Integral Blueprints for Flexible Engineering and Design (part of Water Nexus)

Sub-department of Environmental Technology

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Motivation

Water, especially fresh water, is crucial for sustaining human populations and enabling economic growth. Worldwide 1.2 billion people live in physical water scarcity, and 1.6 billion in economic water shortage. Even in a "wet" country such as the Netherlands extreme weather events, sea level rise, and overexploitation threaten existing fresh water resources. Increased salt water intrusion, due to sea level rise, threatens to turn fresh water resources saline in the low lying areas of the Netherlands. A paradigm shift in the way water is used is required to assure continued abundance for domestic, agriculture, and industrial purposes.

Challenge

Industry requires significant quantities of water to operate. In the Netherlands 68% of the fresh water produced is used by industry. In most cases the water is part of the process, but is not part of the final product (high temperature steam production, cooling liquid in cooling towers, etc.). This range of applications raises questions concerning the quality of the water which is actually required for each of these processes:

- Is it really needed to use high quality fresh water to produce steam?
- Can process water be cascaded for more effective use?
- Can part of the process be operated with saline water?

The central paradigm shift within the Water Nexus program is to consider saline water as a resource, instead of a threat:

Saline water where possible, freshwater where essential.

The main challenge of this research is to match environmental renewable water supply with industrial water demand.

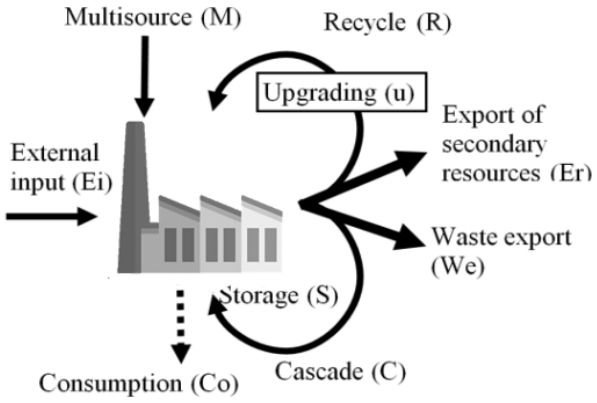
Possible thesis topics

1. Hotspot identification of industrial resource use through Material Flow Analysis (MFA)

Utilize MFA techniques in order to map the resource flows of an industrial case study. Attention to interactions between energy and water flows is required to identify possible locations in which resource use can be reduced.

2. From Urban Harvest to Industrial Harvest

Apply the Urban Harvest Approach (UHA) to an industrial case (IHA) to identify the possibilities of (re)using local available resources.



Adapted from: Agudelo-Vera, Claudia M. 2012. "Dynamic Water Resource Management for Achieving Self-Sufficiency of Cities of Tomorrow. Ph.D. Thesis, Wageningen University, Wageningen, Netherlands."

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