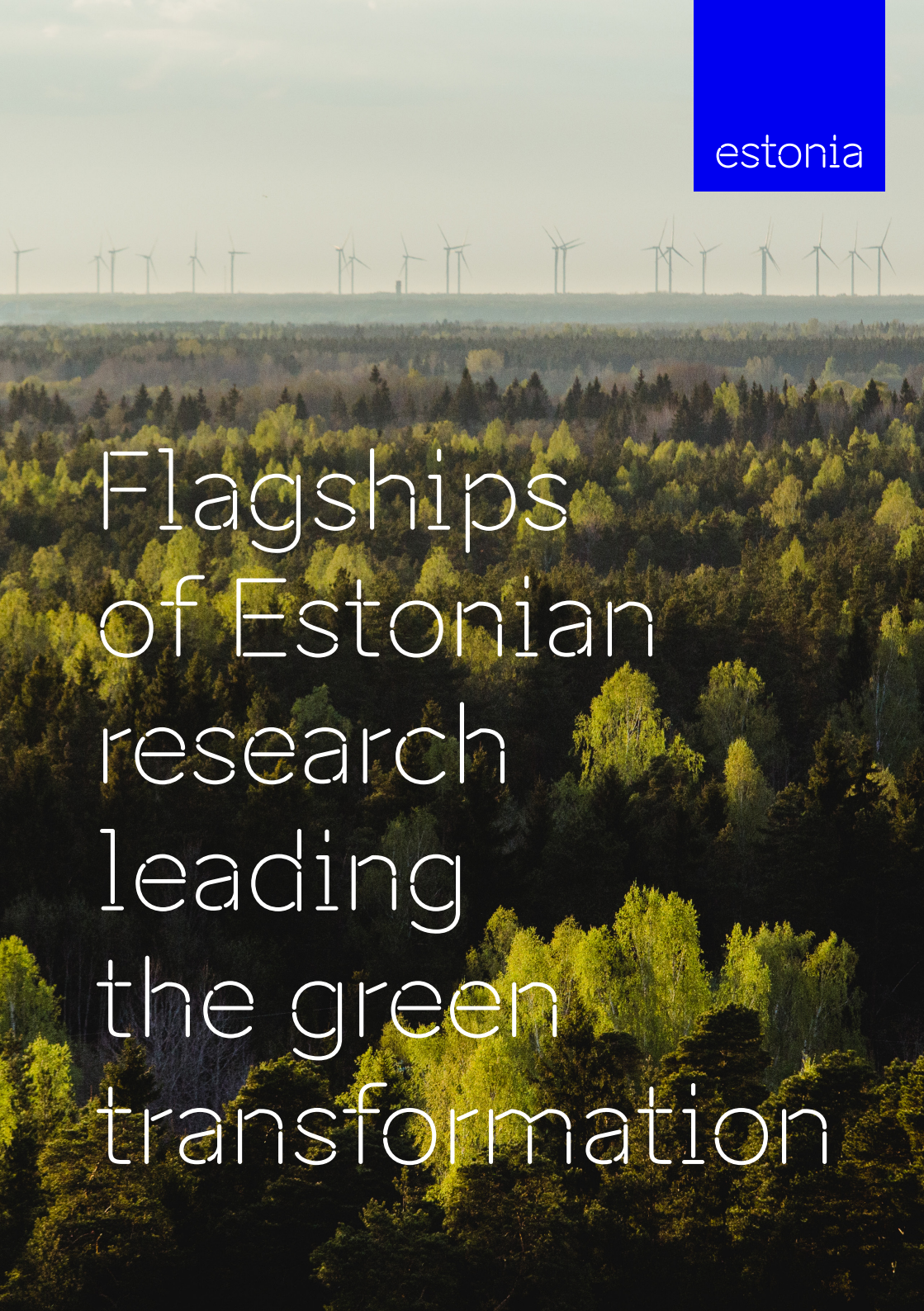

estonia
Flagships
of Estonian
research
leading
the green
transformation

Introduction

Tackling global challenges is nothing new for Estonia.

Our new strategy for research, development, innovation and entrepreneurship (RDIE 2035) states that goals can be achieved by providing competitive and sustainable solutions for the development needs not only of Estonia but of the whole world.

As the slogan for the European Green Deal states, Europe is striving to be the first climate-neutral continent. Estonia has an excellent opportunity to be among the leaders of the green transition in Europe and beyond. We are innovative, digital, and agile - therefore, we can act as a pilot ecosystem and an accelerator.

We have the ambition to become a role model for others by carrying out world-class research in biodiversity, energy-efficient buildings, clean energy solutions, digitalization and agriculture.

We can change the world. Green transition requires a joint effort involving all parts of society - academicians, citizens, politics, and industry worldwide. Let's do it!

Anu Noorma
Director General of Estonian Research Council

Digital transformation

PIX – OPTIMIZING BUSINESS

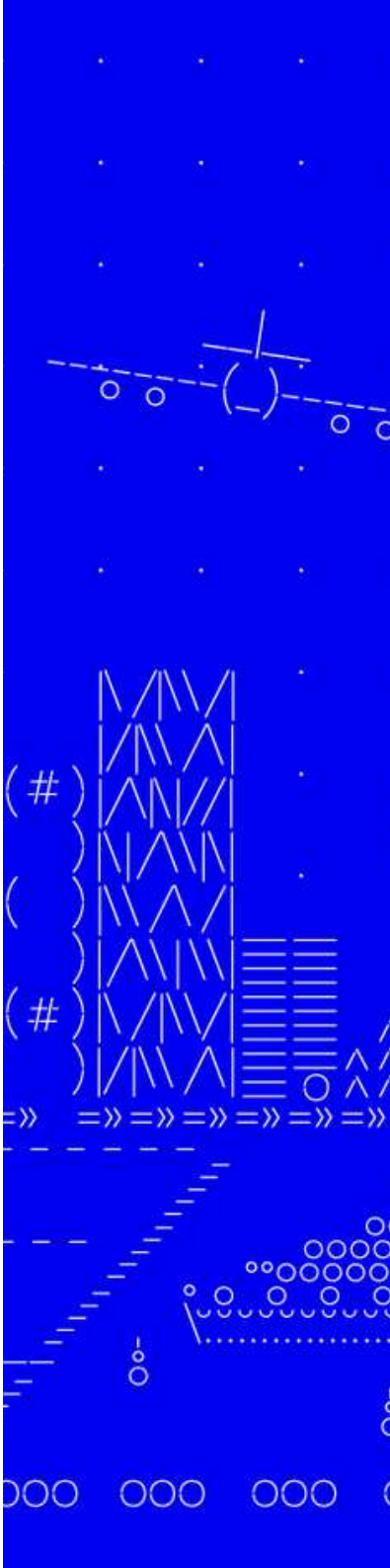
The open-source tool Pix by Marlon Dumas makes artificial intelligence optimise business processes for companies.

Marlon Dumas, professor of Information Systems at the University of Tartu, received the prestige European Research Council (ERC) Advanced Grant in 2019 to develop methods based on artificial intelligence that independently discover opportunities for improving business processes by using information already stored in the company. The result is an open-source tool called Pix, which enables its users to review their workflows regularly.

While there are already various programmes that help with finding solutions to problems fed into the programme, Pix will automatically look for problems in the business processes with the help of artificial intelligence. There are areas of business processes that could be made far more effective but the problem areas are not always easy to find. Contemporary business processes generate so much data that it would be very difficult to manually find the best solutions to make a task more efficient.

Pix would be a predictive programme that draws attention to areas of business processes that may not be functioning the most effectively as early as possible.

Contact: Prof. Marlon Dumas
marlon.dumas@ut.ee



FinEst CENTRE FOR SMART CITIES

The FinEst Centre aims to improve urban environments by testing new technologies and thereby grow into an internationally renowned research and development centre. FinEst Centre is an international organisation founded by Tallinn University of Technology, Aalto University, Forum Virium Helsinki and the Estonian Ministry of Economic Affairs and Communications.

The FinEst Twins project will build a multidisciplinary smart-city Center of Excellence that will match the leading smart city research centres globally and focus on all five key domains of clean and sustainable smart city development: mobility, energy and built environment glued together by governance and urban analytics & data management (research streams).

The FinEst Twins will have a globally unique focus on developing user-driven clean, sustainable smart city solutions that are "cross-border-by-default" in the context of emerging twin cities between Tallinn and Helsinki.

Contact: Dr. Ralf-Martin Soe
ralf-martin.soe@taltech.ee

Prof. Jarek Kurnitski
jarek.kurnitski@taltech.ee

DIGITAL TRANSFORMATION IN EDUCATION

Tallinn Univeristy

The digital revolution in lifelong learning aims to substantially alter the culture of learning and teaching in both formal and informal education, based on a learning ecosystem that takes into account the interests and needs of each individual and society as a whole.

At Tallinn University, the development of employees as individuals is at the core of our research. We are trying to find how to change employees' habits regarding:

- learning processes and skills that support learning
- the ability to identify the need to develop new skills that ensure sustainable socio-technical development, active citizenship and the ability to manage innovation in society

A strategy centred on the individual helps to enable and support knowledge transfer, creativity and critical thinking. We are developing indicators that companies can use to assess the active participation of employees, the acquisition of knowledge and entrepreneurship. We have also begun cooperation with the Business Finland project CREDU.

We are participating in the development of an audio learning application operated by voice commands, which is being piloted in agriculture. In the future, we will expand the use of the application to other sectors.

Part of the research focuses on cultural institutions and creative businesses. Our team cooperates with various forward-looking entities who enable the creation of new industries, art and ecosystems, such as Tartu Centre for Creative Industries, Biotoopia, Helsinki XR Centre, TalTech Mektory XR Centre and Tallinn Creative Incubator.

Contact: Liina Guiter
guiter@tlu.ee

Smart Buildings and Districts

CLIMATE NEUTRAL BUILDINGS AND DISTRICTS TALLINN UNIVERSITY OF TECHNOLOGY

ZEBE Center of Excellence in Research (CER) contributes to energy and resource efficiency improvement in buildings and districts. It consolidates six existing research groups active in the ZEBE domain at three Estonian universities to build up key competencies of CER. ZEBE CER contributes to Estonian Smart Specialization growth area of More Efficient Use of Resources, Smart and more efficient construction of buildings. On the European level, ZEBE CER contributes to the European objective of 20% primary energy savings in 2020, one of the five headline targets of the Europe 2020 Strategy for smart, sustainable and inclusive growth. Research is focused on zero energy, resource efficiency, and renewable energy topics under three main themes:

- Zero energy and resource-efficient smart buildings;
- Resource efficient wooden structures and composites;
- Intelligent and efficient energy management for ZEB (zero energy buildings).

Partner universities: Tallinn University of Technology, Estonian University of Life Sciences, University of Tartu

Contact: Prof. Jarek Kurnitski
jarek.kurnitski@taltech.ee

Associate Prof. Argo Rosin
argo.rosin@taltech.ee

LIFE IP BuildEST

Life IP BuildEST is a research and development program and a starter for building renovation marathon to improve energy efficiency.

The long-term objective of the reconstruction of buildings is for the entire Estonian building stock to be at least at the energy efficiency level class C by 2050. This also contributes significantly to meeting climate targets as buildings currently emit about half of Estonia's CO2 emissions.

The larger goal of the project is for environmental and climate issues to be more closely linked to the development of the built environment — it must be holistic, sustainable and done with a long-term perspective. The renovation project is directly related to achieving the goals of Estonian climate policy and the BuildEST project has a central role in the green transition.

The BuildEST project starts in 2022 and runs until 2028. It will be implemented in three stages, in cycles of about 2-2.5 years. The total budget of the project is about 16.3 million euros, of which the European grant is 9.5 million. It is funded by the European Climate, Infrastructure and Environment Executive Agency (CINEA) through the LIFE IP (Integrated Projects) programme which is intended for environment and climate action projects.

There is a total of 18 project partners. The lead partner and coordinating beneficiary of CINEA is the Ministry of Economic Affairs and Communications.

Contact: Kateriin Ambrozevits
kateriin.ambrozevits@artun.ee

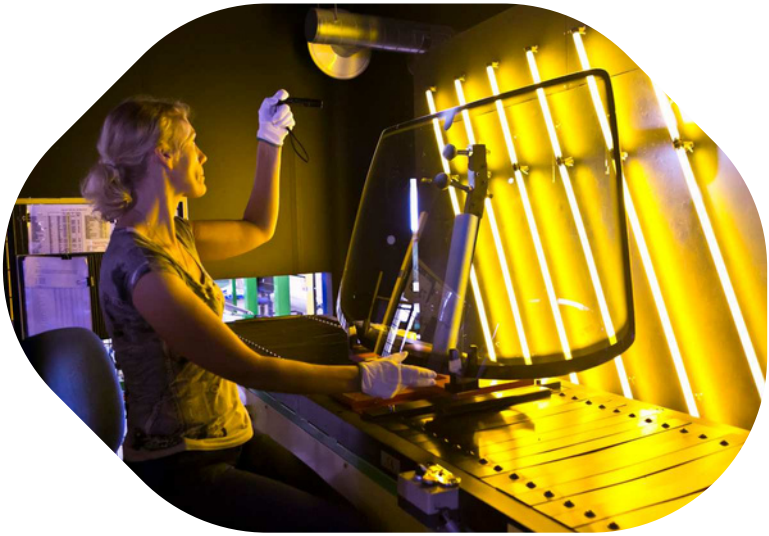
Energy sources of tomorrow

LABORATORY OF FUELS TECHNOLOGY
TALLINN UNIVERSITY OF TECHNOLOGY VIRUMAA COLLEGE

Studies carried out by the Laboratory of Fuels Technology research team show that co-pyrolysis of oil shale and various plastic mixtures is feasible (including mixed plastic waste). The presence of ash makes the process significantly more efficient and improves the products' quality.

It is a unique process allowing non-recyclable plastics to be handled at a level above burning and storage, which is the key to the green economy. Oil Shale Competence Center continues to conduct in-depth research in this area critical to the green transformation.

Based on the results of the current study, the utility model "Method of co-pyrolysis of plastic waste" has been protected.



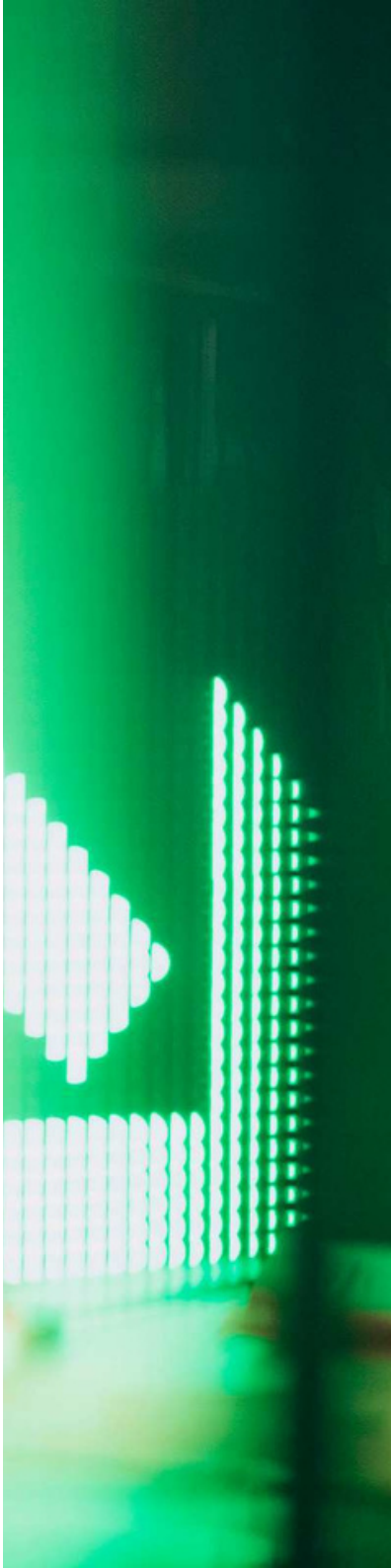
Contact: Olga Pihl
olga.pihl@taltech.ee

PEAT BATTERIES

We are developing a more environmentally friendly and affordable battery technology — working groups led by Enn Lust and Alar Jänes have found an opportunity to use carbon from well-decomposed peat to use in sodium-ion batteries.

A unique technology to monitor the performance of electrodes in batteries has also been developed. During the experiments, the researchers at the University of Tartu have reached the same capacity in sodium-ion batteries as in lithium-ion batteries. However, sodium-ion batteries are significantly cheaper to produce. They also have a lower environmental impact than lithium-ion batteries as they do not use expensive and polluting materials or production methods.

Check the story about how Estonian scientists use peat to make batteries by Reuters.



Contact: Prof. Enn Lust
enn.lust@ut.ee

Associate Prof. Alar Jänes
alar.janes@ut.ee

Environmental protection

NETZEROCITIES

Accelerating cities' transition to net zero emissions by 2030

As cities keep growing and increasingly represent economic activity centres, knowledge about their role in the climate transition is crucial. The EU-funded NetZeroCities project will support European cities in significantly reducing greenhouse gas emissions to achieve climate neutrality. The initiative supports the European Green Deal's aim to realise a low-carbon, climate-resilient future through research and innovation. Bringing together 33 partners from 13 countries, the project

will help cities overcome structural, institutional and cultural barriers to achieve climate neutrality by 2030. Specifically, NetZeroCities will develop a service-oriented platform, co-create solutions and develop new and improve existing tools, resources and expertise.

The partner from Estonia is Tallinn University of Technology.

Contact: Dr. Ralf-Martin Soe
ralf-martin.soe@taltech.ee

Also, the city of Tartu is one of three Lighthouse demonstrators in the EU Horizon 2020 SmartEnCity project. Cities play a crucial role in fighting climate change. Energy demand and CO2 emissions are particularly high in urban areas. At the same time, urban density allows more alternatives for energy-efficient housing, eco-friendly transport and service provision. SmartEnCity's vision is to create Smart Zero Carbon Cities that are more sustainable and inclusive, improve citizens' quality of life, create jobs and wealth, and offer equal growth opportunities.

Contact: Kaspar Alev
kaspar.alev@tartu.ee

PSLIFESTYLE

Co-Creating Positive and Sustainable Lifestyle Tool with and for European Citizens

A new online tool makes you co-creator of a more sustainable Europe. There is an urgent need to increase citizen participation in sustainability actions. The EU-funded PSLifestyle project will empower EU citizens to adopt a sustainable lifestyle and co-create versatile and topical data for decision makers on people's readiness to change their consumption habits in a more sustainable direction. The project will create an online engagement tool that will offer personalised and culturally relevant suggestions through which people can build their own sustainable good life plans based on their carbon footprint. The lifestyle plans will provide insights for other societal stakeholders to help support the changes happening at the grassroots level. The project expects to engage 4 million EU citizens.

The project partners from Estonia are SA Rohetiiger and SA Teeme Ära.

Contact: Jannus Jaska
jannus@rohetiiger.ee

Biodiversity and ecosystem services

WATERLANDS – RESTORATION OF EUROPEAN WETLANDS

Water-based solutions for carbon storage, people and wilderness

Countless plants and animals depend on Europe's wetlands, providing ideal conditions for various habitats and species. Wetlands also support a range of public goods and ecosystem services, for example, providing water. With 50% of European wetlands have disappeared in the last century, protecting them is a priority. The EU-funded WaterLANDS project will tackle the large-scale restoration of wetland sites across Europe decimated by human activity. Going beyond simple restoration, WaterLANDS will synthesise existing knowledge of ecology, community, governance and finance, and best-practice models for scalable, resilient restoration. WaterLANDS will also engage with local communities and stakeholders to ensure that wetland restoration results in tangible community gains alongside environmental rehabilitation.

The project partners from Estonia are the Estonian Fund for Nature, the University of Tartu, AS Tootsi Turvas and the State Forest Management Centre.

Contact: Marko Kohv, Univeristy of Tartu
marko.kohv@ut.ee

Piret Pungas-Kohv, Estonian Fund for Nature
piretpk@elfond.ee

Jüri-Ott Salm, Estonian Fund for Nature
jott@elfond.ee

ILIAD – A DATA-INTENSIVE, COST-EFFECTIVE DIGITAL TWIN OF THE OCEAN

Integrated DigitaL Framework for Comprehensive Maritime Data and Information Services

A digital twin of the ocean allows experts to develop what-if scenarios, analysing the impact of measures to prevent and adapt to climate change. Integrating various data sources is key to formulating predictions of future developments in marine social-ecological systems.

The EU-funded ILIAD project creates an interoperable, data-intensive, and cost-effective Digital Twin of the Ocean, contributing to the implementation of the European Green Deal. It capitalises on the increasing wealth of data and advanced computing infrastructures by combining these diverse data in a semantically rich and data-agnostic approach allowing simultaneous communication with real-world systems and models. ILIAD will also create a marketplace to distribute apps, plug-ins, interfaces, raw data, citizen science data, synthesised information and value-added services.

The project partner from Estonia is Tallinn University of Technology.

Contact: Asko Ristolainen
asko.ristolainen@taltech.ee

Farm to Fork

SCHOOLFOOD4CHANGE

Shifting school meals and schools into a new paradigm by addressing public health and territorial, social and environmental resilience

Food choices and eating habits are learned. This is why schools play a significant role. All school children are vulnerable to diet-related conditions. In this context, the EU-funded SchoolFood4Change project will put sustainable and healthy diets back on the school menu. Specifically, the project will innovate and deploy sustainable healthy food supply in line with the EU's Farm to Fork Strategy and the UN Sustainable Development Goals, train and empower cooks and urban food enablers, and ensure a healthy food culture is realised in and around schools. SchoolFood4Change will assess its impact on vulnerable children's health and behavioural change. It will also evaluate the impact on over 3 000 schools and 600 000 children in 12 EU Member States.

The project partners from Estonia are SA Stockholm Environment Institute Tallinn, the city of Tallinn and Viimsi Parish.

Contact: Evelin Piirsalu
evelin.piirsalu@sei.org

European Union
European Regional
Development Fund

Investing
in your future

Estonian
Research Council