

# INDUSTRIAL SYMBIOSIS V 2.0



- HOW GLOBAL CHALLENGES BECOME LOCAL  
ADVANTAGES

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# KALUND BORG

An aerial photograph of Kalundborg, Denmark, showing a coastal town, industrial area, and a large body of water. The town is built on a peninsula, with a large harbor area. The industrial area is located in the center, with several large buildings and a railway line. The water is a deep blue, and the sky is clear. The text "KALUND" and "BORG" is overlaid in large white letters.





Kalundborg Municipality

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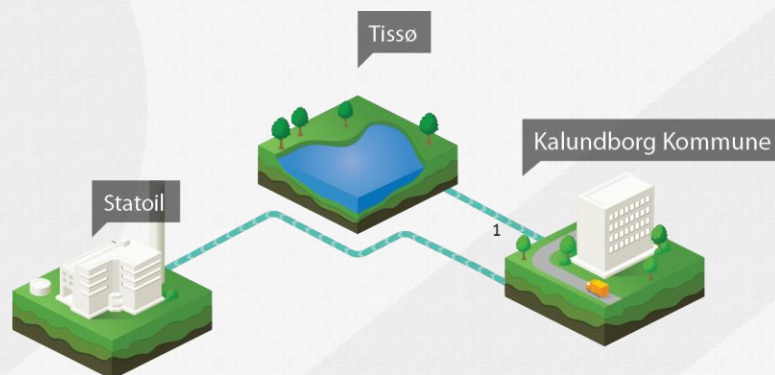
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1961



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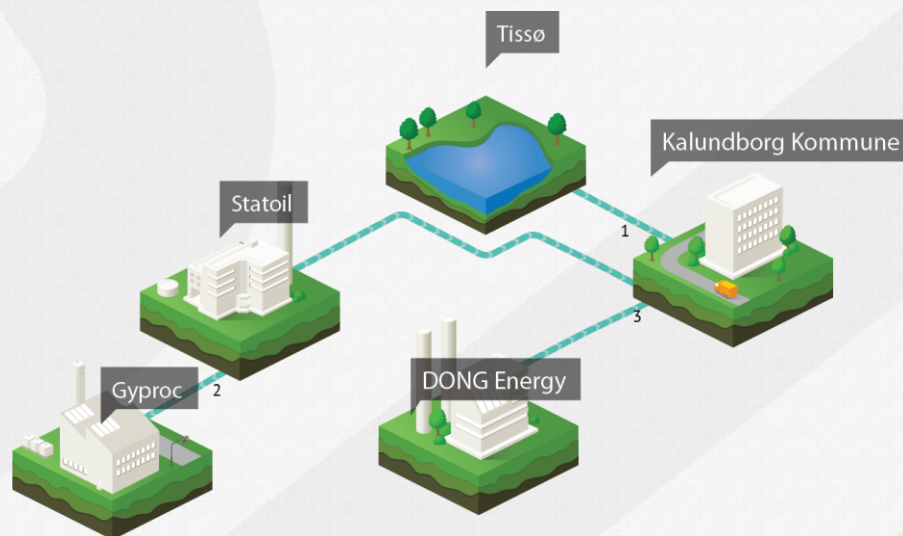


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1972



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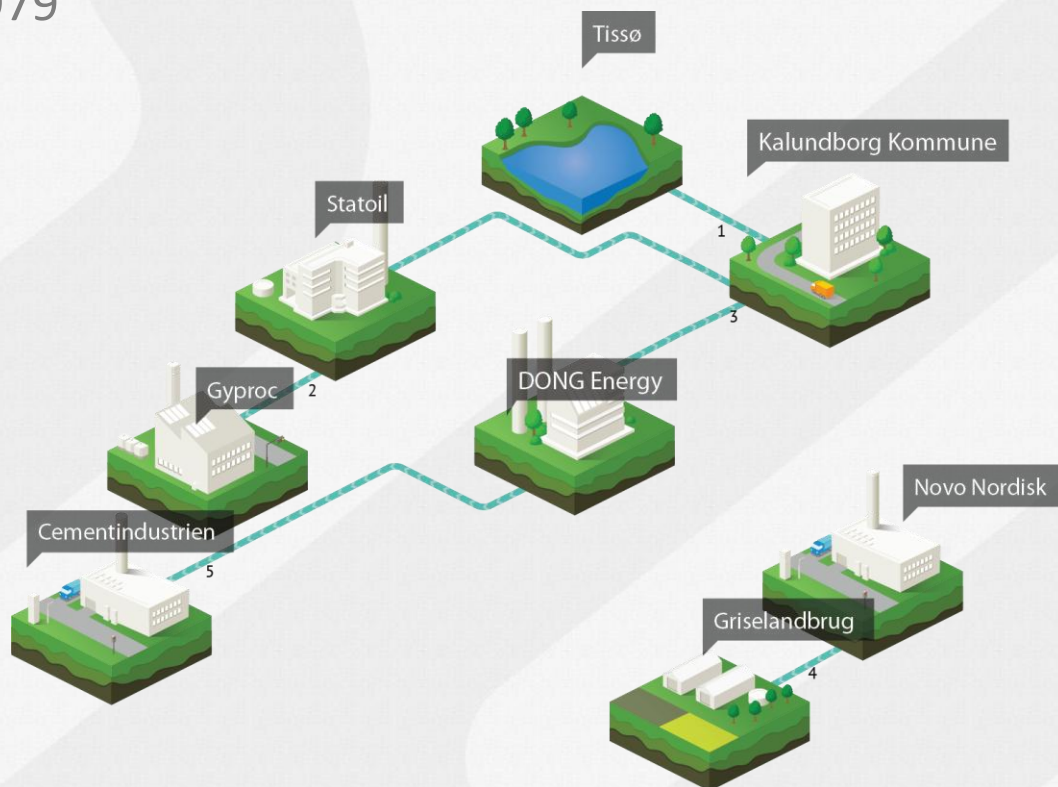
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1979



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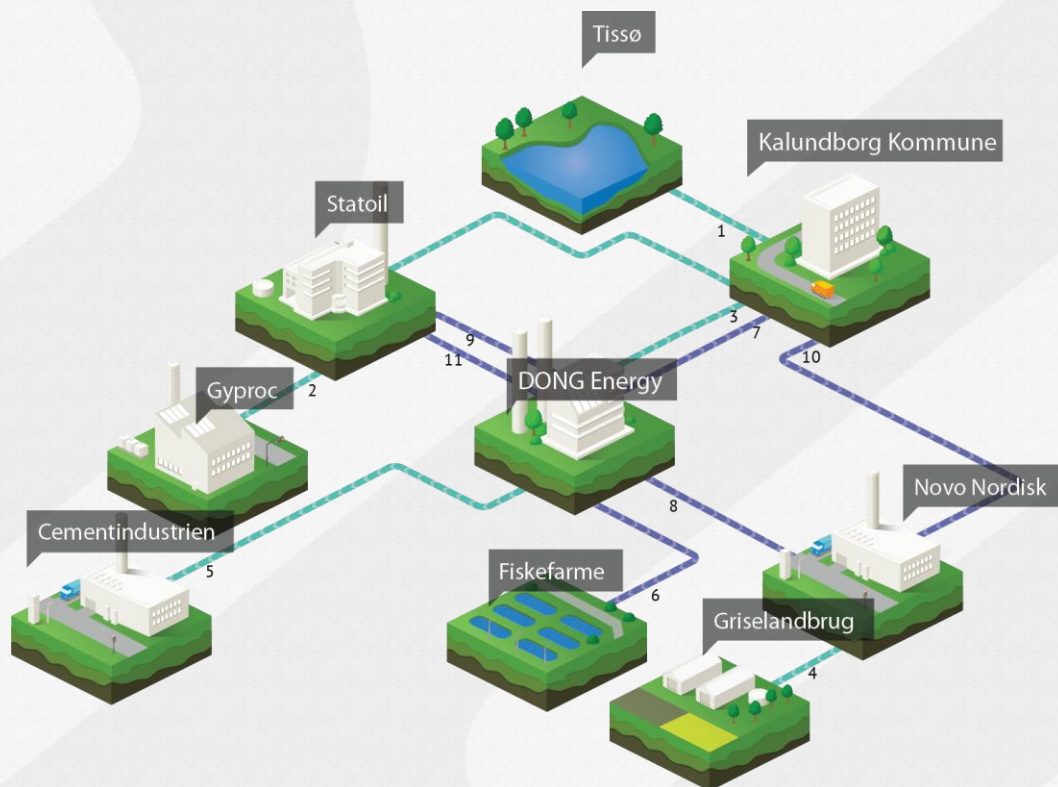
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1980 - 1989



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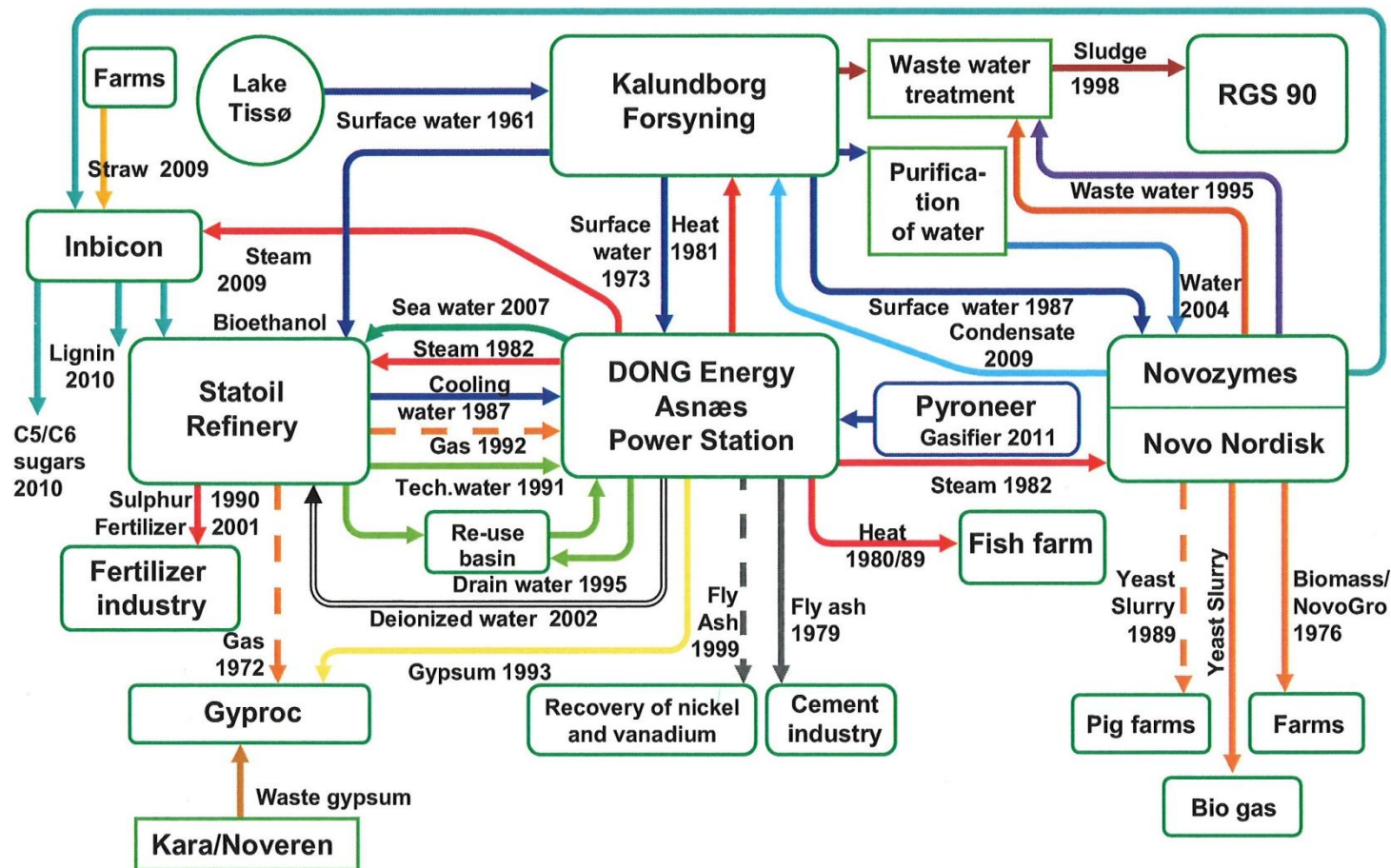
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# TOTAL SYMBIOSIS SYSTEM 2011



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# Types of Projects

Three types of projects:

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

A model for business development in 3 dimensions:

- **Economy:** Minimizing costs and improved bottom line and competitive edge
- **Environment:** Resource efficiency through reuse, recycling, and reduced intake of virgin materials
- **Innovation and development:** Improved introduction and access to new technologies and R&D, job creation and regional development





# Economy:

- Individual agreements between companies
- Jan Hoff, Production Manager Novo Nordisk:  
600 mio. DKK or app. 80 mio. Euro



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## Environmental Aspects

Resource savings:

Examples:

Ground water .....	2,0 mill. m3/year
Surface water .....	1,0 mill. m3/year
Natural gypsum .....	200,000 tons/year
Oil .....	20,000 tons/year

Reduction of CO2 emission (2008): app. **275.000 tons**

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# Innovation

Kalundborg Symbiosis has proven to be an environment which nurtures **innovation and the establishment of test facilities** (pitstop between laboratories and market):

- DONG Energy's demonstration plant Inbicon
- DONG Energy's Pyroneer
- E4Water micro algae test facility



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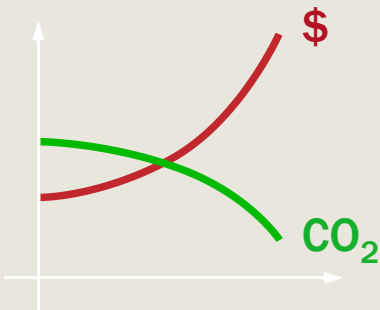
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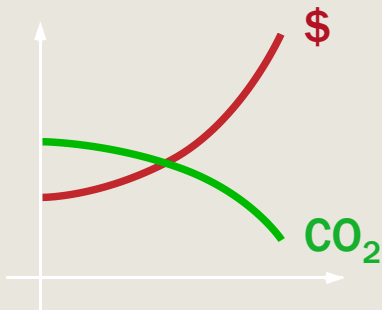


Minimizing costs on waste handling and creating revenue from new by-products

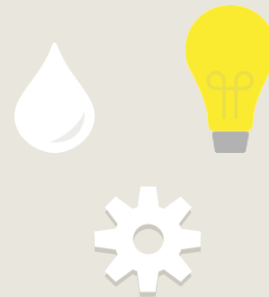
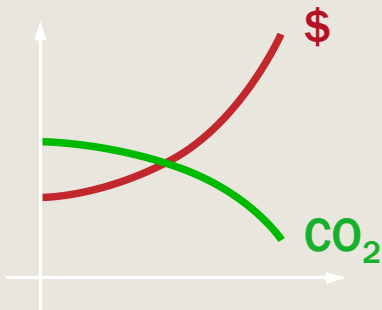
And at the same time reducing the ecological footprint by minimizing the intake of virgine resources and increasing reuse and recycling



# A targeted process of communicating and establishing links between diverse companies

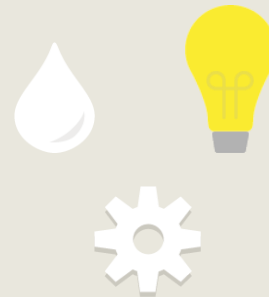
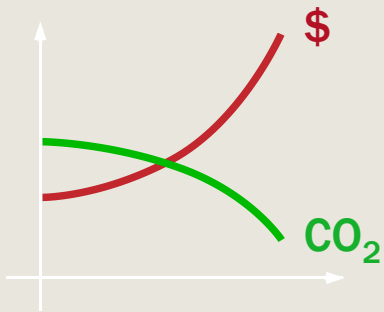


# In the process fostering a productive environment for innovation and development





Which all can be summed up as the Symbiosis Model





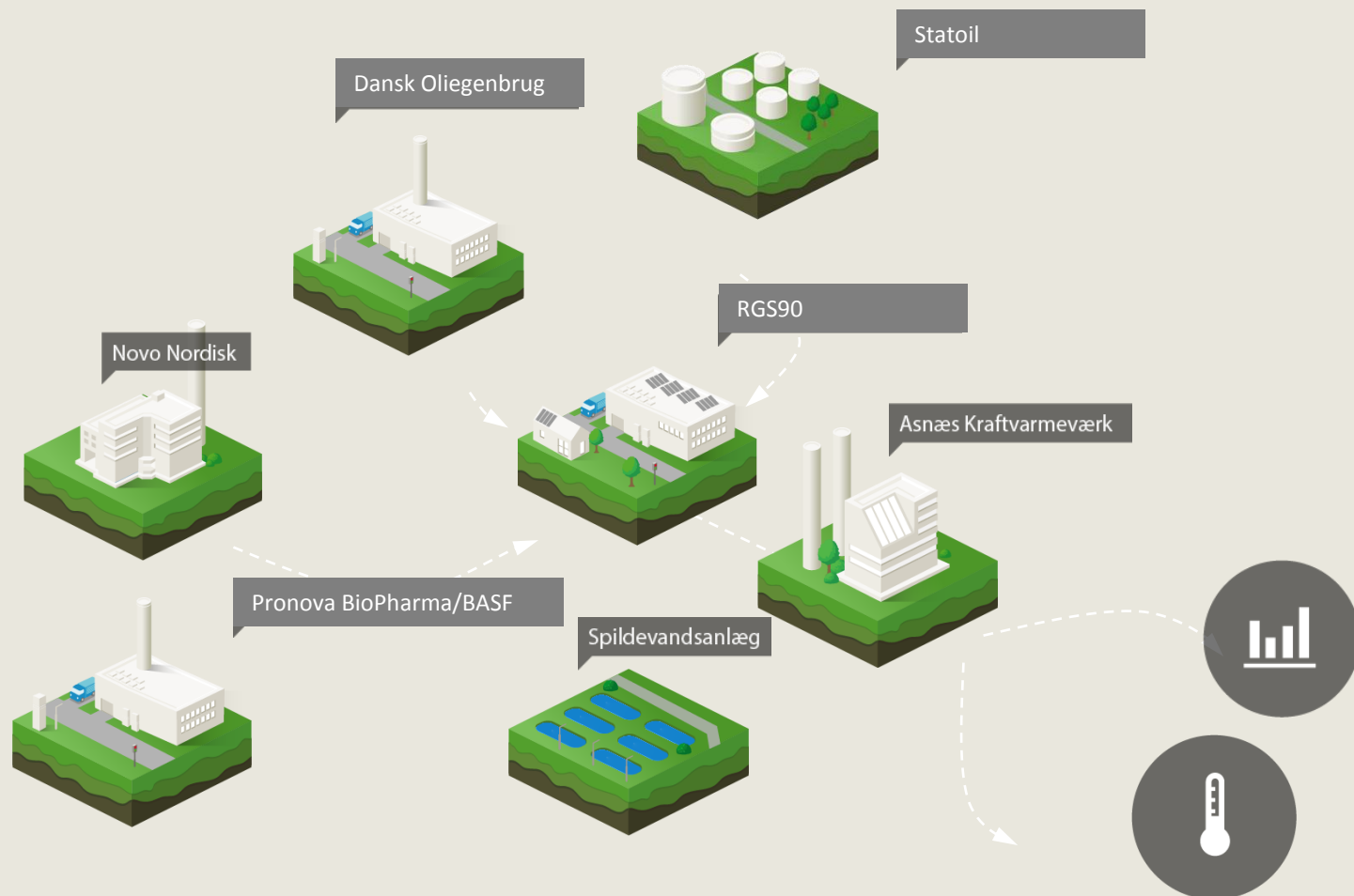
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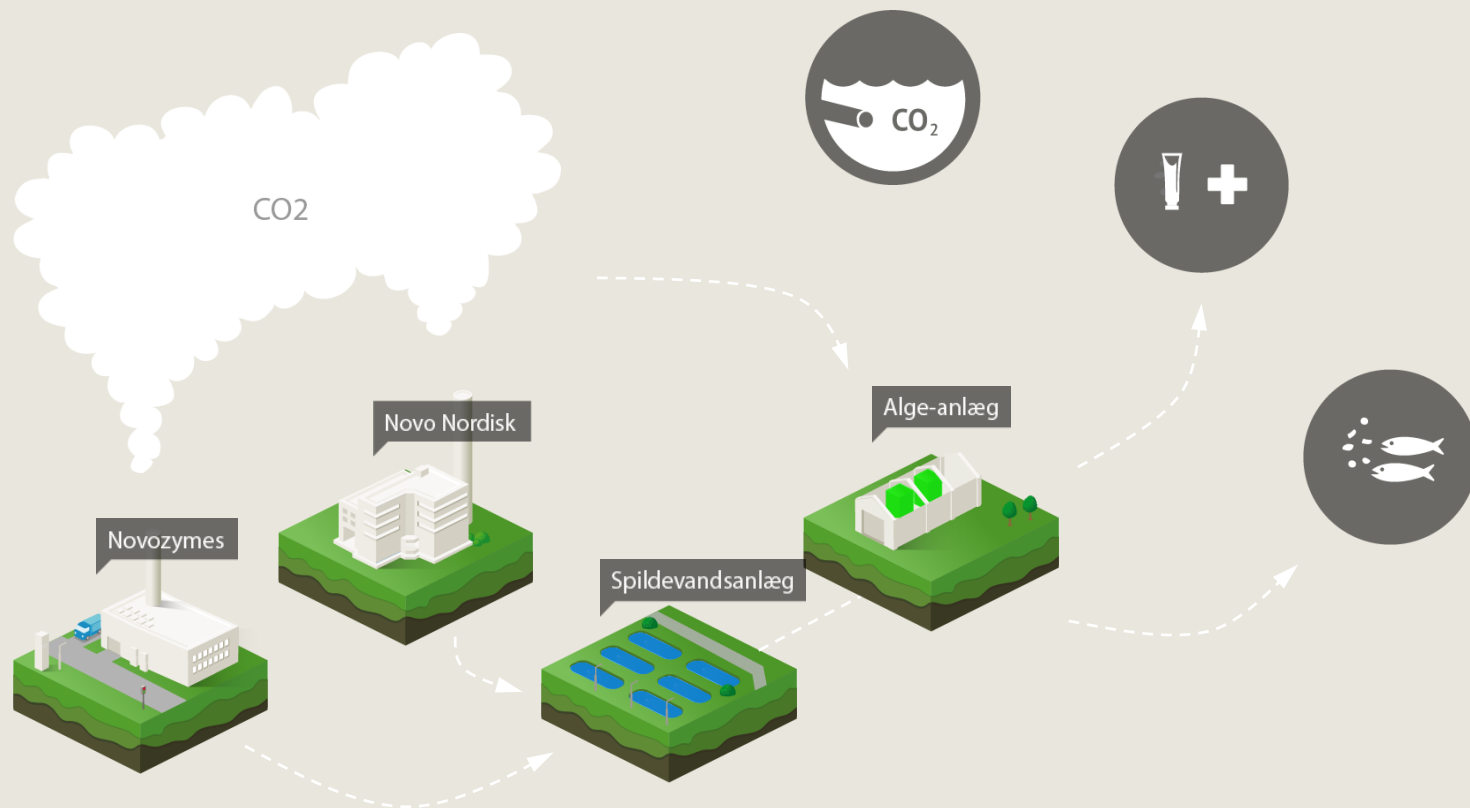


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# The Regional Symbiosis Center



A Symbiosis Center to facilitate new symbiosis projects  
and expand the learnings from the Kalundborg  
Symbiosis

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# Service to companies



Initial  
screening of  
area or  
waste  
fractions



Training of  
management  
and  
employees



Matchmaking  
between  
potential  
partners



Facilitating of  
new projects

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# Green Industrial Symbiosis

A national program facilitated  
by the Danish Business  
Authority



An aerial photograph showing a coastal system. A narrow, light-colored strip of land, possibly a dike or beach, runs diagonally from the bottom left towards the top right, separating a shallow, light-blue lagoon on the left from the deep, dark blue ocean on the right. The lagoon has some internal channels and patches of darker water. The land strip has some vegetation and small structures. The ocean surface shows some ripples and a slight wake.

Systems make it possible  
People make it happen