

CHALMERS

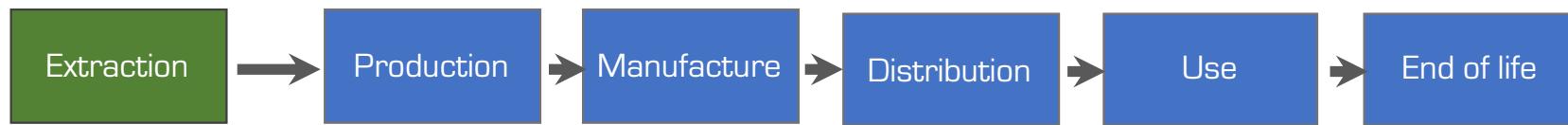
Industrial Symbiosis CONCEPTS

Leonardo Rosado and João Patrício
6th of March 2020

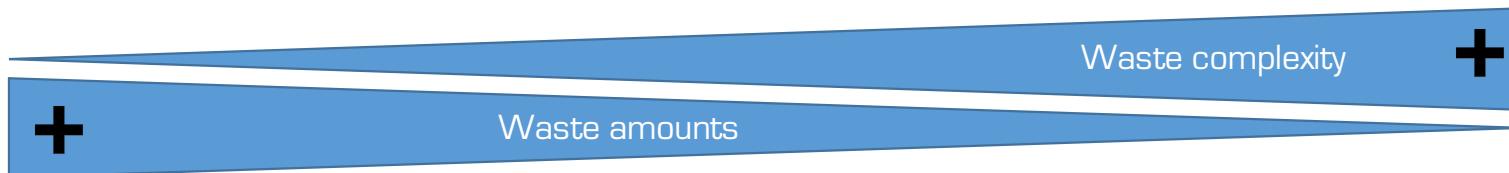
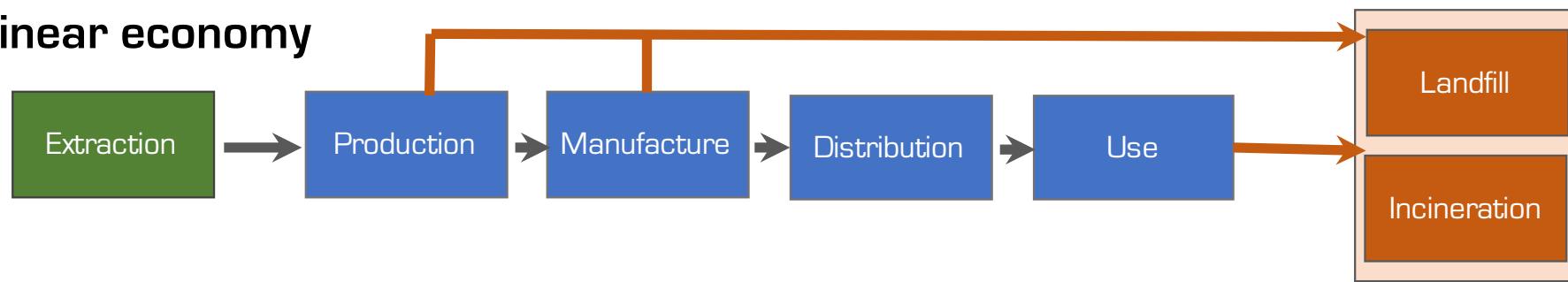


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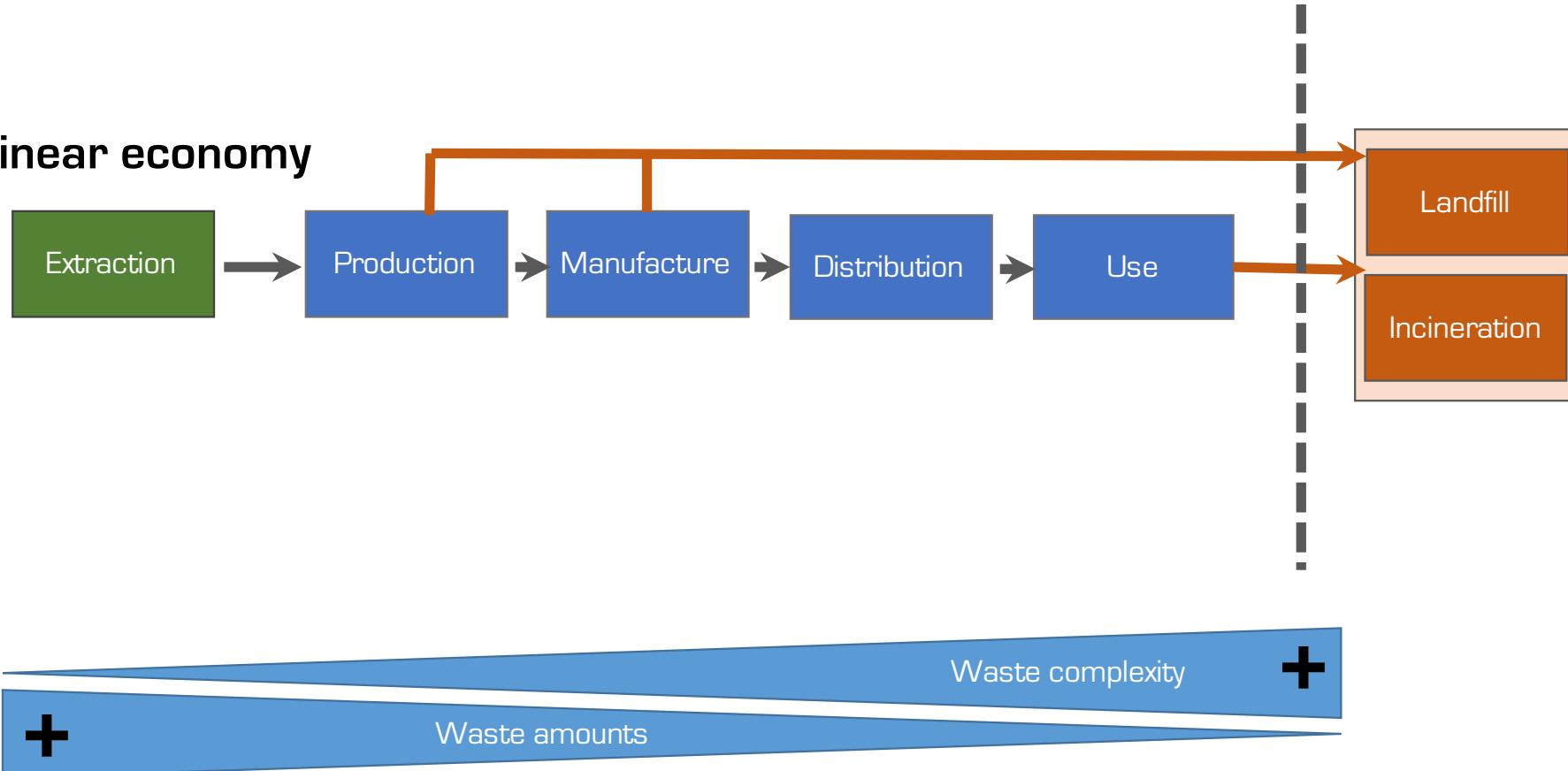
Supply chain



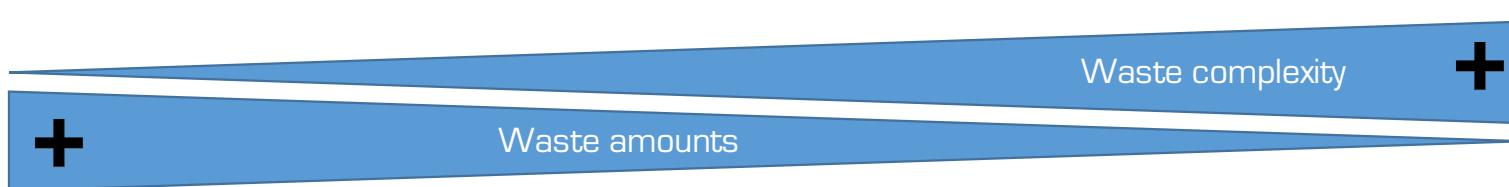
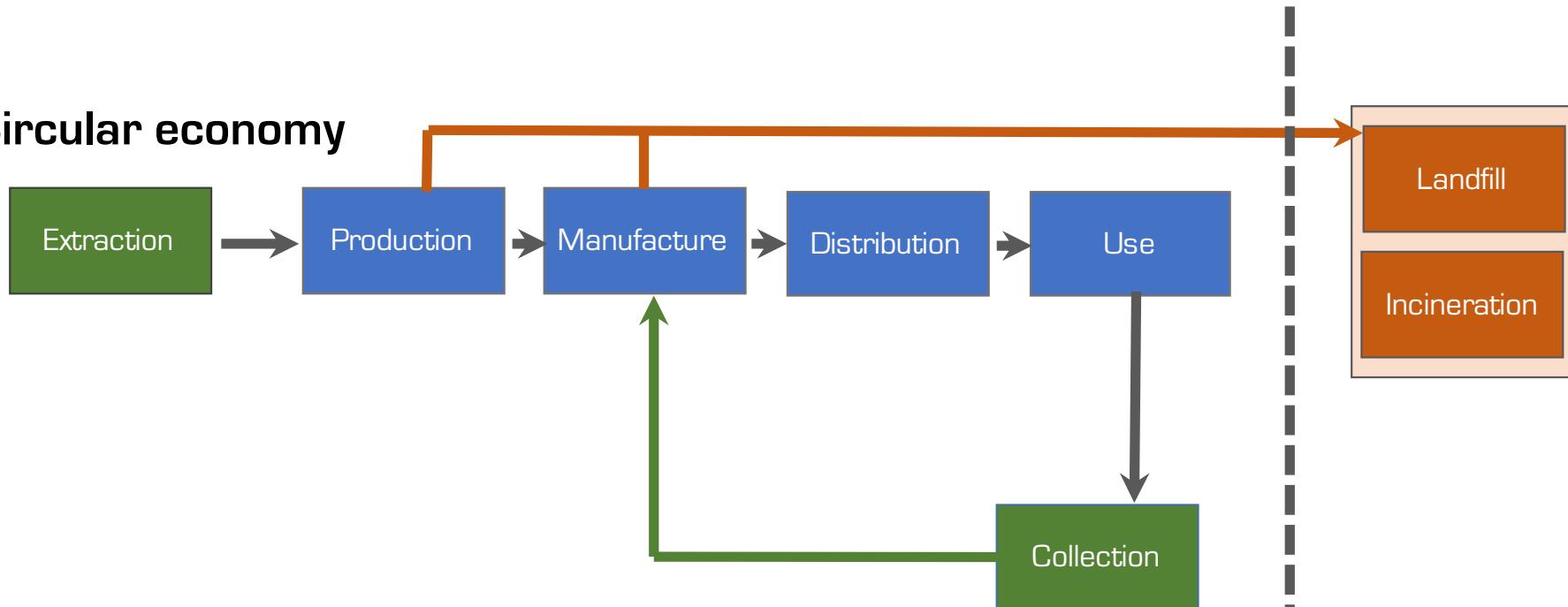
Linear economy

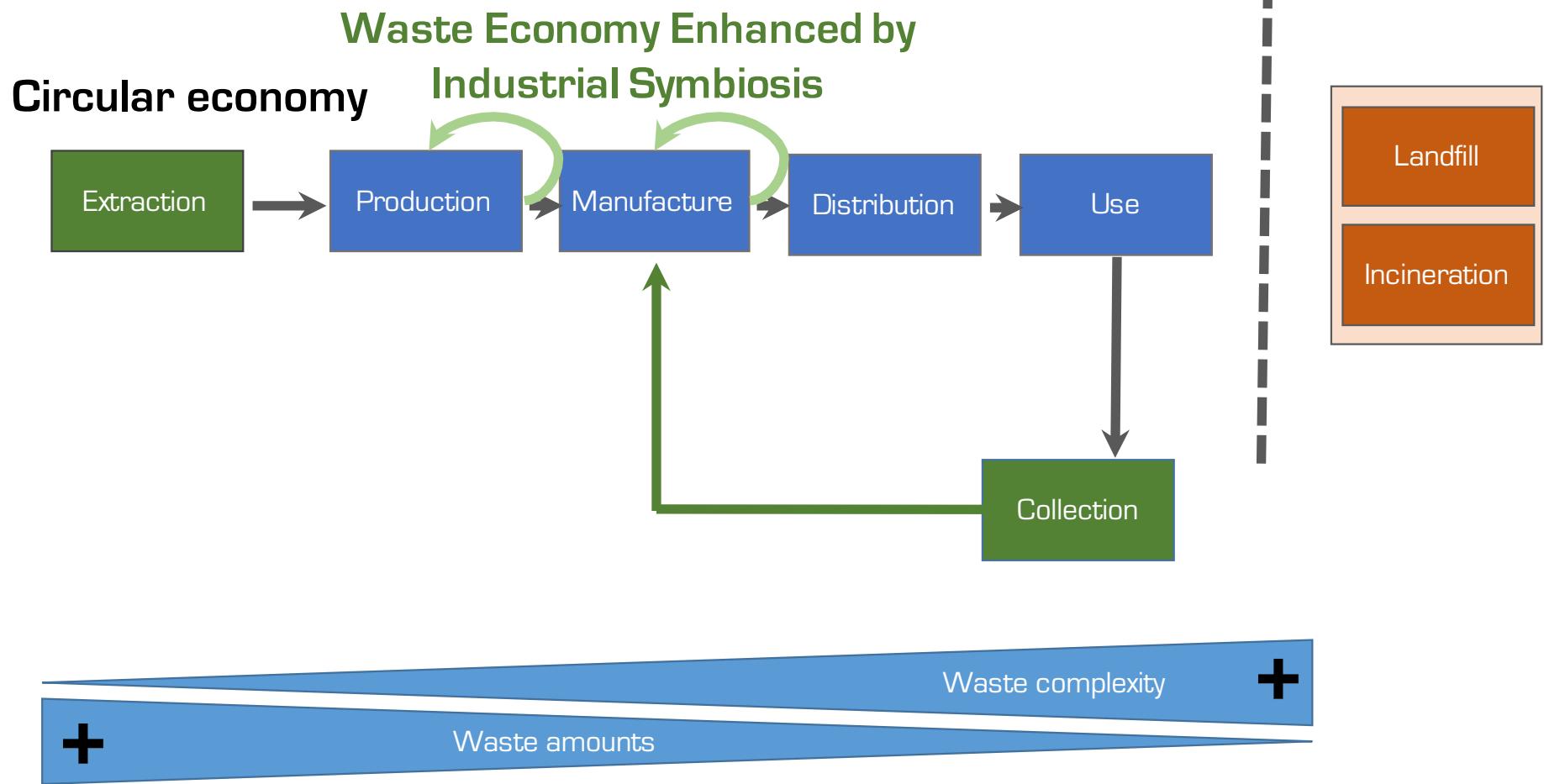


Linear economy



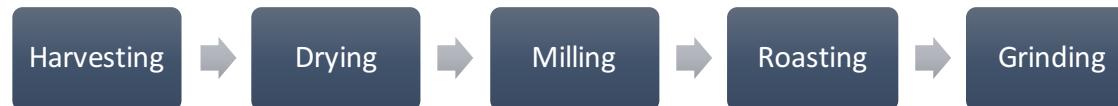
Circular economy





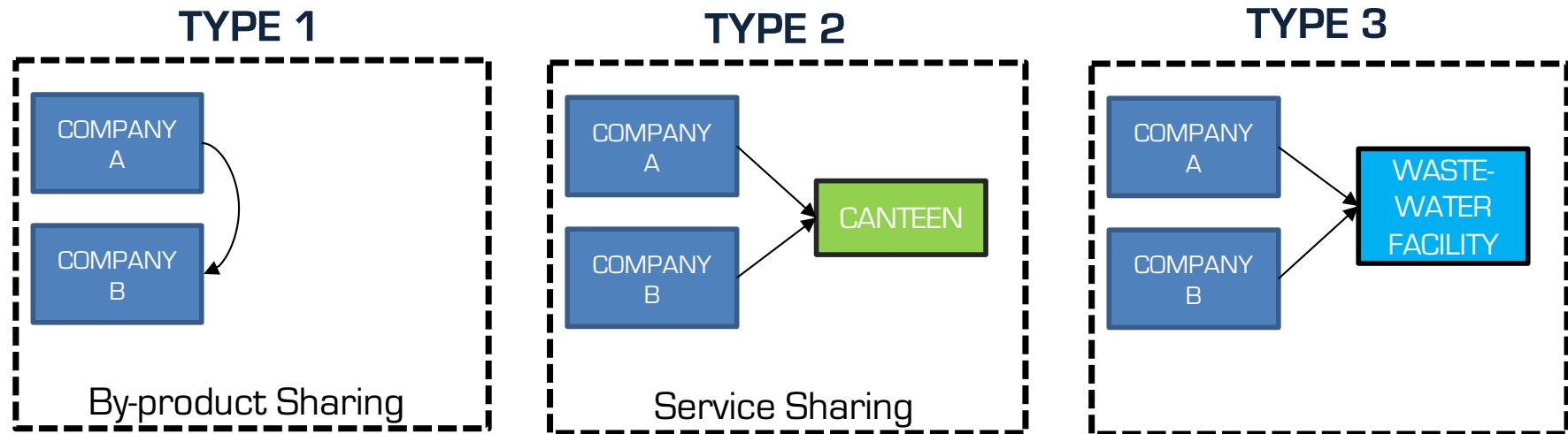
Coffee example

Second largest trade commodity in the world after petroleum



Examples of solutions for the waste:

- Converting pulp into nutrient-rich compost
 - Convert agriculture pulp into biogas
 - Making tea from dried coffee (innovative process)
 - Convert coffee pulp into Coffee Flour (innovative process)



Industrial Symbiosis

“**inter-firm sharing**, which include **physical exchanges** of wastes, energy, water and by-products, or **infrastructure** and **services** sharing.”

Industrial Symbiosis examples

Sugar factory and a Greenhouse

Location: Norfolk, United Kingdom

- **Waste heat and carbon dioxide** are transported to a greenhouse (18ha).
- Natural agents are used to **pollinate the crop - over 8,500 bees**
- More than **115 million liters of rainwater** is annually collected on the roof

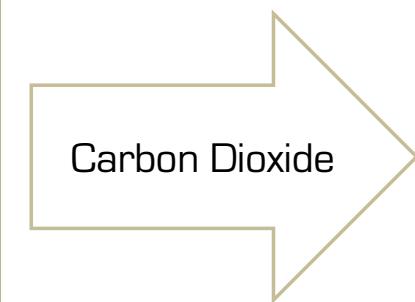


Geothermal energy production and methanol

Location: Iceland



Geothermal Plant

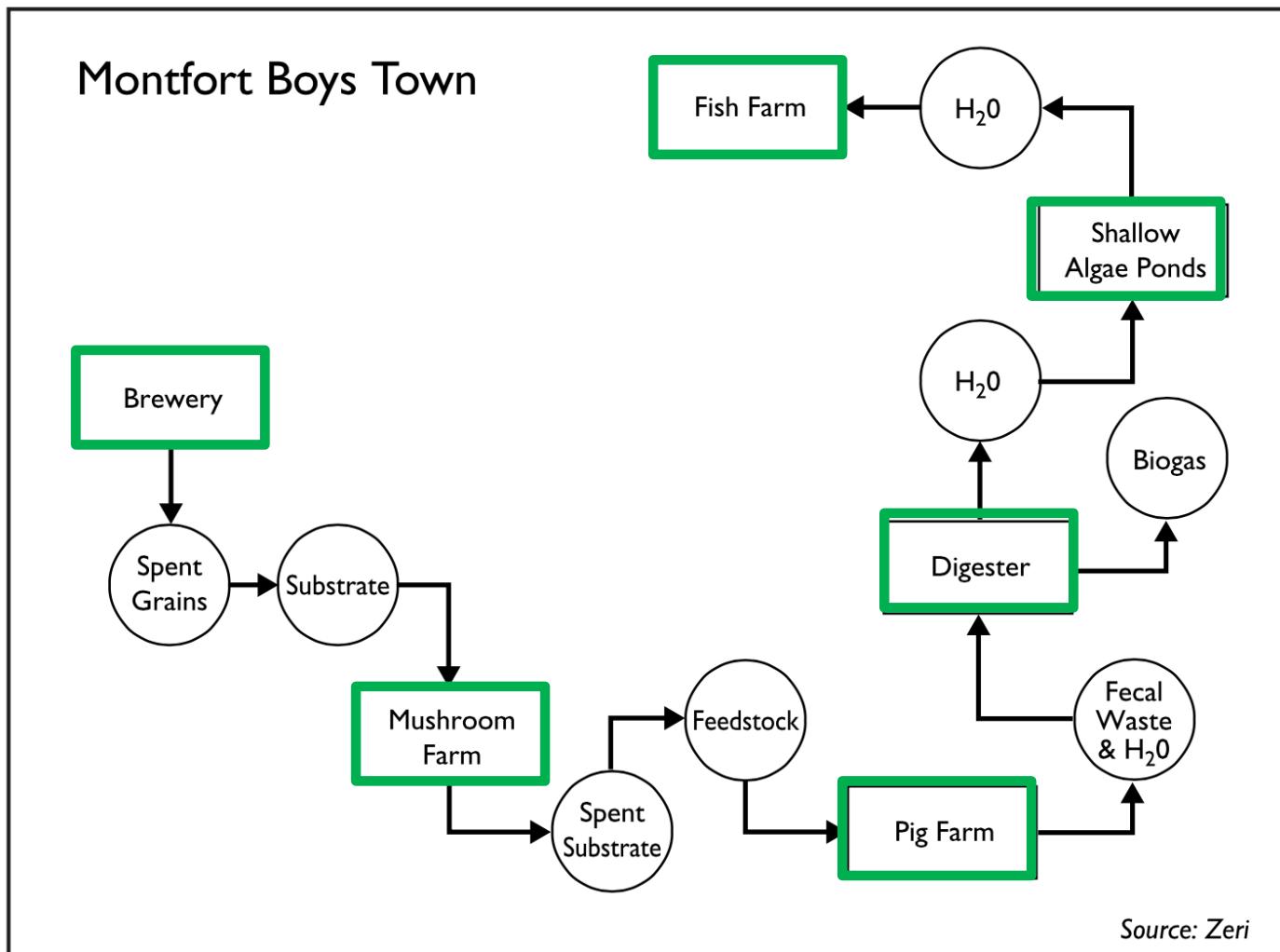


Methanol Plant

- **Methanol production:** 5 million liters a year
- **Carbon dioxide utilization:** 5.5 thousand tones per year
- **Energy Sources:** hydro and geothermal sources

Industrial park

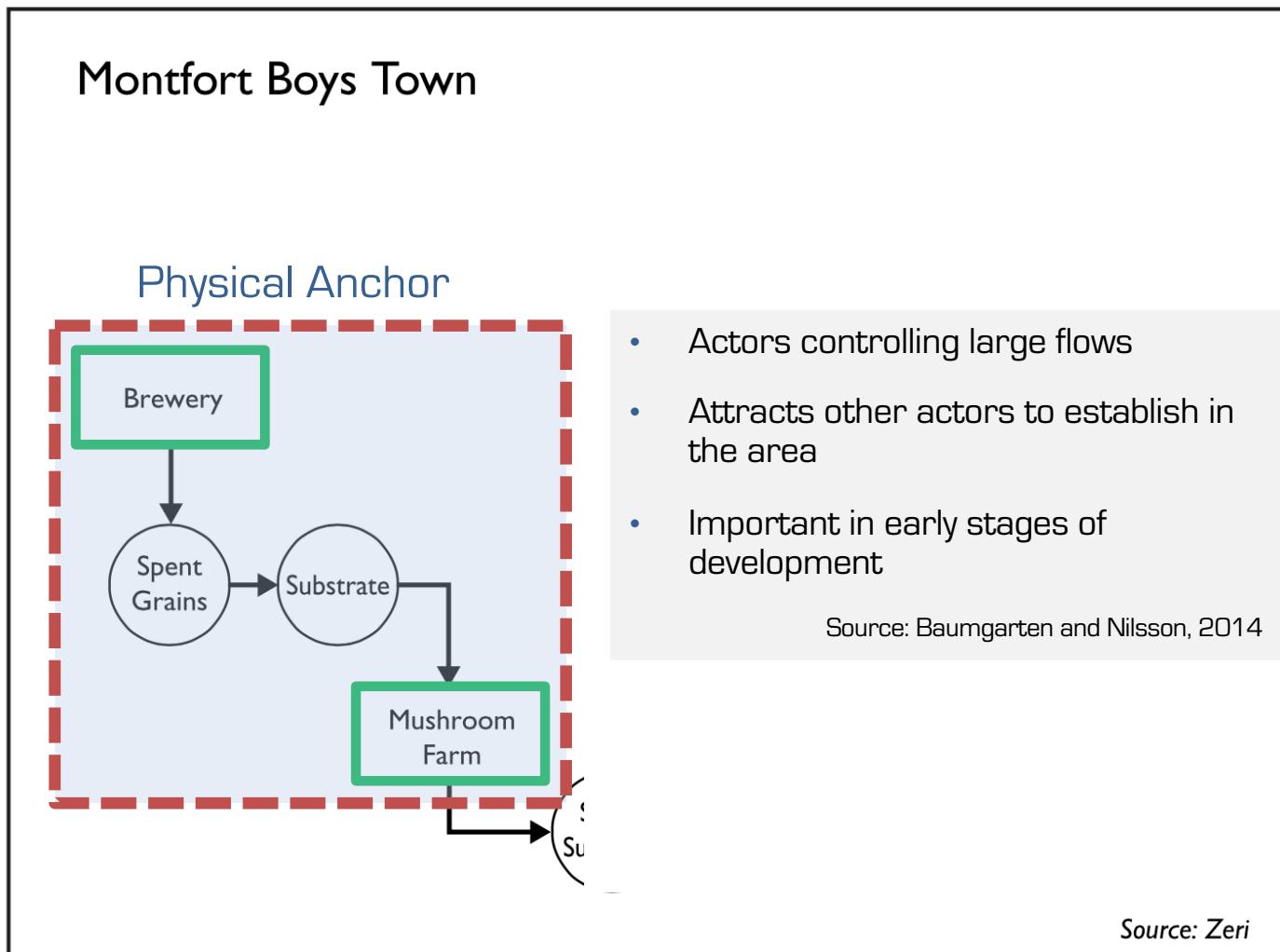
Location: Suva, Fiji



A Model IBS (Montfort Boys' Town, Suva, Fiji)

Industrial park

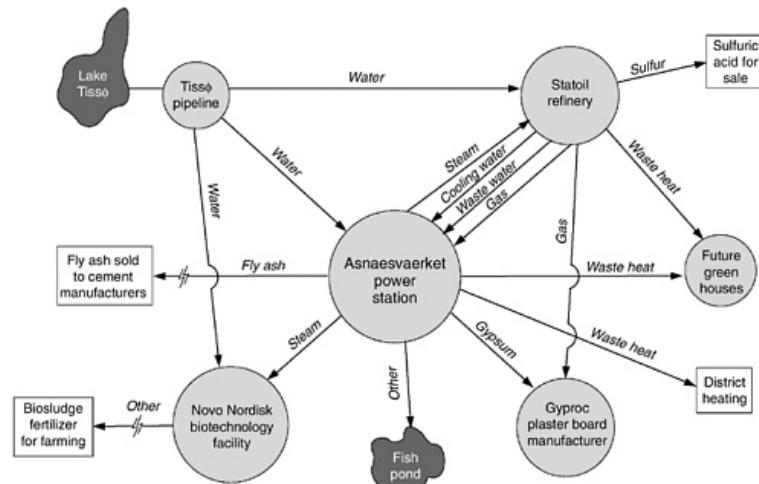
Location: Suva, Fiji



A Model IBS (Montfort Boys' Town, Suva, Fiji)

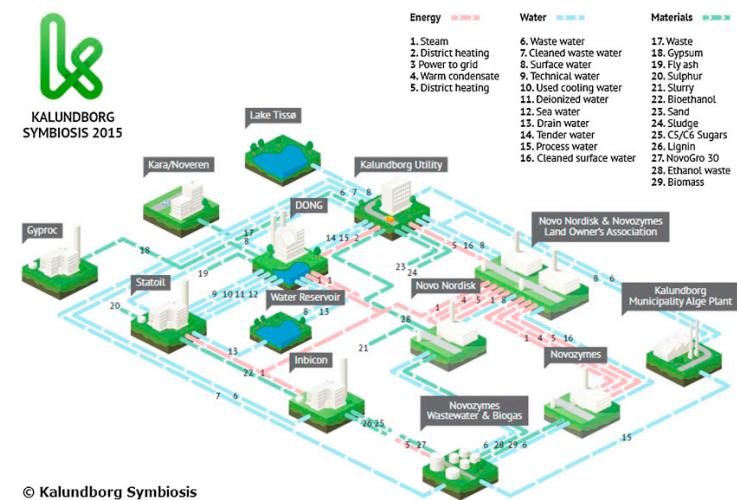
Industrial park

Location: Kalundborg, Denmark



1993

Source: <https://www.nap.edu>

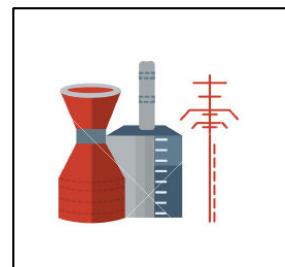


2019

Source: <http://www.symbiosis.dk/en/>

Exercise

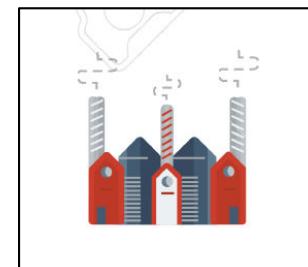
identify one example of industrial symbiosis that includes at least a company from the following industrial sectors: Agriculture, Food processing and Wood



Donor

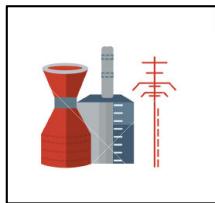


SHARING?



Receiver

Agriculture example



Farm



Mushrooms
Leftovers

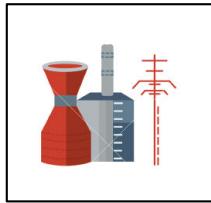


Pig raising



Mushrooms sauce

Wood example



Sawmill

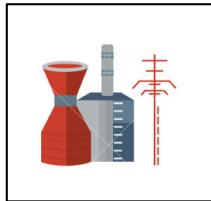


Sawdust



Plywood

Food example



Cheese
industry



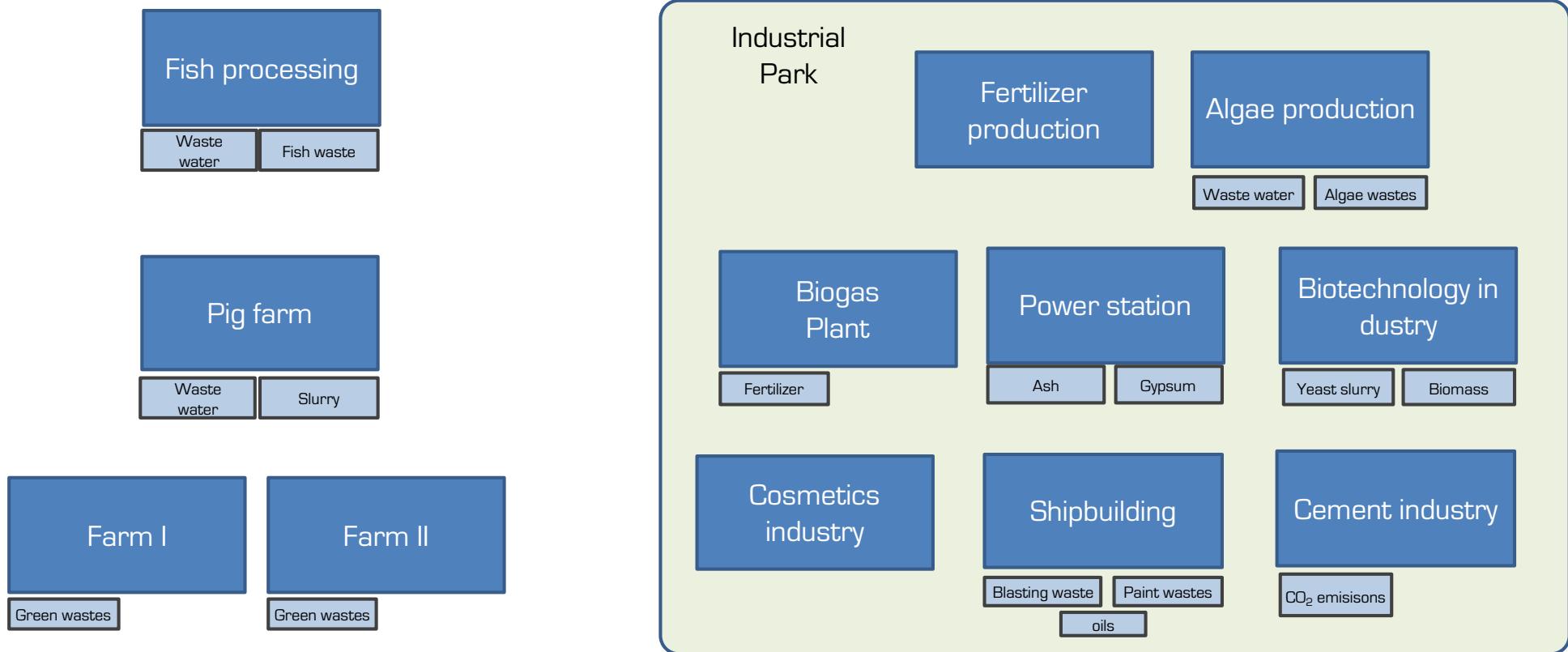
Whey



Protein shakes

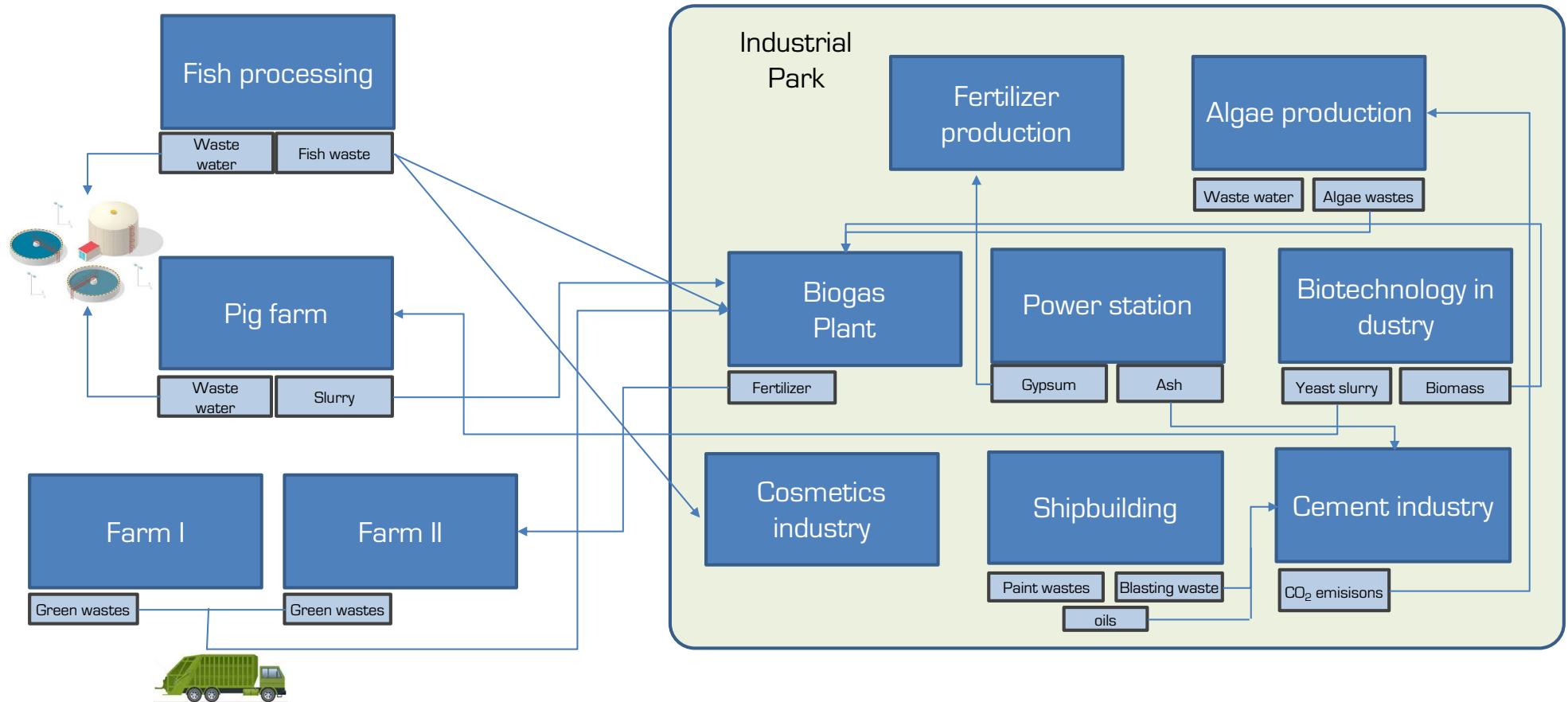
Exercise

suggest industrial symbiosis partnerships that could be implemented in the following system:



Exercise

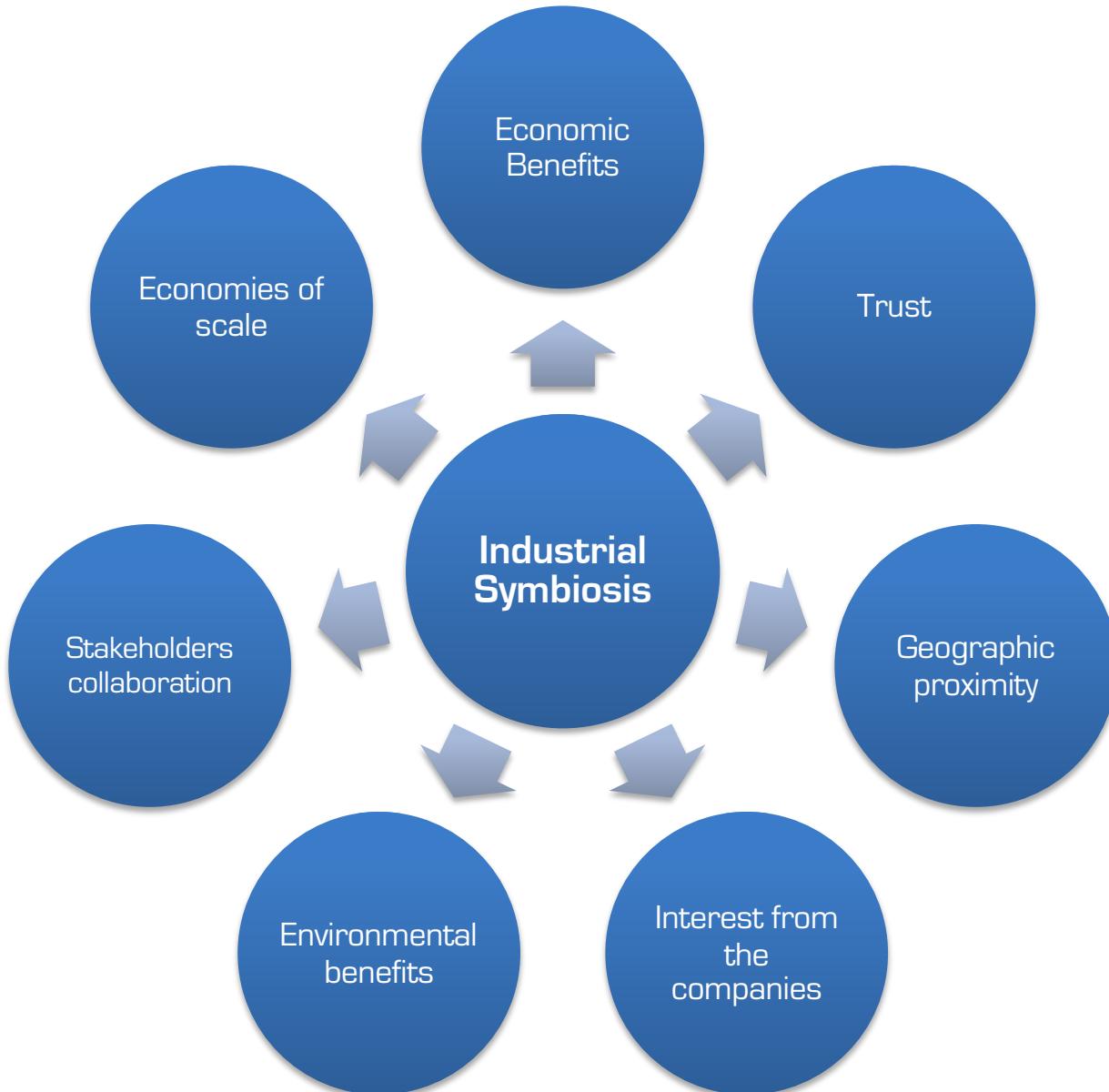
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Reflection

Discuss factors that may be important to make industrial symbiosis partnerships.
Use the previous linkages to give examples, if necessary.

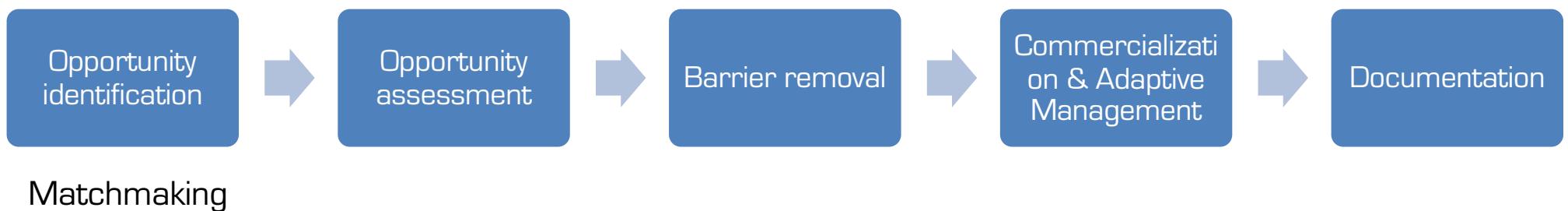
Important factors for initiating Industrial Symbiosis



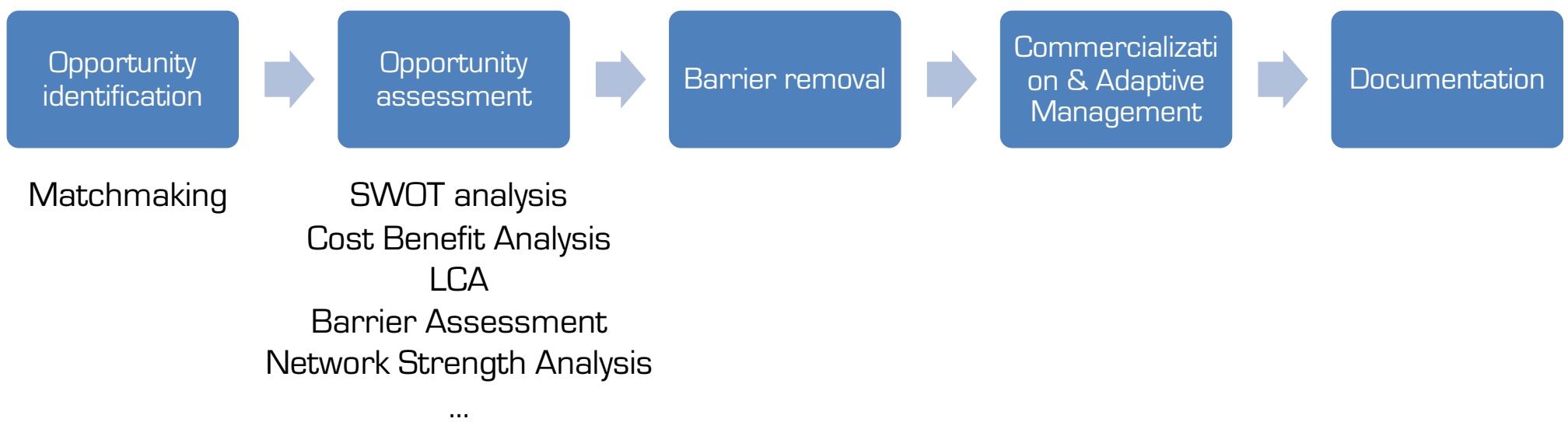
Industrial Symbiosis implementation steps



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