

# **(DRINKING) WATER IN BRABANT: OPPORTUNITIES FOR ABUNDANCE**



**INVENTORY  
RESEARCH**



Pim de Jager, Huub Rijnaarts, Xiaomeng Zhou & Stijn van Terwisga

**Wageningen University  
TU Delft**

# DRINKING WATER: OPPORTUNITIES FOR CREATING ABUNDANCE

## Content

### Why:

With climate change, the Netherlands is more exposed to extreme weather situations. The Netherlands has faced local droughts in summer and spring the past years, despite being a very water rich country

### How:

In this project, an inventory of the water system was made by 3 researchers from the Delft and Wageningen University. The main goal of this research was to determine whether there is a water abundance in the province of North Brabant in the long term and where the opportunities are for the creative industry to contribute to water abundance. The inventory was used to start an initial discussion with members of the Embassy of Water and creative professionals.

### What/result:

Report

Discussion outcome

Powerpoint presentation

2 summarizing visuals

## INVENTORY RESEARCH



# DRINKING WATER: OPPORTUNITIES FOR CREATING ABUNDANCE

## Goal:

The main goal of this research was to determine whether there is a water abundance in the province of North Brabant in the long term and where the opportunities are for the creative industry to contribute to water abundance

The research questions in this research were:

- Is there an abundance of water when looking at a yearly timescale?
- Can the water shortage and abundance be regulated, and how?
- Where are the opportunities to create water abundance?
- Where can creative professionals play a role in creating water abundance?

## INVENTORY RESEARCH



# DRINKING WATER: OPPORTUNITIES FOR CREATING ABUNDANCE

## Research set-up

- Desk research: 3 researchers from the Wageningen University and TU Delft performed most of the inventory work to create an overview of the water system in North Brabant
- There was a weekly discussion between the WUR, Design United and the Embassy of Water to discuss results and exchange ideas.
- A workshop was organised with the research team, members Embassy of Water and creative professionals.

## Demarcation:

- Province of Brabant and Waterboard De Dommel
- In particular because most members of the Embassy of Water were located in this area

## INVENTORY RESEARCH



# DRINKING WATER: OPPORTUNITIES FOR CREATING ABUNDANCE

## INVENTORY RESEARCH



## Research set-up: network and sources

### Design United:

Wageningen University and Research

- Huub Rijnaarts
- Pim de Jager
- Xiaomeng Zhou

Delft University of Technology

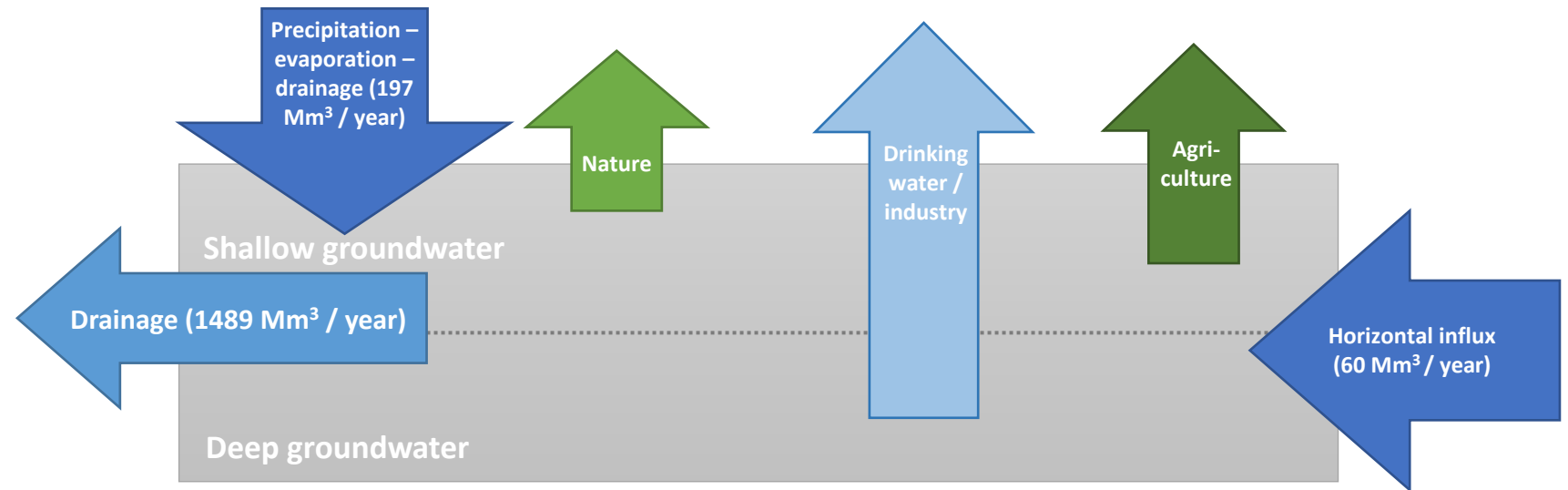
- Stijn Terwisga
- Marijke Idema
- Daan van Eijk

### World Design Embassy of Water

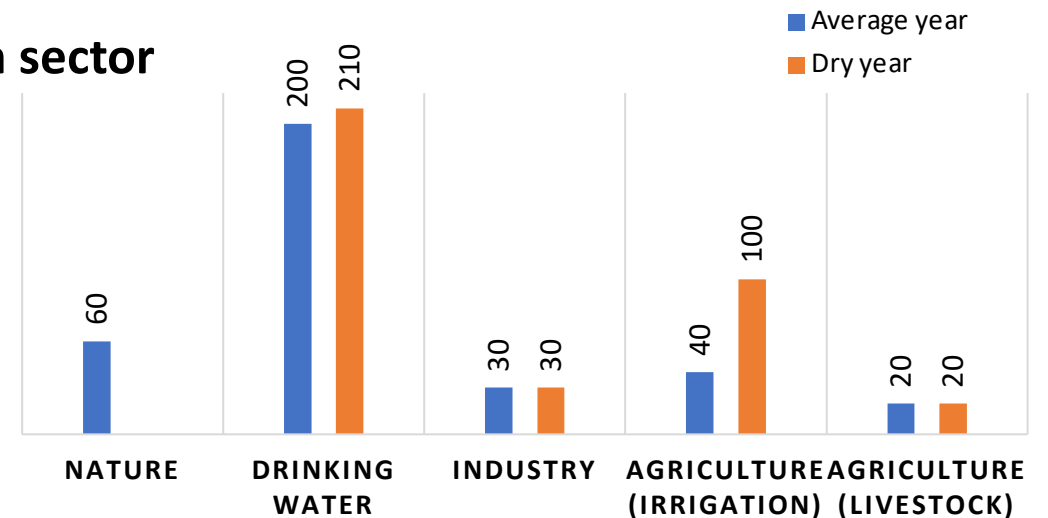
- Anouk van der Poll  
vanderPolloffice
- Waterboard de Dommel
- Province of Noord-Brabant
- Brabant Water
- Municipality of Eindhoven

# DRINKING WATER: OPPORTUNITIES FOR CREATING ABUNDANCE

## Overview water system that affects availability of deep groundwater necessary for drinking water



### ➤ Groundwater use by each sector



Deltares. (2020). *Een verkenning naar de Watervraag van de Noord-Brabantse Natuur*.

INVENTORY  
RESEARCH





# DRINKING WATER: OPPORTUNITIES FOR CREATING ABUNDANCE

## INVENTORY RESEARCH



## Groundwater extraction locations

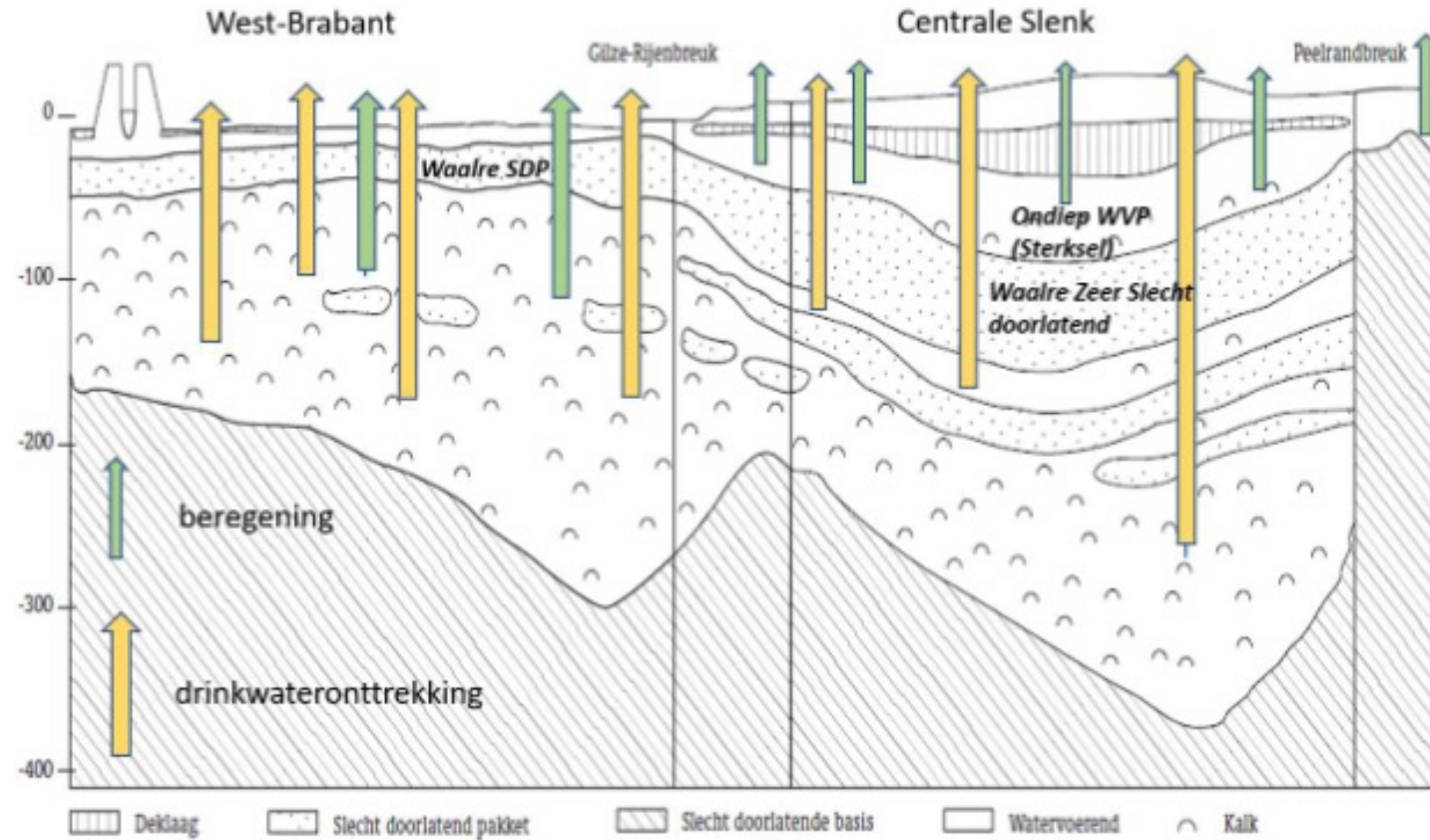
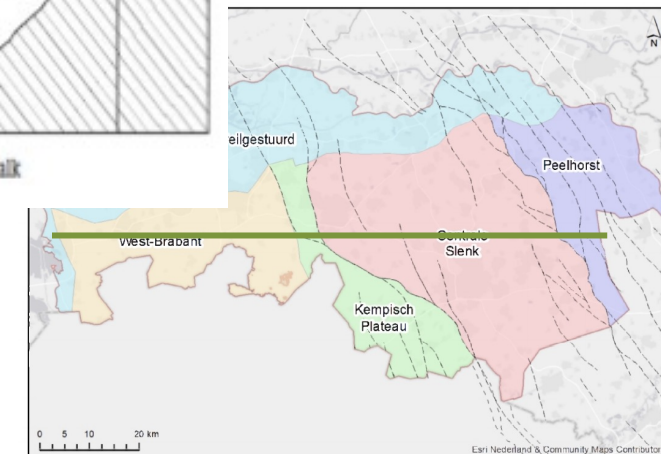


Figure 4. Schematic depth of groundwater extraction

Deltares. (2020). *Een verkenning naar de Watervraag van de Noord-Brabantse Natuur*.  
Verhagen, F., Stuurman, R., Van Steijn, T., & Hunink, J. (2017). *Draagkracht grondwater Noord-Brabant Inventarisatie literatuur*.



# DRINKING WATER: OPPORTUNITIES FOR CREATING ABUNDANCE

## Drinking water consumption at homes

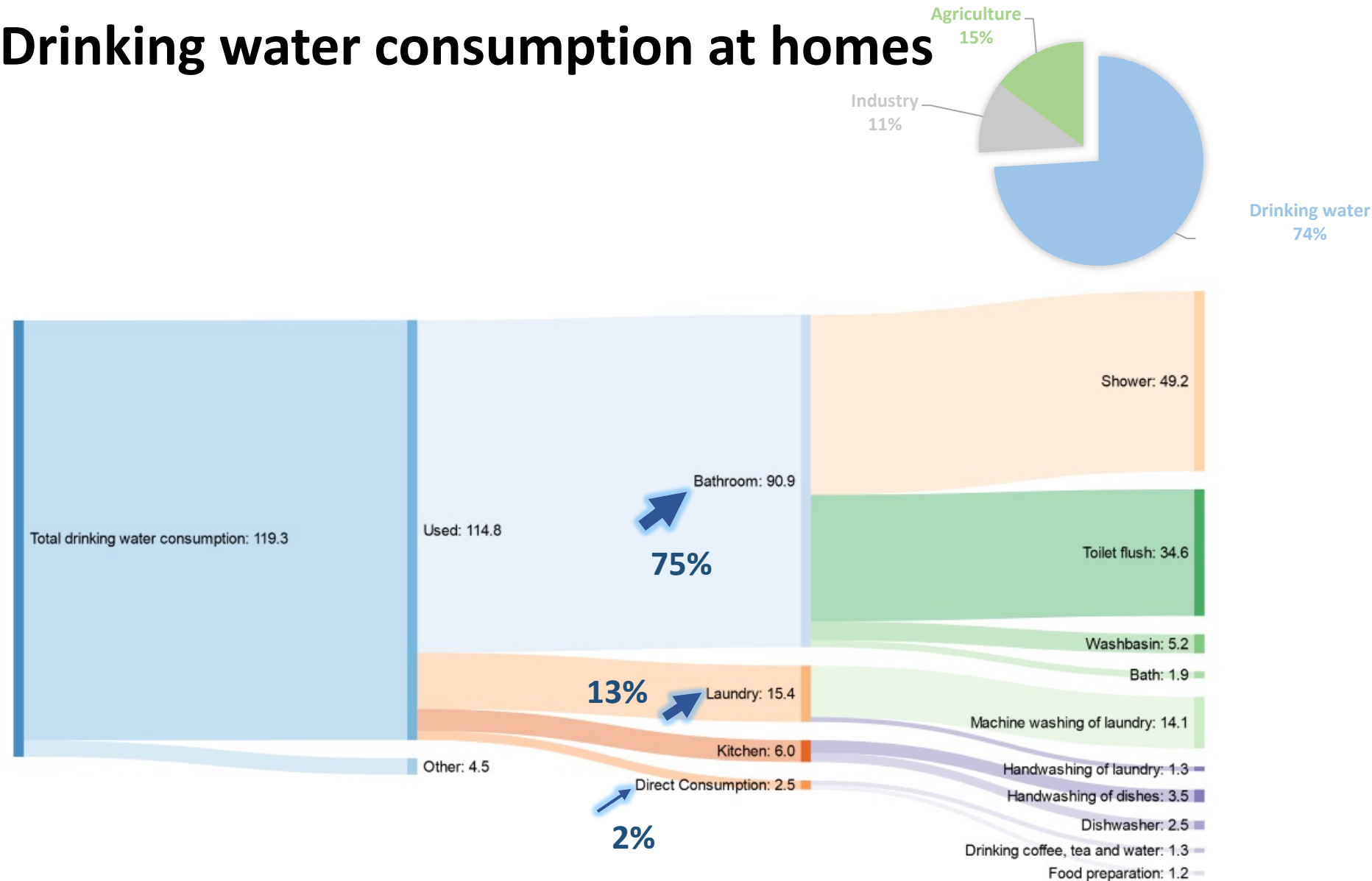


Figure 6. Drinking water use (L/day) in the Netherlands by application in 2016

## INVENTORY RESEARCH





# DRINKING WATER: OPPORTUNITIES FOR CREATING ABUNDANCE

## Groundwater use by industrial sector

### ➤ Large groundwater user:

- Zinc company
- Drinks companies
- Chemistry companies

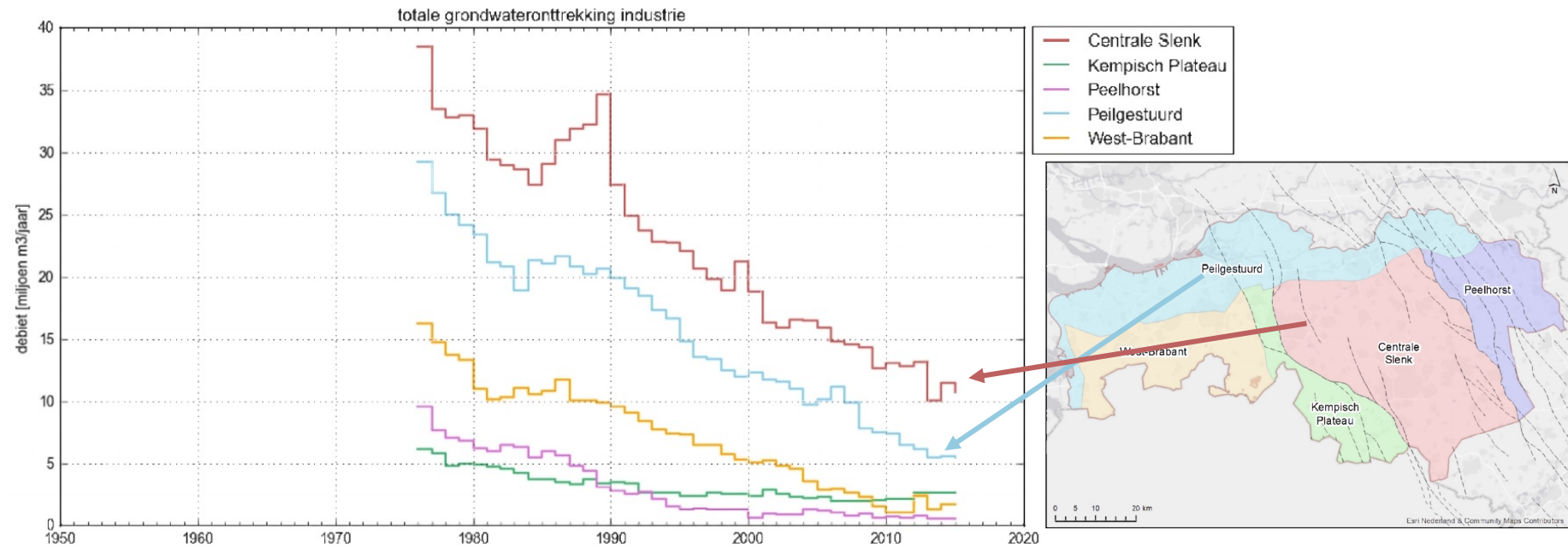
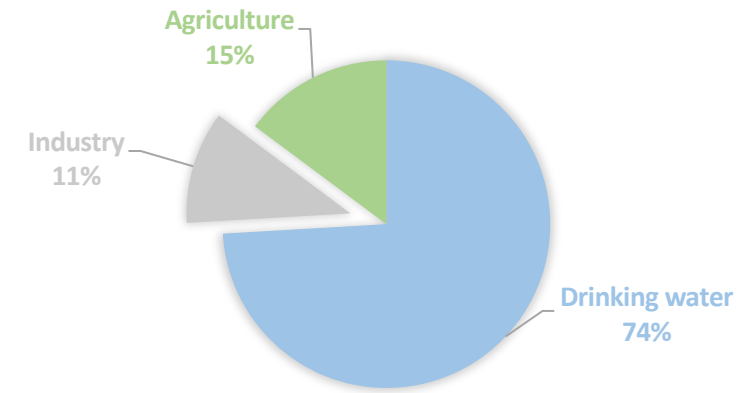


Figure 7. Groundwater extraction by industry sector over the years in North Brabant

INVENTORY  
RESEARCH



DRINKING  
WATER:  
OPPORTUNITIES  
FOR  
CREATING  
ABUNDANCE

Groundwater use by agriculture sector

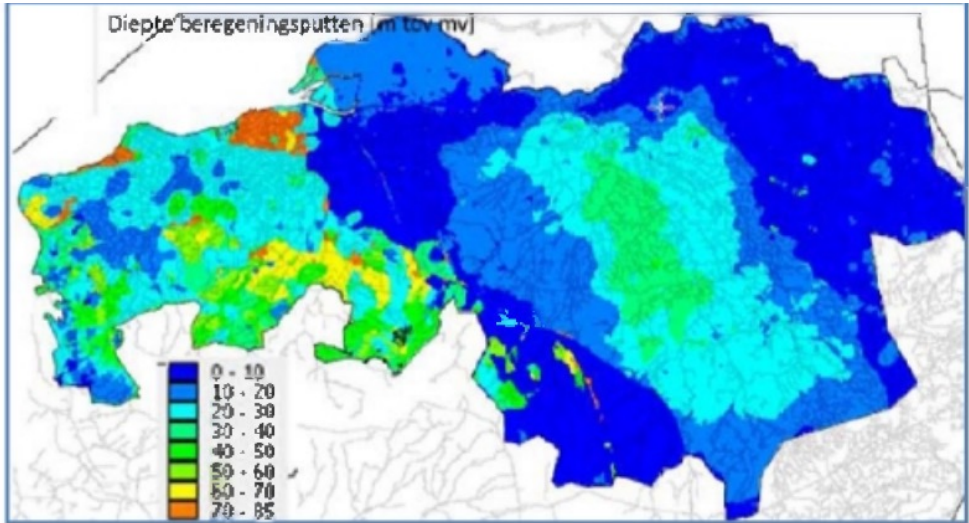
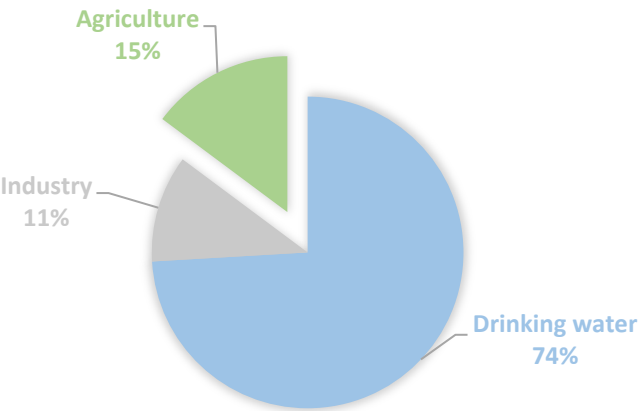
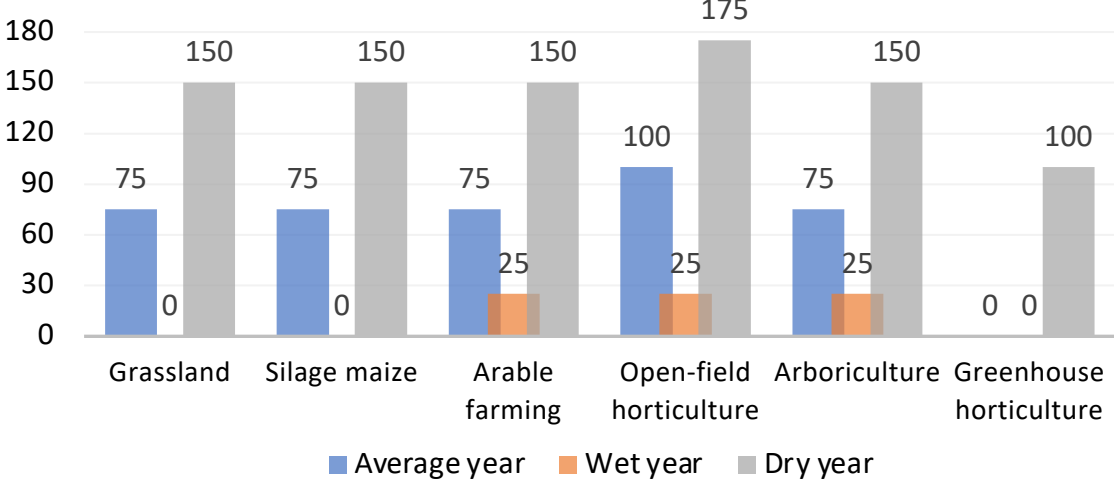


Figure 8. Predicted extraction depth of groundwater for irrigation



Theoretical irrigation requirement of crops (mm)



INVENTORY  
RESEARCH



# DRINKING WATER: OPPORTUNITIES FOR CREATING ABUNDANCE

## Best practice 1: Well designed urban rainwater harvesting

How can water partners and designers contribute to the effective implementation?

- Promote acceptance
- Additional value
- Increase quality of living in neighborhoods
- Encourage behavioral change



*Credit: DIJKSTRA, ROEL*

*Figure 12. Bentheplein Water square in Rotterdam*

INVENTORY  
RESEARCH





# DRINKING WATER: OPPORTUNITIES FOR CREATING ABUNDANCE

## Best practice 2: Well designed waste water treatment plant

“New sanitation”:

- Extremely low flush toilet: 1L
- Vacuum collection and separate collection
- Closed treatment system: small footprint and no smell

Create awareness through design:

- Well designed waste water treatment plant in Sneek, Friesland. Created awareness under inhabitants, resulting in an additional 10% water savings.
- Floating waste water treatment plant in Amsterdams canal. With viewing platform so inhabitants can visit.

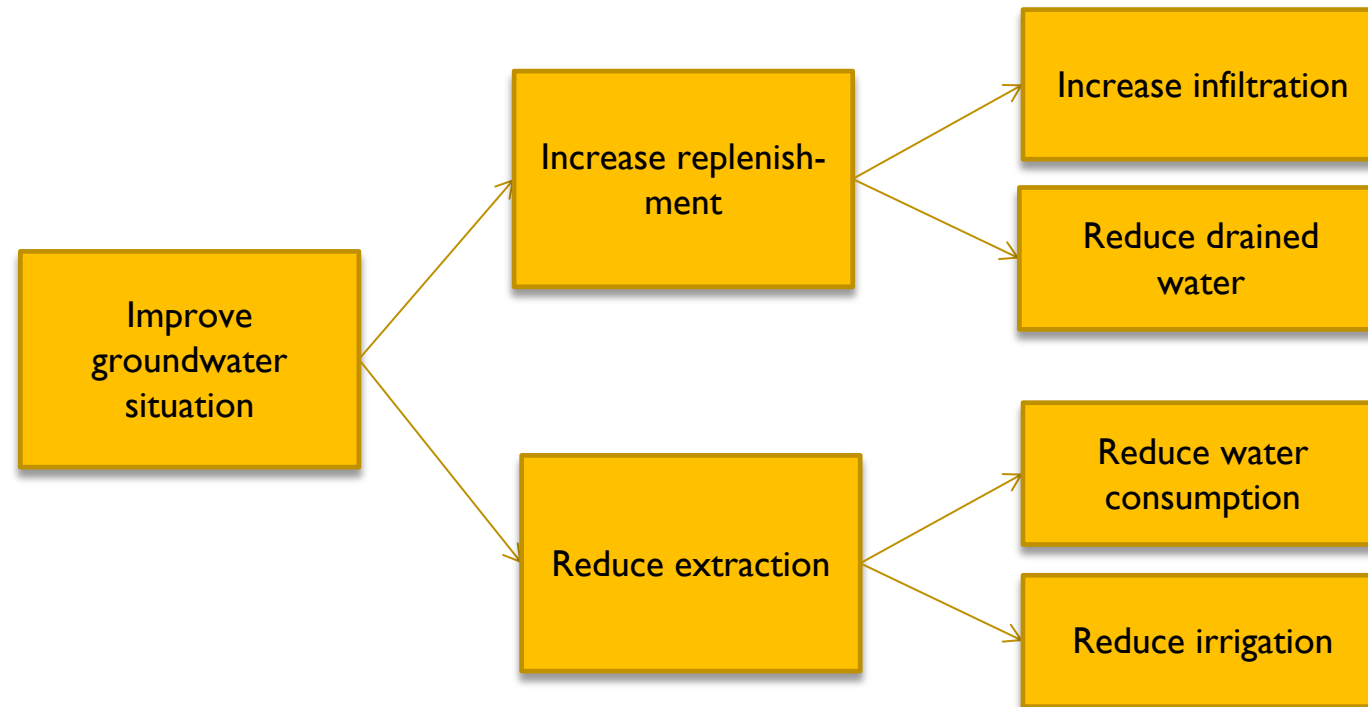


INVENTORY  
RESEARCH



# DRINKING WATER: OPPORTUNITIES FOR CREATING ABUNDANCE

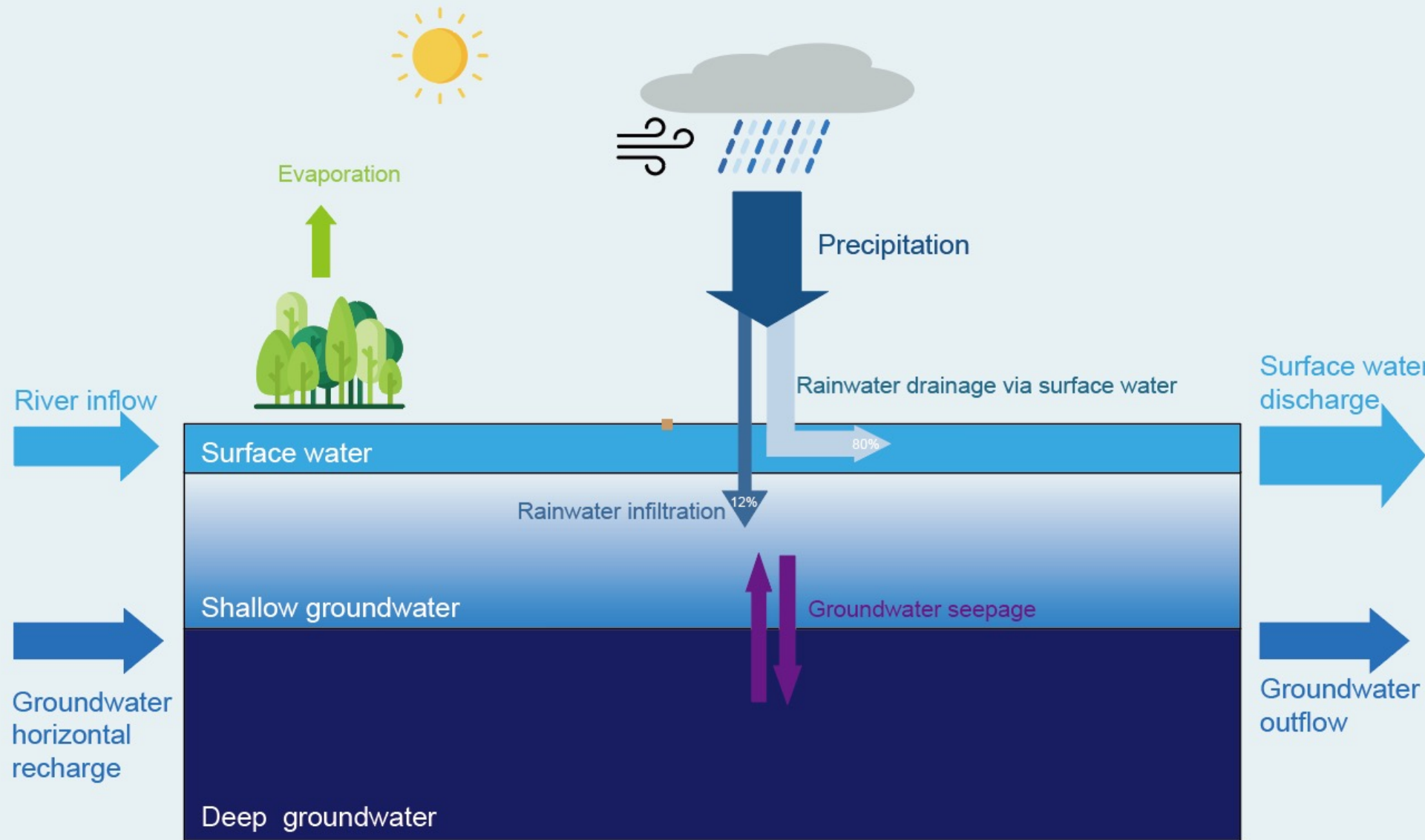
## Opportunities: from where to create water abundance



**INVENTORY  
RESEARCH**

# DRINKING WATER: OPPORTUNITIES FOR CREATING ABUNDANCE

## Natural water system

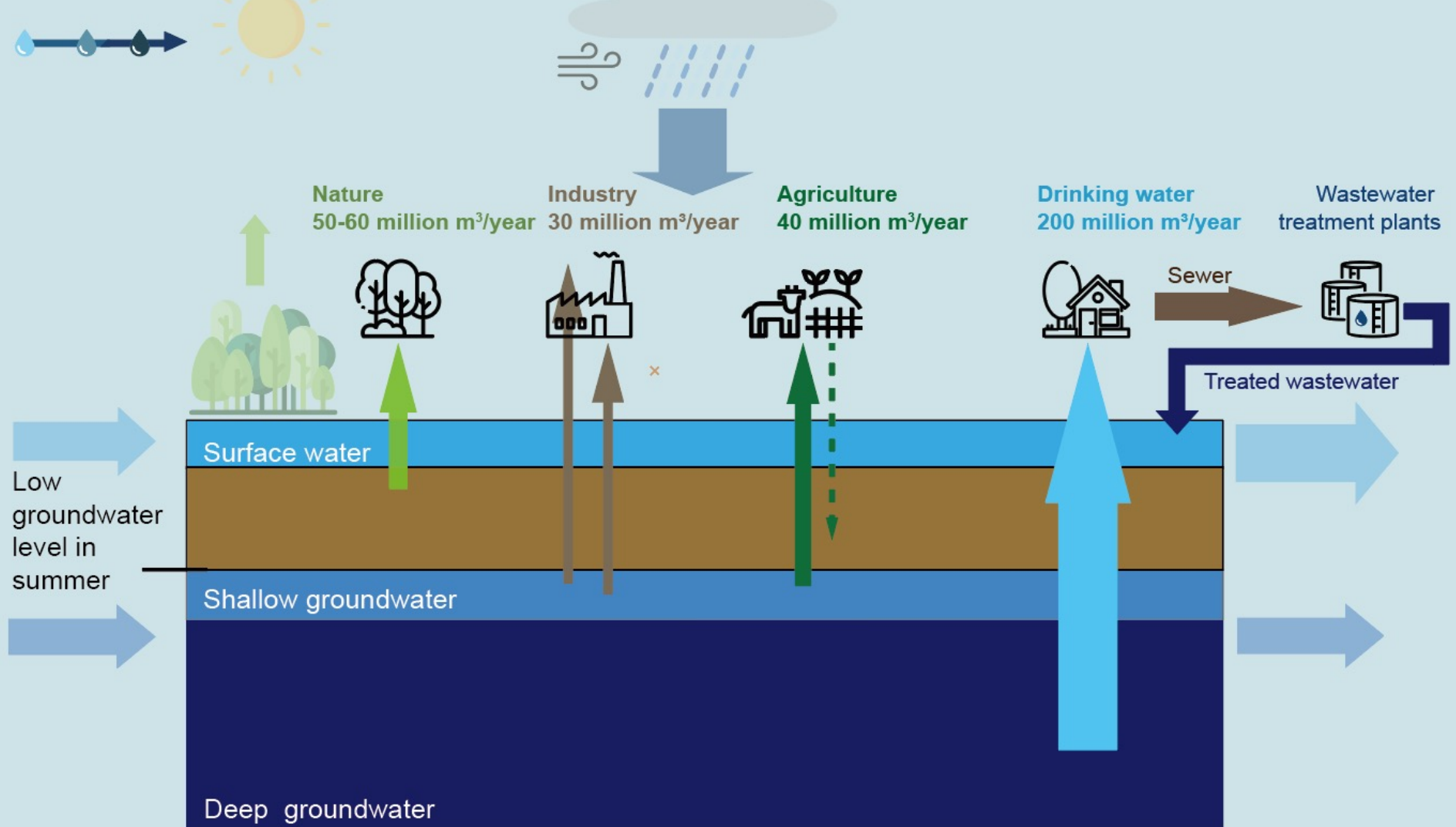


## INVENTORY RESEARCH

# DRINKING WATER: OPPORTUNITIES FOR CREATING ABUNDANCE

## Current situation

Linear water use



**Annual groundwater use by human activities  $\geq 270$  million m³/year**

## INVENTORY RESEARCH

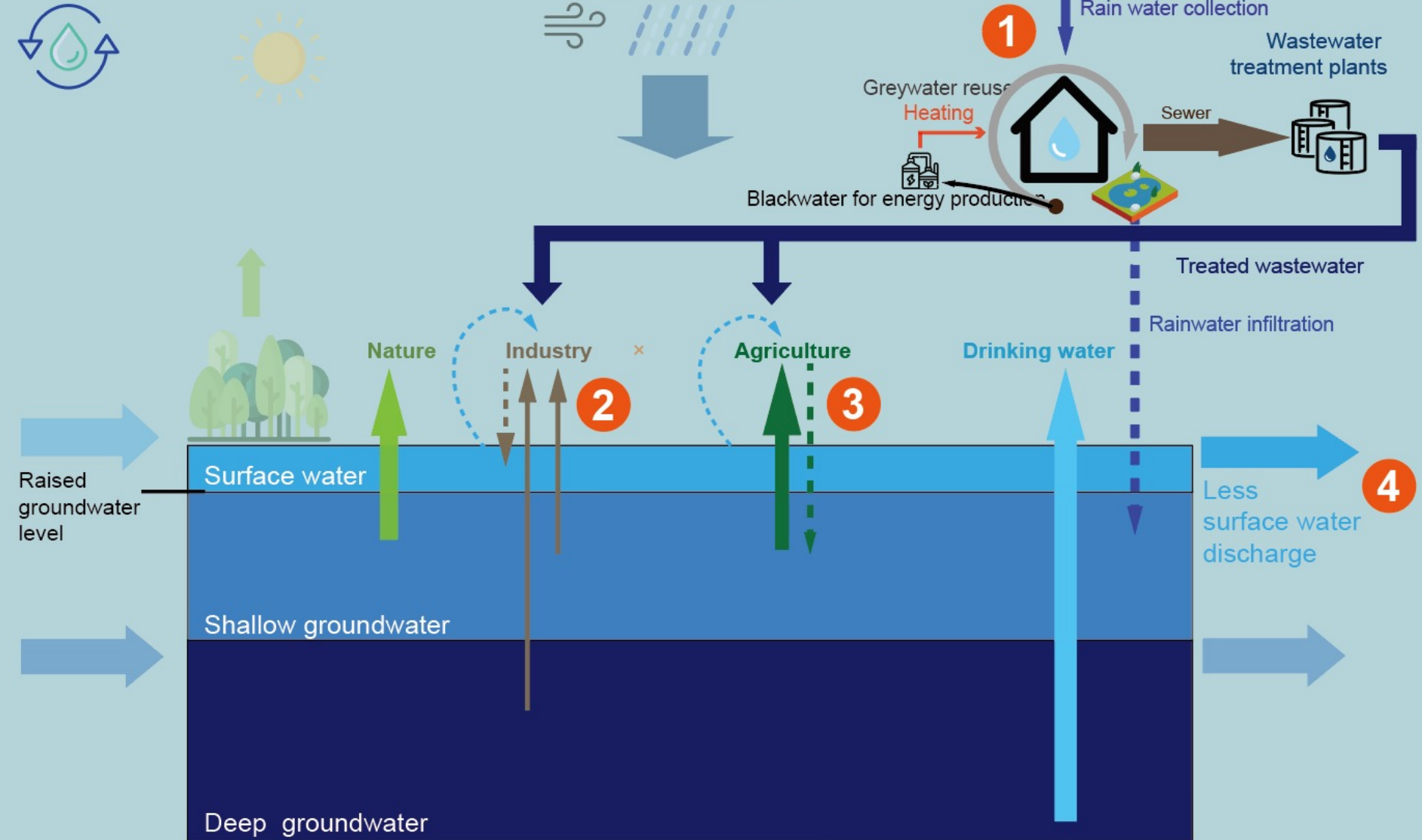




# DRINKING WATER: OPPORTUNITIES FOR CREATING ABUNDANCE

## Desired situation

Circular water use

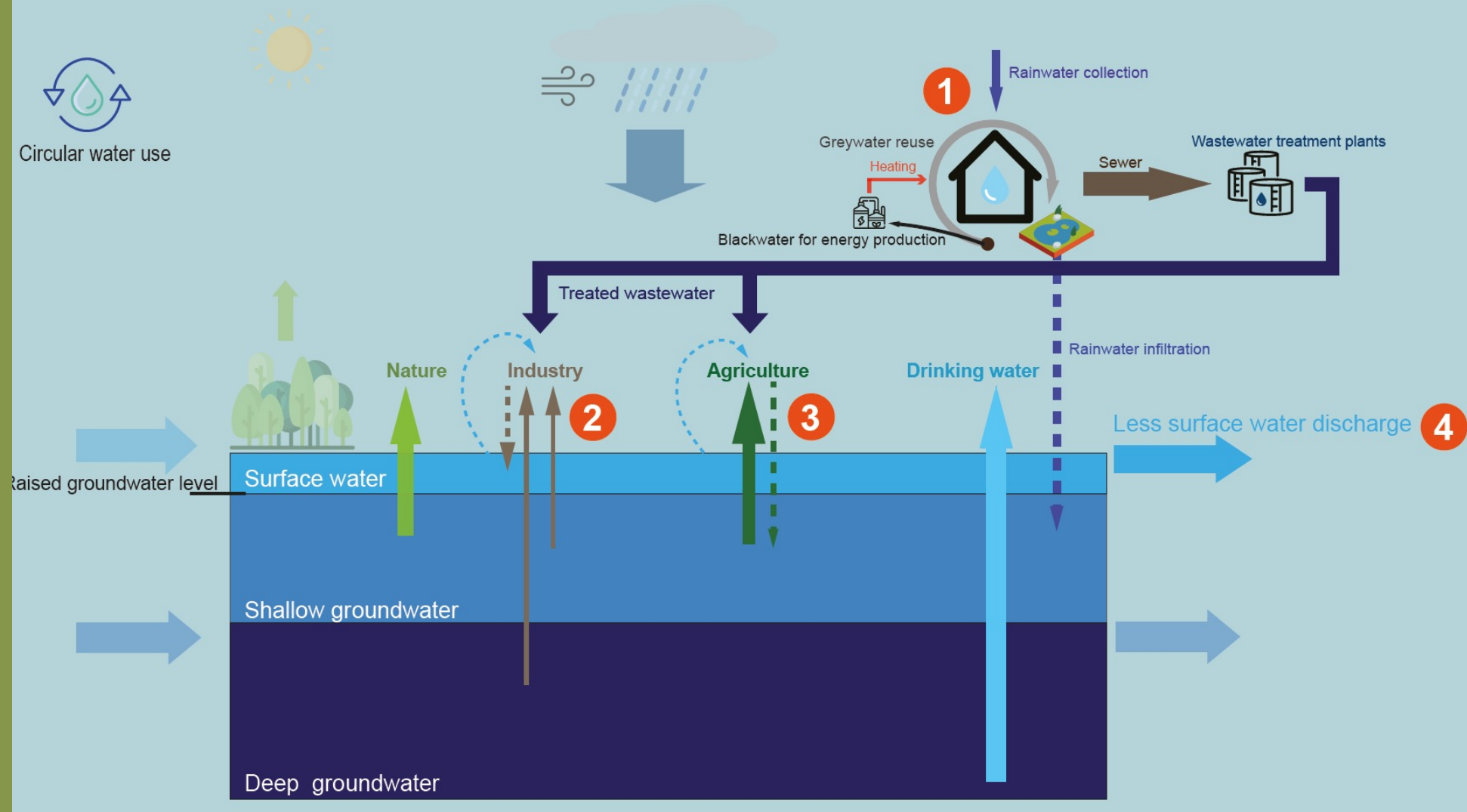


INVENTORY  
RESEARCH



World Design  
Embassies

# DRINKING WATER: OPPORTUNITIES FOR CREATING ABUNDANCE



## Opportunities for creating water abundance

1

1. Wastewater separation; Greywater reuse locally, blackwater for energy production
2. Rainwater collection and use locally
3. Create water ponds and green areas to retain water and enable water infiltration

2

1. Use surface water to replace groundwater in the industrial processes with low water quality requirement
2. Use treated wastewater from near wastewater treatment plants/water factories.
3. Discharge excess clean industrial water back to surface water system

3

1. Replace part of groundwater with surface water for irrigation.
2. Use treated wastewater from near wastewater treatment plants/water factories.

4

1. Less ditches and higher drainage level in fields.
2. Create water ponds to retain water.
3. Increase green-paved area to enable rainwater infiltration

## INVENTORY RESEARCH



# DRINKING WATER: OPPORTUNITIES FOR CREATING ABUNDANCE

## Next Steps & recommendations:

- Continue discussion with technical, social, creative professionals. How to improve effectiveness of technical solutions?
- How to involve stakeholders that are affected by the implementation of certain measures?
- How to create added value (monetary / quality of living/environment) from measures that can be implemented?
- Identify more best practices, which measures are already put into place and by whom?

## INVENTORY RESEARCH



# DRINKING WATER: OPPORTUNITIES FOR CREATING ABUNDANCE

## Relevant links and documents

- Report: Opportunities for creating abundance of drinking water
- Mural (result Workshop)
- For literature and references, take a look at the report

## INVENTORY RESEARCH

