# Carbon saving potentials from industrial symbiosis implementations

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- Diversified
- Integrated



Skoghallsverken vid Klarälvens utlopp i Vänern är en mönsteranläggning, där träindustriens snart sagt alla grenar, elektriskt sågverk, sulfitfabrik, sulfatfabrik, sulfitspritfabrik, elektrokemisk fabrik etc., finnas sammanförda, och där stora hamnanläggningar möjliggöra direkt utförsel med oceangående fartyg (efter Trollhätte kanals senaste utvidgning). Foto: Aero-Materiel (1049).



- Specialisation
  - Core business
- Globalisation
- Economy of scale

The core business focus have served significant parts of humanity well



However, serious resource and pollution problems grow

Because sectors and supply chains are disconnected and rely on primary inputs





# Biogas solutions connect parts of systems creating multifunctional solutions and are inherently "symbiotic"





## Elleholms tomatoes, Mörrum

**Climate-efficient** tomatoe production Heat from Sodra Cel pulp mi CO<sub>2</sub> from liquour production

ÖVERSKOTTSVÄRME MÖRRUMS BRUK

TILL TOMATHUSET

0.05 kg CO<sub>2</sub> per one kg tomatoes - 20X better than average

### Industrial symbiosis – changing connectedness



### Value creation through industrial and urban symbiosis

- Increasing value of underutililised resources
- Joint coordination of industrial areas
- Face-to-face meetings
- Long-term innovations arenas

Industrial competetiveness Collaborative innovation Innovative collaboration Biobased and circular economy The biobased & circular economy in Norrköping, Sweden



## Industry, city and rural areastin a sustainable symbiosis

Carbonic acid

District heating and cooling

Waste handling service Biofuel

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Forest residues Industrial waste Household waste Grain

Main inputs

Black-box-model including all inputs and outputs to assess climate performance



### Händelö EIP system performance for CO<sub>2</sub> emissions

- Doing things right
  - Integrate the system 16% (2015)
- Doing the right thing
  - Using renewable energy sources 72% (2015)





For 2025 scenario 45% (Doing things right) 112% (Doing the right thing)





# Biogas solutions in pulp and paper mills – performance can be expressed at different organisational levels

#### Mill level

Better treatment capacity and decreased emissions

Reduction needs and costs for nutrients

Easier to comply with environmental permits

Sludge volume reduction

Economic diversification and can enable growth



#### **Product level**

Improved product performance

## Environmental product declaration



#### **Corporate level**

Fossil-free goals

Climate positive

Contributing to sustainable development goals



The framing and identity of biogas solutions

Sustainability strategies – direct and indirect system effects

Circular and biobased economynutrient flows

> Energy and climate-Carbon focus

> > Waste/water treatment – hygienic focus