

# Nordic Green Growth

Research and Innovation  
Programme

Funded projects



**Nordic Green Growth Research  
and Innovation Programme**  
– **Funded projects**

© Nordic Innovation 2017

Layout: Nordic Innovation  
Cover photo: Markus Spiske/  
Unsplash.com

Nordic Innovation  
Stensberggata 25  
NO-0170 Oslo  
[www.nordicinnovation.org](http://www.nordicinnovation.org)

# Accelerating the transition towards a **sustainable Nordic society**

The Nordic countries have committed themselves to ambitious climate goals towards 2050 in terms of developing energy efficient and low-carbon societies.

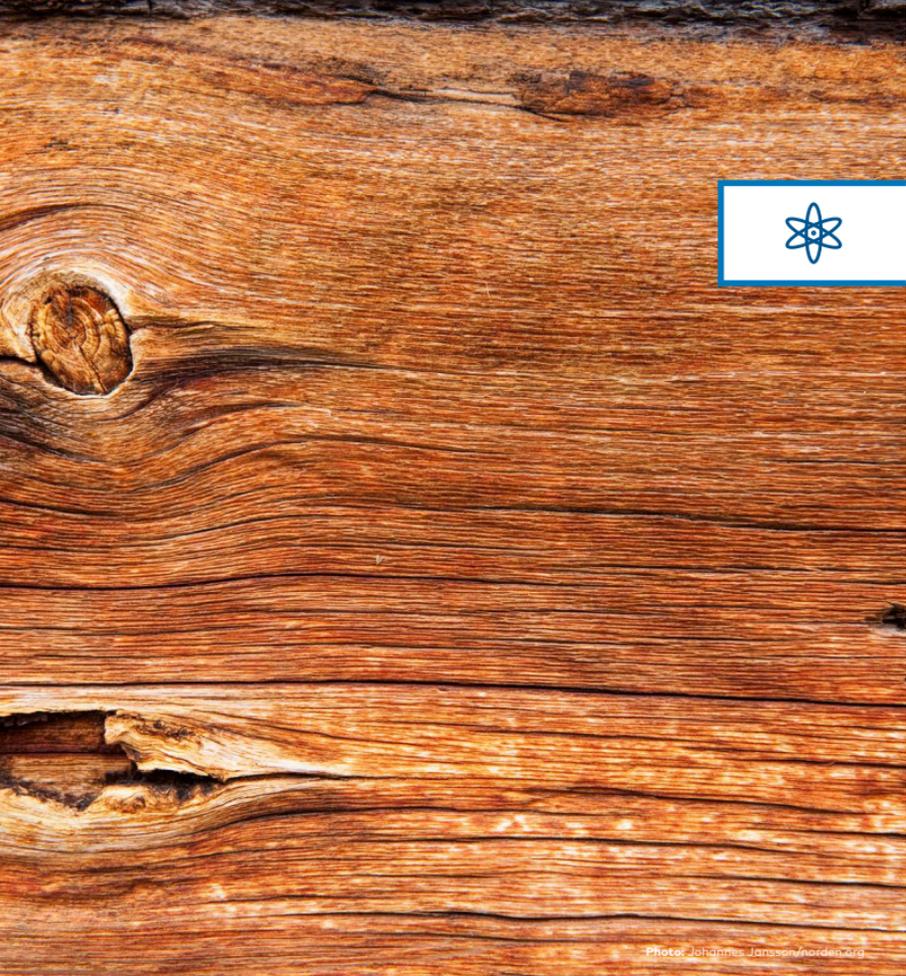
To achieve these goals, we need extensive green transitions in all areas of the Nordic societies and economies. We need to promote green economic growth, sustainability and competitiveness both in the public and private sector.

**NordForsk**, **Nordic Innovation** and **Nordic Energy Research**, the main financiers of cooperative research and innovation in the Nordic countries, have therefore together launched the **Nordic Green Growth Research and Innovation Programme**, which will run from 2016 to 2019.

In this brochure, we shortly present the six projects funded under the programme – four research-led projects marked with  and one industry-led projects marked with .

We hope you will enjoy learning more about the projects and maybe find some inspiration on our way to a greener future.

**Svend Søyland**  
Programme Manager  
Nordic Energy Research



– Increasing the value of ligning  
as a renewable material source

# High-Value Products from Lignin

## Project partners:

Tarja Tamminen, VTT (FI) (project lead)

Orlando Rojas, Aalto University (FI)

Anders Feilberg, Aarhus University (DK)

Gunnar Henriksson, Royal Institute of Technology (SE)

Lignin is a side stream component that is available in large quantities from industrial wood refining processes. The objective of this project is to develop technologies to use lignin as an alternative renewable material source in selected high value applications. The applications that will be looked at is multifunctional metal coatings, ultra-pure biogas and functional films for biomedical use or edible food packages.

The aim is to reduce production costs while simultaneously improve material properties by using a material that is currently mostly regarded as waste.



New membranes for creating ultra-pure biogas



H<sub>2</sub> production of renewable energy with lower energy use



Bioplastics replacing “fossil plastic”



Functional films for food and medicines

# New Nordic Ways to Green Growth

## Project partners:

Mikael Skou Andersen, Aarhus University (DK) (project lead)

Annica Kronsell, Lund University (SE)

Jon Birger Skjærseth, Fridtjof Nansen Institute (NO)

Patrick Söderholm, Luleå University of Technology (SE)

Tuula Teräväinen-Litardo, University of Eastern Finland (FI)

How to upscale and finance innovative low-carbon and resource-efficient technologies is essential to green growth. Nordic countries are early adopters of novel environmental technologies, and as such serving as a unique laboratory. This research project will improve the basic understanding needed for policy-making related to promote green growth innovations.

The project will aim to identify key bottlenecks and options for improvement in existing governance arrangements and will look at mechanisms behind technology development and financing models. The output can be used in both the Nordic countries and globally to promote green growth. Experiences from Nordic countries are much needed for a timely de-carbonisation internationally.



Improve understanding of policy-making related green growth innovations



Explore new types of private and public partnerships



Explore innovative finance and risk-offsetting mechanisms



Identify key bottlenecks in both local and national governance arrangements



– Strengthening the foundation  
for technological green growth  
innovation policy



Photo: Karin Beate Næsterud/norden.org

– Investigating the conditions  
for green growth

# Where Does the Green Economy Grow?

## The Geography of Nordic Sustainability Transitions

### Project partners:

Teis Hansen, Lund University (SE) (project lead)  
Christian R. Østergaard, Aalborg University (DK)  
Markku Sotarauta, University of Tampere (FI)  
Antje Klitkou, NIFU (NO)  
Håkon Finne, SINTEF (NO)  
Anne Nygaard Tanner, Lund University (SE)

There is no one-size-fits-all approach to greening the growth path of an economy. This research proposal addresses the place-based, context-dependent nature of the shift to green growth in the Nordic countries by asking the question: Where does the green economy grow? In addressing this question, the project will highlight the importance of innovation, new industry formation, and radical industry transformation.

The project will analyse the importance of human capital and technological specialisation for the greening of the economy, as well as focusing on the role of institutions and account for the diversity in Nordic regional green pathways. Participating regions will benefit from a thorough analysis of current green growth processes and the opportunities for further greening.



Regions becoming green transition champions



Examples of successful green growth regions



Institutional design to promote green transition

# CIRCit

## – Circular Economy Integration in the Nordic Industry for Enhanced Sustainability and Competitiveness

### Project partners:

Tim C. McAloone, DTU (DK) (project lead)

Anna-Karin Jörnbrink, Swerea (SE)

Pekka Abrahamson, NTNU (NO)

Sigridur Kristjansdottir, Innovation Center Iceland (IS)

Carina Wiik, Federation of Technology Industries in Finland (FI)

Circular economy (CE) is a promising approach towards maximising value by increasing resource productivity, enhancing energy efficiency, lowering resource consumption and decreasing waste. By transitioning to CE, Nordic industry can pave the way for modern sustainability thinking and establish itself as benchmark in the field, whilst also enhancing its position in the highly competitive international market.

The CIRCit research project will develop science-based tools and approaches, in close collaboration with companies.



**Increase resource productivity**



**Enhance energy efficiency**



**Lower resource consumption**



**Less waste**



Photo: Johannes Jansson/norden.org

– Exploring the Nordic  
circular economy potential



Photo: Karin Beate Næsterud/norden.org

- Developing a way to use feather as an alternative source of feed

# Feather2Feed

## **Project partners:**

Diana Lindberg, Nofima (NO) (project lead)

Lars Peter Andersen, Tailorzyme (DK)

Edvard Hall, Bioextrax (SE)

With an increasing world population and mean income, there is a growing demand for proteins from meat. Alternative sources for feed ingredients are needed, preferably derived from by-products from local sources using mild processing conditions. Feather waste, a globally abundant by-product-derived nutritional protein-rich feed source, is an excellent choice.

The final goal of Feather2Feed is to present a market ready technology, where a colourless feather hydrolysate of high digestibility and nutritional value, is ready for industrial scale production at the end of the project period. This is achieved by using a new and radical combination of technologies.



**Market ready technology**



**Industrial scale production**



**New and radical combination of technologies**

---

# Low Temperature Plasma for Chemical Production

## Project partners:

Martin Østberg, Haldor Topsøe (DK) (project lead)

Hana Baránková, University of Uppsala (SE)

Rune Ingels, N2 Applied (NO)

The project consortium aims to develop a process, based on low temperature plasma that will be able to decompose lignin, a waste material from wood processing, into valuable chemicals. This can enable a production of bio-based chemicals at a price level that is comparable to today's cost.

The consortium will also focus on utilising waste from this process to produce synthesis gas (hydrogen and carbon monoxide), which also is a valuable feedstock for production of chemicals, and to examine if the technology can be used on black liquor.



Developing innovative process to extract chemicals



Synthesis gas from waste



International demand creates large export potential



– A new way to extract high-value chemicals from lignin



## Nordic Green Growth

The **Nordic Green Growth Research and Innovation Programme** is a joint financing programme by **Nordic Energy Research**, **NordForsk** and **Nordic Innovation**. The programme builds on the Top-level Research Initiative, and shall contribute to accelerate the transition towards greener Nordic societies. The programme will run from 2016 to 2019.

Nordic Energy Research, NordForsk and Nordic Innovation are institutions under the **Nordic Council of Ministers**.

**Read more at:** [www.nordicinnovation.org/greengrowth](http://www.nordicinnovation.org/greengrowth)