

Industrial Symbiosis

A driver of Green Growth in Nordic Regions

Case Kalundborg

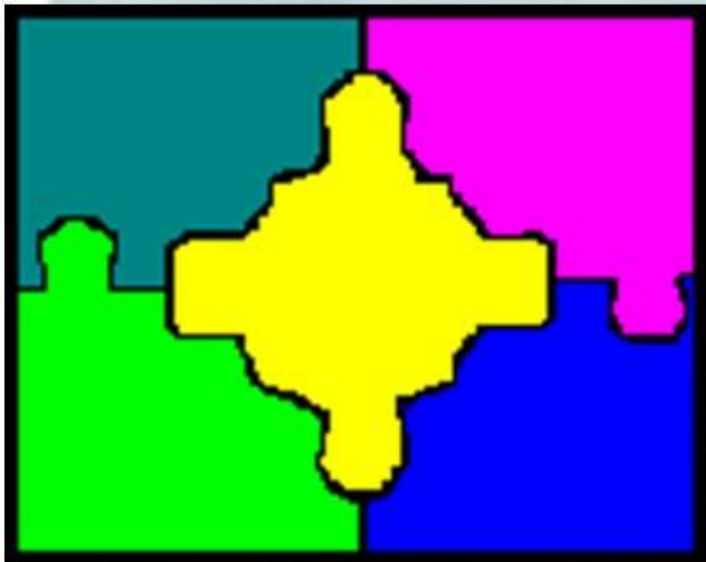


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- **A network co-operation between:**
 - **Six processing companies**
 - **One waste handling company**
 - **The Municipality of Kalundborg.**





Philosophy:

- **Exploit each other's residual or by-products**
 - **One company's by-product becomes an important resource to one or several of the other companies**
 - **The outcome is reduced consumption of resources and a significant reduction in environmental strain**
 - **The partners also benefit financially from the co-operation**
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**KALUNDBORG
SYMBIOSIS 2015**

Diagram: www.symbiosecenter.dk

Energy

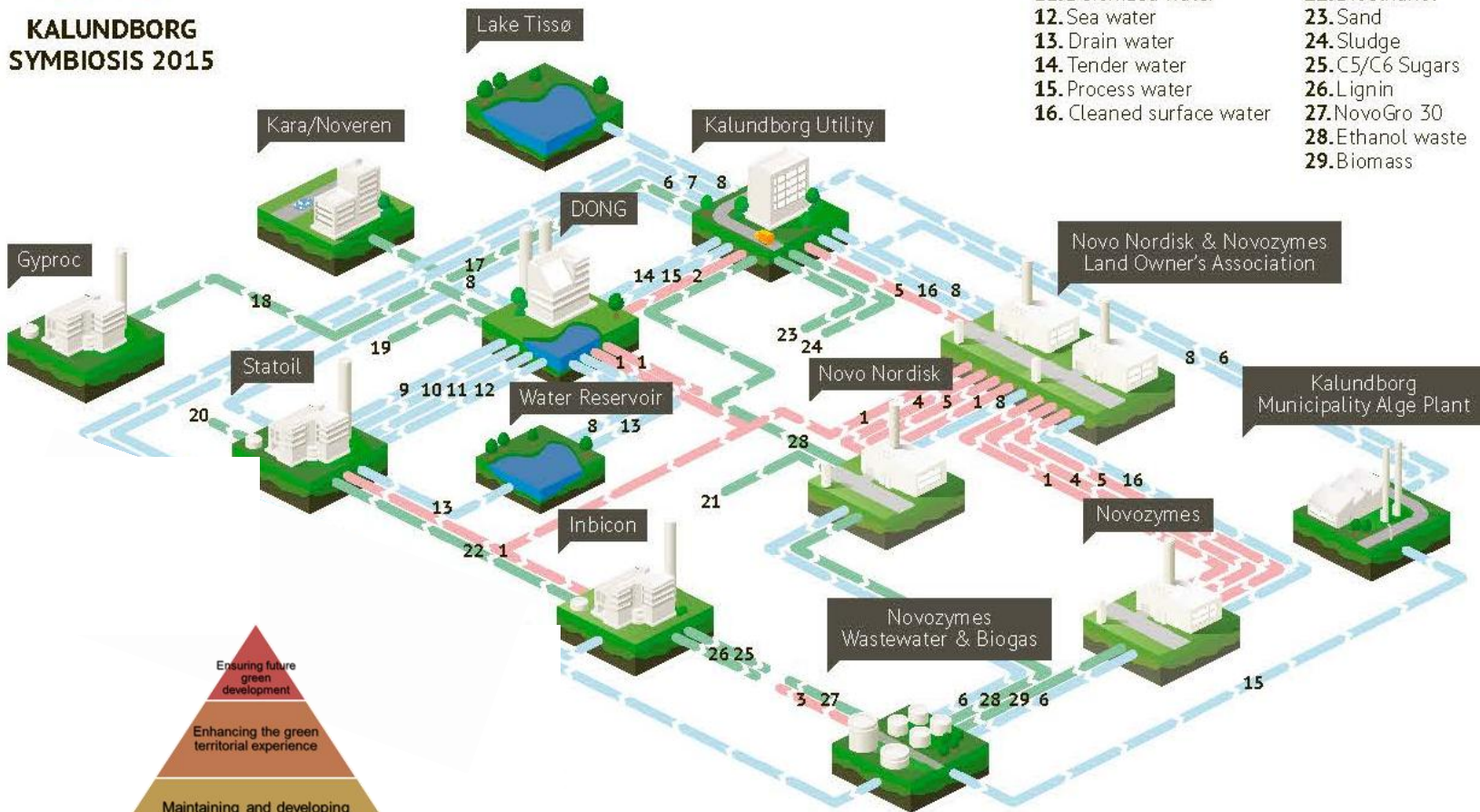
Water

Materials

- 1. Steam
- 2. District heating
- 3. Power to grid
- 4. Warm condensate
- 5. District heating

- 6. Waste water
- 7. Cleaned waste water
- 8. Surface water
- 9. Technical water
- 10. Used cooling water
- 11. Deionized water
- 12. Sea water
- 13. Drain water
- 14. Tender water
- 15. Process water
- 16. Cleaned surface water

- 17. Waste
- 18. Gypsum
- 19. Fly ash
- 20. Sulphur
- 21. Slurry
- 22. Bioethanol
- 23. Sand
- 24. Sludge
- 25. C5/C6 Sugars
- 26. Lignin
- 27. NovoGro 30
- 28. Ethanol waste
- 29. Biomass





Material share



- **Steam and Heat**
- **Water**
- **Wastewater**
- **Refinery gas**
- **Gypsum**
- **Ash**
- **NovoGro®**
- **Yeast slurry**
- **Liquid fertilizer**
- **Sludge**





Requirements

- **A number of company conditions must be fulfilled:**
 - The companies must fit each other
 - There must be openness between the companies
 - A bottom up process based on trust is needed
- **A number of territorial conditions must be fulfilled:**
 - The companies must be located near each other
 - The municipality should help facilitating the processes
 - Local actors need to be involved
 - The bottom-up strategies should however not only be related to local actors, but also related to regional actors
- **A number of overarching national strategies should be developed**
 - Requires interactions between bottom-up and top-down planning to ensure that regions are competitive

Ensuring future
green
development

Enhancing the green
territorial experience

Maintaining and developing
the territorial connections

Ensuring and developing a green
livable environment

Maintaining and developing a green
territorial base





Thank you for your attention

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