Nordic Industrial Symbiosis

Murat Mirata
22 February 2018

LINKÖPING UNIVERSITY

Industrial Symbiosis research group @ LINKÖPING UNIVERSITY

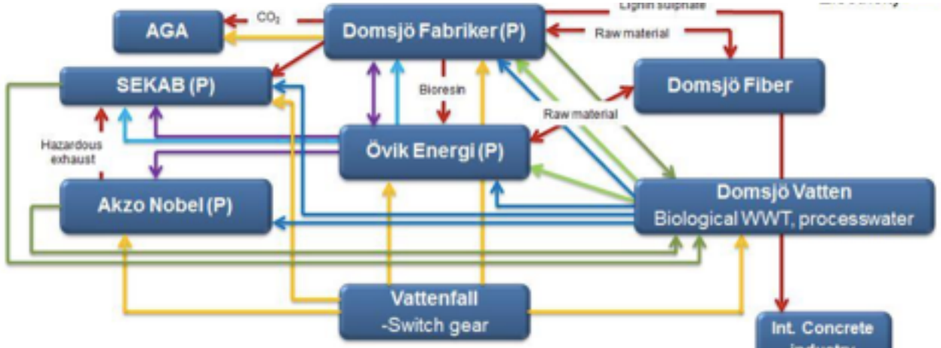
- Dedicated research & MSc and PhD education on industrial symbiosis in order to support practical implementation of IS for bio-based and circular economies through co-creation of knowledge and capacitation of key stakeholders.

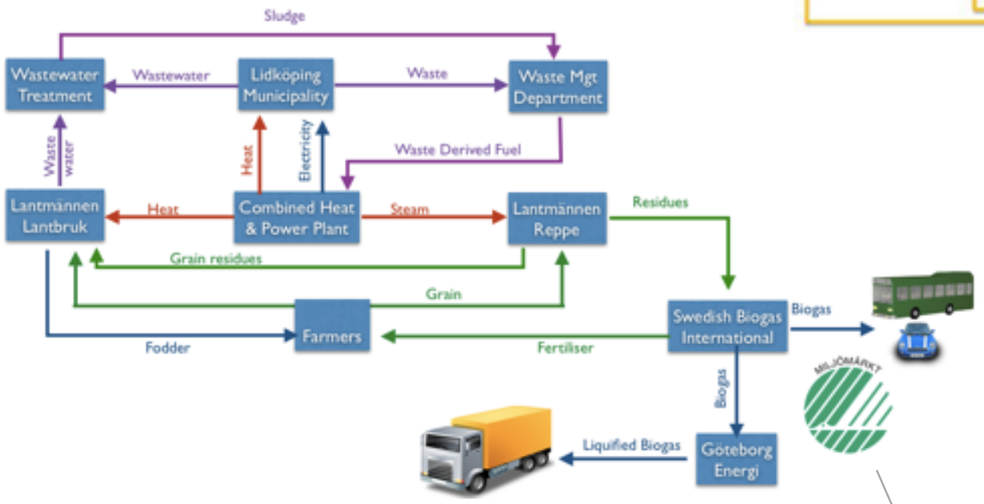
Development determinants

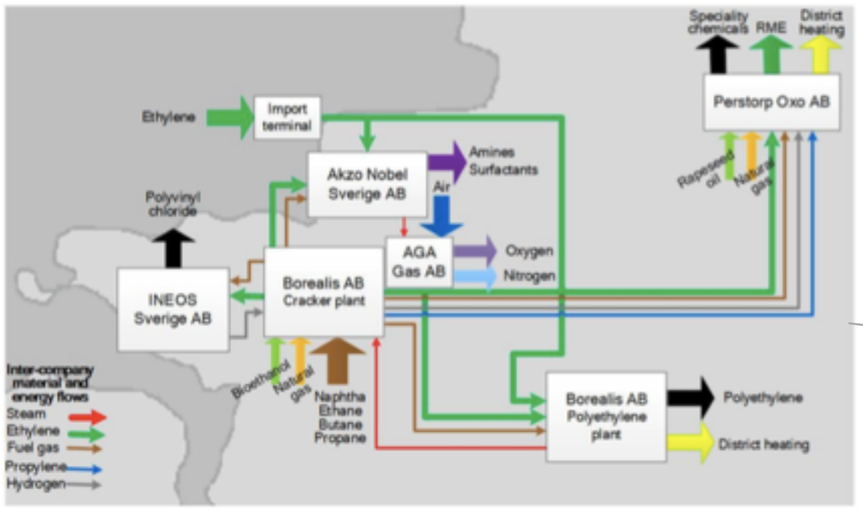
Outcomes

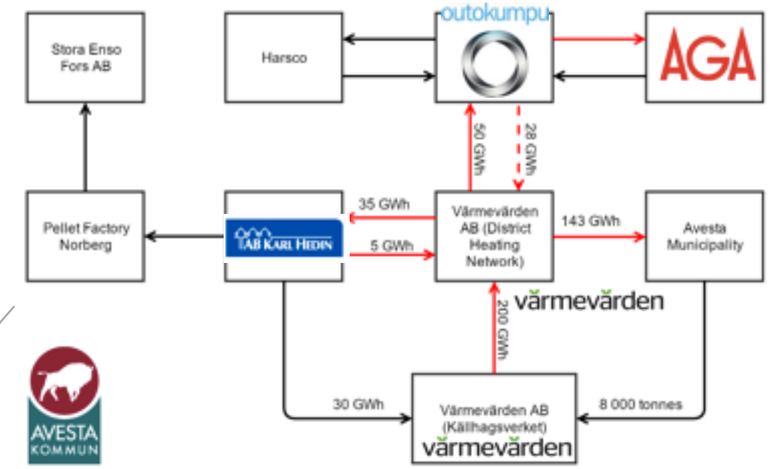
Facilitation methods/tools

- Team has 17+ years of experience with research and practice – in Europe & Sweden
- Since 2012 uncovered 20+ Ind sym networks & maintain a web-portal of Swedish cases;
- Actively involved in multiple regional Ind Sym development projects
- Leading the efforts of developing Swedish and Nordic Ind Sym networks

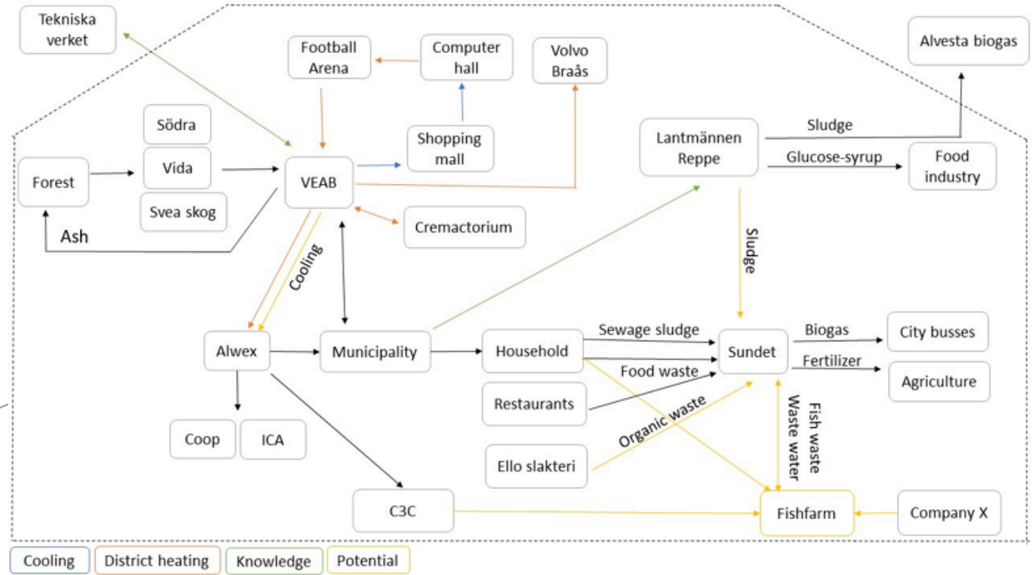








http://www.industriellekologi.se/symbiosis/



Growing, inter-connected challenges

Competitive industries

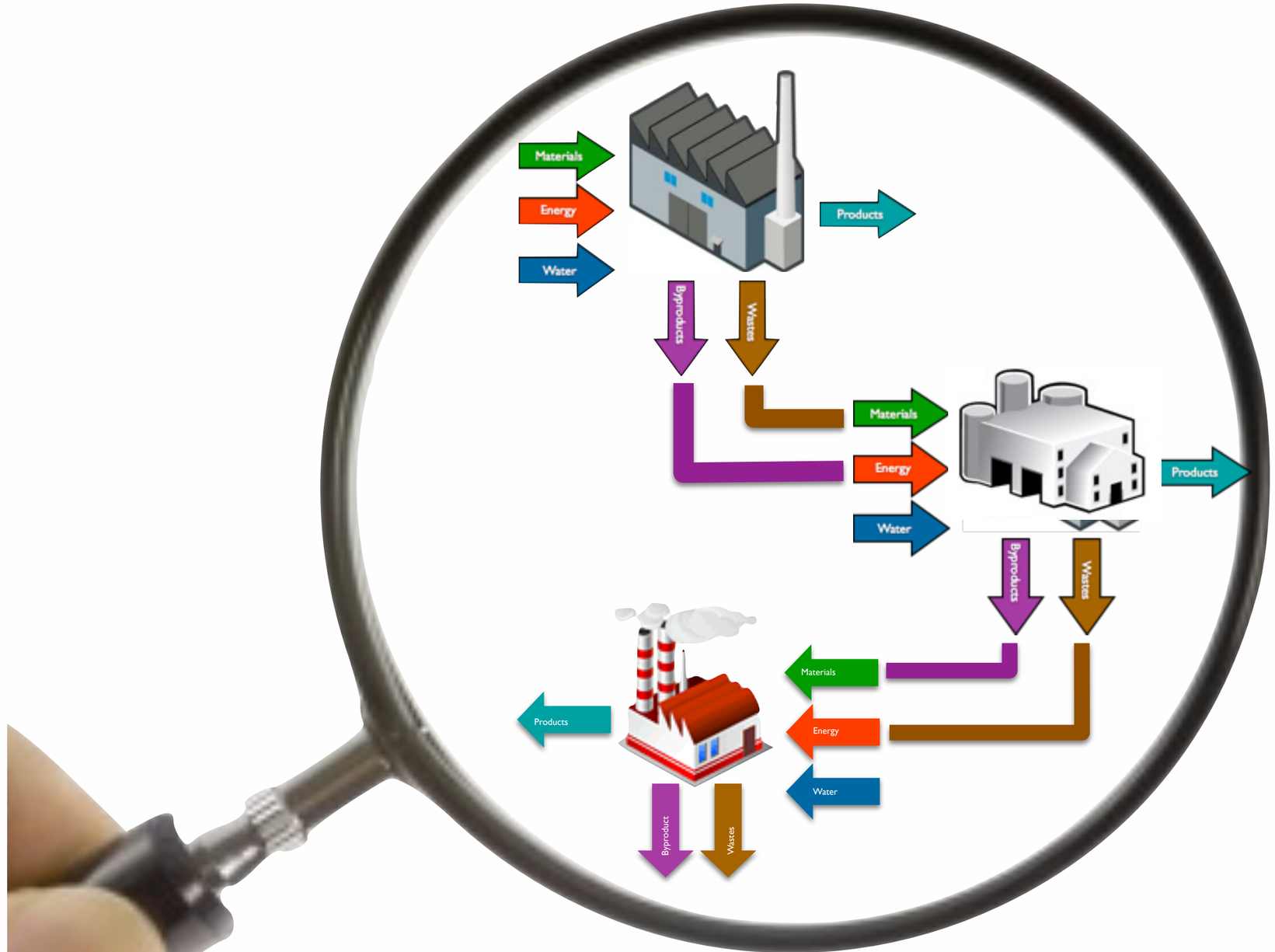
Resource & environmental pressures

Viable urban & rural systems

Traditionally...

Progress with such sector-specific (silo) approach is important and necessary – but is insufficient and misses a significant opportunities.

Industrial symbiosis



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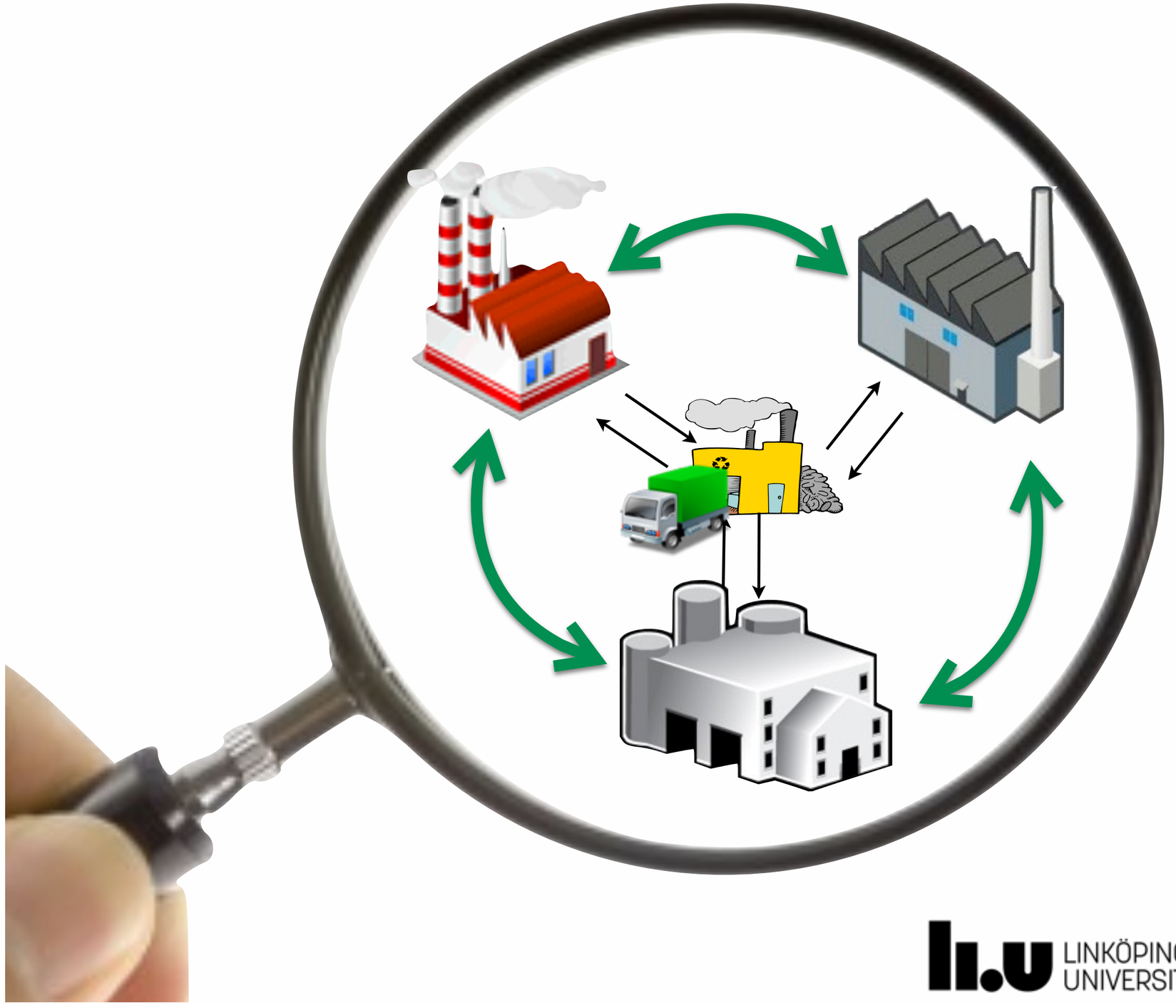
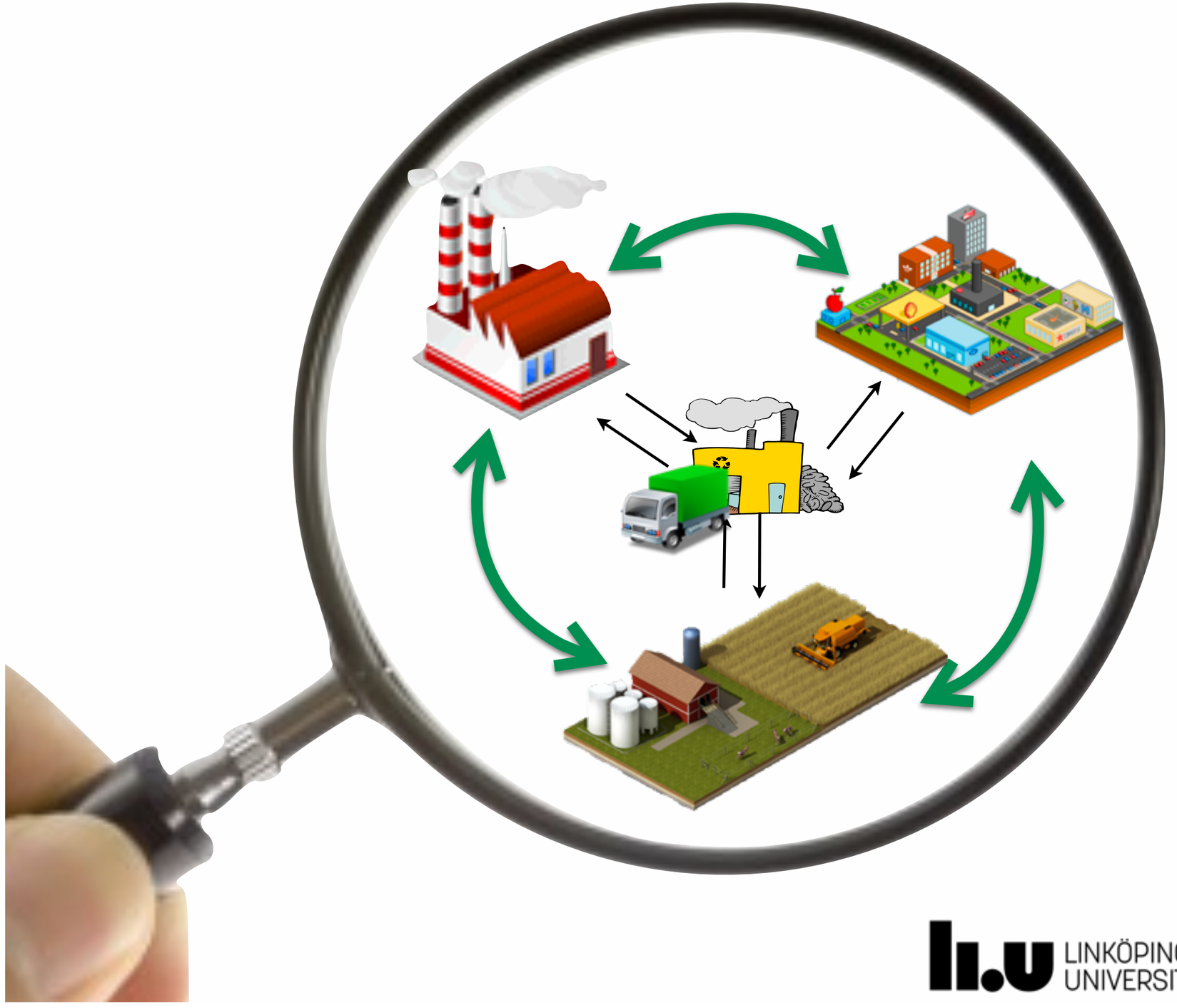
Thursday 22 February 18

Industrial symbiosis



Industrial symbiosis



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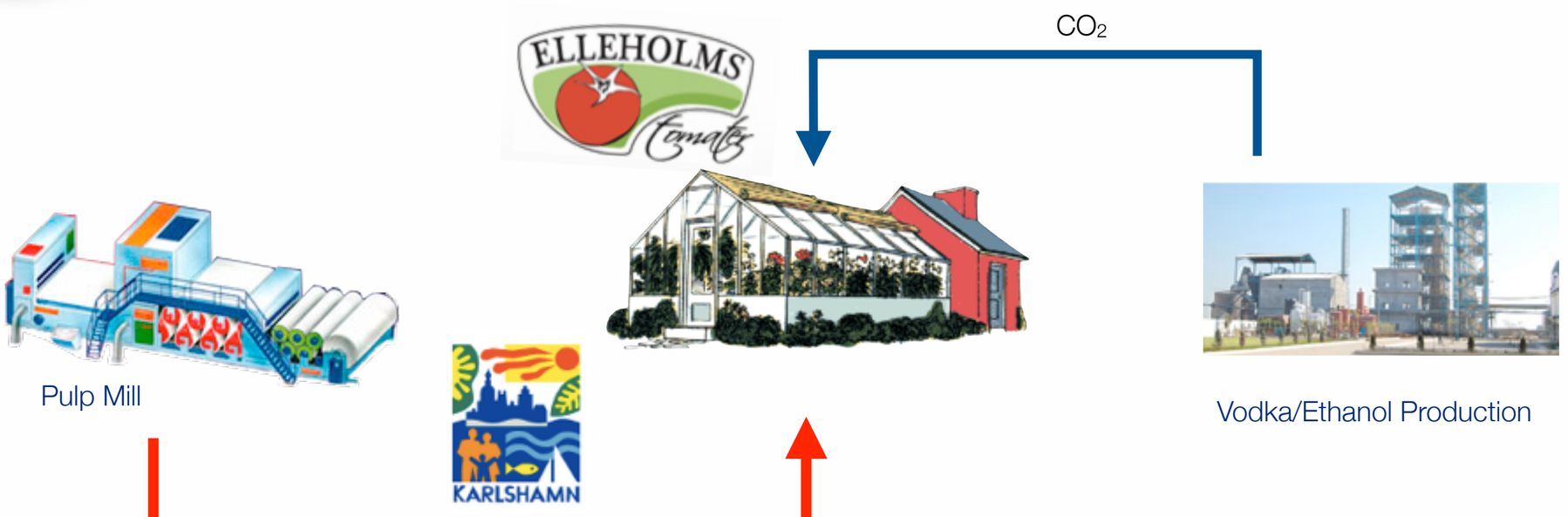
This tomato speaks for it

Comparable price & quality and superior environmental performance

x 20 CO_2 reduction over Swedish average

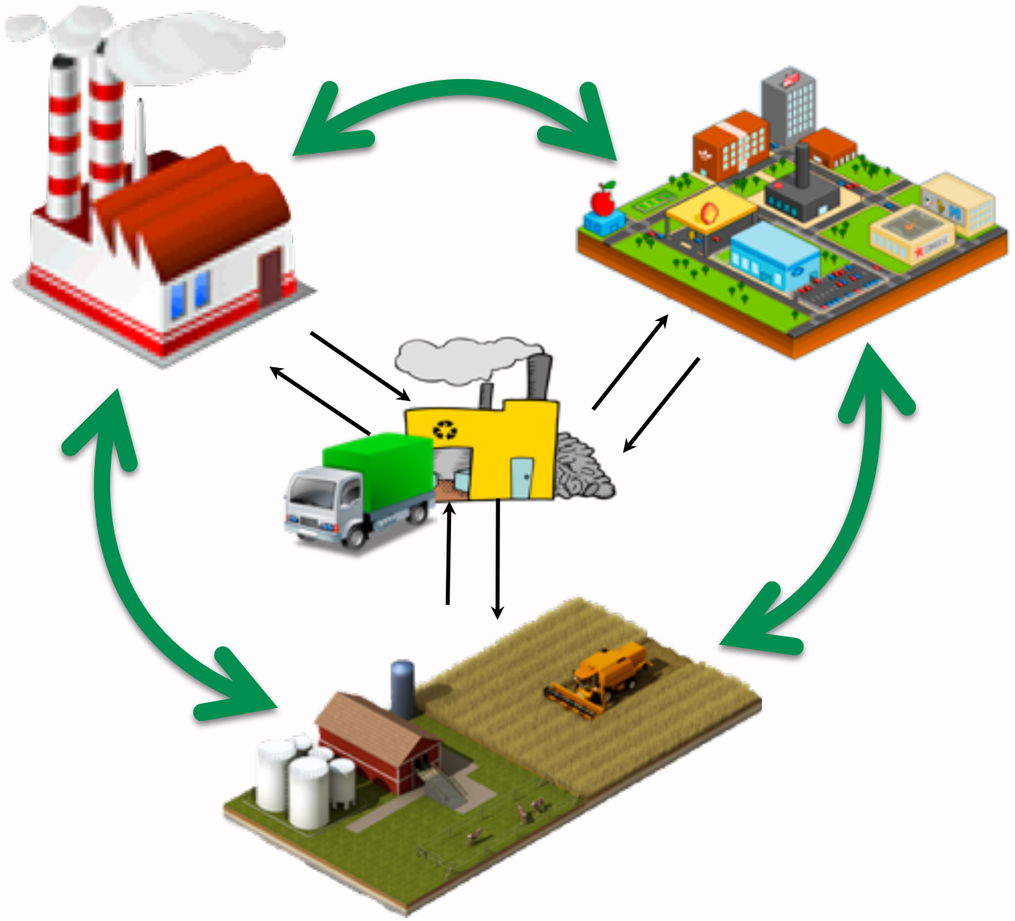
x 50 CO_2 reduction over fossil-based production



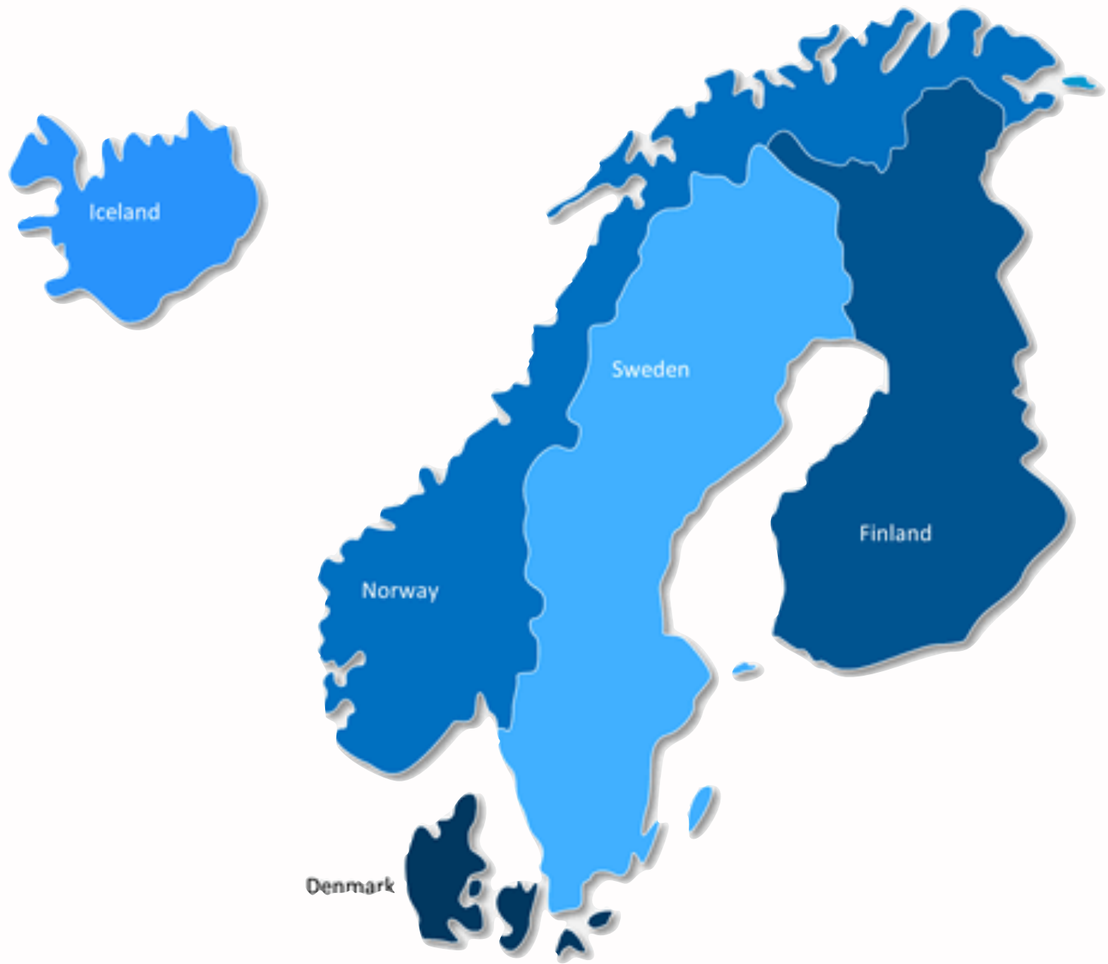
Industrial Symbiosis

Multi-party, cross-sectoral and (often) geographically concentrated resource management collaborations that meet industrial and societal needs more sustainably by:

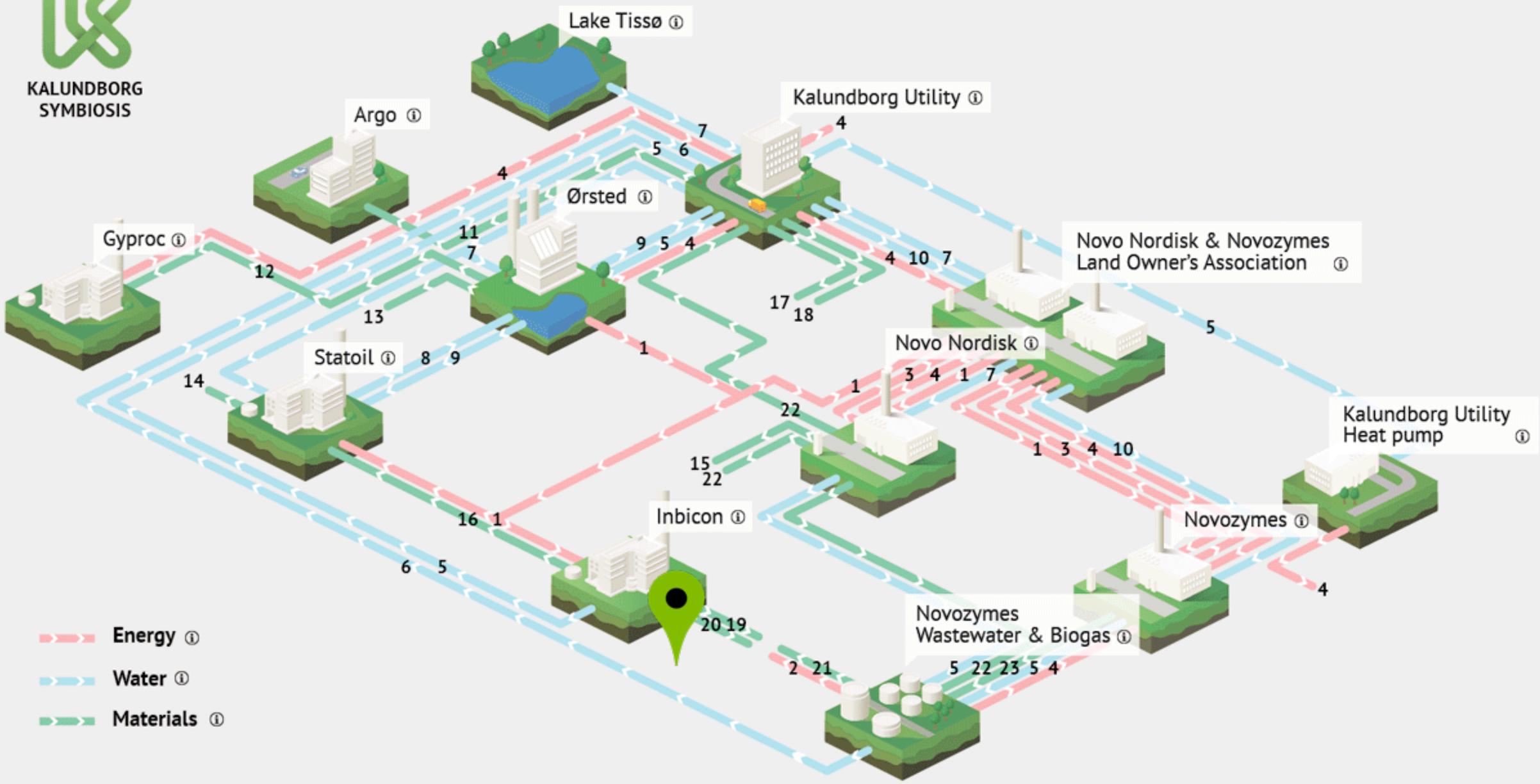
- creating improved value from secondary resources;
- developing more efficient and effective products, services, and utilities.



Nordic Countries - Rich in examples



KALUNDBORG SYMBIOSIS



Norrköping

Wastewater Treatment

Norrköping Municipality

Wastewater

Vehicle Fuels

Raw Biogas

Gas Upgrading

Raw Biogas

Organic Waste

Dist. Heating

Electricity

Household Waste

Gardening & Construction Materials

Forestry

Biomass

Biomass Residues

Pulp & Paper Production

Bottom & Fly Ash

Power Plant

Waste Processing

Sludge

Waste Derived Fuel

Industrial Waste

Imported Waste

Biofertilizer

Organic Waste

Stillage

Steam

Grain

Fodder

Regional Farms

Ethanol Plant

Imported Grain

Waste

Various Industries

CO_2

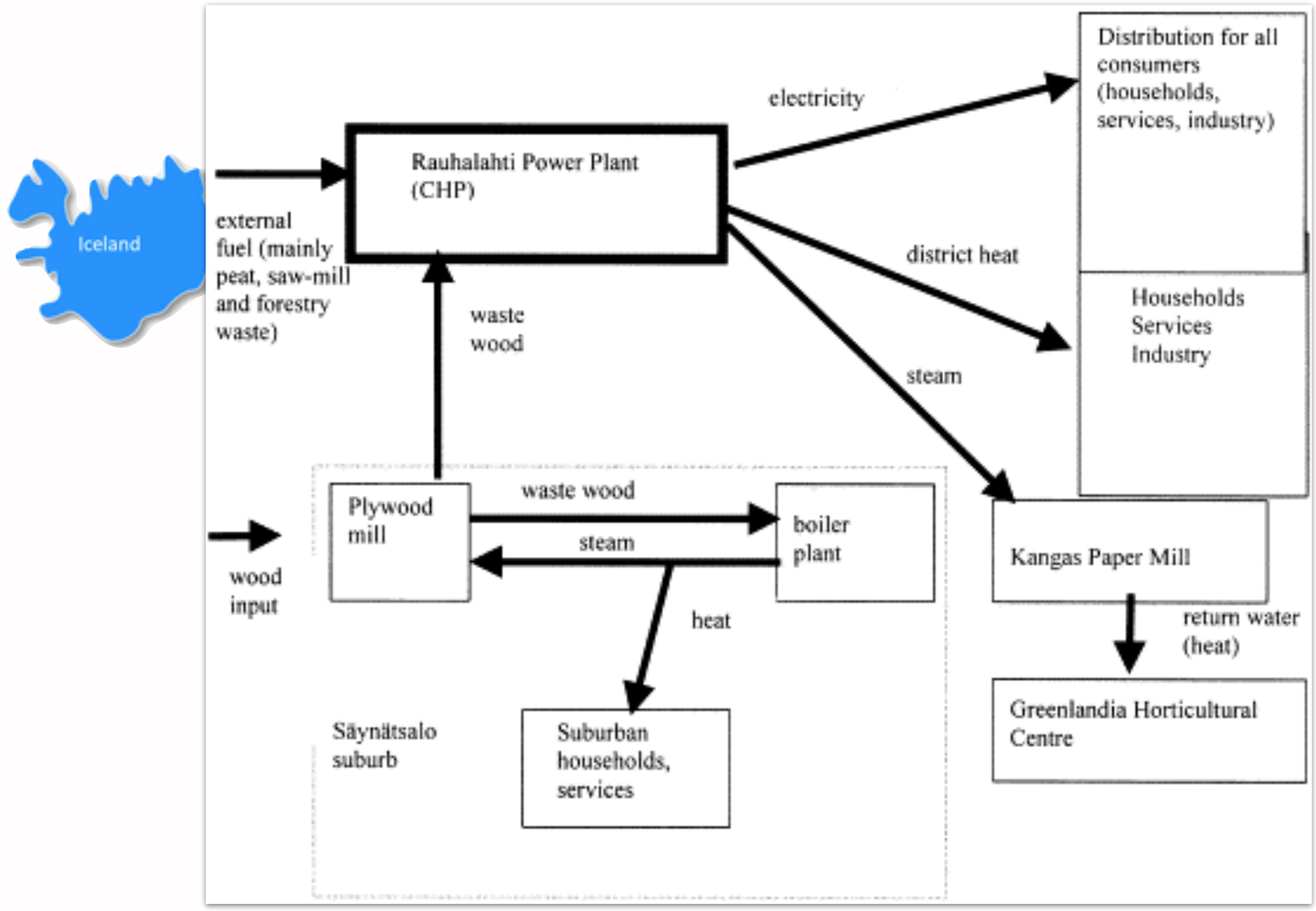
Chemicals Plant

Ethanol

Food industry waste

Port of Norrköping

Nordic Countries - Rich in examples



Outcomes

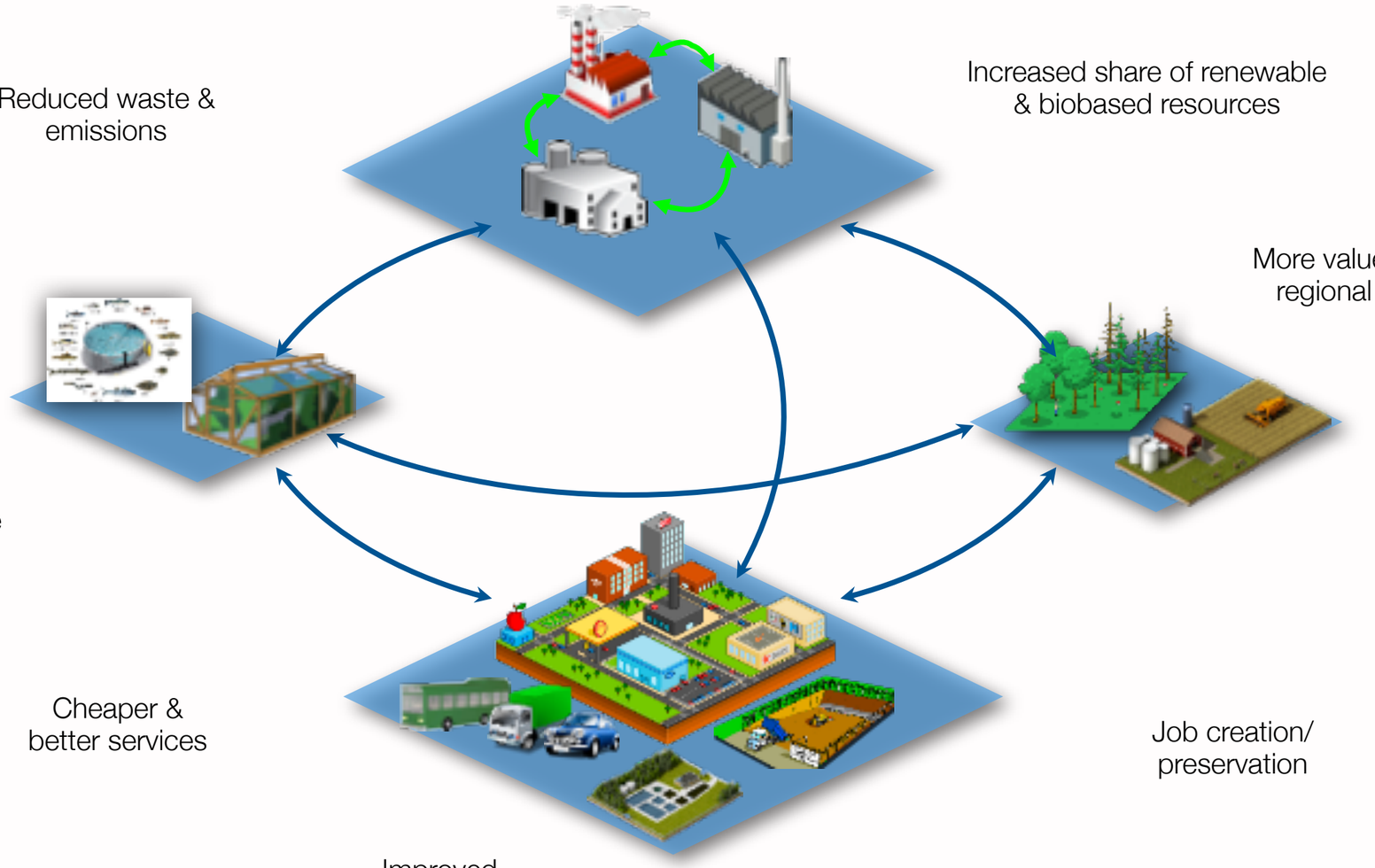
Reduced input & residue management costs

Reduced waste & emissions

Increased share of renewable & biobased resources

Reduced overall resource demand

More value from local/ regional resources



Improved colloborative innovation capabilities

Reduced fossil & external resource dependence

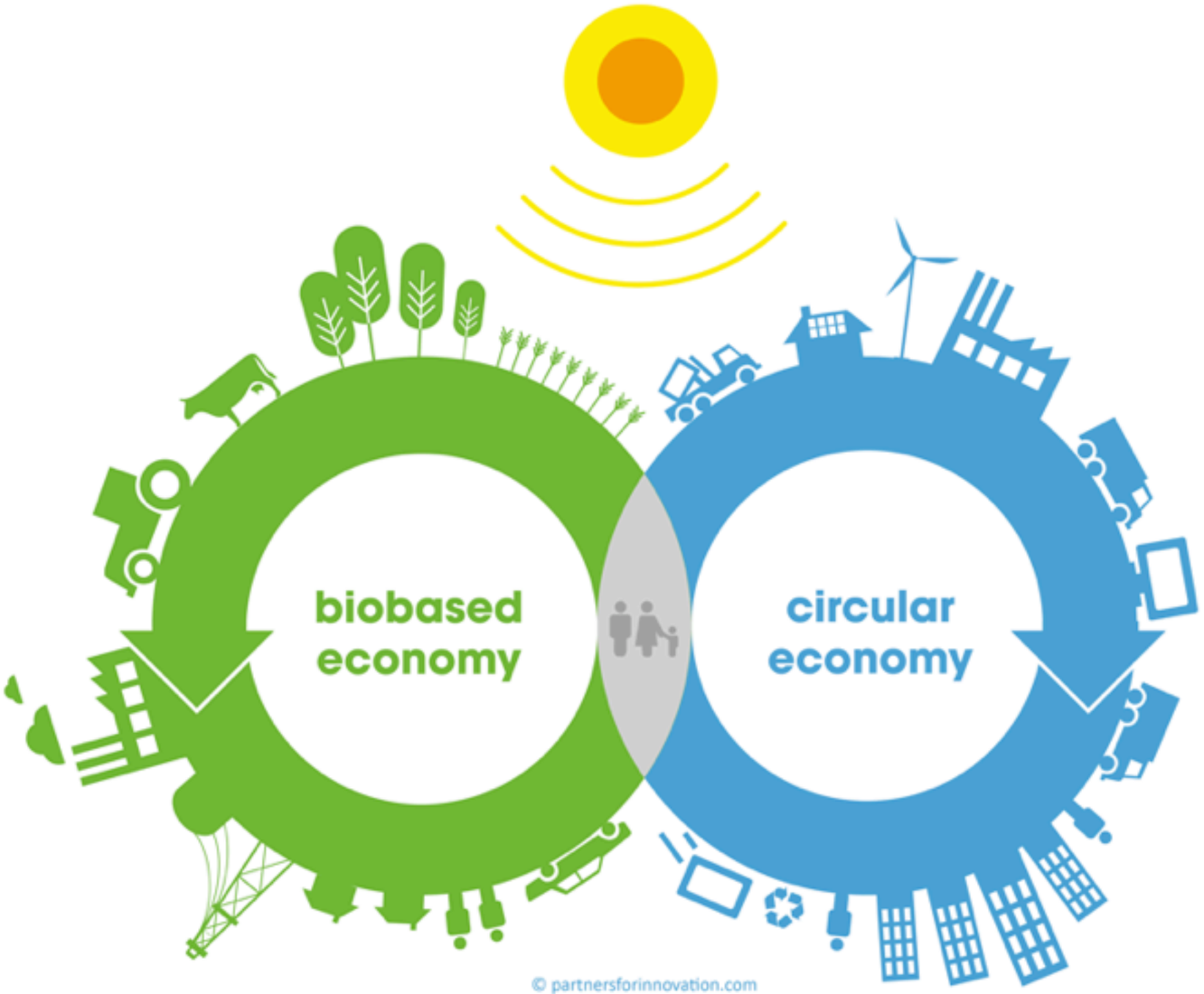
Cheaper & better services

Job creation/ preservation

Improved environmental quality

Increased local tax base

For circular and bio-based economies



Industrial symbiosis offers a process (the means) for effective progress towards desired outcomes.

Industrial symbiosis as a means/process

New ideas with additional improvement potential are identified

Industry competitiveness

Development prospects of identified options are enhanced

Innovative collaborations
&
Collaborative innovations

Resource & Environmental pressures

Sustainable urban development

Growing interest in facilitation

With a strong focus on developing new businesses and transforming existing systems

The approaches ...

Public authority
Company
Buss. Assoc.
Cluster organisation
University
Institution

Idea introduced to local/regional DNA

A review

Business (or buss. assc.)

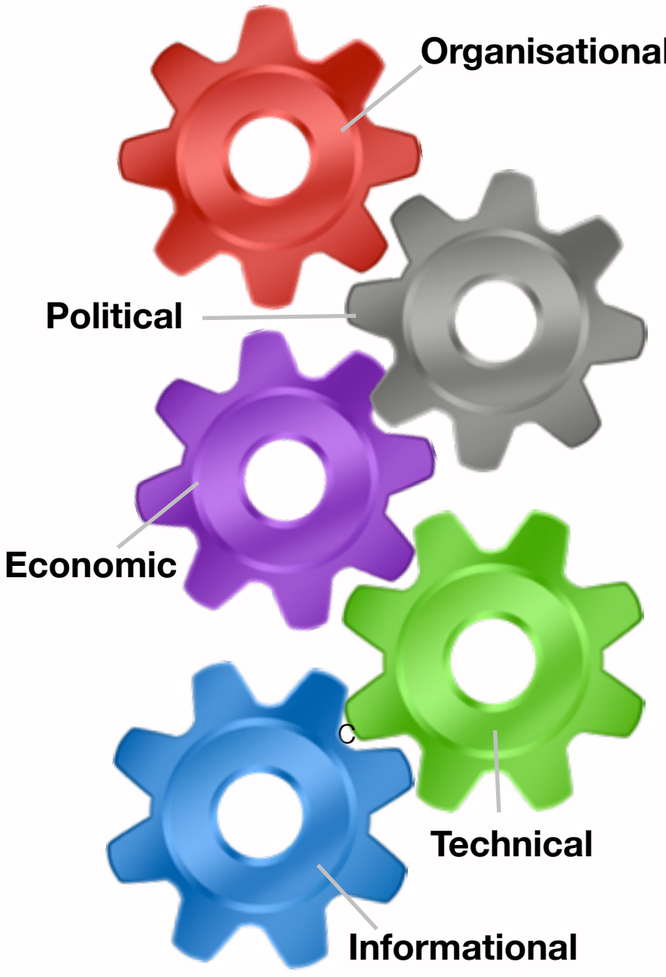
Academia/
knowledge inst.

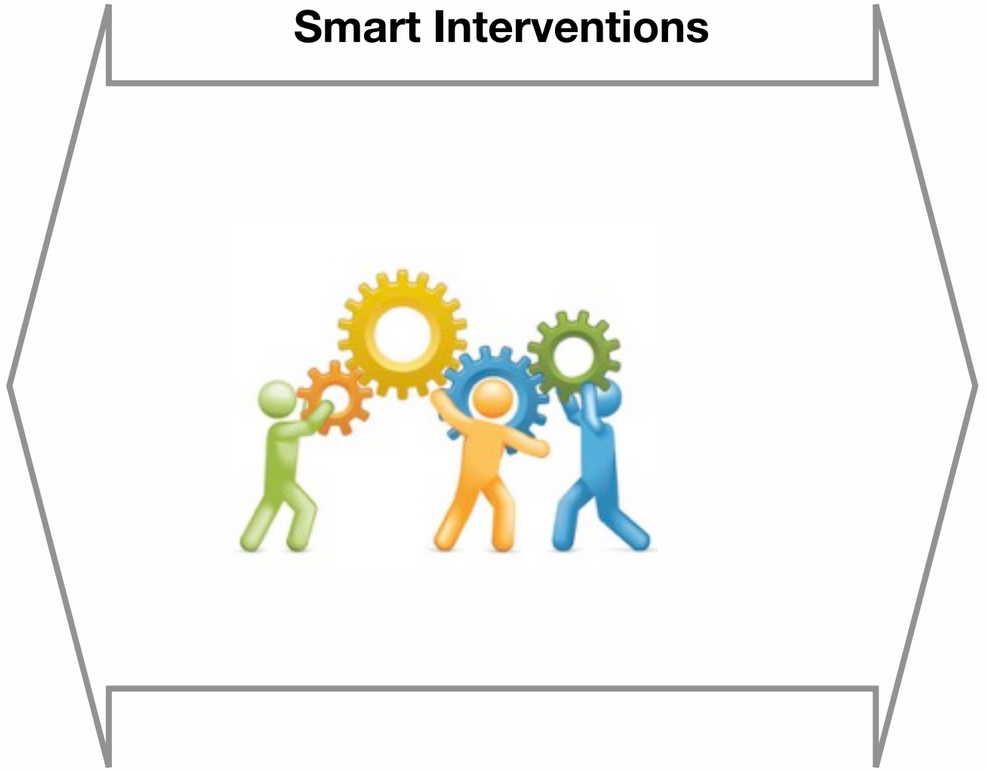
Public govn.

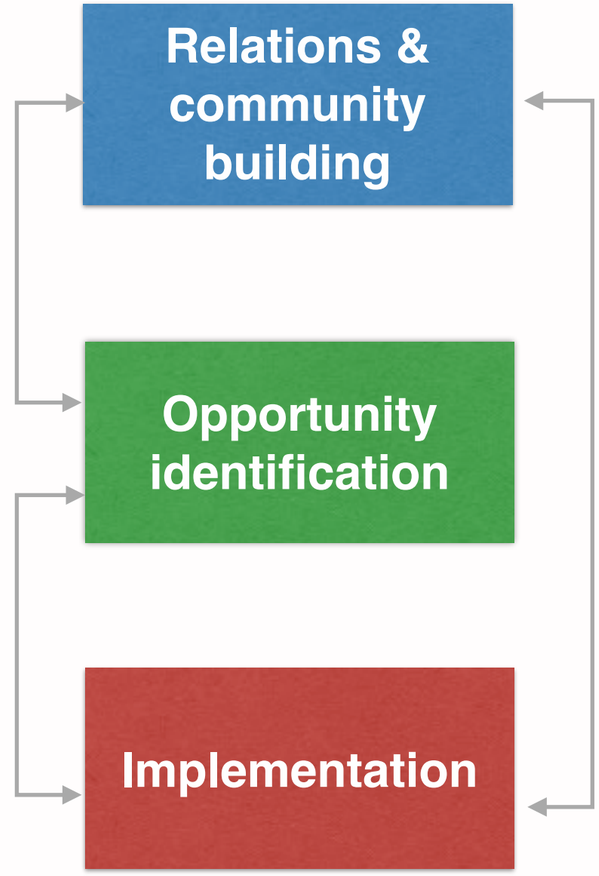
Development
support orgs

A core team

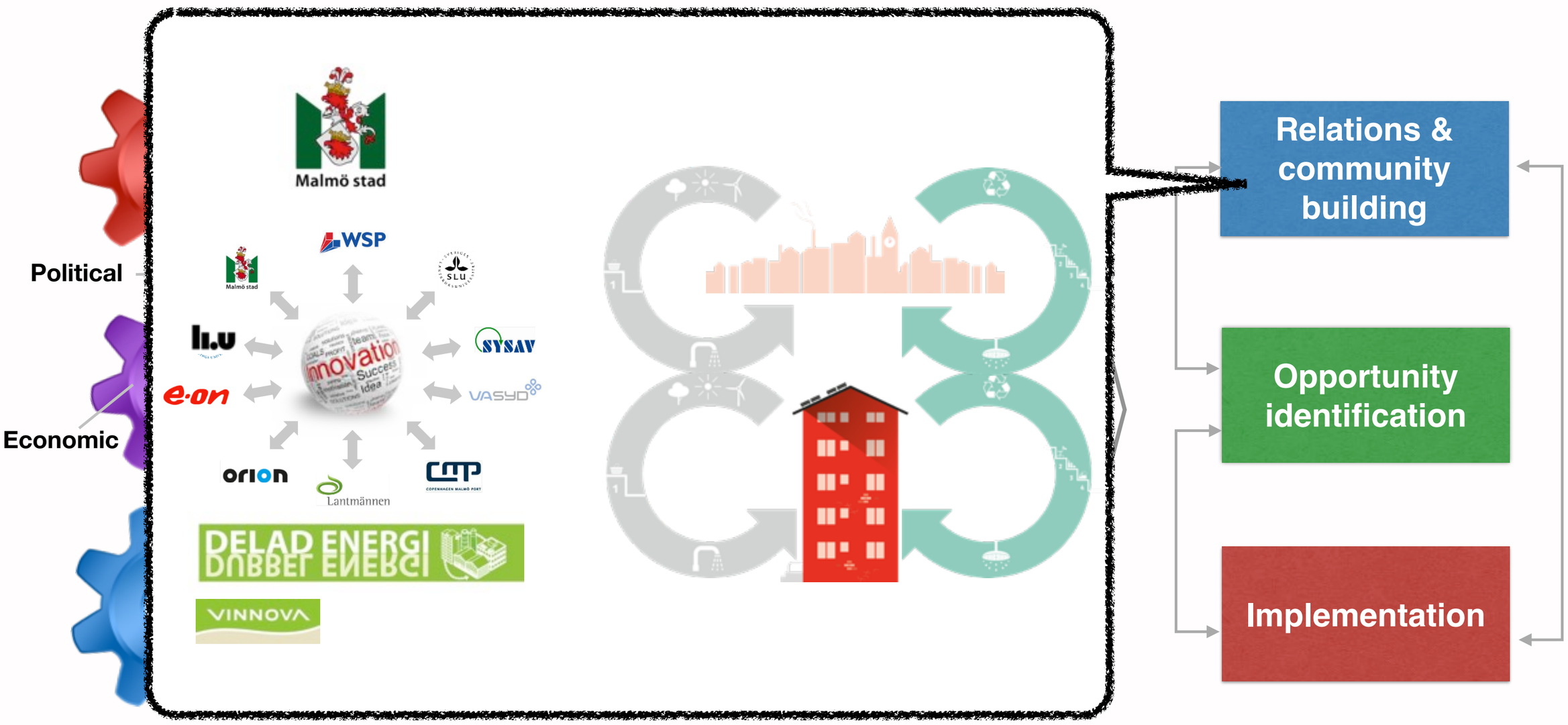
The approaches ...







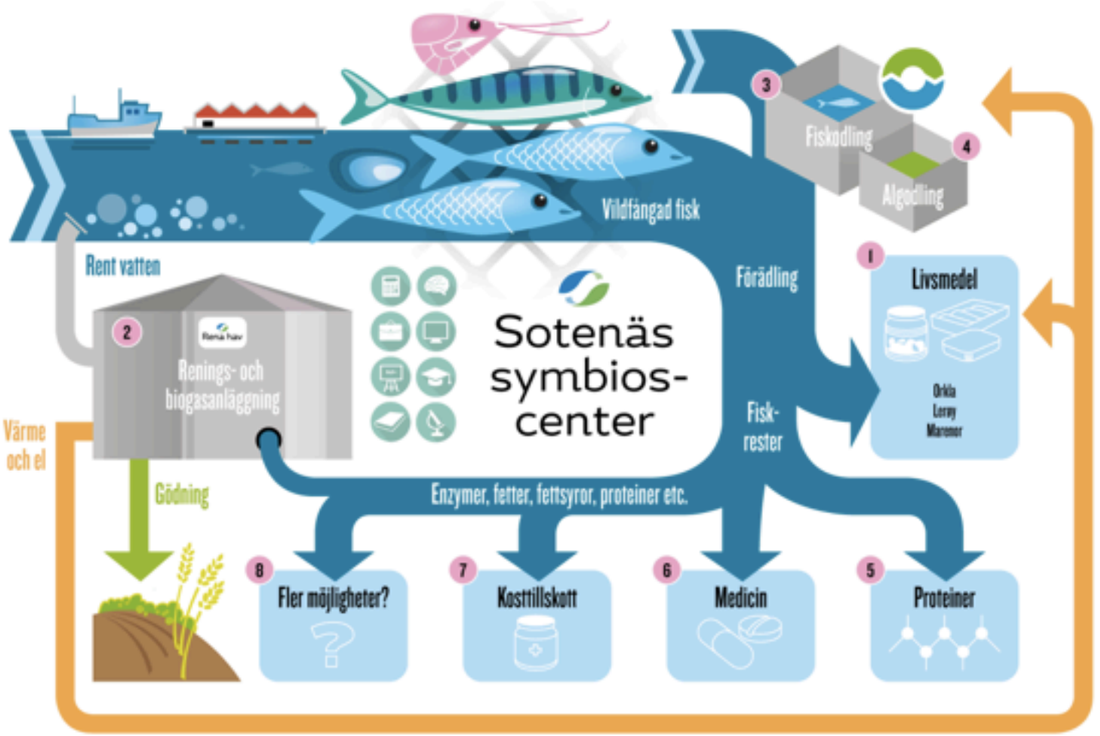
The approaches ...



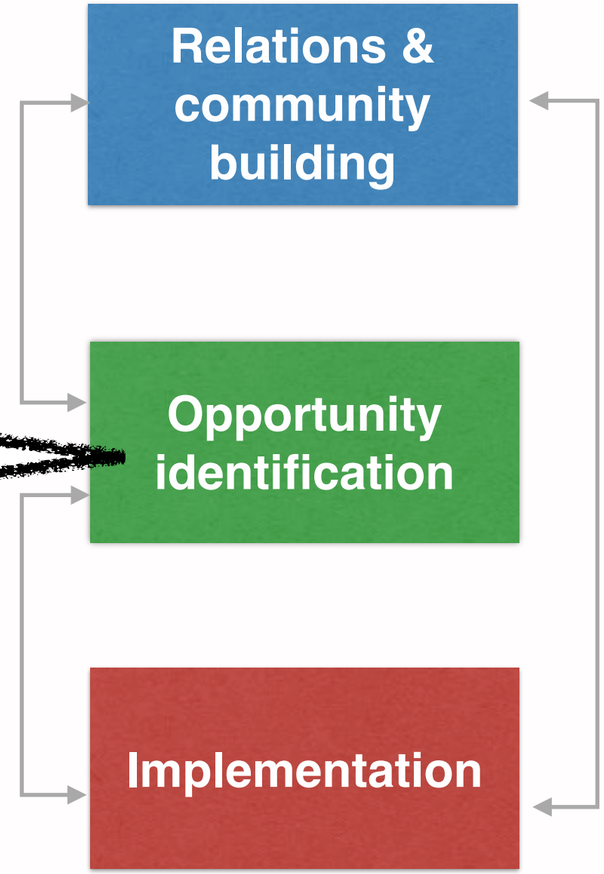
The approaches ...

Stream	Quantity t/a
Ferro-Chrome Slag	650 000
Steel Slag	400 000
Calcite + Filter Dust	60 000
Burnt Lime/Slaked Lime	30 000
Fiber Clay	20 000
Water Purification Precipitate (Steel)	20 000
Dolomite- Bricks	20 000
Clacite	15 000
Biosludge	12 000
Ferro-Chrome Underflow	10 000
Debarking Waste	9 000
Fly Ash	7 000

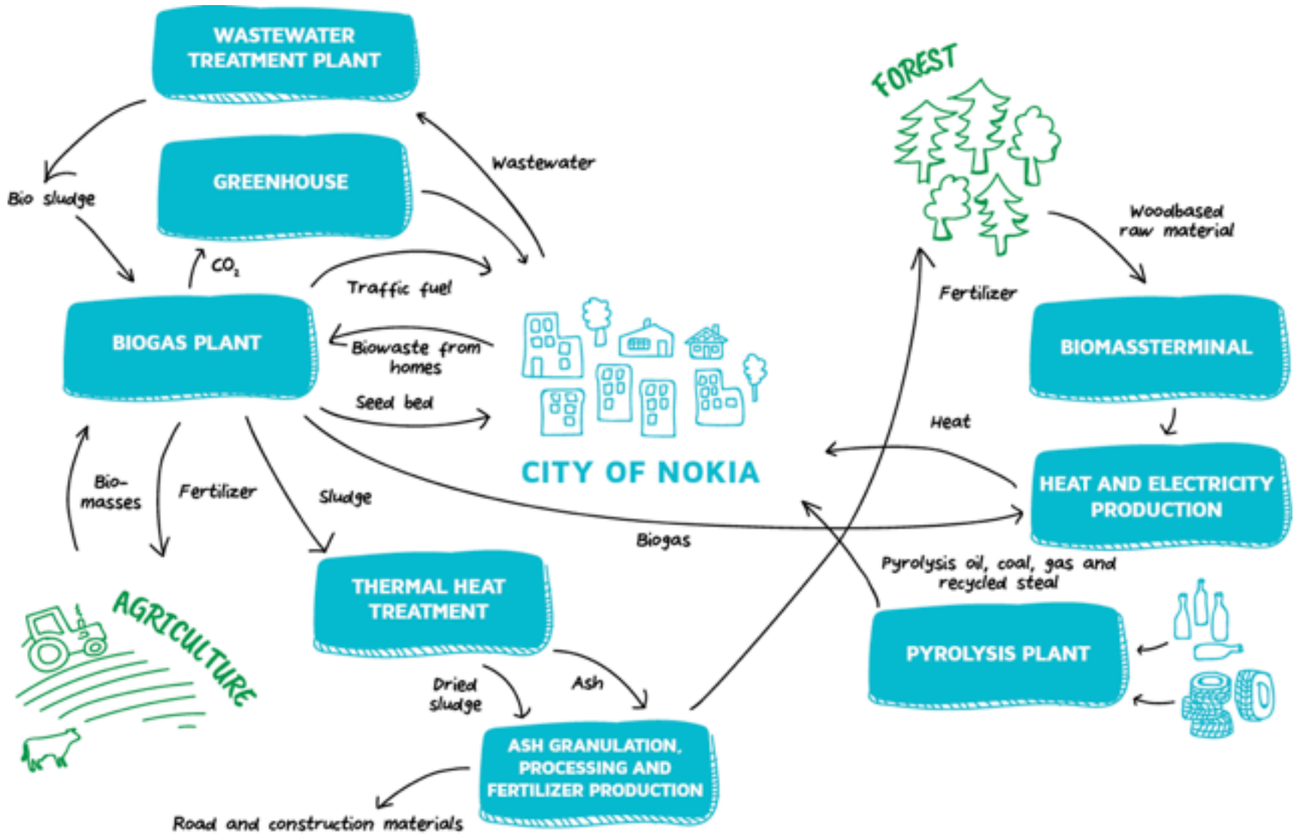
Resource flow assessment
Kemi-Tornio, Finland



Actor needs and interests
Sotenäs, Sweden



The approaches ...

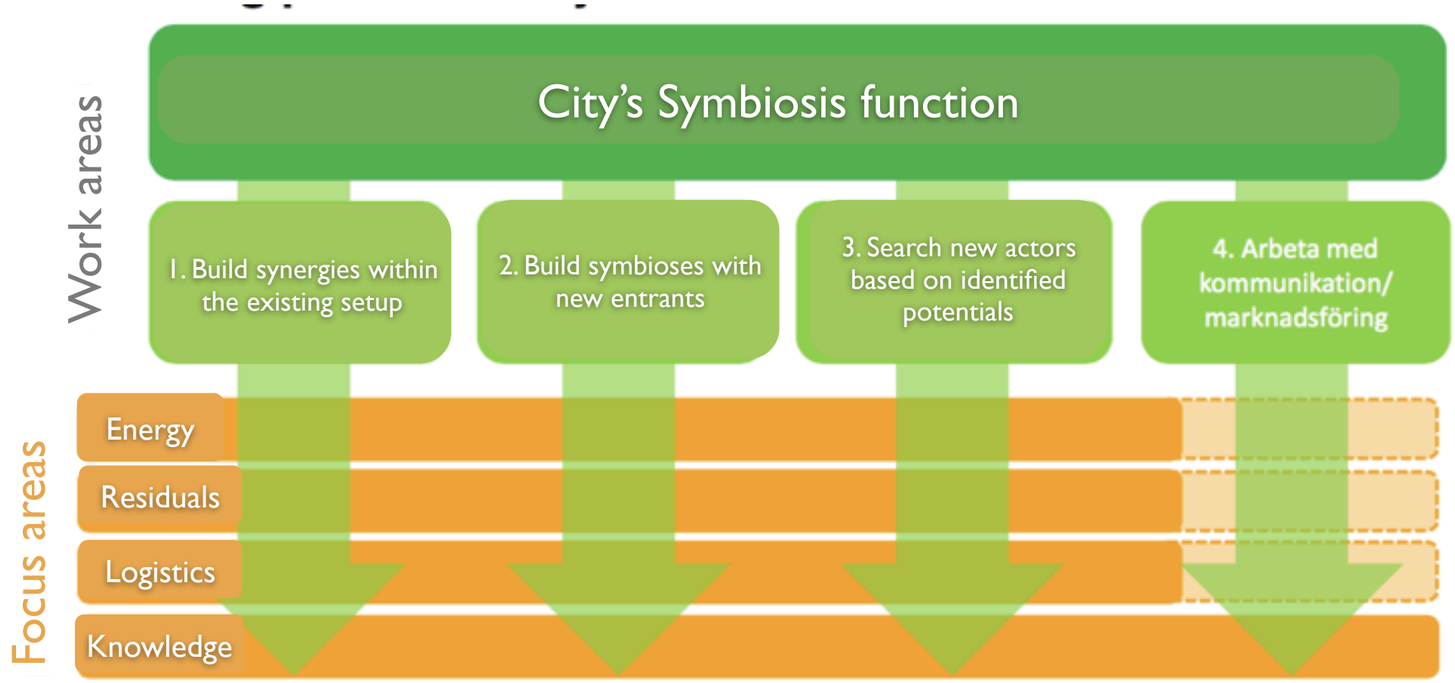


Relations & community building

Opportunity identification

Implementation

The approaches ...



Relations & community building

Opportunity identification

Implementation

The approaches ...

Financiers

Technology providers

Entrepreneurs

Relations & community building

Opportunity identification

Implementation

The approaches ...

55 BN SEK

Materials with a value of 55 billion SEK reach end of use each year in Sweden. This corresponds to 1.2% of Sweden's GDP or 12,000 SEK per Swedish household.

24 %

Only 24% of this material value remains after one use cycle. The loss of value amounts to 42 billion SEK each year, out of which 30 billion SEK remains after accounting for the process costs that are hard to avoid.

LINEAR ECONOMY

The Swedish economy therefore is still significantly more linear than implied by public statistics. Official numbers suggest recycling of 75-95% of steel, 50% of plastic, 50% of demolition waste, etc. – whereas the retained value is only 24%.

87 %
LOSS OF PLASTICS VALUE

58 %
LOSS OF STEEL VALUE

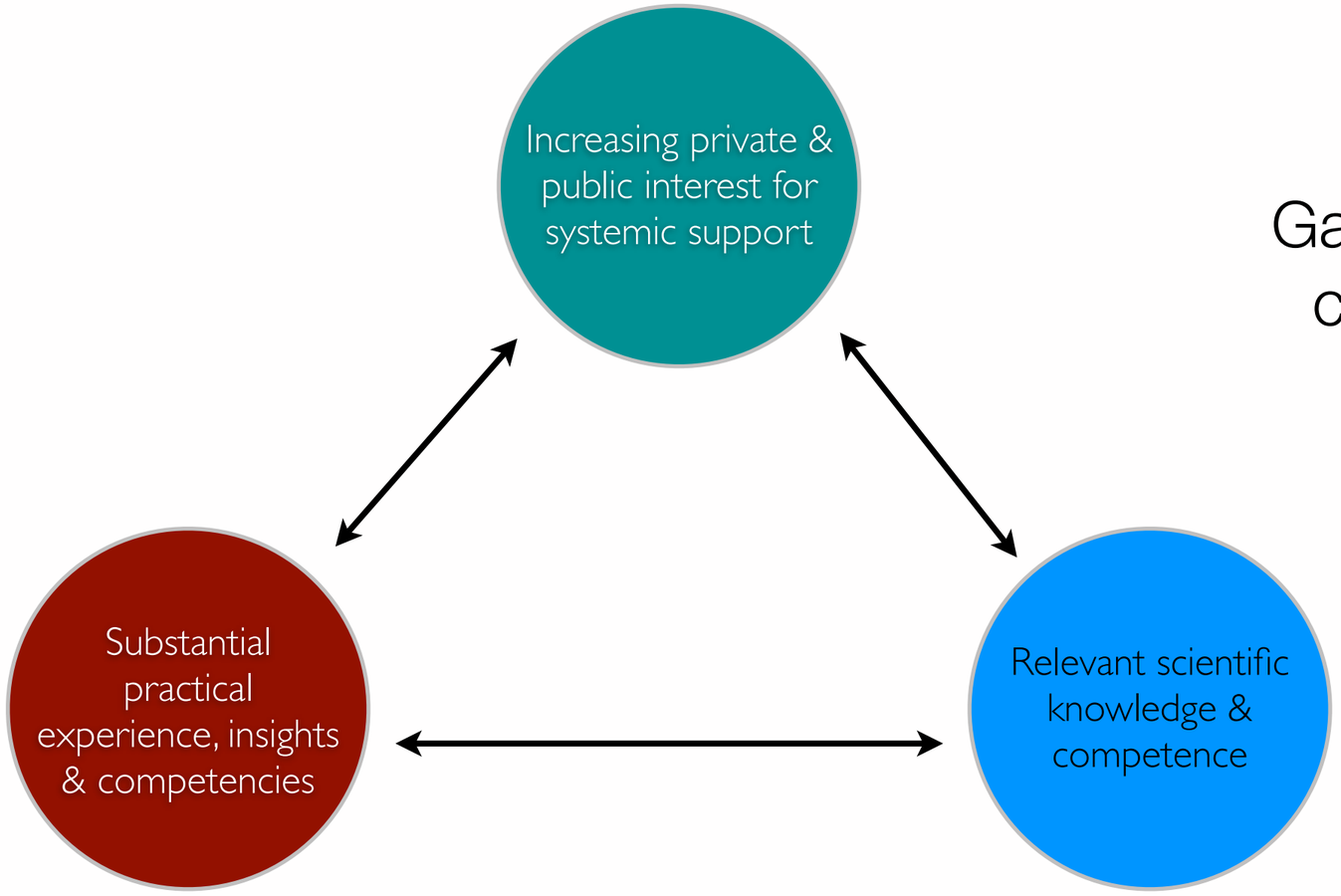
62 %
LOSS OF ALUMINIUM VALUE

Relations & community building

Opportunity identification

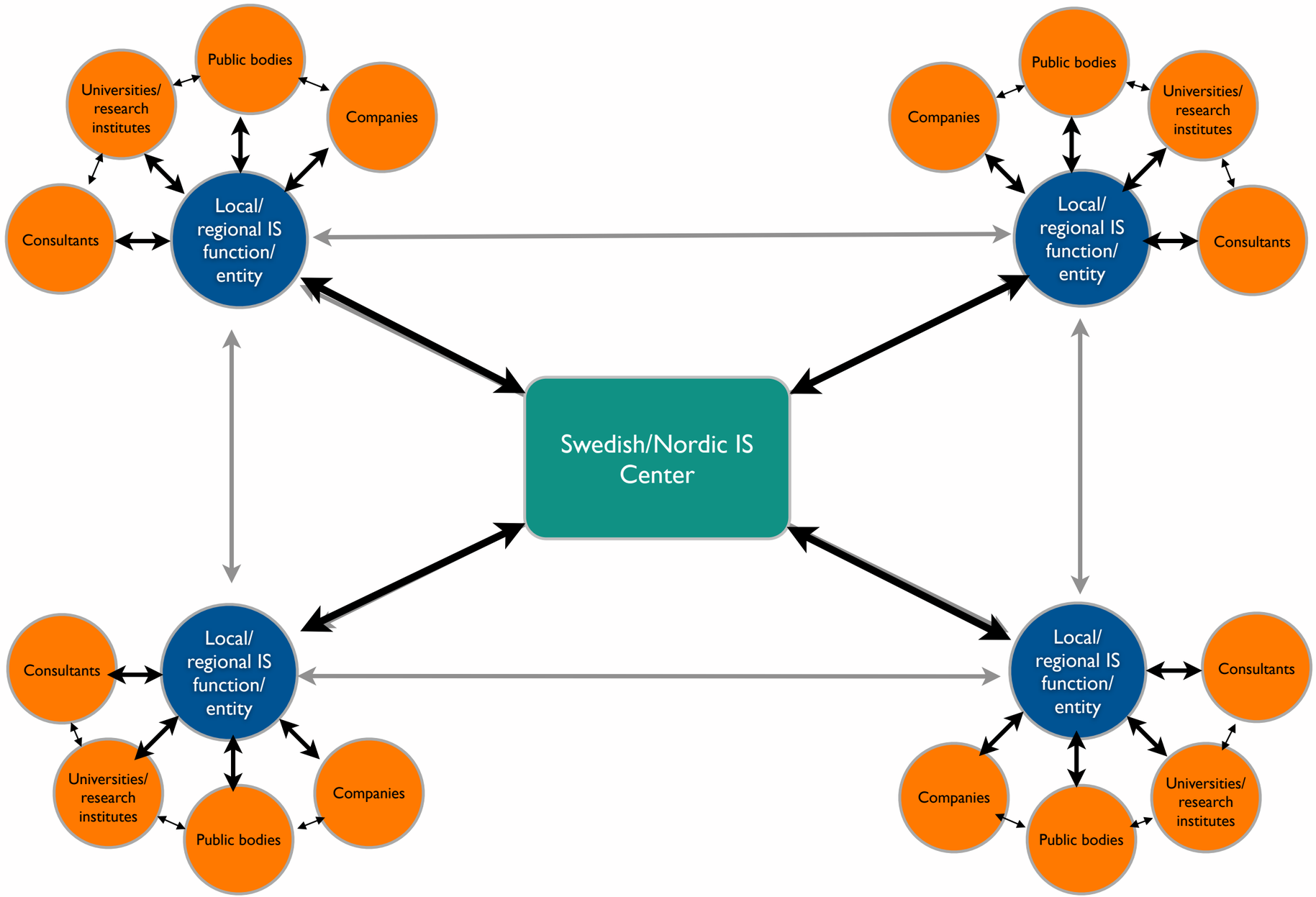
Implementation

Swedish & Nordic Industrial Symbiosis Networks



Gains to be made from improved communication & cooperation

Swedish/Nordic Initiatives for Industrial Symbiosis



Goal and objectives

Main Goal: Supporting practical IS developments in Swedish regions.

Key Objectives

- Build/enhance regional capacity to support IS
- Improve knowledge creation, cooperation, & learning
- Develop & diffuse tools benefiting all members
- Form a common & amplified voice towards key actors
- Improve national & international profiling

Members of Swedish Initiative for Industrial Symbiosis

Members of Nordic Initiative for Industrial Symbiosis

LINKÖPING UNIVERSITY

DIGIPOLIS
Kemi Technology Park

EYDE CLUSTER
NCE EYDE Norwegian Center of Expertise
Sustainable Process Industry

NORDREGIO
Nordic Centre for Spatial Development

KALUNDBORG SYMBIOSIS

PAPER PROVINCE

Sotenäs kommun

TAMPERE

???

Thank you

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