

Best Duurzaam Water A3s

by *Gerrit Muller* USN-SE

e-mail: gaudisite@gmail.com

www.gaudisite.nl

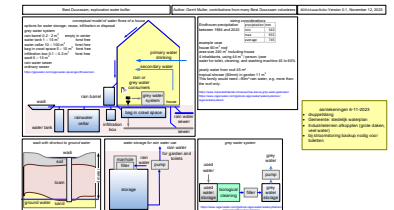
Abstract

This presentation captures the water situation in the municipality Best and options to improve the situation. These A3s are the result of workshops strategy of Best Duurzaam (Best Sustainable).

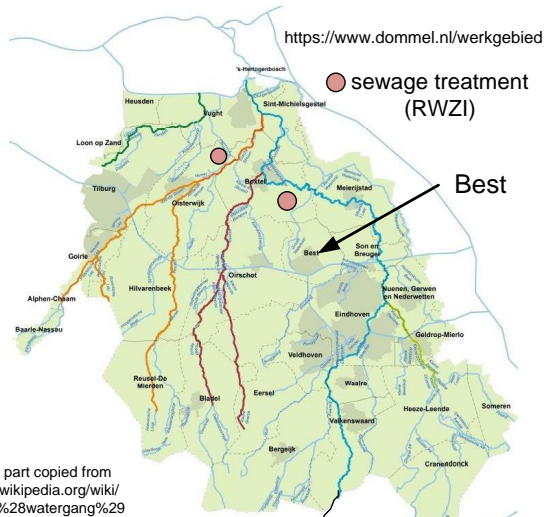
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draft
version: 0



Waterschap de Dommel



Belgium part copied from https://nl.wikipedia.org/wiki/Dommel_%2Bwatergang%29

Waterschap de Dommel Lommel Pelt Peer Houthalen-Helchteren

https://www.dommel.nl/_flsystem/media/folder-feiten-cijfers-wdd-digitaal.pdf

cleaned wastewater: $0.1 * 10^9 \text{ m}^3/\text{year}$

water consumption per person: $43.8 \text{ m}^3/\text{year}$

900,000 inhabitants

water consumption: $0,039 * 10^9 \text{ m}^3/\text{year}$

Background information

Brabant Waterland; Book with background information: <https://www.brabant.nl/-/media/1fb7de40c9fb447386438923d82af8d6.pdf>

Brabant

average extraction of ground water per year

- for agriculture normal years: $70 * 10^6 \text{ m}^3$
- for agriculture in dry years: $100 \text{ to } 200 * 10^6 \text{ m}^3$
- for drinking water and industry: $240 * 10^6 \text{ m}^3$

extraction of ground water during droughts per day:

- for agriculture: $2.0 * 10^6 \text{ m}^3$
- for drinking water and industry: $0.66 * 10^6 \text{ m}^3$ (p75)

Water inlets

Brabant's brooks and streams can be filled through

- the canals
- water treatment systems (p77)

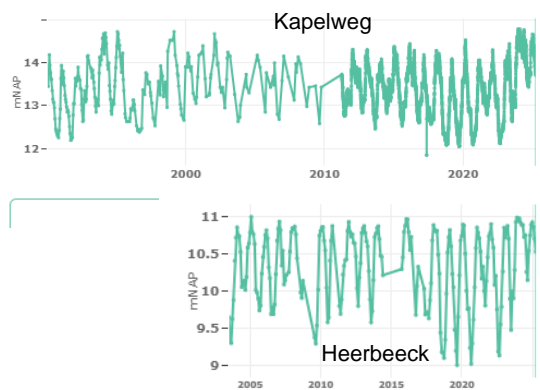
who pays what: <https://www.dommel.nl/tarieven>

visualizations of Brabant Water: <https://www.brabantinzicht.nl/toestand-natuur-water-en-milieu/water/>

Brabant Water, drinking water



groundwater level



<https://grondwaterstand.brabant.nl/>

At this moment, the minimum rising height gets lower over time, however it seems to recover still during the wet season.

The lower minimum may be problematic for biodiversity, for instance when fens and shallow pools and lakes dry up during spring or summer.

Problem exploration

- precipitation
- decrease in summer
 - increase in winter
 - increase of probability of intense downpours
 - increase of droughts
 - many roofs and streets discharge in sewer
- water quality
- chemical pollution
 - biodiversity
- clean water consumption
- increase due to growing population

Consequence exploration

- precipitation
- buffer water for use during droughts
 - sufficient buffers to prevent flooding
 - redirect water to land rather than sewer
- water quality
- lower chemical emissions
 - extend water treatment systems
 - adapt to facilitate biodiversity
- clean water consumption
- reduce individual consumption
 - use "grey" water where feasible

Quotes from solution brainstorm

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Concluding questions and comments

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precipitation Eindhoven average over 10 years

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	year
1994	66	38	62	48	43	70	68	65	64	60	63	82	730
1995	74	46	66	42	46	62	67	57	68	60	59	81	727
1996	62	51	59	37	45	59	67	63	66	58	63	74	705
1997	59	56	52	39	49	60	61	62	63	54	57	76	687
1998	52	50	49	46	45	72	51	62	71	64	62	73	698
1999	60	52	48	42	52	72	52	70	71	59	65	78	721
2000	60	51	52	44	57	69	63	69	72	65	68	77	745
2001	59	56	60	47	56	66	71	73	83	68	63	78	780
2002	65	65	56	46	57	65	73	66	81	65	62	82	784
2003	64	64	59	49	59	65	69	66	72	67	63	77	773
2004	66	67	53	47	59	63	81	68	66	65	66	72	774
2005	58	67	48	50	57	61	89	71	62	66	71	71	771
2006	58	72	53	54	60	61	88	69	60	67	69	73	786
2007	70	70	56	50	61	60	95	70	63	66	72	75	808
2008	71	74	56	46	64	51	100	73	51	56	69	72	784
2009	66	73	55	47	59	51	102	69	48	61	78	67	776
2010	65	70	55	44	58	47	95	78	51	57	80	67	768
2011	65	70	48	39	59	51	90	85	39	58	74	72	750
2012	68	60	46	41	62	56	93	84	43	59	68	75	754
2013	65	63	47	38	60	57	88	84	49	61	72	72	757
2014	60	61	45	35	66	56	89	90	48	63	68	75	756
2015	64	57	48	30	66	54	84	94	52	64	68	75	755
2016	72	57	47	32	64	71	85	85	53	60	69	70	766
2017	66	55	47	34	57	65	85	84	55	62	70	73	754
2018	70	52	46	39	58	60	75	83	54	60	68	81	745
2019	71	51	49	36	59	62	69	82	58	61	61	82	743
2020	71	60	49	35	53	72	69	72	54	62	55	83	736
2021	74	59	53	38	58	75	70	66	54	65	58	74	745
2022	68	67	52	34	55	77	60	61	60	61	60	69	723

source: ROYAL NETHERLANDS METEOROLOGICAL INSTITUTE https://cdn.knmi.nl/knmi/map/page/klimatologie/gegevens/maandgegevens/mndgeg_370_rh24.txt

yearly precipitation Eindhoven 1985-2022

precipitation	mm
min	563
max	955
average	745

conceptual model of water flows of a house

options for water storage, reuse, infiltration or disposal

grey water system

rain barrel 0.2 - 2 m³ empty in winter

water tank 1 - 15 m³ forst free

water cellar 10 - 100 m³ forst free

bag in crawl space 5 - 15 m³ forst free

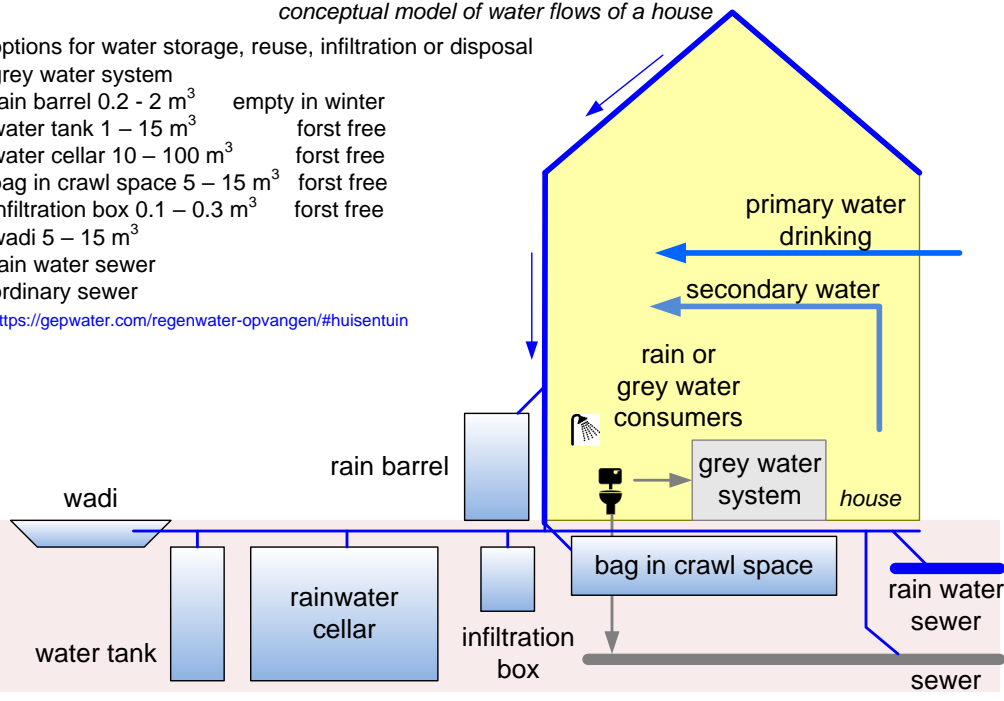
infiltration box 0.1 - 0.3 m³ forst free

wadi 5 - 15 m³

rain water sewer

ordinary sewer

<https://gepwater.com/regenwater-opvangen/#huisentuin>



sizing considerations

Eindhoven precipitation between 1984 and 2022

precipitation	mm
min	563
max	955
average	745

example case

house 60 m² roof

area size 240 m² including house

4 inhabitants, using 44 m³ / person /year

water for toilet, cleaning, and washing machine 45 to 60%

yearly water from roof 45 m³

tropical shower (60mm) in garden 11 m³

This family would need ~90m³ rain water, e.g. more than the roof only.

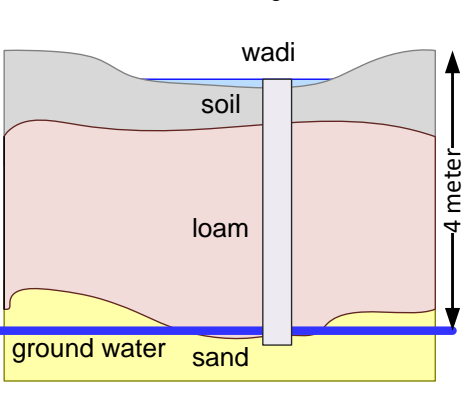
<https://www.mijnwaterfabriek.nl/nieuws/hoe-kan-ik-grijs-water-gebruiken>

<https://www.regenwater.com/gebruik-regenwater/watersystemen/regenwatersysteem>

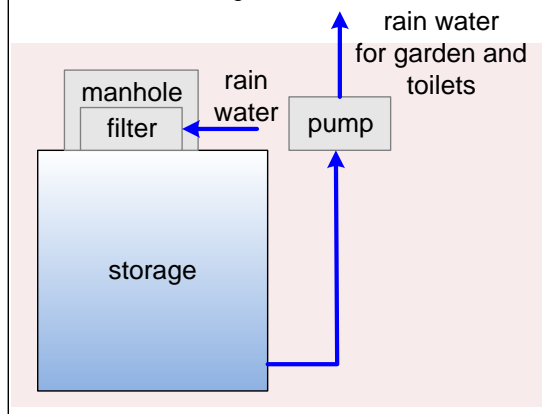
aantekeningen 6-11-2023

- druppelslang
- Gemeente: stedelijk waterplan
- Industrierrein afkoppelen (grote daken, veel water)
- bij stroomstoring backup nodig voor toiletten

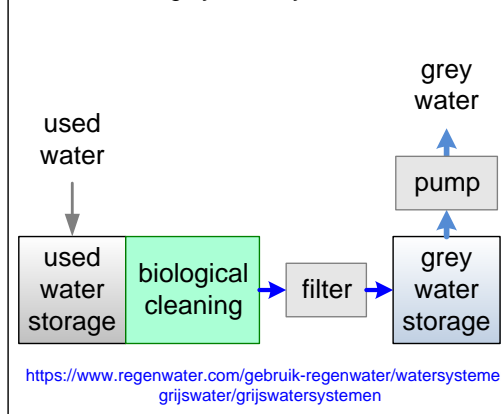
wadi with shortcut to ground water



water storage for rain water use



grey water system



<https://www.regenwater.com/gebruik-regenwater/watersystemen/grijswater/grijswatersystemen>