

## Micro Waste to Energy Solutions for Rural Enterprise in the Northern Periphery

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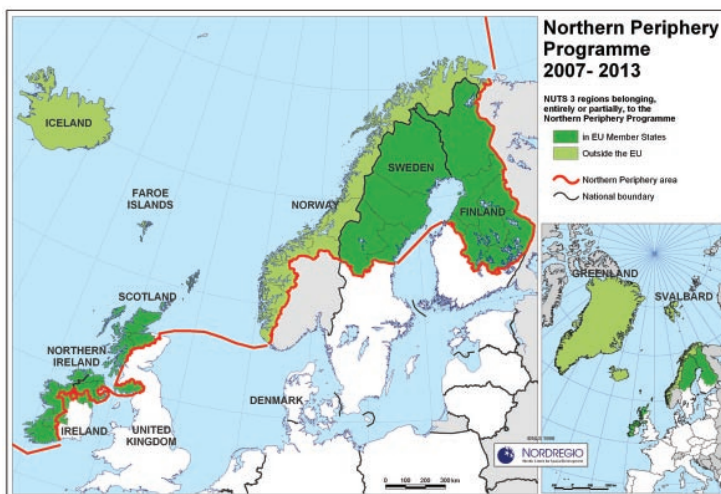
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### 1 Introduction

Rural areas in the Northern Periphery (Figure 1) face unique challenges with respect to their economic development. Due to their remote location and long winters, Northern Periphery (NP) areas are very resource intensive and, with a few exceptions, have traditionally been dependent on fossil energy. According to the OECD, over the past 20 years the fossil energy carrier use in fast developing regions such as China, India, Indonesia, Russia, Brazil and South Africa has grown 58% and has surpassed the use rate of OECD countries. The increase in fossil resource use is expected to increase even more, about 60% outside of OECD for the next 20 years. Certainly this trend indicates that all NP areas will have to reduce their dependency on imported fuel and make commitments to the use of renewable energy sources that also generate fewer greenhouse gas (GHG) emissions.



**Figure 1** The Northern Periphery area as defined by the Northern Periphery Programme

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The EU Waste Framework Directive has created challenges for all countries in the handling of waste. The challenges weigh even heavier in NP regions due to uneconomic scale and spread of waste amounts and long transportation distances. The European Spatial Development Perspective also stresses the need for economic diversification in rural areas through strategies based on local resources and needs.

Technology policy lies at the core of these challenges. There is a need for technological solutions that can cope with the constraints of resources availability and, at the same time, able to decouple growth from environmental degradation. There are several renewable energy sources which contribute to the achievement of EU policy targets. Among them, biomass is considered the energy source with the largest unexplored potential by 2010. However, exploiting resources in wastes for bio-fuel and renewable energy through small-scale technical solutions also offers excellent opportunities for decentralized business innovation. Small-scale biomass- and waste based energy solutions are able to answer the challenges of resource availability, while progressively reducing the impact of human activities on the environment.

New approaches to efficient and sustainable management of resources and small scale renewable energy solutions are important to strengthen the synergies between environmental protection and growth in peripheral regions. While a lot of research and background knowledge has been gained worldwide in this field, implementation and commercial application of the results needs to be enhanced. Although knowledge exists, access to it and actual application for profitable, decentralized and small scale energy from waste (EfW) technologies is limited.

To address these issues, a transnational partner consortium has been established which combines research expertise in EfW technologies and business evaluation with experience in regional development and business innovation. This consortium is lead by the North Karelia University of Applied Sciences, and the members are the University of Oulu, University of Ulster (Northern Ireland), International Resource and Recycling Centre (Scotland), Josek Oy, Regional Development Centre, North Karelia Regional Environment Centre, WestBic Business and Innovation Centre (Ireland), West Regional Authority (Ireland) and Umeå University (Sweden). This transnational co-operation will be initiated in frames of a Northern Periphery project (NPP) entitled Micro Waste to Energy Business: Micro Energy to Rural Enterprise (MicrE).

## **2 Objectives of the research**

Among the general objectives of the NPP work programme are to promote competitiveness by increasing and developing the capacity for innovation and networking in rural and peripheral areas and to strengthen synergies between environmental protection and growth in remote and peripheral regions. The overall goal of the MicrE project is to enhance the capacity for self-sustaining business and organisation life in rural NP regions. This will be achieved by developing a service that will make EfW technologies for small scale renewable energy generation available to SME's and organisations in rural NPP partner regions on a scale that is viable and economically feasible; and to embed them within specific organisations within the

partner regions to demonstrate the benefits they can deliver. The technologies provisionally identified for development work are micro pyrolysis of wood based products to energy and fuel, micro bio-methane production and purification for vehicles, anaerobic digestion with heat and power and small scale gasification with heat and power. Targeted are especially SMEs e.g. from food and biotechnology industries which generate organic by-products and waste implementing the MicrE technologies.

The research at the University of Oulu will be performed at the Department of Process and Environmental Engineering and NorTech Oulu, and will consist of compiling a directory of best practices for biowaste valorization applicable in the NP area, technology testing and down-scaling and evaluation of environmental impacts.

### **3 Results**

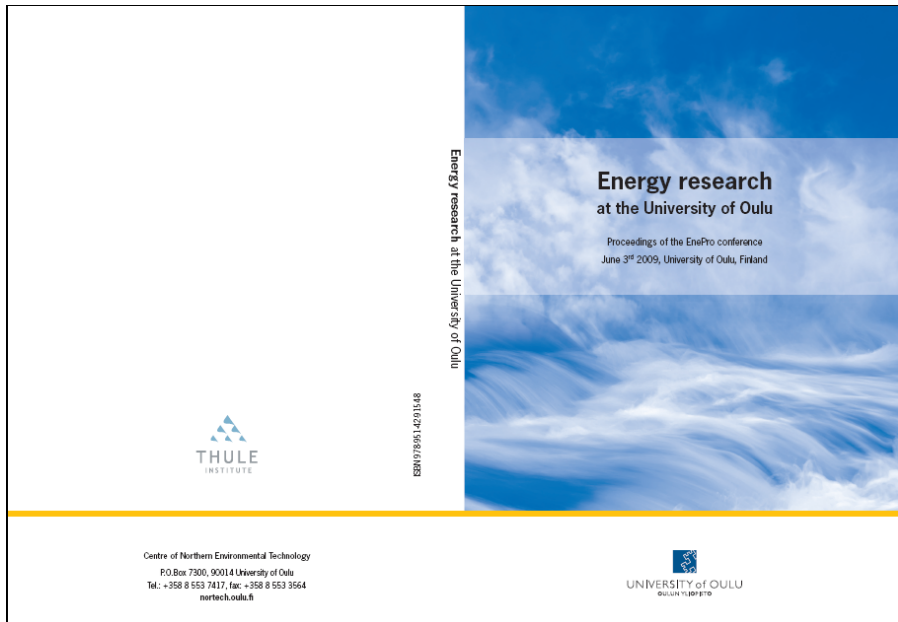
The technologies for renewable energy generation are dominated by those which achieve economies of scale. Even those technologies which have been adapted for micro-generation of renewable energy are dominated by urban provision, because the suppliers, retailers and service companies of the micro-generation technology require volume sales in order to be economic, and the volume required can only be found in urban environments. MicrE will seek to innovate by making technologies that were previously unavailable to rural regions accessible. It will have a particular interest in small-scale renewable energy solutions for SME's and local organisations in rural areas whereby they can generate energy on site from their own wastes and by-products, at the same time as solving their waste disposal problems.

### **4 Relevance of the research**

Through the recovery of waste as a source of energy at the place of its generation, a diversion of (biodegradable) wastes from landfill will be achieved. Small-scale biomass- and waste-based energy solutions are able to answer the challenges of resource availability, while progressively reduce the impact of human activities on the environment. Furthermore, bioenergy is labour-intensive and, as a result, it creates employment in the sensitive rural NP. Consequently, the use of biomass for energy generation contributes to a sustainable resource supply, enhanced security, and macroeconomic benefits for rural communities and society at large. The solutions MicrE is going to bring will also contribute to the reduction of anthropogenic CO<sub>2</sub> emissions. This project will, therefore, support the growth of small and medium-scale industry in the periphery areas, whilst respecting the limits of ecological sustainability, and ensure the wellbeing and livelihood of people.

Reference to this article:

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