

# Translation of national guide into practical implementation

## - exemplified by a case study in Thise Dairy

**Jens Møibæk**  
Technical Manager, Thise Dairy

**Martin Andersen**  
Business Development Manager, Industry and Water Technologies

**50** | 50 YEARS  
OF SOLVING  
CHALLENGES IN  
WATER ENVIRONMENTS  
1964 - 2014



## About Thise Dairy

- Founded: 1988
- Milk supply: 100 mio. kg organic milk
- No. of products: 85 (milk, cultured products, butter and cheese)
- Revenue 2014 : 850 mill. DKK
- Export to: Sweden, Germany, UK, Netherlands, Belgium, France, Finland
- Export : 18 %



Sharing facilities with Dybbækdal Dairy (conventional) – 40 mio kg

## “Water story” of Thise Dairy

- Experienced insufficient supply of potable water during one dry summer
- Limited by release of wastewater via pre-treatment through spreading on agricultural soil
- Connection to municipal wastewater treatment plant would require 20 km pipeline

## Ambition

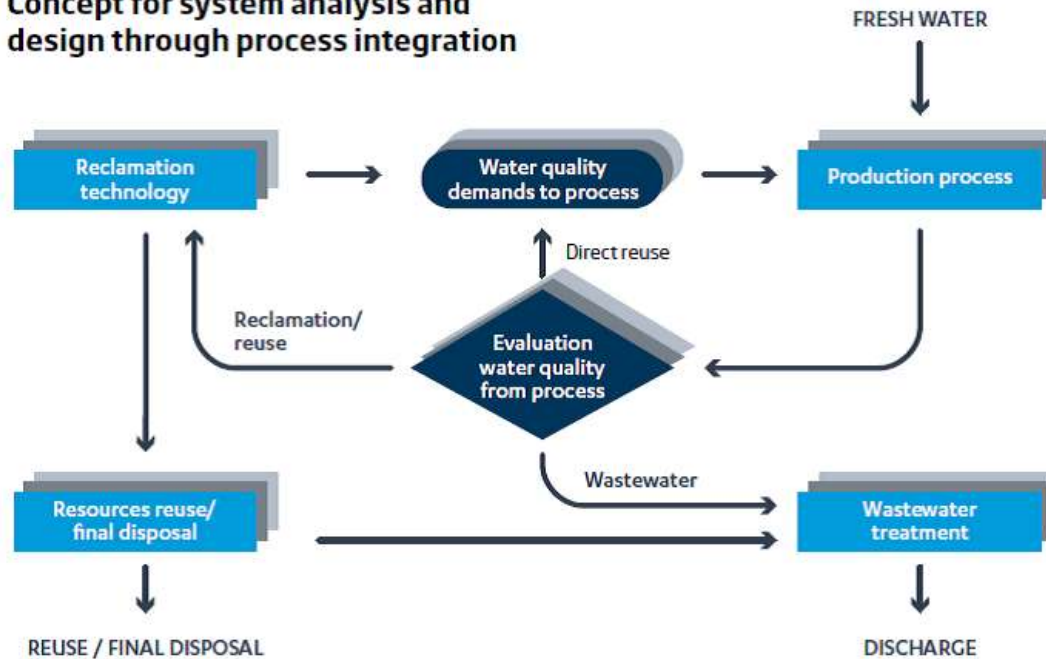
- Have the most efficient use of available water resources
- Make it simple - minimising the need for advanced (waste)water treatment (and reuse)

## The process

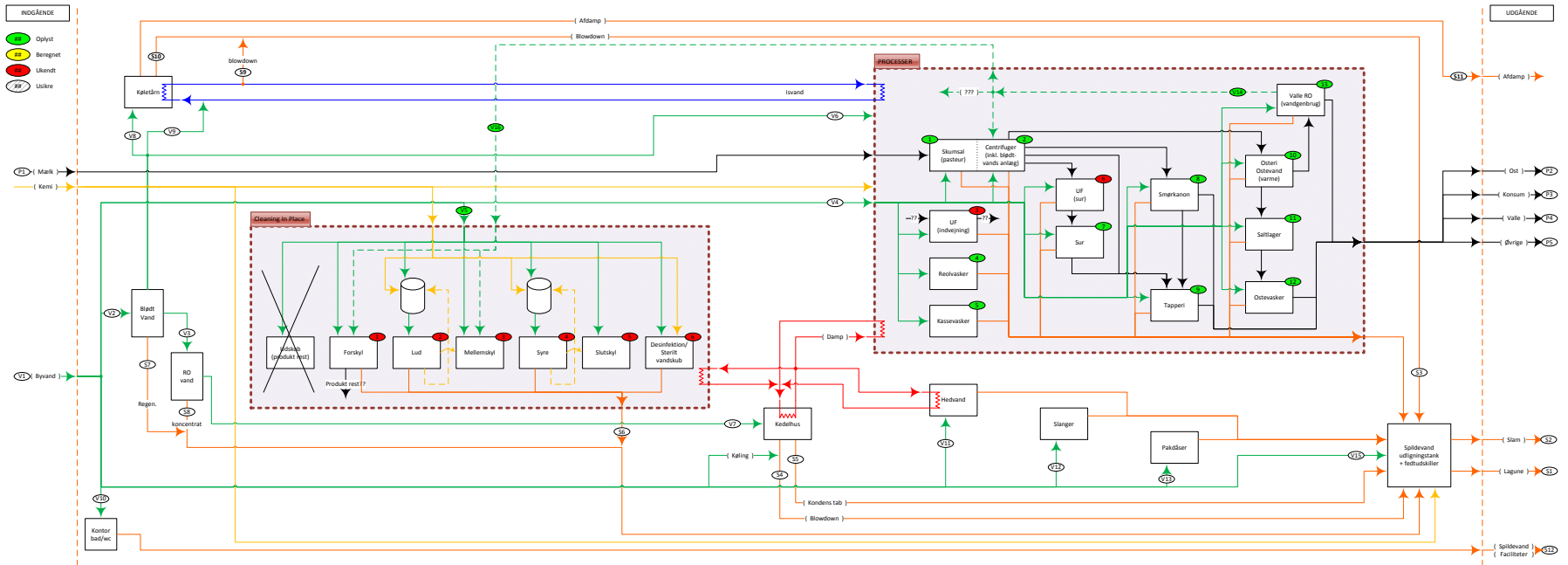
1. Mapping and system analysis
2. Identification and evaluation of scenarios for improved water efficiency
3. Detailed design and cost evaluation
4. Implementation

# Mapping and system analysis

Concept for system analysis and design through process integration



# Mapping of water streams (quantity and quality)



Name		Origin	Quality	Use
1	Potable water	<ul style="list-style-type: none"> <li>Water works</li> <li>Own dwelling</li> </ul>	According to standards for potable water	<ul style="list-style-type: none"> <li>All uses</li> </ul>
2	Water of same standard as potable water	<ul style="list-style-type: none"> <li>Used potable water</li> <li>Reused water</li> </ul>	<ul style="list-style-type: none"> <li>Relevant potable water standards</li> <li>Free of pathogens</li> </ul>	<ul style="list-style-type: none"> <li>Direct food contact</li> <li>Fit for storage</li> </ul>
3	RO (milk) water (=filtrated cow water)	<ul style="list-style-type: none"> <li>Whey</li> <li>Dairy permeates</li> <li>Condensates</li> <li>Products push (white water)</li> </ul>	<ul style="list-style-type: none"> <li>Criteria specific to the combination of origin and use</li> <li>Free of pathogens</li> </ul>	<ul style="list-style-type: none"> <li>Ingredients</li> <li>Direct food contact</li> <li>Cleaning</li> </ul>
4	PO (milk) water (=polished cow water)	<ul style="list-style-type: none"> <li>RO (milk) water</li> <li>Used PO (milk) water</li> </ul>	<ul style="list-style-type: none"> <li>Specifications to chemical and microbiological composition</li> <li>Free of pathogens, where required</li> </ul>	<ul style="list-style-type: none"> <li>Short term storage unless treated</li> <li>Suitable for storage without further treatment</li> </ul>
5	Reuse water	<ul style="list-style-type: none"> <li>Used potable water</li> </ul>	<ul style="list-style-type: none"> <li>Relevant potable water standards</li> <li>Criteria specific to the combination of origin and use</li> <li>Free of pathogens</li> </ul>	<ul style="list-style-type: none"> <li>Direct food contact (e.g. cooling of cheese)</li> <li>Cleaning (e.g. product push, intermediate rinse, lye, acid)</li> <li>Once/multiple recycling</li> </ul>
6	Water of other quality	<ul style="list-style-type: none"> <li>Used reuse water</li> <li>Used RO (milk) water</li> <li>Used PO (milk) water</li> </ul>	<ul style="list-style-type: none"> <li>Specifications to chemical and microbiological composition</li> </ul>	<ul style="list-style-type: none"> <li>Cleaning</li> <li>Depending on origin &amp; 1st use, conditioning/treatment into categories 2, 3, 4 or 5</li> </ul>
7	Technical water	All origins	<ul style="list-style-type: none"> <li>Added chemicals (detergents, disinfectants)</li> </ul>	<ul style="list-style-type: none"> <li>Cleaning</li> <li>No food contact</li> </ul>

Thise

WQ1

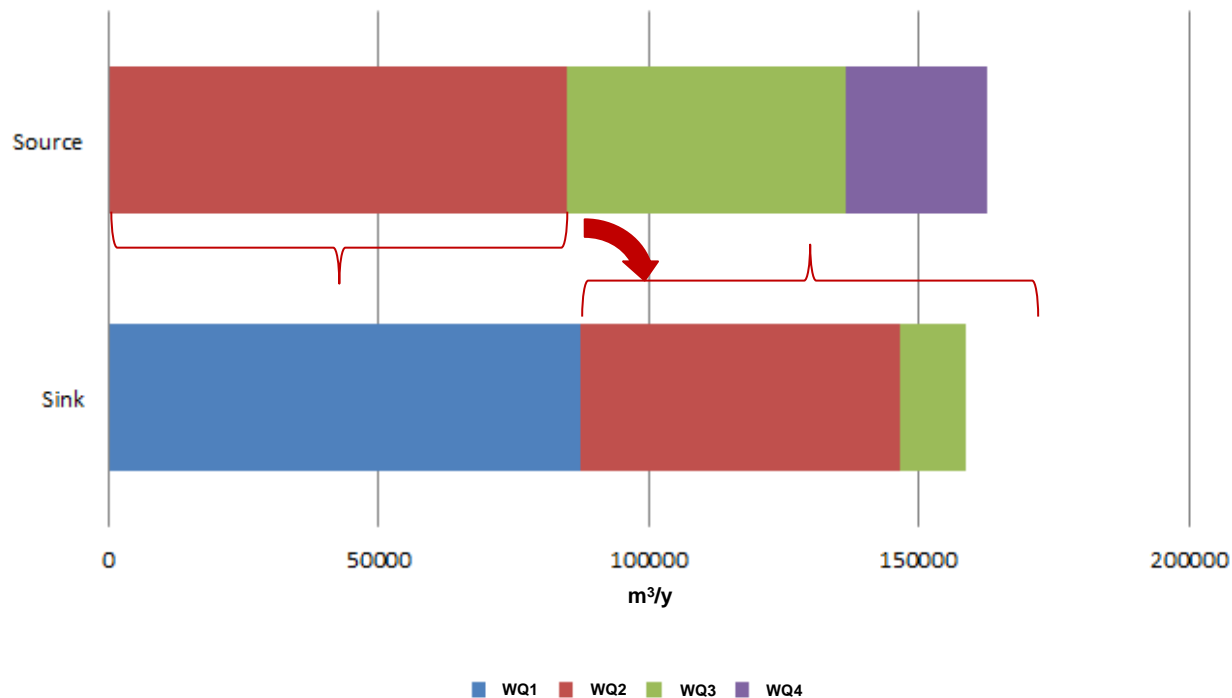
WQ2

WQ3



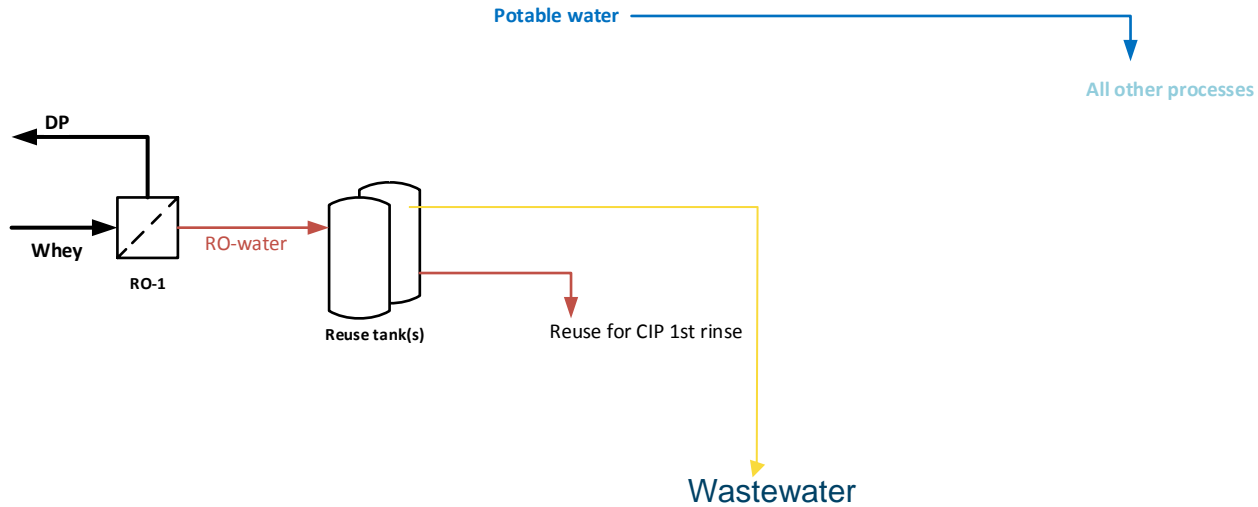


# Sink-source matching (reuse)

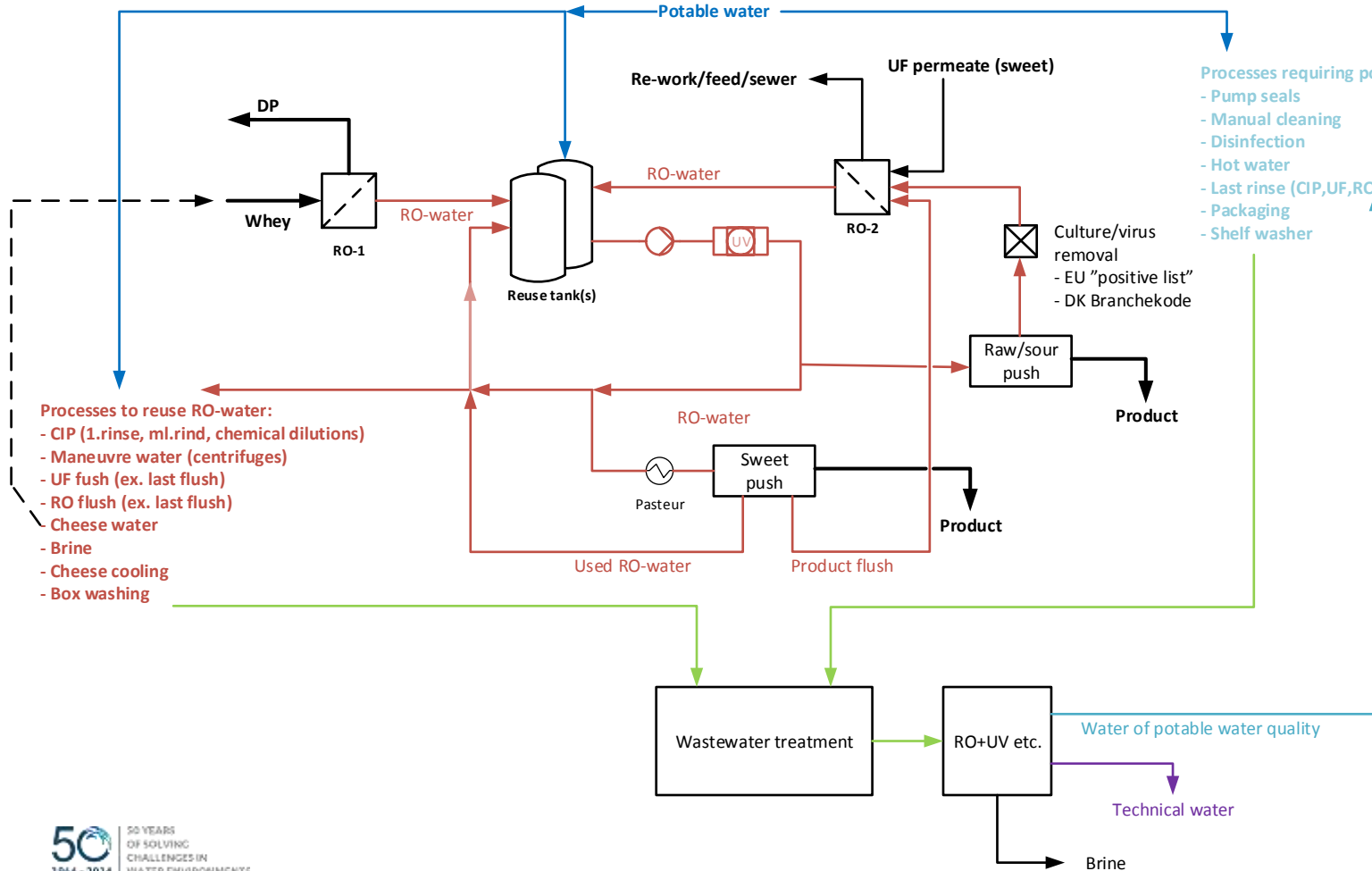


# Systematic development of scenarios

1. Reduce: water use at source
2. Renew: unit operation to be more water efficient
3. Reuse: water from proces in another (no treatment)
4. Recycle: water several times over same proces (no treatment)
5. Reclaim: water to reach quality requirement for reuse/recycle
6. Return: excess waster to receiving waters within environmental standards



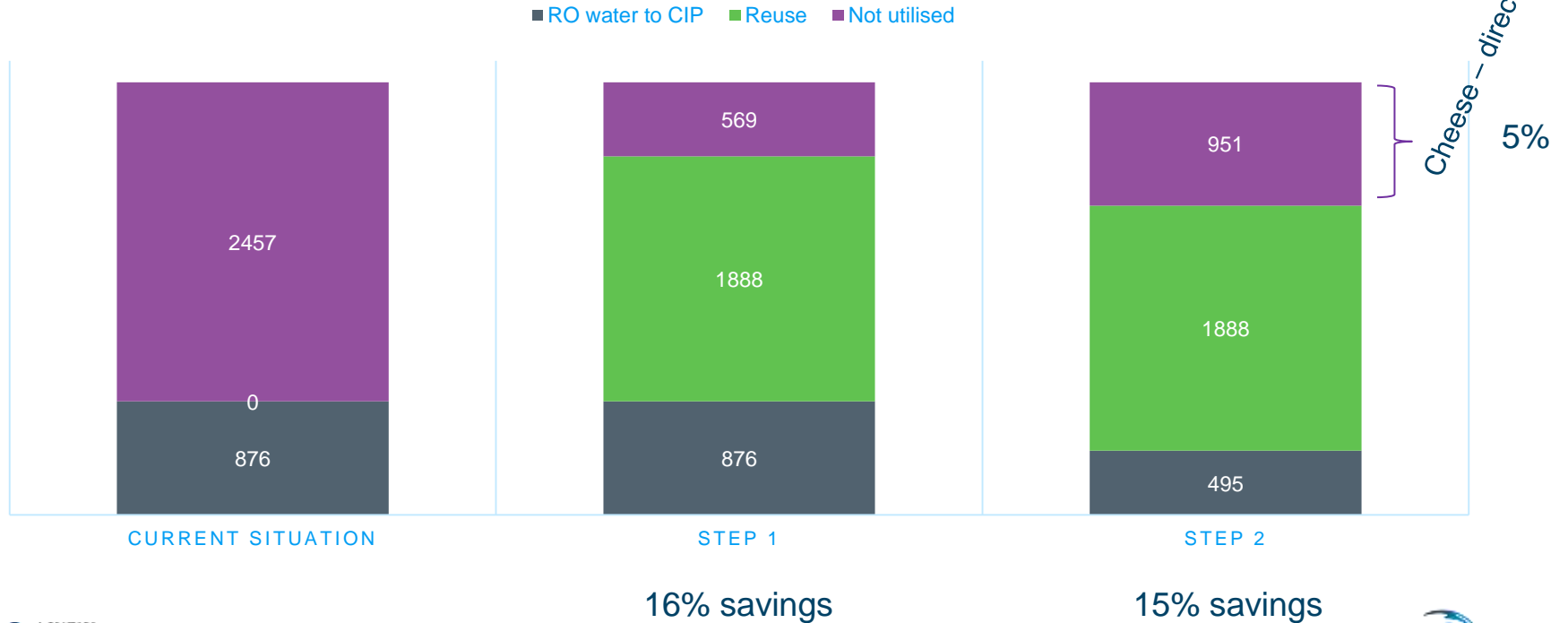
Current situation: Only 25% utilisation of RO-water



## Result of scenario development

- 29 scenarios identified for increased water efficiency
- Scenarios further analysed and aggregated
- Finally 4 solutions selected for implementation:
  - Full utilisation of RO-water
  - Optimisation and refurbishment of CIP
  - Reuse reject from Boiler Feed Water treatment on cooling towers
  - Optimisation of UF-plant

# Water balance RO-water 2016 (m<sup>3</sup> per month)



# Implementation plan

- Management approval: 29 Feb 2016!!!
- Commissioning: Before 1 July 2016
- Official opening: Before 30 Sept. 2016

## Expected result:

40% reduction in raw water intake (limited by availability of RO-water)

## Future opportunities:

- Continue focus on upstream optimisation
- Increase RO-water production by increased whey dry matter
- RO for re-work/feed (water and protein recovery)
- MBR-RO treatment on wastewater for reuse in utilities

## Attention points

- Keep focus on decentral optimisation and efficiency
- Hygienic design
- Storage time vs CIP frequency – online monitoring and control?
- Organic vs conventional RO-water – need to separate?



**Thank you for your attention!**

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# About DHI

DHI are the first people you should call when you have a tough challenge to solve in a water environment.

In the world of water, our knowledge is second-to-none, and we strive to make it globally accessible to clients and partners.

So whether you need to save water, share it fairly, improve its quality, quantify its impact or manage its flow, we can help. Our knowledge, combined with our team's expertise and the power of our technology, hold the key to unlocking the right solution.