

# KALUNDBORG SYMBIOSIS

- AND HOW IT BECAME SUCCESSFUL

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KALUNDBORG  
SYMBIOSIS



# KALUNDBORG CITY

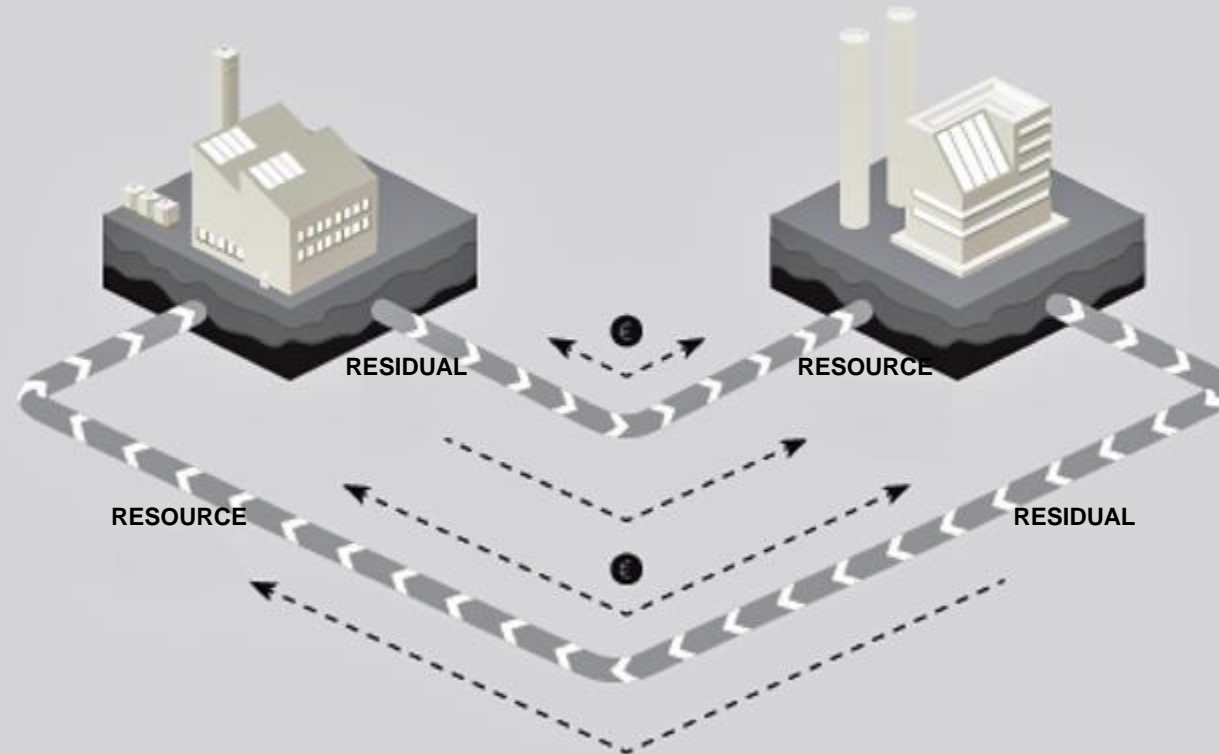


# AGENDA

1. Industrial Symbiosis - a brief definition
2. Kalundborg Symbiosis - best practice for more than 40 years
  - partners and streams
3. Two cases - underlining the key drivers of a successful symbiosis



# MUTUAL BENEFIT

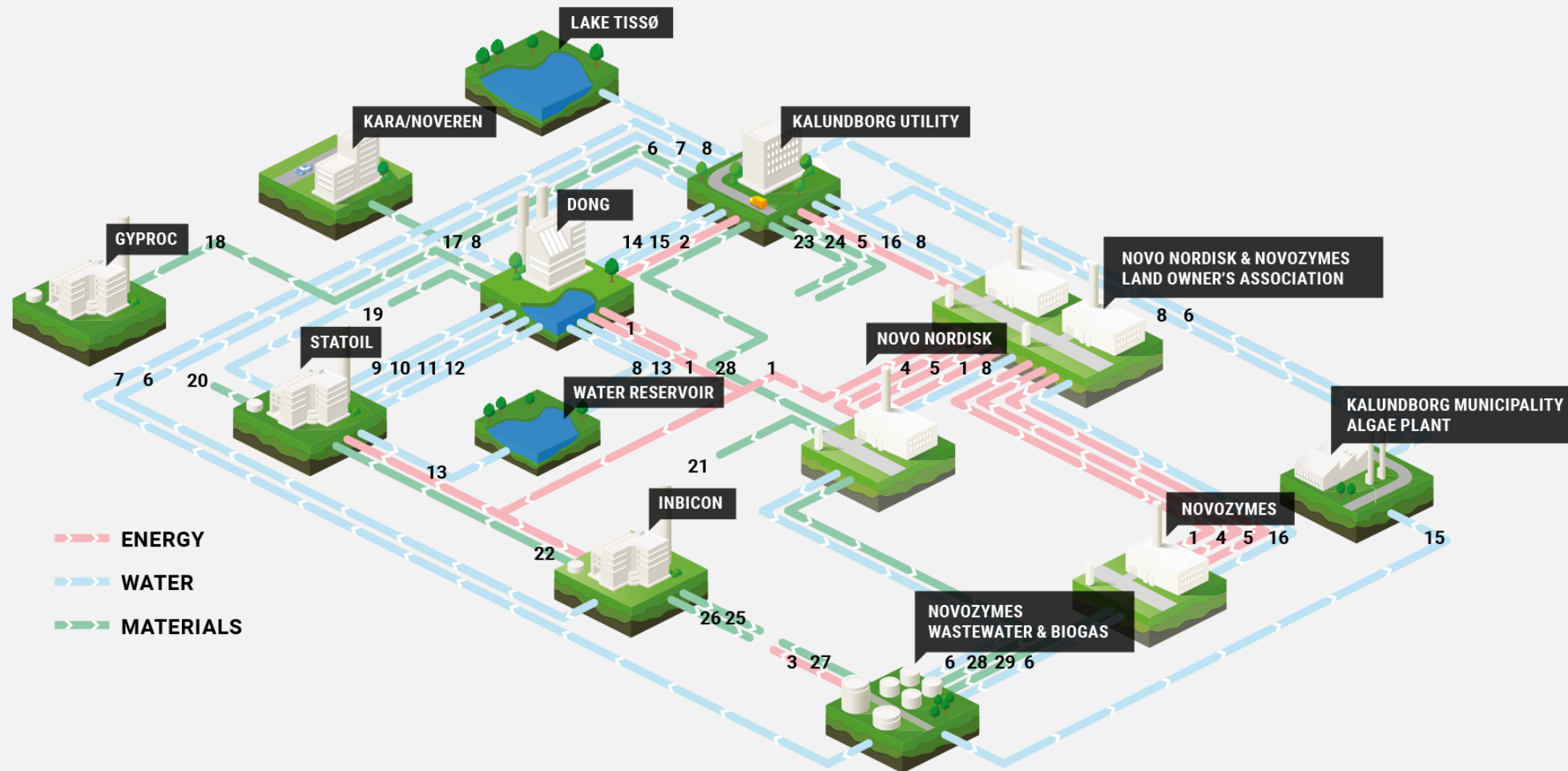




# BAY OF PARTNERSHIP

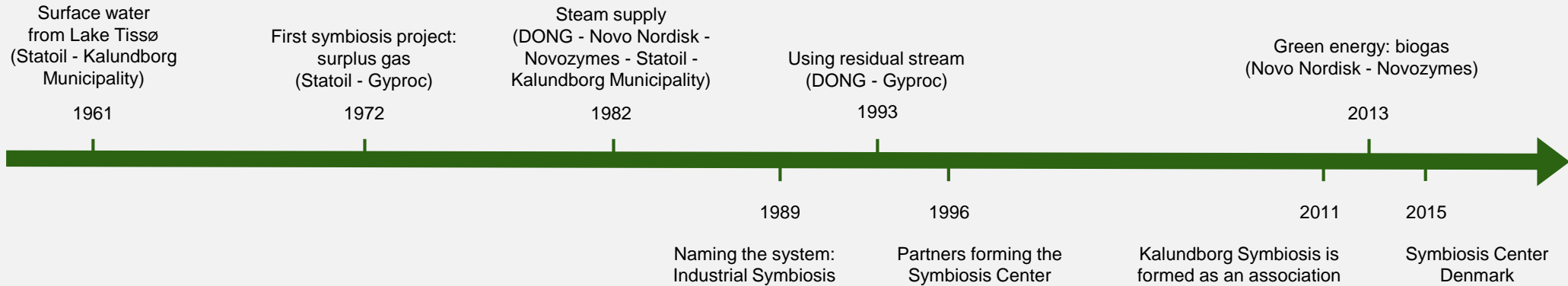


# STREAMS OF AGREEMENTS



# MORE THAN 40 YEARS OF COOPERATION

PROJECTS



ORGANIZATION





# Environmental Aspects

Resource savings:

Examples:

Ground water .....	2.0 mill. m <sup>3</sup> /year
Surface water .....	1.0 mill. m <sup>3</sup> /year
Natural gypsum .....	200.000 tonnes/year
Oil .....	20.000 tonnes/year

Reduction of CO<sub>2</sub> emission (2008):

**275.000 tons**



# GOING FORWARD: FUTURE PROJECTS

Biogas from 3000 tons of  
pharmasutical biomas  
After digestion used as fertilizer



8 mio. m3 biogas upgrade to  
naturel biogas

CO2 reduction 17.000 tons/year



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# GOING FORWARD: ONGOING PROJECTS

Heat pump installation using hot waste water, 24-25 °C from the industry

80.000 MWh heat produced

CO2 reduction 16.600 tons/year

Covers 30 % of total district heating demand  
Equal to full summer load

3 heat pump modules á 3,3 MW, total 10 MW installed at Kalundborg Utility



3 x waste water reuse

Novozymes extracts organic matter to biogas production

Separate waste water streams from the city and Novozymes are mixed at WWTP, makes bacterial processes 3 times faster

Heat is used again in the heat pump system

# SYSTEMS MAKE IT POSSIBLE PEOPLE MAKE IT HAPPEN



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