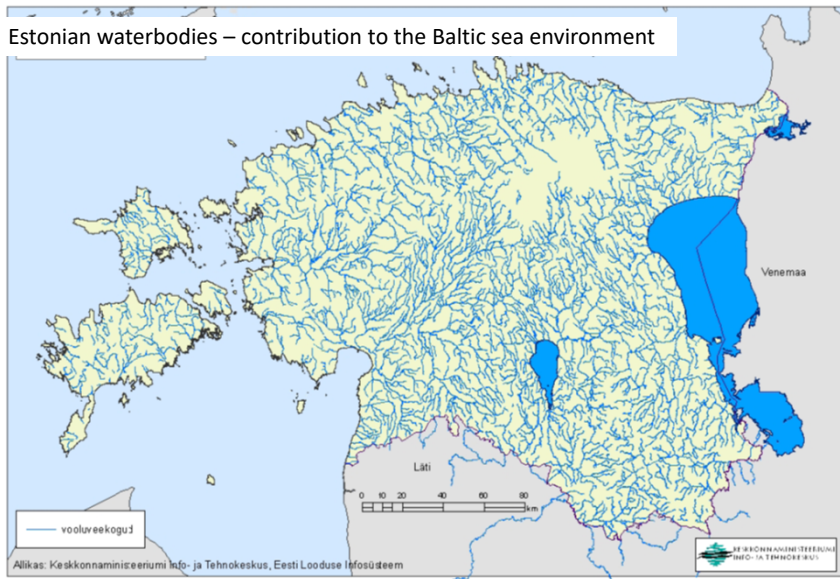
Examples of changed oxygen saturation concentrations at sea bottom, with today's climate compared to future climate. The maps are based on different nutrients loads. Left map with today's nutrient load, middle map reduced nutrient loads, and right map highly increased nutrient loads.



ECOSUPPORT - a BONUS funded project, 2011
A tool for the assessment of combined future impacts of climate change and industrial and agricultural practices on the Baltic Sea ecosystem - the combined effect of climate change and nutrient loads to the Baltic Sea.

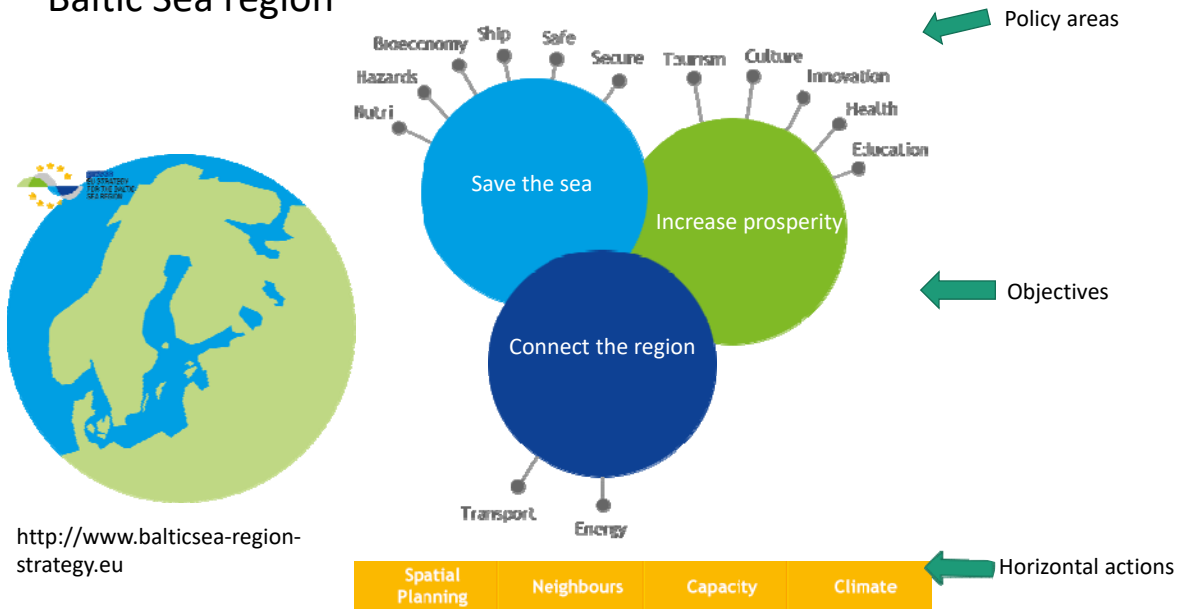
<http://www.smhi.se/en/research/climate-change-increases-eutrophication-in-the-baltic-sea-1.19526>
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Estonian waterbodies – contribution to the Baltic sea environment



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Objectives and the policy areas of the EU strategy for the Baltic Sea region



The important resources of the Baltic sea region



- **Forest** – wood, novel products and materials, chemicals, biomass for the energy and materials



- **Land** – production of food (including functional and health promoting food), biomass for the feed, biofuels and materials; danger of soil degradation, phosphorus crisis!



- **Water** – production of food, sediments of water bodies as a resource of phosphorus

- **Waste** – in a wide sense – agriculture, food industry, rural and urban households etc)



Development of value chains, integration, sustainability!

The Estonian potential

- Two times more arable land per capita than in average for EU 27 (respectively 0,69 ha and 0,37 ha).
- The proportion of employment in agriculture, forestry and fishery is 4,3% (ca 26 500 employees), at the same time the proportion of value added in these sectors is 3,6% of total value added (2013)
- Nearly half of the territory is covered by forests (48,2%), 75% of this is under the management – Estonia is one of the most forest-rich countries in Europe (2013)
(Ants Noot, presentation 4.02.2015)
- From January to September 2015, the share of renewable energy was 16,2% (wind energy ca 40 and biomass, biogas and waste ca 60%)
<http://www.erametsaliit.ee/2015/10/21/biomassist-toodetud-elektrienergiat-60-taastuvenergiatoodangust/>

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Preparation of the Estonian bioeconomy strategy till 2030 (Analysis. Ministry of Rural Affairs, 2025)

- The main problem: in bioeconomy-related areas, low value added per employee (23000-25000 EUR vs average 61 000 EUR in EU)
- We do not use efficiently all bioresources and the potential for the production of these resources – herbal biomass, wood, land (11.2% of agricultural land is out of agricultural production), the supply of meat, eggs, fruits and vegetables is not sufficient
- Prerequisites of development:
 - Food security
 - Energy security: renewable energy
 - Efficient use of waste
 - Innovation – both processes and products
 - Balanced regional development

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RITA – programme for the support of socially relevant research

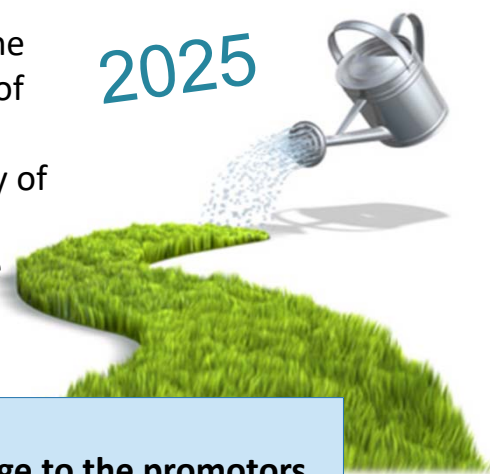
- RITA - supported by the ERDF, aims to increase the role of the state in the strategic managing of research and the capabilities of R&D institutions in carrying out socially relevant research
- Research topics proposed by the Ministries
- **Increase of value added and efficiency in the bioeconomy sectors in Estonia** – topic proposed by the Ministry of Economic Affairs and Communications, Ministry of Rural Affairs, Ministry of Environment)
- Tackle the socio-economic challenges faced by society - wide collaboration of R&D institutions, ministries, industry

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Development plan of Estonian University of Life Sciences for 2016 - 2025

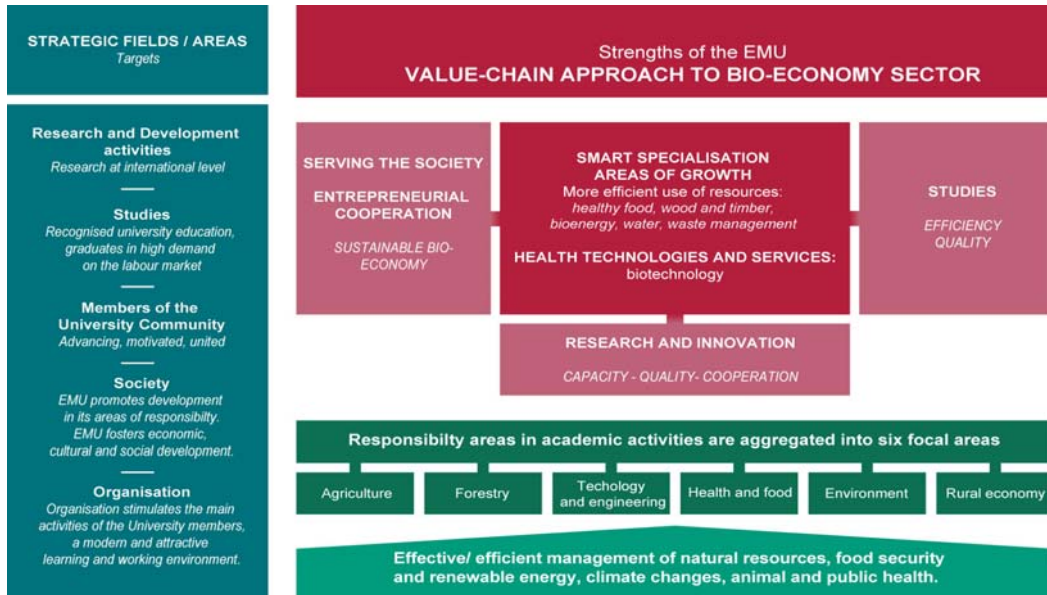
The Development Plan focuses on serving the society and increasing the competitiveness of the University, enhancing research and development activities, raising the efficiency of teaching and building up and boosting the strength of the University – integrated value chain approach in bio-economy sectors



Our mission:

The University creates and shares knowledge to the promoters of bio-economy for the best of Nature and Man

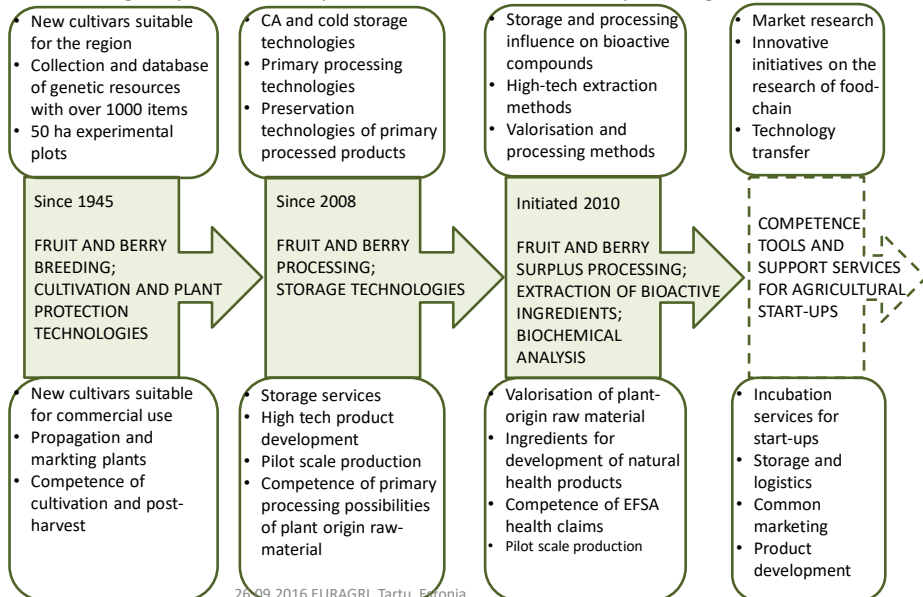
Development goals and sectorial relationships to build up the strengths of the University



Value chain approach: horticulture

Polli Horticultural Research Centre

Full range of product development services for the users of plant origin raw material



Value chain approach: forest

Estonia holds 3rd place in Europe in terms of volume of standing timber per capita, making forestry and wood processing the most important industries in Estonia.

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Export of Prefab Wooden Houses in EU 2006-2015

Year	Estonia	Germany	Lithuania	Sweden	Poland	Finland	Czech Republic	Belgium	Austria	Latvia	Italy
2006	109	175	75	160	40	100	30	70	20	20	30
2007	129	210	80	155	45	110	35	65	25	25	35
2008	128	180	75	150	50	100	40	60	30	30	40
2009	91	120	60	110	45	110	35	55	25	25	35
2010	138	130	65	115	50	110	40	60	30	30	40
2011	175	155	70	120	55	110	45	65	35	35	45
2012	193	160	75	125	60	110	50	70	40	40	50
2013	208	140	80	120	65	110	55	75	45	45	55
2014	238	135	85	115	70	110	60	80	50	50	60
2015	286	130	90	110	75	110	65	85	55	55	65

Source: Eurostat/Estonian Woodhouse Association

The world's tallest wooden building in Bergen, Norway (Kodumajatehase AS, Tartu, Estonia)
<http://www.kodumaja.ee/en/Introduction/History-of-Kodumaja>

Estonia is the biggest producer of wooden houses in Europe regarding export volume

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Problems and areas of improvement

- **The content of bio-economy is not yet clear to the society and even to the policy-makers.** Often it is limited to improved use of natural resources; the ecosystems services as a whole and environmental aspects are considered as secondary aspects
- **Financing** of research, development and innovation in Estonia, including bio-economy area, has been **unstable, project-based**
- The bio-economy industry is growing, however the **enterprises are small and not capable to invest much into the R&D**
- **The collaboration between the sectors** and between the ministries needs major improvements

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Questions for the higher education

- Efficient collaboration with the policy-makers and bio-economy sectors: **what type of knowledge and competences we need to develop? What are the prospects of labour market in these sectors?**
- **Bio-economy in the curricula**
 - Integration of bio-economy and value chain approach into the existing curricula (plant and animal science, food technology, forestry, energetics etc)
 - Launch a separate curriculum to address different aspects of bio-economy development
- **Integration of academic studies and practical experience** is highly needed – improved collaboration of the university and industry
- **Diversity of bio-economy sectors** – hard for the education in small countries. Individual approach in teaching covering many areas of bio-economy vs selected few tracks?
- The most promising innovation areas develop in the interface of different sectors – **multi- and interdisciplinary approach** is needed via active networking (inside and outside of the university, industry sectors)

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