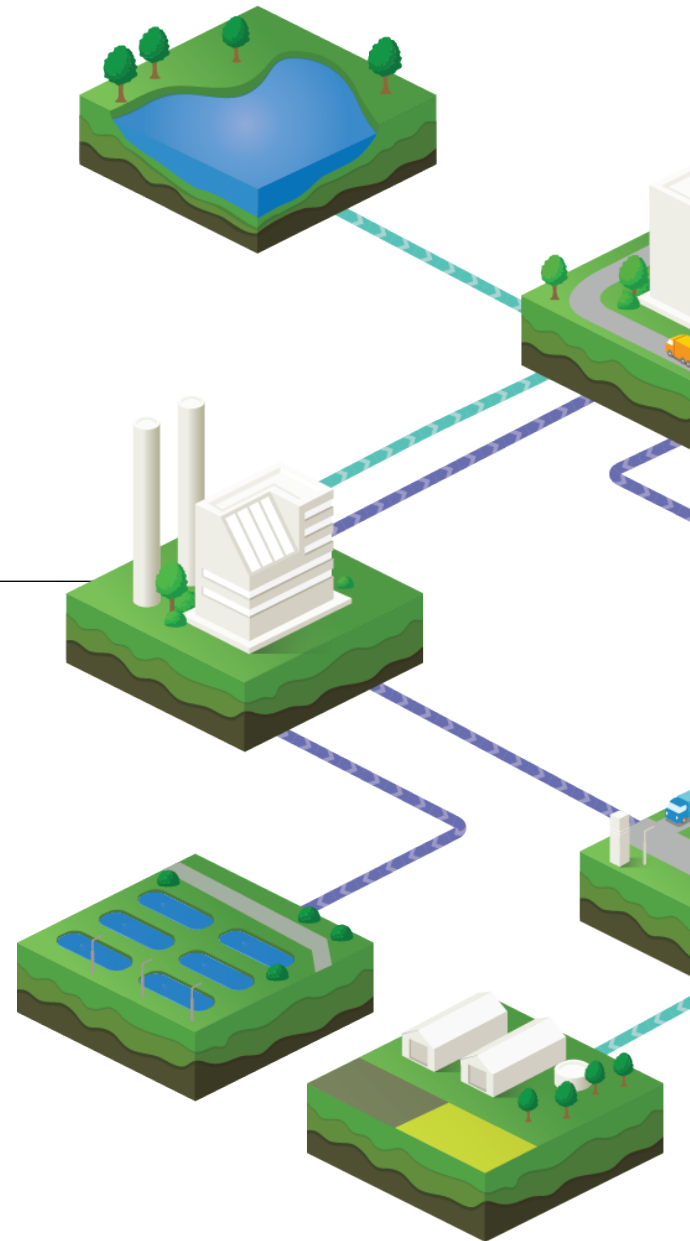




KALUNDBORG SYMBIOSIS

Resource Efficiency &
Industrial Ecology

Niels Larsen
1. March 2012



Kalundborg



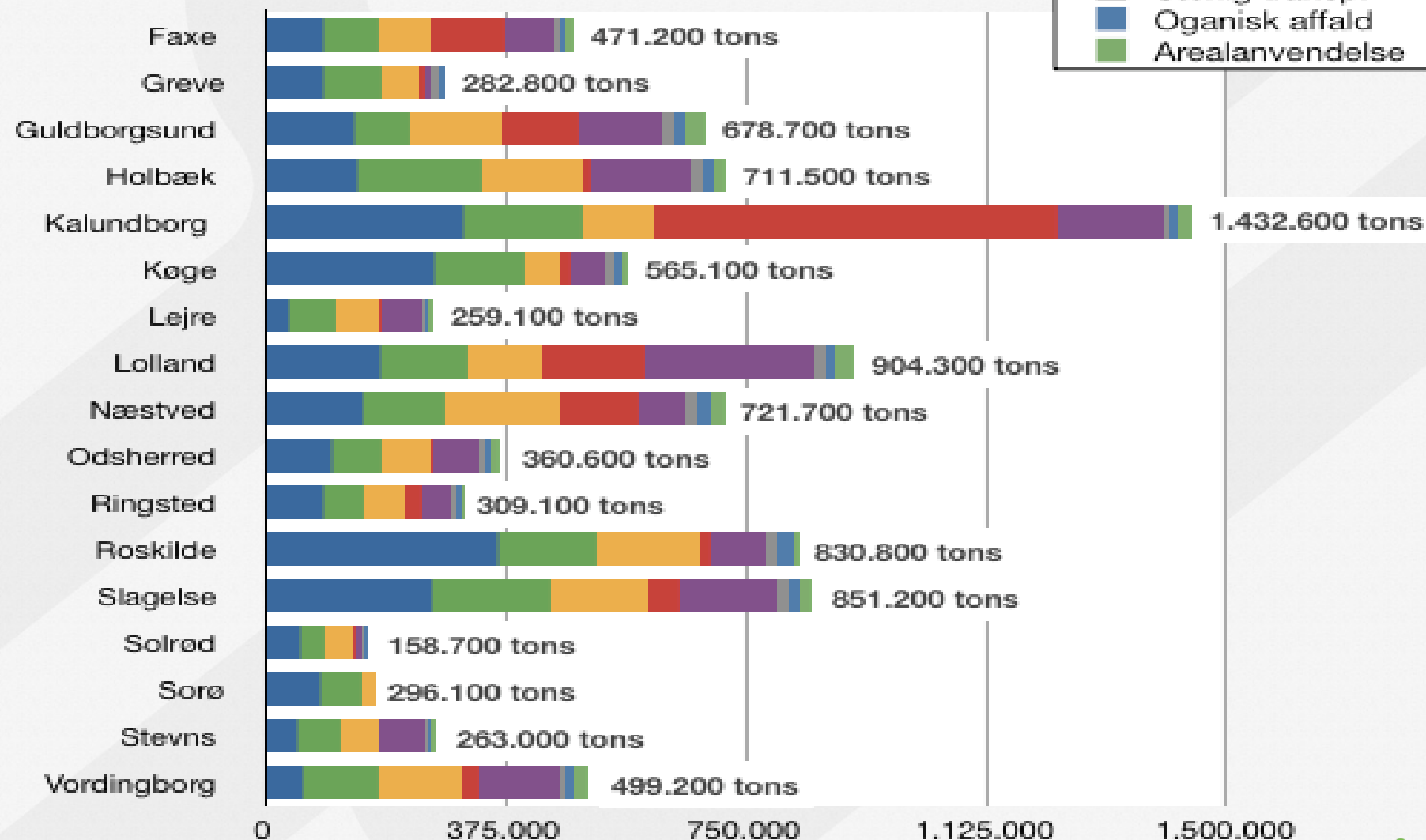
Kalundborg hosts Zealand's largest industrial concentration outside of Copenhagen.

The annual emission of Kalundborg's industries is approx 9 % of Denmark's total CO₂ emission (2008).

Region Sjælland

Udledningen af drivhusgasser 2008

Mængder i tons



Kalundborg Symbiosis is the world's first working industrial symbiosis.

- One partner's bi-product is the raw material in another partner's production.
- Kalundborg Symbiosis is based upon commercial agreements between independent partners.
- Today, over 30 waste streams exist between partners.

Movie Kalundborg Symbiosis

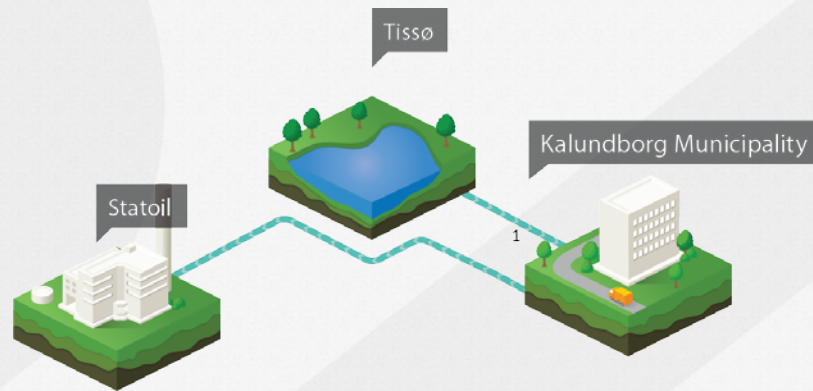
<http://www.symbiosis.dk/video>

<http://www.youtube.com/watch?v=1yCYGOxnpSY>

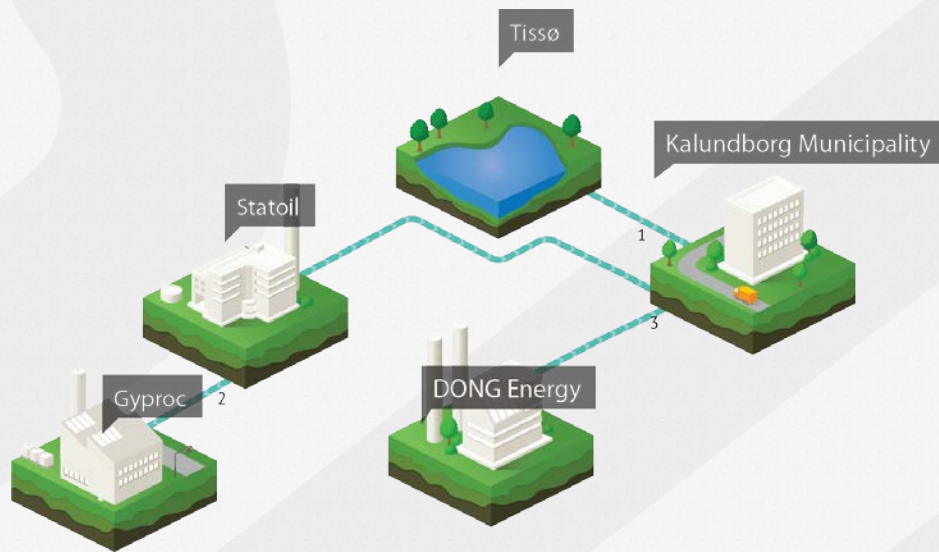
Kalundborg Symbiosis: How it started.

- The Symbiosis was not invented, but developed organically over many decades.
- Kalundborg Symbiosis was a “non-project”, created by a “non-organisation”.
- Symbiosis means ‘collaboration between different organisms for mutual benefit’ - a metaphor used about the system since 1991.

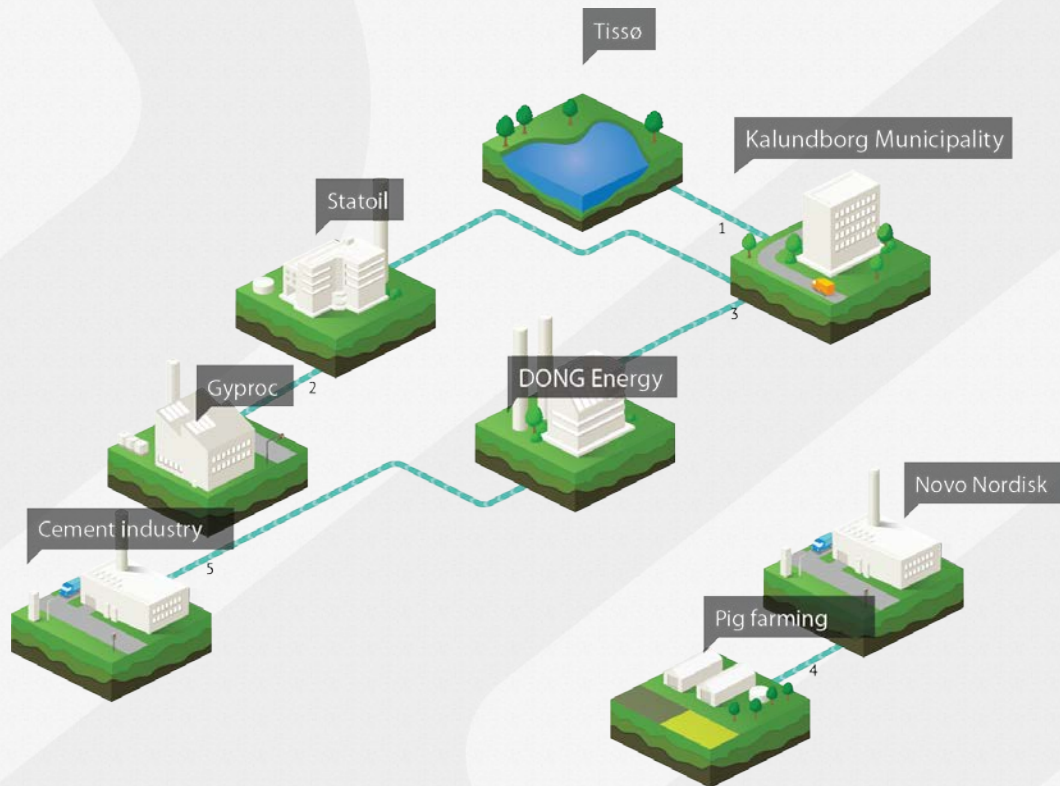
1961



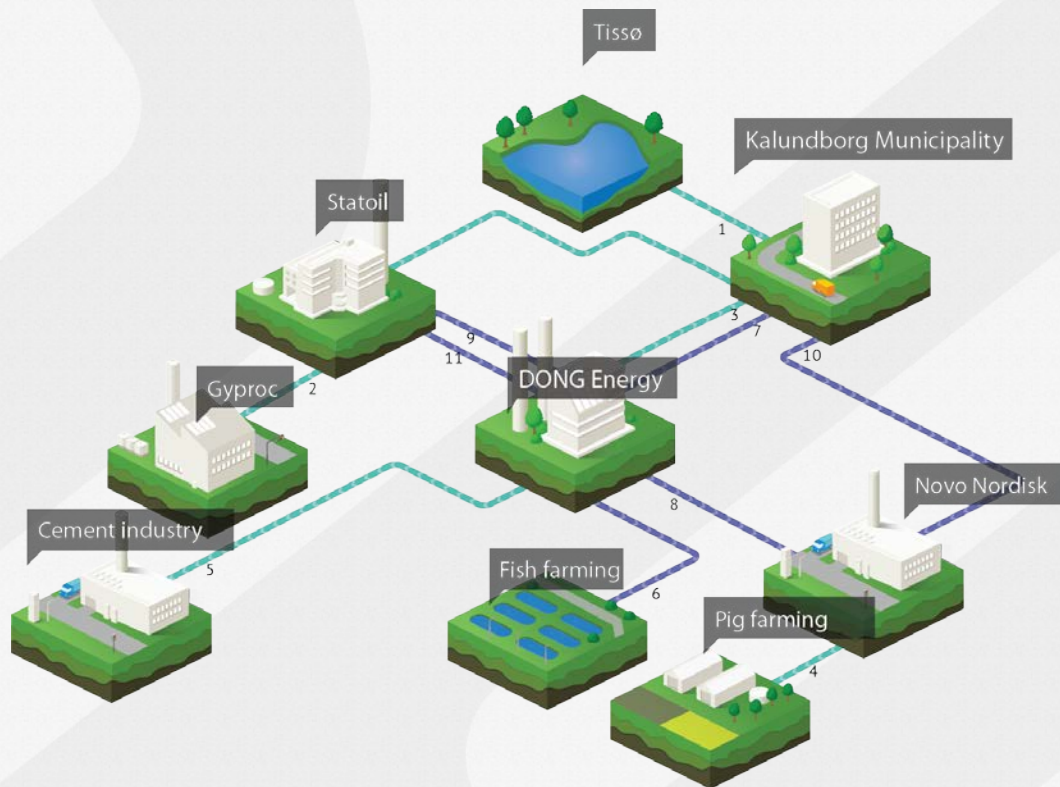
1972



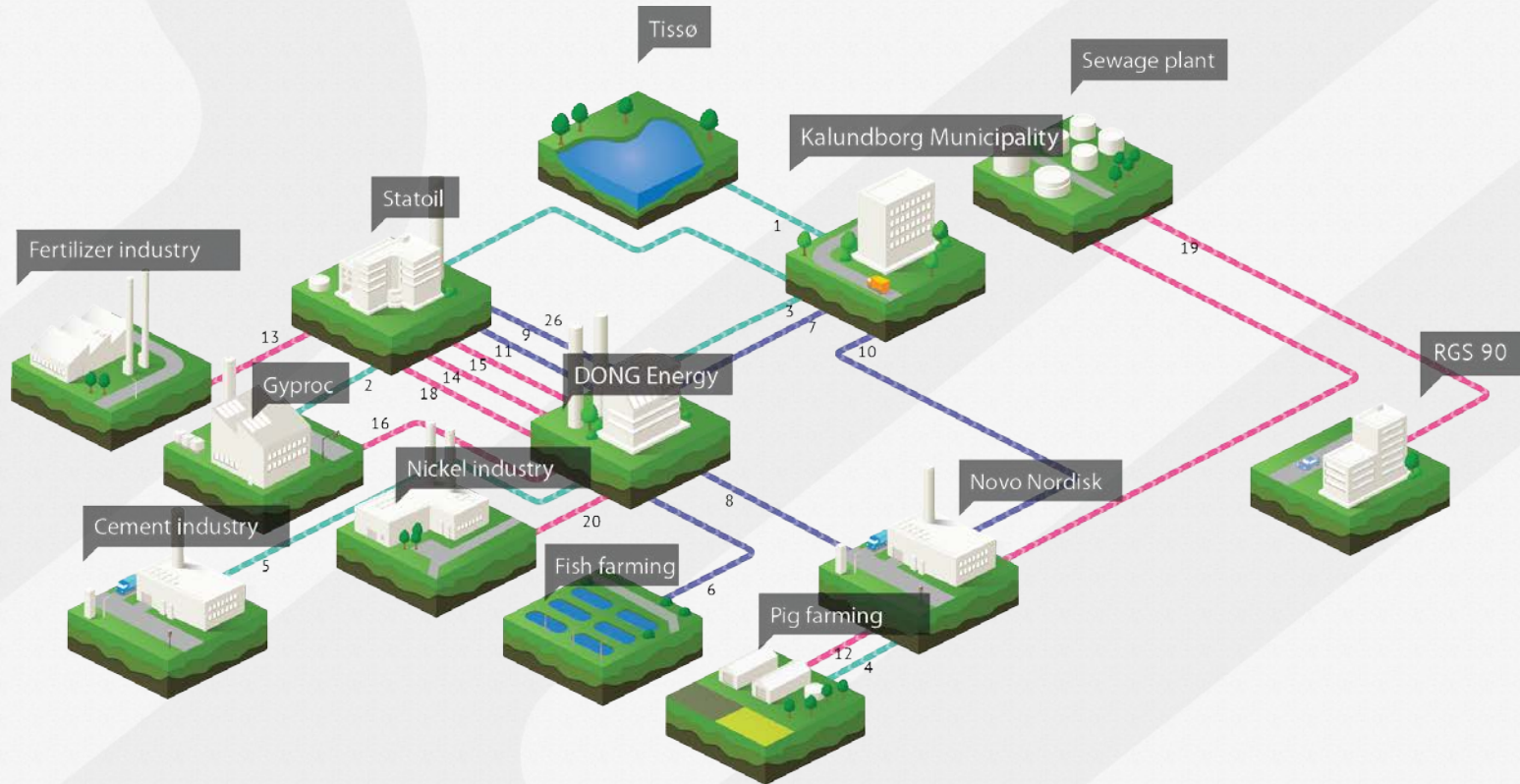
1979



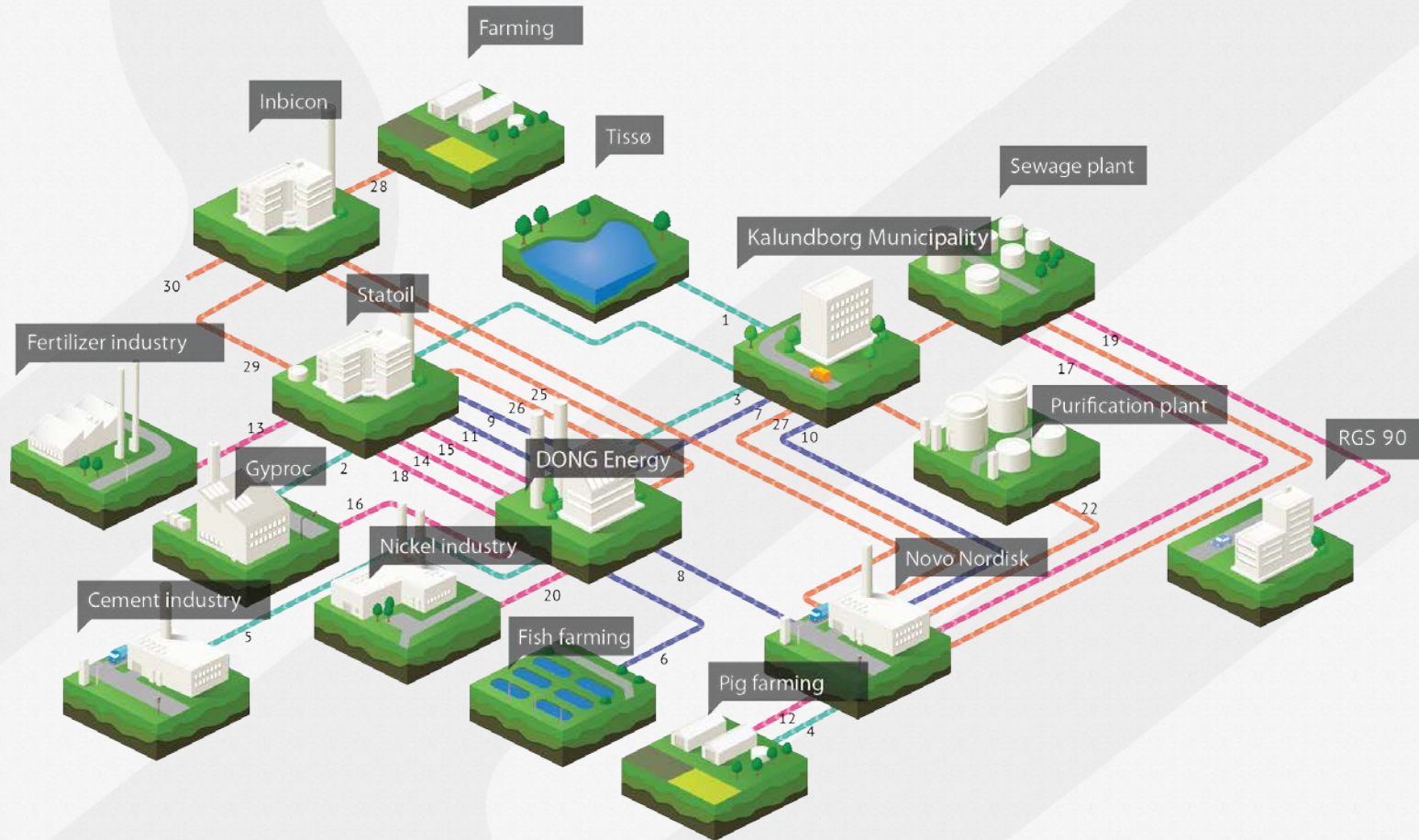
1980 - 1989

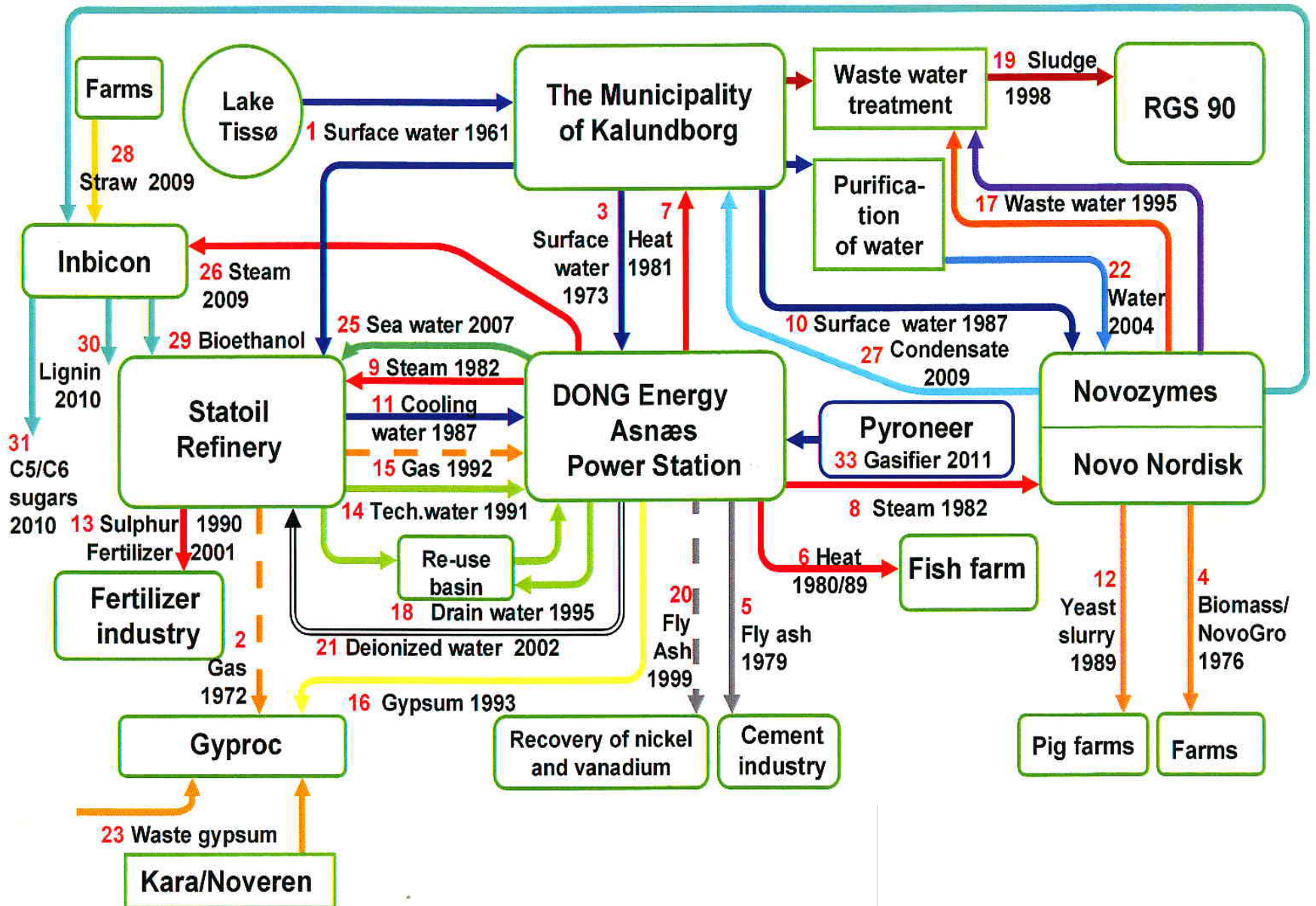


1990 - 1999



2000 - 2010







Types of Projects

Three types of projects:

Recycling of water:	14 Projects
Exchange of energy:	7 Projects
Recycling of waste products:	12 Projects

Environmental Aspects

Resource savings:

Examples:

Ground water	1,9 mill. m ³ /year
Surface water	1,0 mill. m ³ /year
Natural gypsum	200,000 tonnes/year
Oil	20,000 tonnes/year

Reduction of CO₂ emission (2008):

275.000 tons

5 principles for making a successful symbiosis:

Principle #1:

- In a successful symbiosis the members fit together but can be different.

Principle #2:

- In a successful symbiosis the members focus on large, continuous waste streams.

Principle #3:

- In a successful symbiosis every project is economically feasible.

Principle #4:

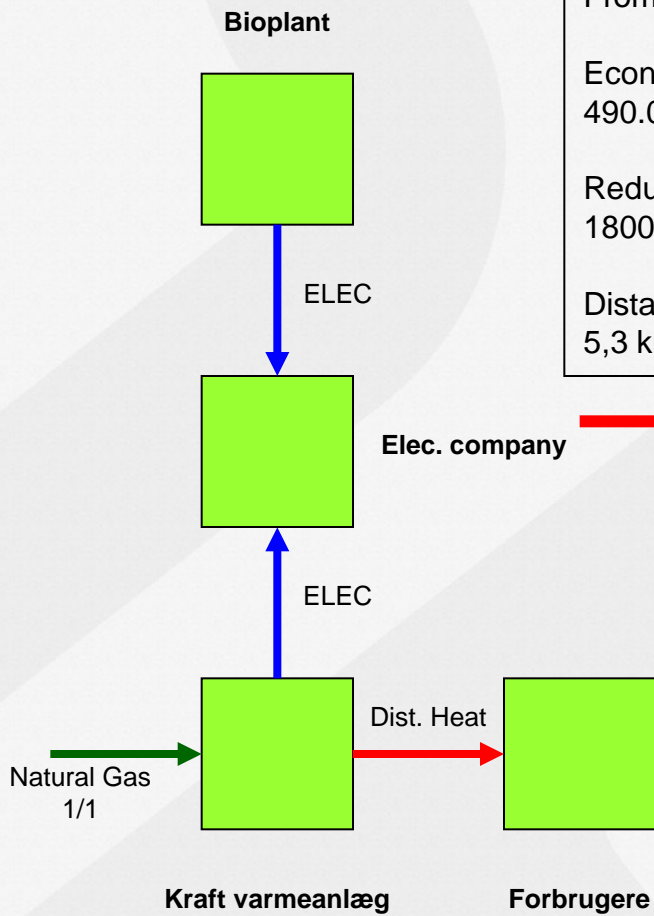
- In a successful symbiosis the geographical distances between the members is small.

Principle #5:

- In a successful symbiosis the mental distances between the members is small.

Example small Symbiosis

Before



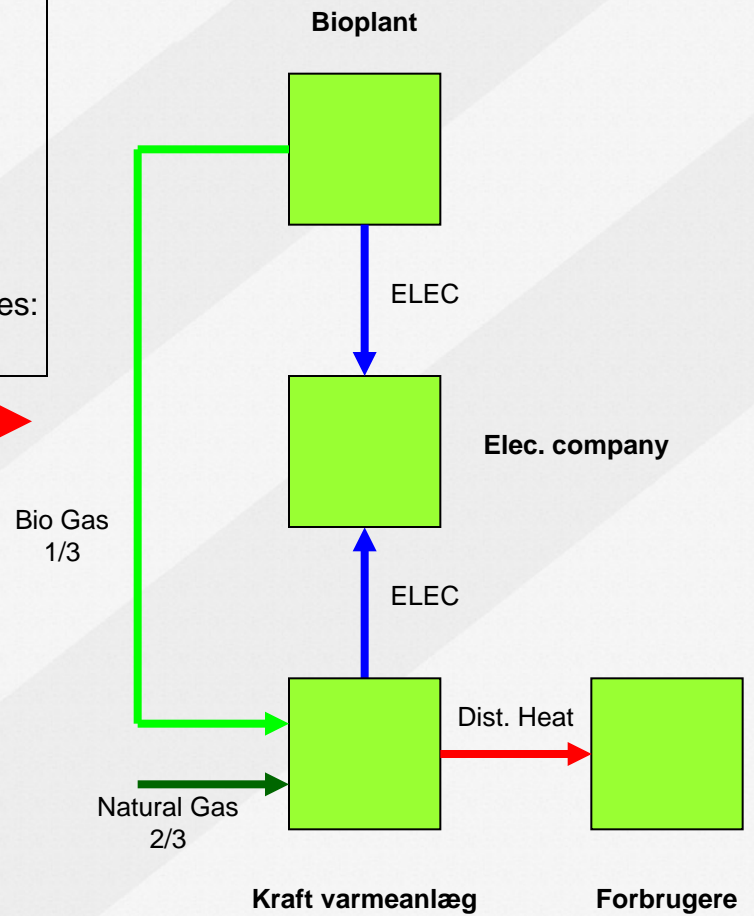
Before and now biogas
From 25% to 90%

Economic benefits min.
490.000 Euro/year

Reduction Co2 emission
1800 ton/year

Distance between companies:
5,3 km

Now





The recipe for success in Kalundborg?

- The industrial potential existed:
 - Several large industries
 - Limited physical distances (location)
 - "A good fit"
- The economic incentive existed
- There were no legal barriers
- The communication was good: 1) managers were already acquainted, 2) no competitors were involved, 3) open management style

Lessons learned from Kalundborg

- The Kalundborg Symbiosis is a spontaneously developed network – a bottom-up, not a top-down phenomenon
- Economy was the initial incentive; environmental idealism came later
- In practice, the mutual dependence between the partners has never been a problem
- Communication is more important than technology





Future for Symbiosis development (in Scandinavian)

- Support from authorities.
- Frame and regulative (laws) in the countries.
- Financiering from Governments foundation or programs for facilitating and matchmaking.
- Anchoring of a facilitating unit – ex. The Symbiosis Center – non-profit independent organization.

Please visit
www.symbiosis.dk
www.symbiosecenter.dk
to find more information.

and join our groups on:



**Systems make it possible,
- but people make it happen**

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