SHAREBOX
SECURE SHARING

Industrial Symbiosis and LCA

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Contents

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Symbiotic industrial system

- A synergistic industrial (eco-)system
  - Less waste generation
  - Less primary resources consumption
- Wealthier companies due to extra income and cost savings
- Cost-effective reduction in resource use

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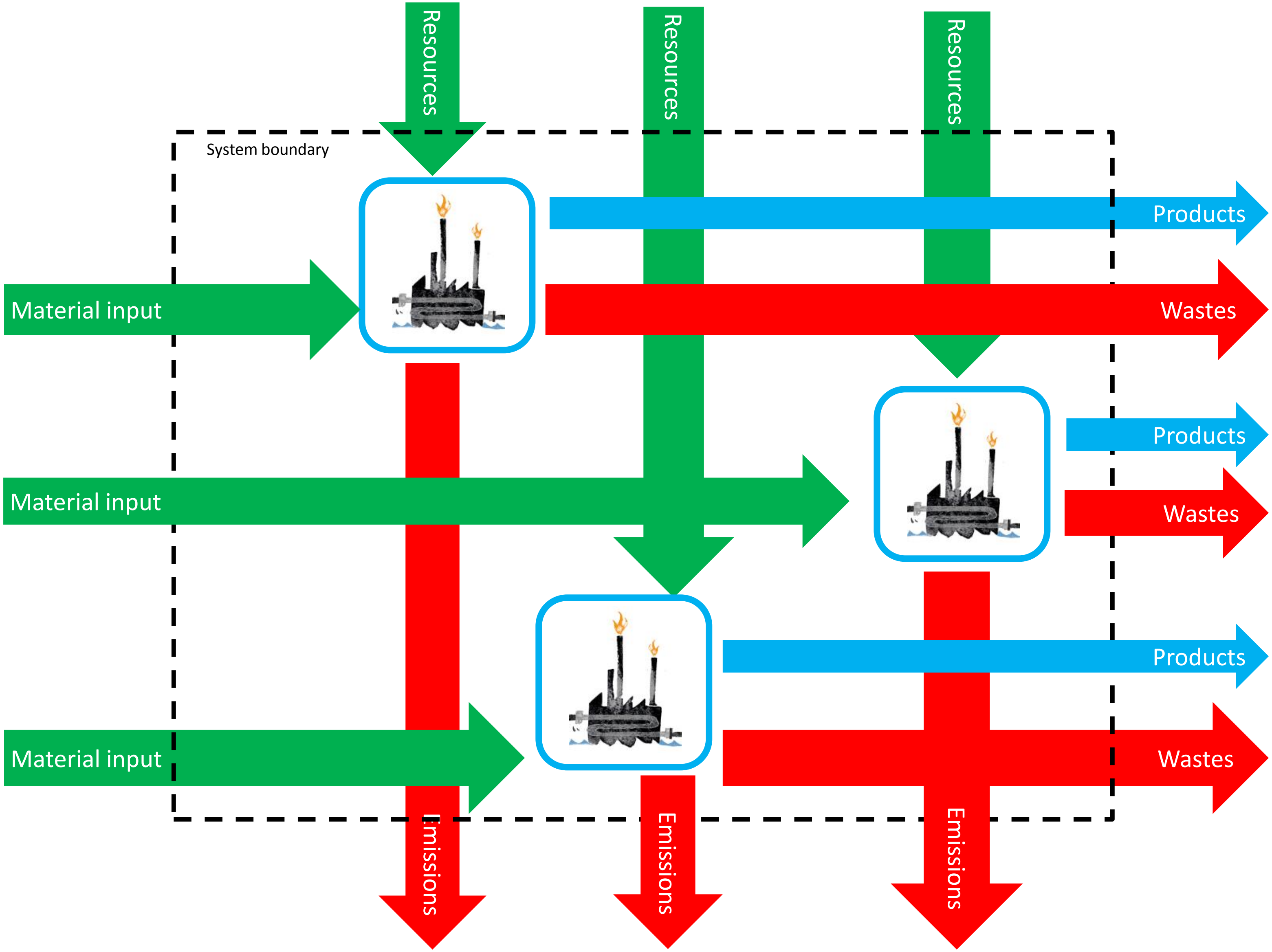
Linear industrial system



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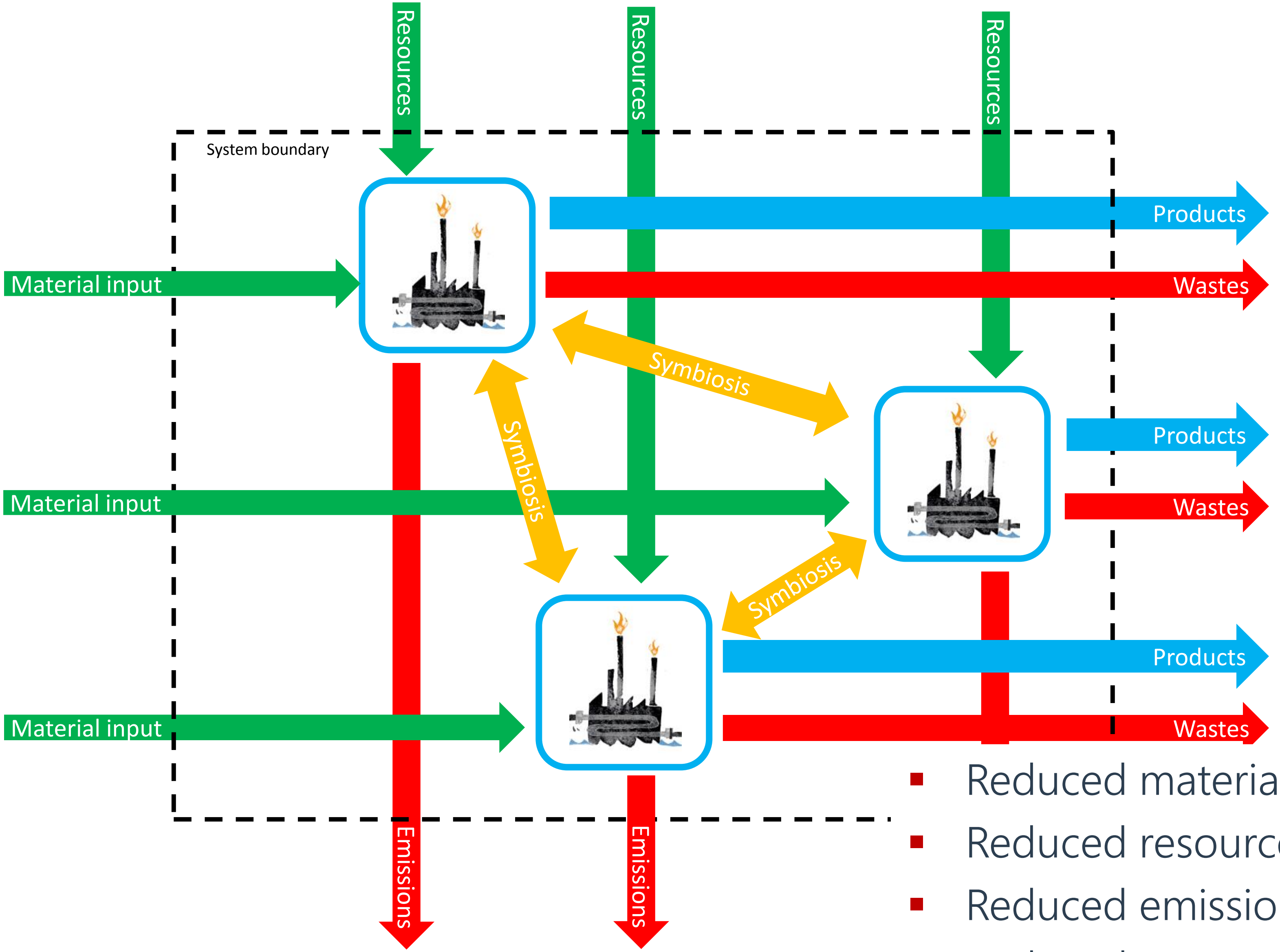
Circular and symbiotic industrial system



- Reduced material input
- Reduced resource use
- Reduced emissions
- Reduced wastes

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In reality: Kalundborg

http://www.symbiosis.dk/en/lokalomraadet

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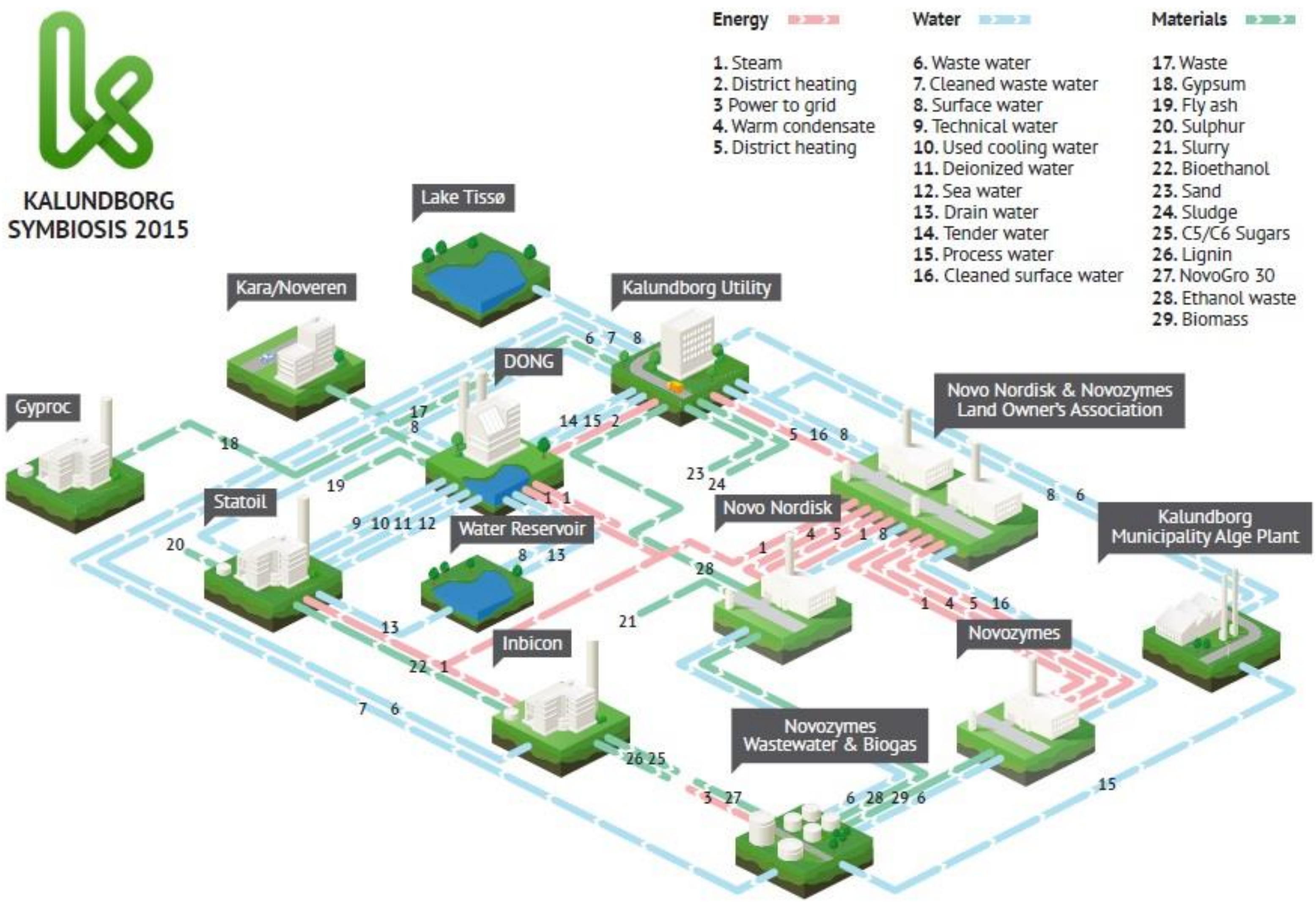
In reality: Kalundborg



http://www.symbiosis.dk/en/diagram

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Challenges to the adoption of industrial symbiosis?

- Information flow and knowledge of opportunities
- Lack of a secure platform including cross-sectorial experience
- Inadequate resource information re.: contamination, classification and resource availability
- Initial effort needed for the implementation before the cost benefit for companies

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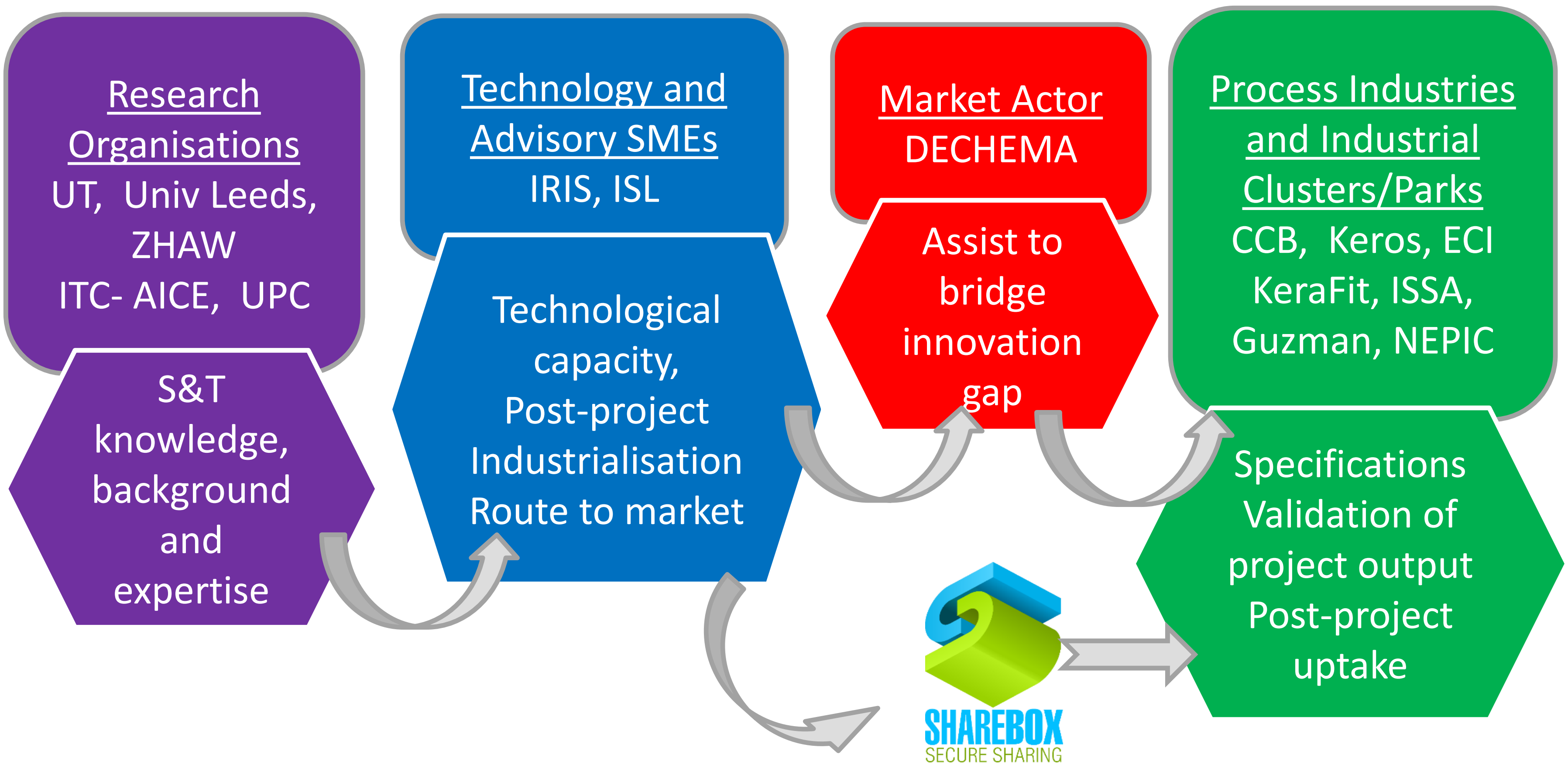
Partners of SHAREBBOX



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Key objectives of SHAREBOX

- Facilitating industrial symbiosis through ICT and data intelligence
- To provide plant operations and production managers with the robust, reliable and timely information they need to effectively and confidently identify resource reuse opportunities (for materials, energy, water) with other companies in an optimum symbiotic eco-system.
- To identify new cross-sectorial synergies
- Impact of SHAREBOX (phase 1, during project)
  - Waste avoided: 137’000 tonnes
  - Virgin material use avoided: 593’000 tonnes
  - CO_2 savings: 227’000 tonnes
  - Cost savings: 10 million euro

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Transforming wastes to resources

- There are no wastes only resources
  - Waste oil can be used as alternative fuel
  - Wasterwater can be reused (in processes with low quality req.)
  - Waste heat can be used in drying processes etc.
- HAVE and WANT after the first workshops

- HAVE
  - Bio-waste (fruit peel,)
  - Packaging waste
  - Waste copper
  - Waste (vegetable) oil
  - Waste batteries
  - Electronic waste
  - Paper, cardboard, wood
  - Wastewater
  - Waste Heat
  - Aluminium shavings
  - Scrap metal
  - Waste solvents
  - Natural mineral waste
  - Fertilizer waste
  - Flat pallets

- WANT
  - Sawmill dust and shavings
  - Packaging waste
  - Waste oil
  - Food waste
  - Debris waste
  - Metal waste
  - Iron and steel scrap
  - Pallets
  - Water
  - Construction waste
  - Thermal energy
  - …

Match?

Match?

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LCA of industrial symbiosis: End of life

- The transformation of wastes to resources is an End-of-Life process
- Open-loop recycling requires allocation of environmental benefits
  - 50:50 rule
  - Avoided burden (100:0)
  - Cut-off (0:100)
  - System expansion
- The symbiotic system can be complex and include (a lot) more than two partners
- How to quantify the benefits of the symbiotic system?

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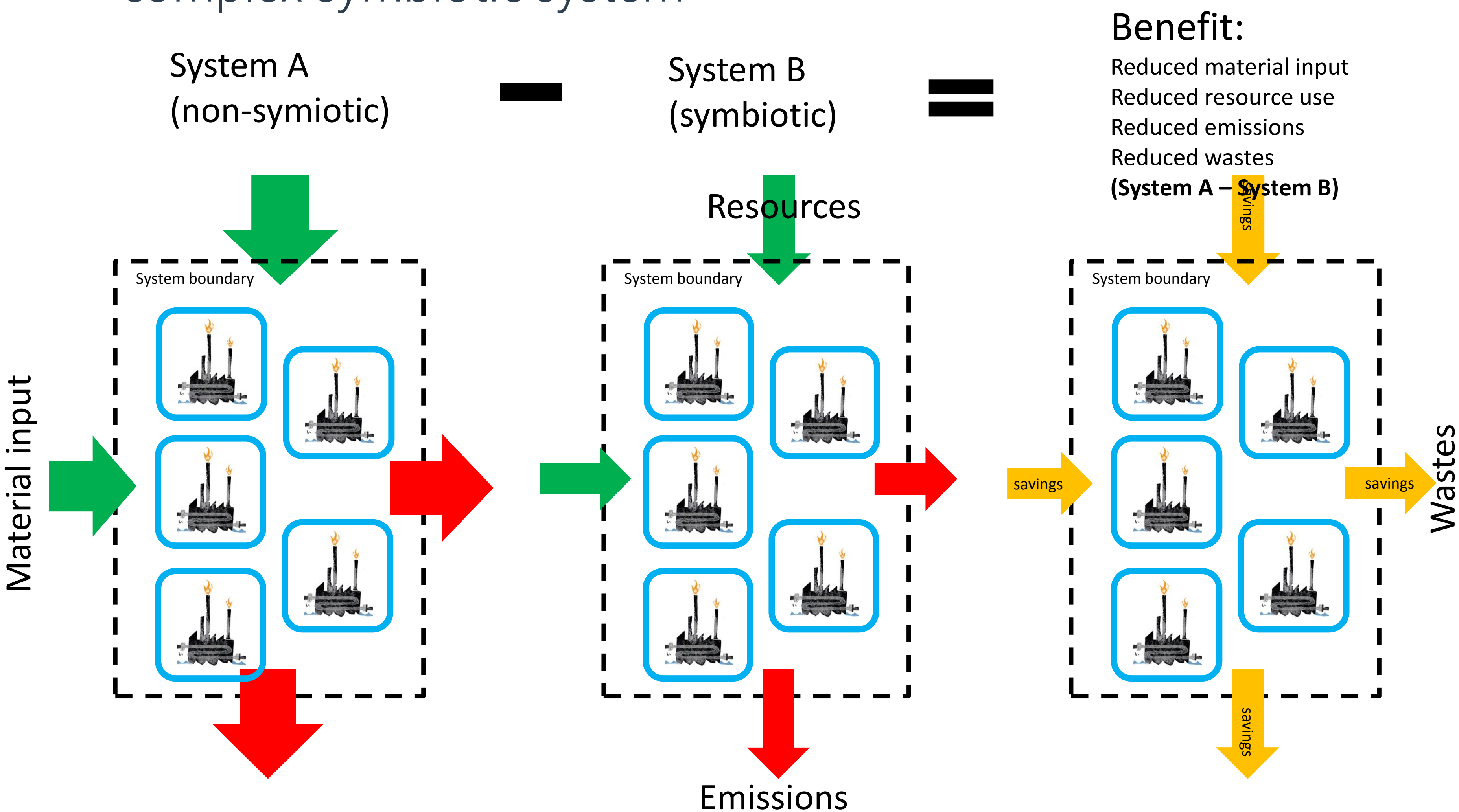
Allocation of benefits

- System expansion allows the quantification of benefits of a complex symbiotic system



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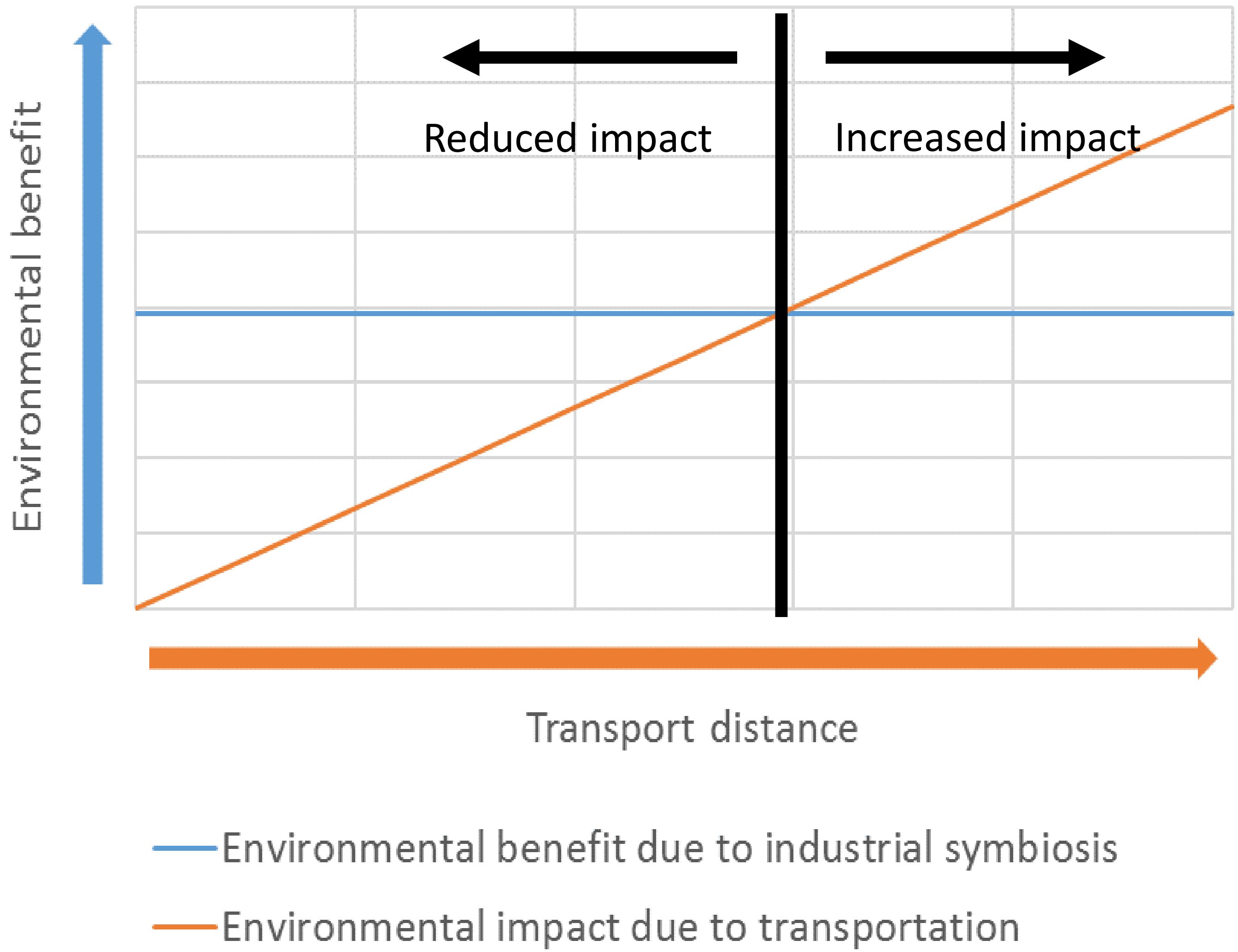
Transportation: tipping point



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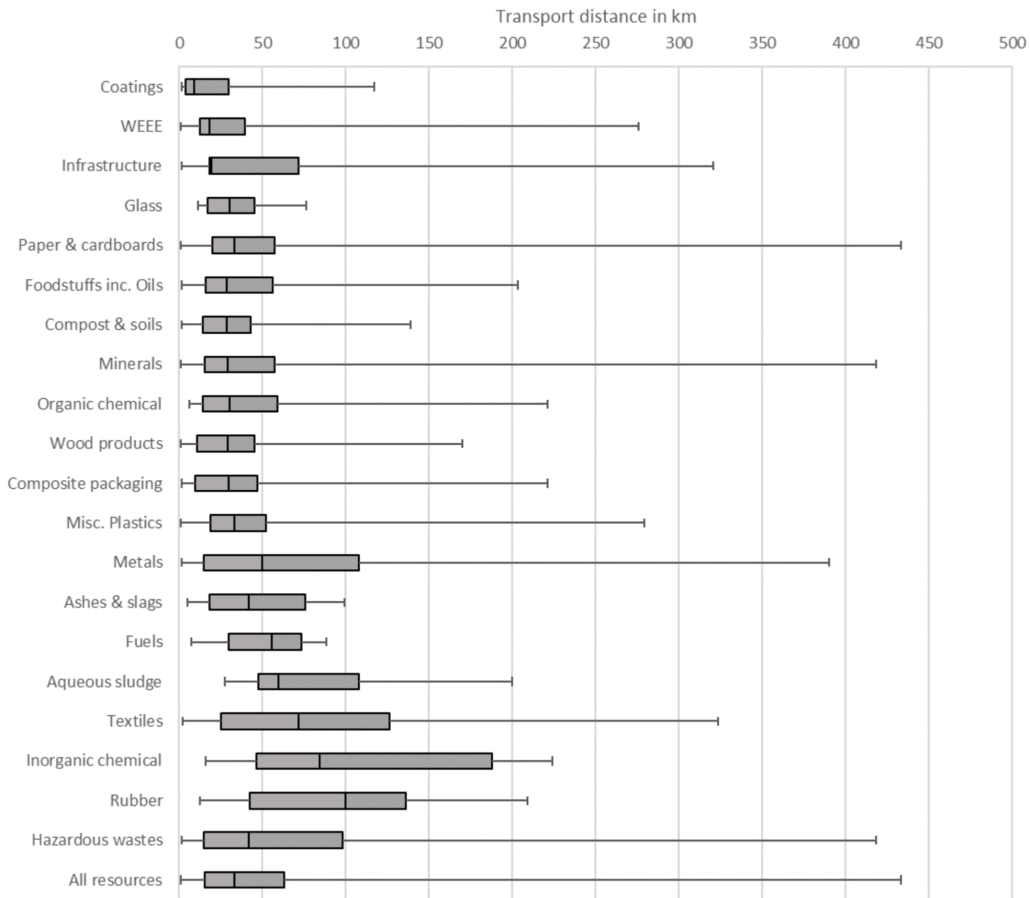
Geographic proximity NISP

- Travelled distances of shared resources facilitated by the National Industrial Symbiosis Programme (NISP) in the UK (total 979)

- Half of synergies completed within 34 km radius
- One-quarter of synergies involved distances greater than 64 km radius
- Some resources travel over 320 km:
  - Textiles
  - Metals
  - Minerals
  - Paper and card
  - Hazardous waste



Jensen et al. (2011), in Resources, Conservation and Recycling

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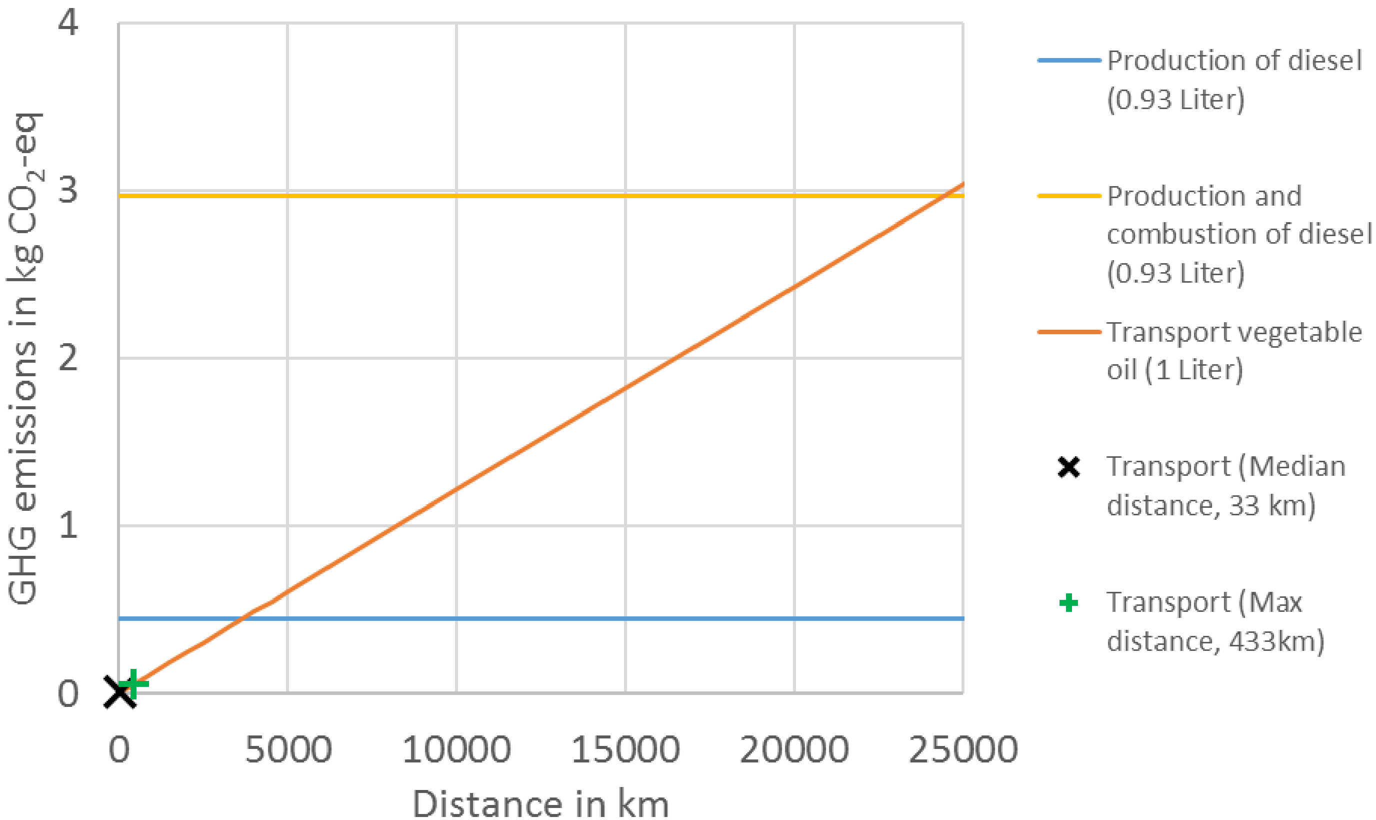
Tipping point: actual numbers



- Example: use of waste vegetable oil instead of diesel
- Blue: emissions of the production of 0.93 liter diesel (excl. combustion)
- Yellow: emissions of the combustion of 0.93 liter diesel
- Orange: emissions due to transportation of 1 liter waste vegetable oil

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Thanks for your attention!

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Partners

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