

# **INDUSTRIAL SYMBIOSIS**

## **KEY SOCIAL ASPECTS**

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## Definition of Industrial Symbiosis

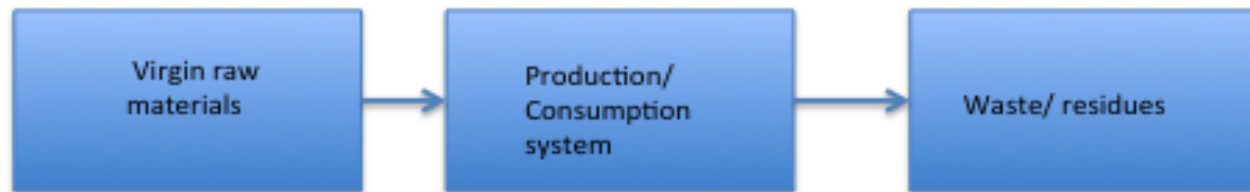
- Industrial Symbiosis (IS) is a **system approach** to **optimize material and energy cycles** by identifying **business opportunities** in the use of **underutilised resources** (such as materials, energy, water, capacity, expertise, assets etc.) (Lombardi, 2012).

# SYSTEM-APPROACH

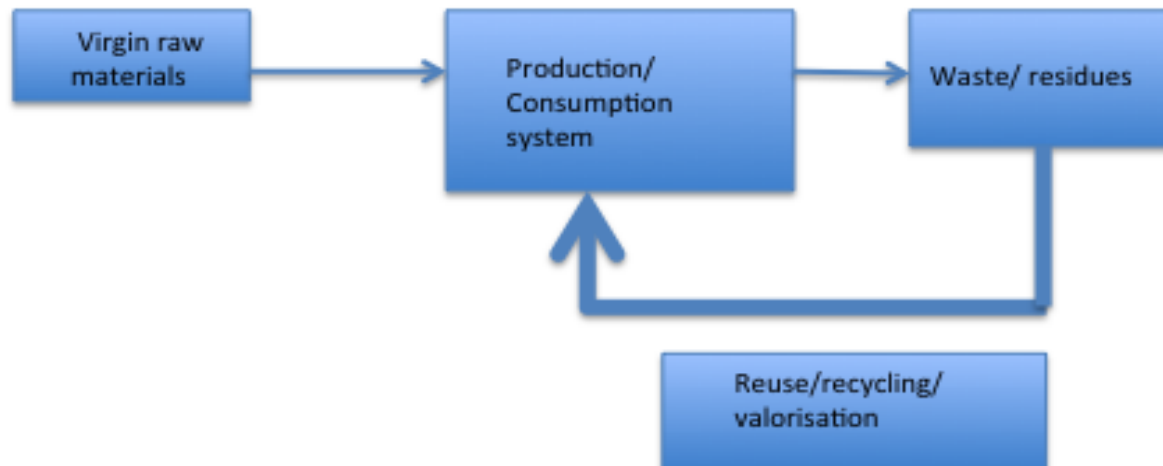
- A) **Integration of systems**: IS looks at the interconnections between economic-social-environmental systems
- B) Material and energy flows are optimised both at the facility and at the **industrial-system level**

## CLOSING THE LOOP OF MANUFACTURING PROCESSES

Linear  
system

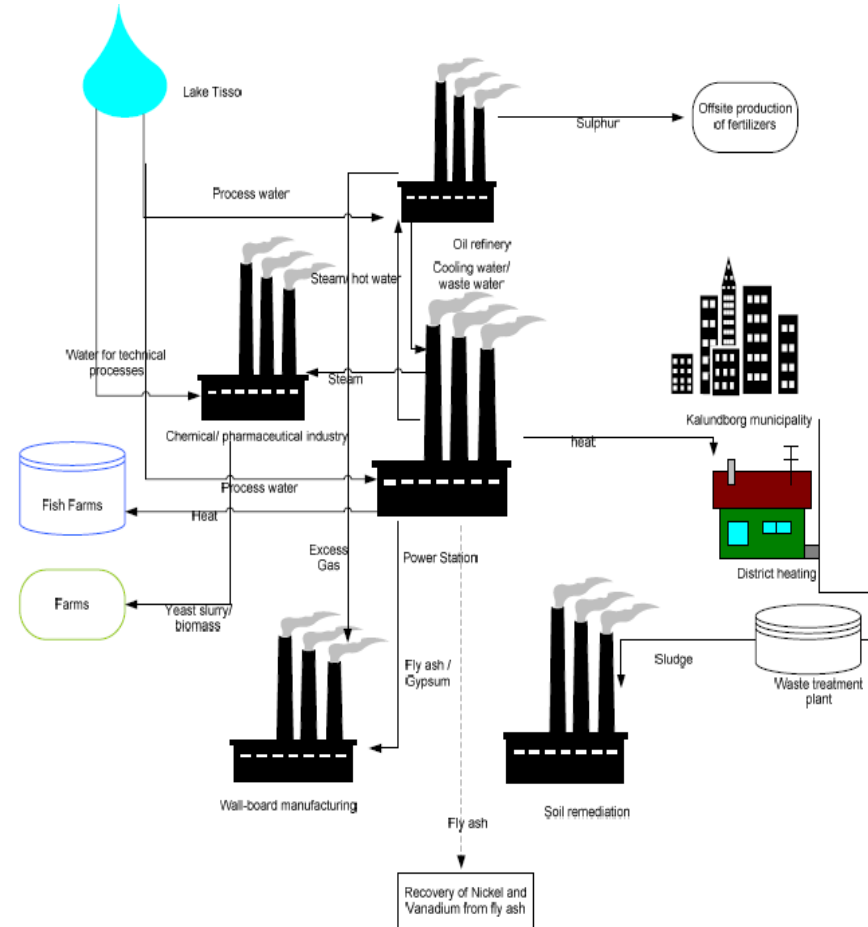


Circular  
system



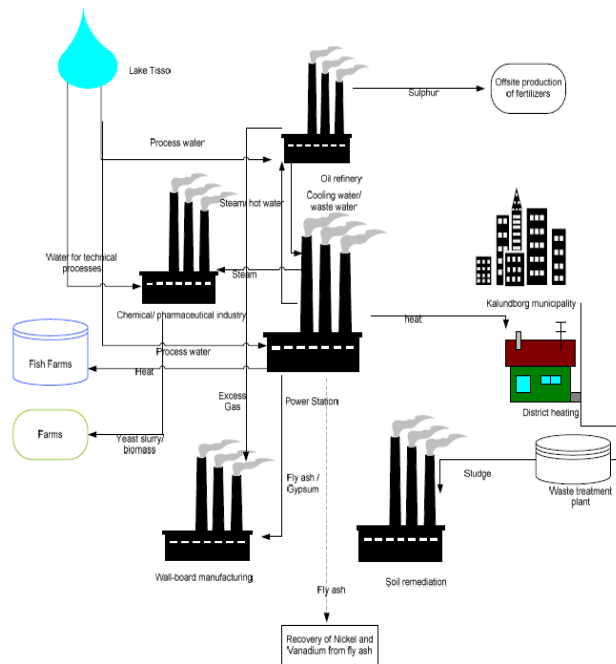
# The Ecological Metaphor

- Industrial units as organisms
- Waste are reprocessed as nutrients by scavengers- Different industries work as food chain
- Residual elements from the system are minimised

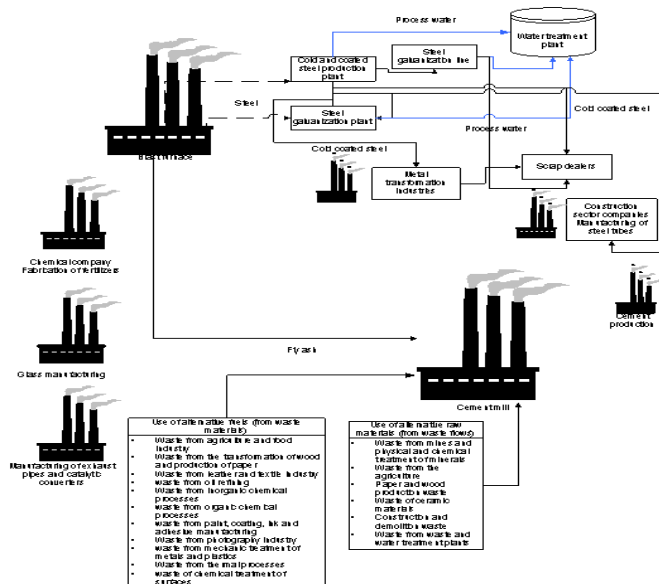


# SPOT THE DIFFERENCES

## • KALUNDBORG



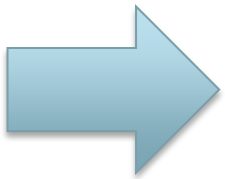
## • SAGUNTO



- What mechanisms make industrial symbiosis happen?
- Technical conditions are a necessary but not sufficient condition

# THREE LAYERS TO INDUSTRIAL SYMBIOSIS

- Material and energy flows
- Informational, knowledge and cultural ties
- Economic flows

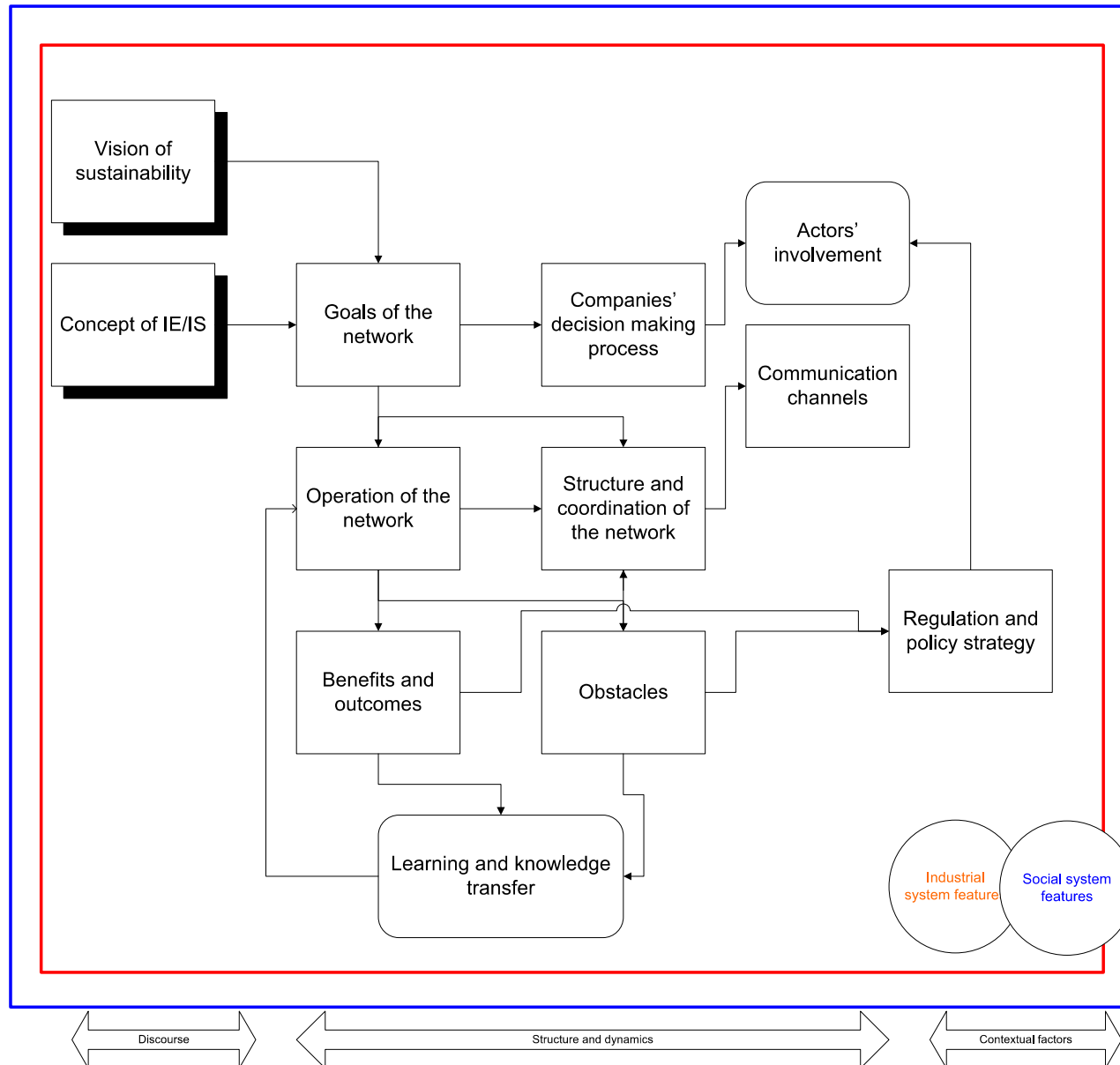


For industrial symbiosis to happen we need a combination of the three



# KEY SOCIAL ASPECTS IN INDUSTRIAL SYMBIOSIS

- THE ROLE OF AGENCY
- THE ROLE OF SOCIAL TIES: TRUST AND EMBEDDEDNESS
- THE ROLE OF POLICY



# EMBEDDEDNESS

- Describes how different actors interact and achieve cooperation by aligning patterns of actions
- Embeddedness has been an enabling mechanisms for industrial symbiosis: it creates trust and reciprocity, lowering social transaction costs
- There are different types of embeddedness: structural, cultural, social and political

# THE ROLE OF POLICY

- Policy provides the institutional framing of market transactions. What options would be economically and socially feasible highly dependent on policy
- It has acted as main initial driver for IS projects (increase in landfilling, ban and limitations on waste and residuals, etc)
- It is a necessary condition but not sufficient

## IS as an evolutionary approach

- Evolutionary approaches (Chertow, 2000):
  - Build on existing projects where some sort of energy/material transaction already exists (demonstration)
  - Pre-existent organisational relationships and networks
  - Anchor-tenant model

Thanks for your attention!

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