Linköping, Sweden

Waste-to-Fuel: biogas powers public transport in Linköping

The Linköping project is a successful example of the integration of agriculture and energy production for public transport, through coordinated organic waste management. Organic waste collected from farms and slaughterhouses serves as raw material for the production of bio-methane to fuel public and private vehicles as well as bio-fertilizer.

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The project in brief

The Linköping waste-to-biogas plant was initiated in 1996 to treat organic waste from agriculture and slaughterhouses around Linköping and to fuel transport efficiently. Financed by the local government, the biogas plant currently processes about 45,000 tons of waste per year and fuels the City's 89 buses and over one thousand private vehicles (Martin, 2009; IEA, 2007). Over the past few years, the plant has undergone several upgrades to increase its capacity to match the growing demand for biogas (IEA, 2007). Additionally, the waste-to-energy plant supports local produce through the production of 52,000 tons/year of bio-fertilizer for farms in the region (IEA, 2007). In 2001, the project was expanded to include waste from school canteens and restaurants, by installing three waste macerators throughout the city (Swedish EPA, 2009).

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The City's main waste-to-energy plant thus only takes in the non-recyclable waste from throughout the region, and incinerates it in an efficient process that generates district heating and electricity for local and national consumption.

Date	1996-present
NEXUS Sectors	Waste-Energy-Transport
NEXUS Innovations	Institutions; Communications + Social Behavior, Delivery Models
Scale	City-wide
Budget	14,000,000 EUR

What makes it "Urban NEXUS"?

In high-income countries, incineration or landfilling are the most common methods for waste disposal. Organic waste remains in landfills where it decomposes and emits considerable quantities of methane gas (World Bank, 2012). In 1995, the primary objective of the project was to address organic waste in the food sector while enhancing local transport. Linköping successfully turned the negative effects of landfilling into an opportunity for an "Urban NEXUS" of institutional integration for the cascading of resources. The Linköping Biogas AB, an umbrella organization created to manage the project, facilitated cooperation between the abattoirs, Swedish Meats AB, the Farmers association Lantbrukets Ekonomi AB, and the Technical Office of the City of Linköping, *Tekniska Verken i Linköping AB*. Today the project is jointly-owned by the City of Linköping and Swedish Meats AB, who collectively manage the closed-loop system (IEA, 2007).

Urban NEXUS Definition

The Urban NEXUS is an approach to the design of sustainable urban development solutions. The approach guides stakeholders to identify and pursue possible synergies between sectors, jurisdictions, and technical domains, so as to increase institutional performance, optimize resource management, and service quality.

It counters traditional sectoral thinking, trade-offs, and divided responsibilities that often result in poorly coordinated investments, increased costs, and underutilized infrastructures and facilities. The ultimate goal of the Urban NEXUS approach is to accelerate access to services, and to increase service quality and the quality of life within our planetary boundaries.

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Scope for improvement

At present, the primary focus of the project is food waste (from agriculture and slaughterhouses). However, there is still capacity to further integrate organic waste from restaurants. The municipality has already expressed concerns over increasing food waste in the city, yet the collection of organic waste from school canteens remains marginal (IEA, 2007). Increasing the number of macerators across town, while broadening stakeholder involvement from newly targeting sectors, would help to establish a comprehensive and city-wide waste collection.

Replication

This project is widely replicable, provided there is strong institutional integration between various stakeholders to ensure efficient resource management. Various upgrades in 1997 and 2002, allowed scaling up to satisfy growing demand for bio-fuel. A similar project in Lille, France has been equally successful.

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Further Reading

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