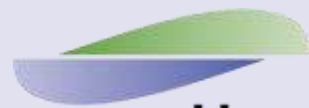


# "Water Scarcity and Climate Change in Germany: A New Feeling - Adaptive Reservoir Management in Lower Saxony to Increase Resilience"

10th Water Research Horizon Conference 2019  
18th-19th JUNE 2019 | GEOZENTRUM HANNOVER |  
GERMANY  
Christoph Donner/ Harzwasserwerke



**Harzwasserwerke**

*herrlich weiches Wasser*

# Network and pipe system

The Harzwasserwerke network provides security to customers such as municipal utilities and supply companies:

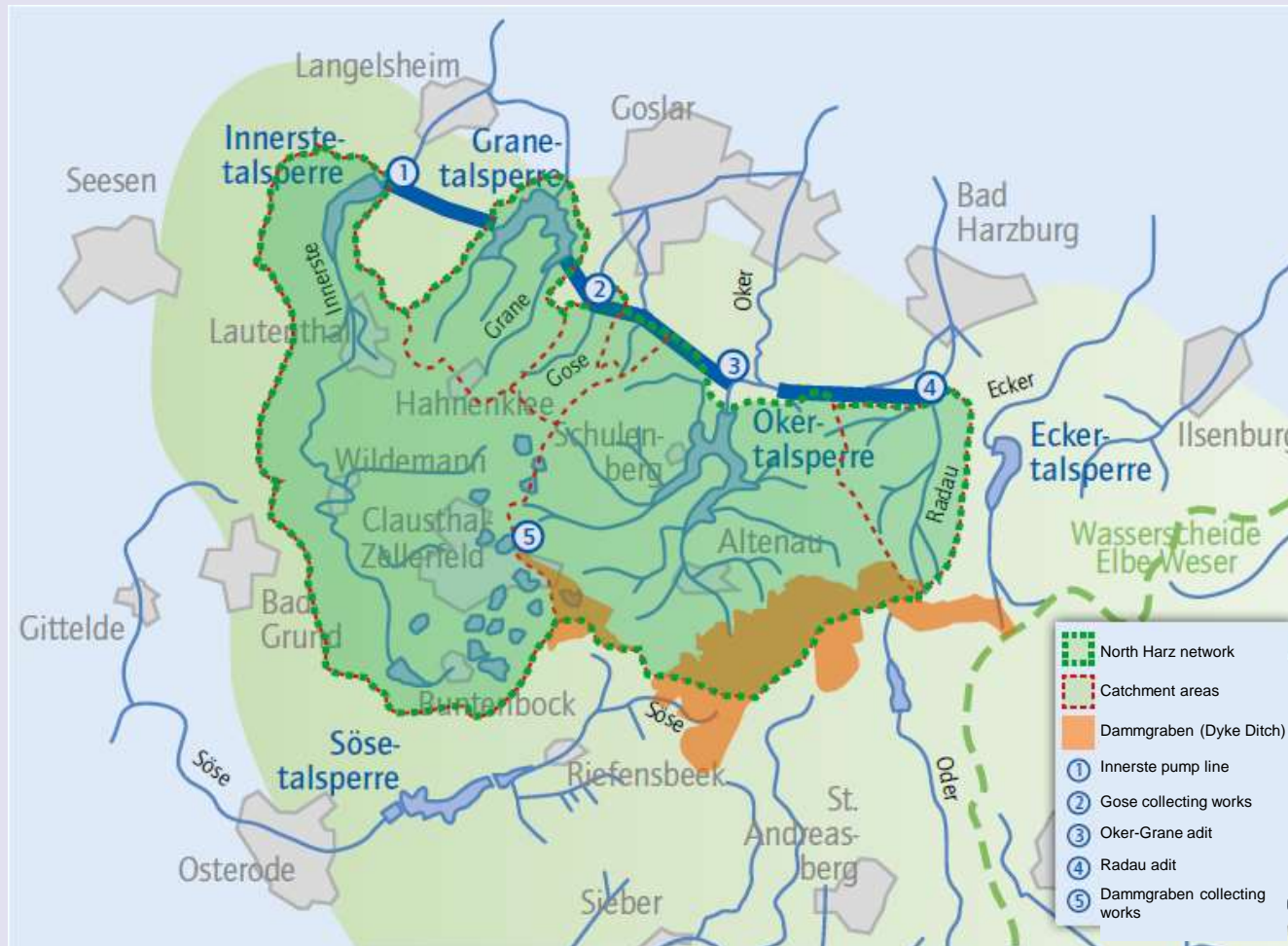
- Six dams (large); 67 in total
- Four ground/ three surface water treatment plants
- Approximately 520 kilometres of pipes, numerous water towers and pressurisation systems



2018 planned: 95.5 M m<sup>3</sup> drinking water

2018 supplied: more than 100 M m<sup>3</sup> drinking water

# North Harz network



Innerste dam

- Completion: 1966
- Catchment area: 97 km<sup>2</sup>
- Reservoir capacity: 19.26 M m<sup>3</sup>
- Maximum height: 35 m



Grane dam

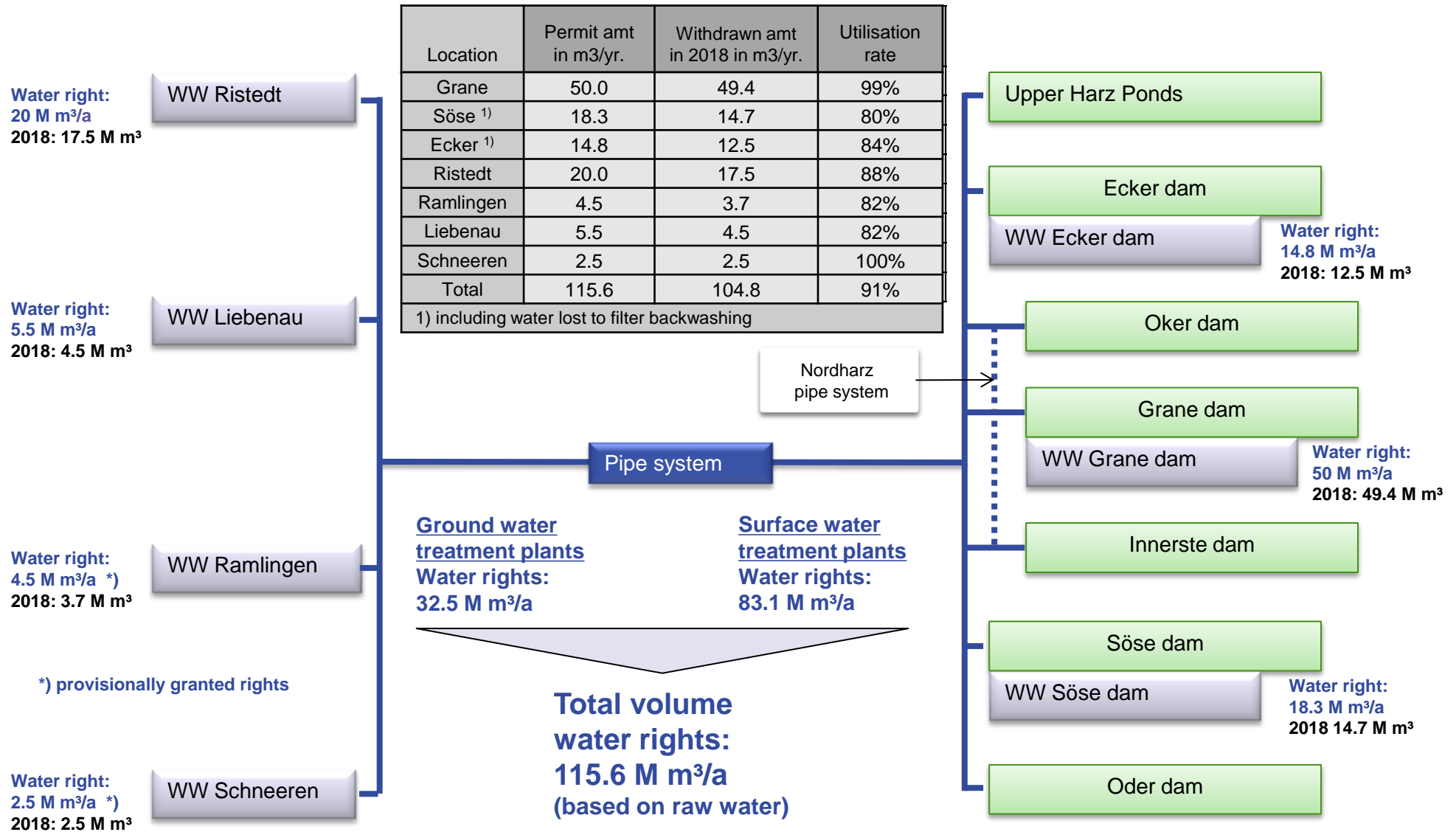
- Completion: 1969
- Catchment area: 22 km<sup>2</sup>
- Reservoir capacity: 46.39 M m<sup>3</sup>
- Maximum height: 62 m



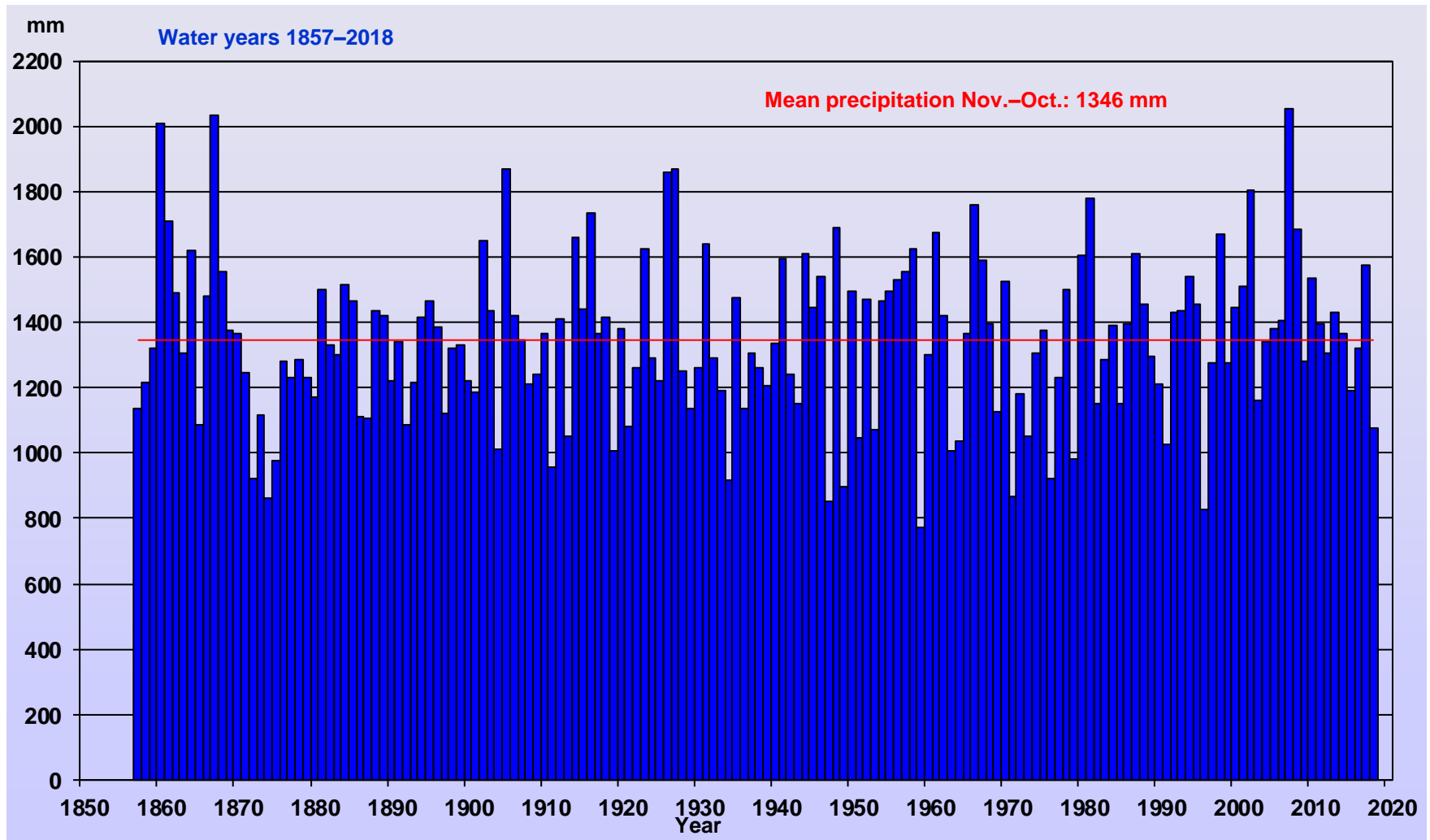
Oker dam

- Completion: 1956
- Catchment area: 85 km<sup>2</sup>
- Reservoir capacity: 46.85 M m<sup>3</sup>
- Maximum height: 67 m

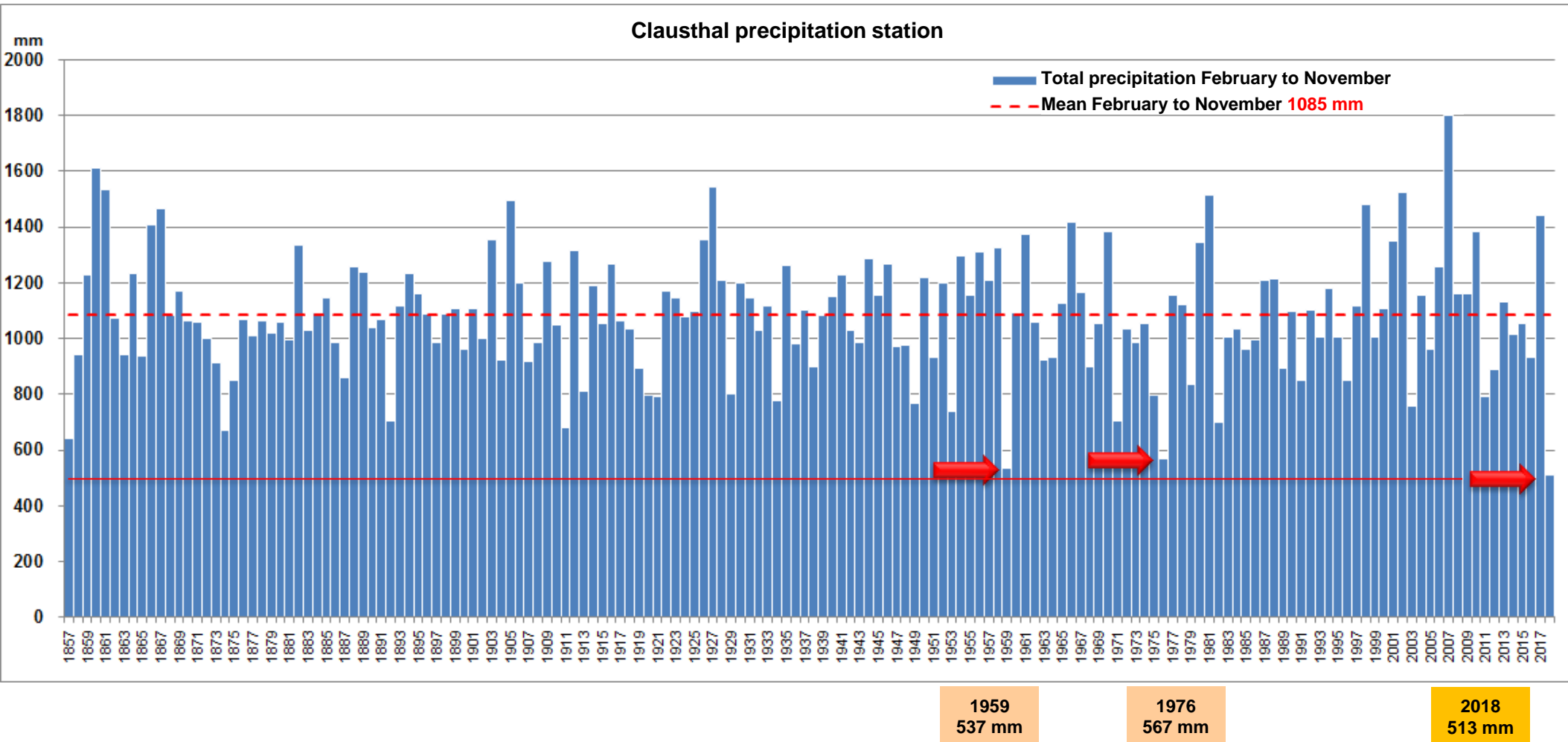
# Resource management 2018 overview



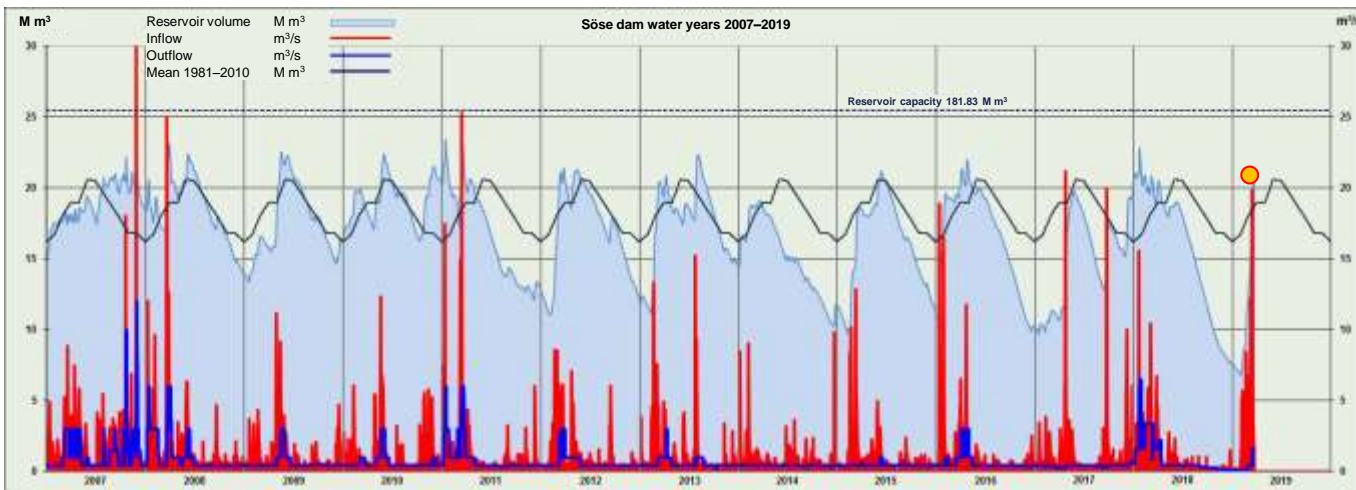
# Annual precipitation in mm Clausthal station (563 metres above sea level)



Total precipitation in mm  
 Clausthal station (563 metres above sea level)  
 Feb. to Nov.



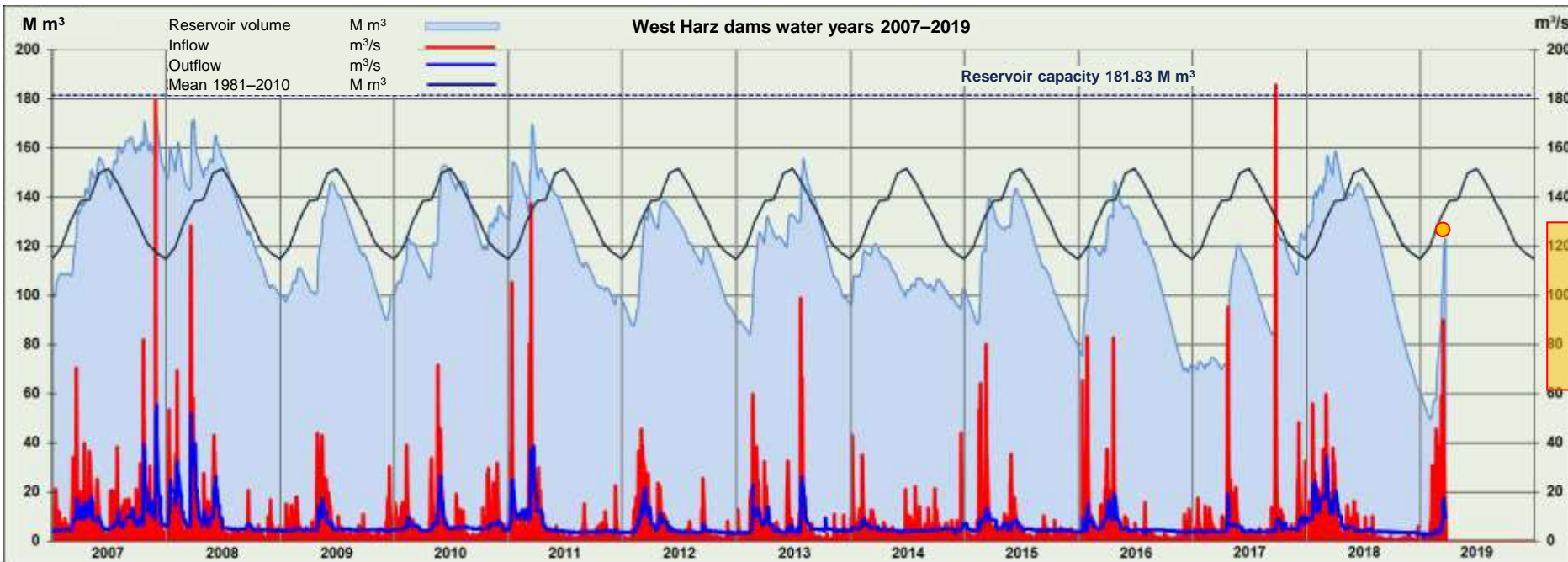
# Reservoir volumes: Overview 2007 - 2019



**Söse dam  
volume  
(21.01.2019)  
20.3 M m<sup>3</sup>  
80 %**

## Dam levels in percentage of capacity (21.01.2019)

Oder	72 %
Söse	80 %
Ecker	61 %
Oker	63 %
Grane	60 %
Innerste	81 %

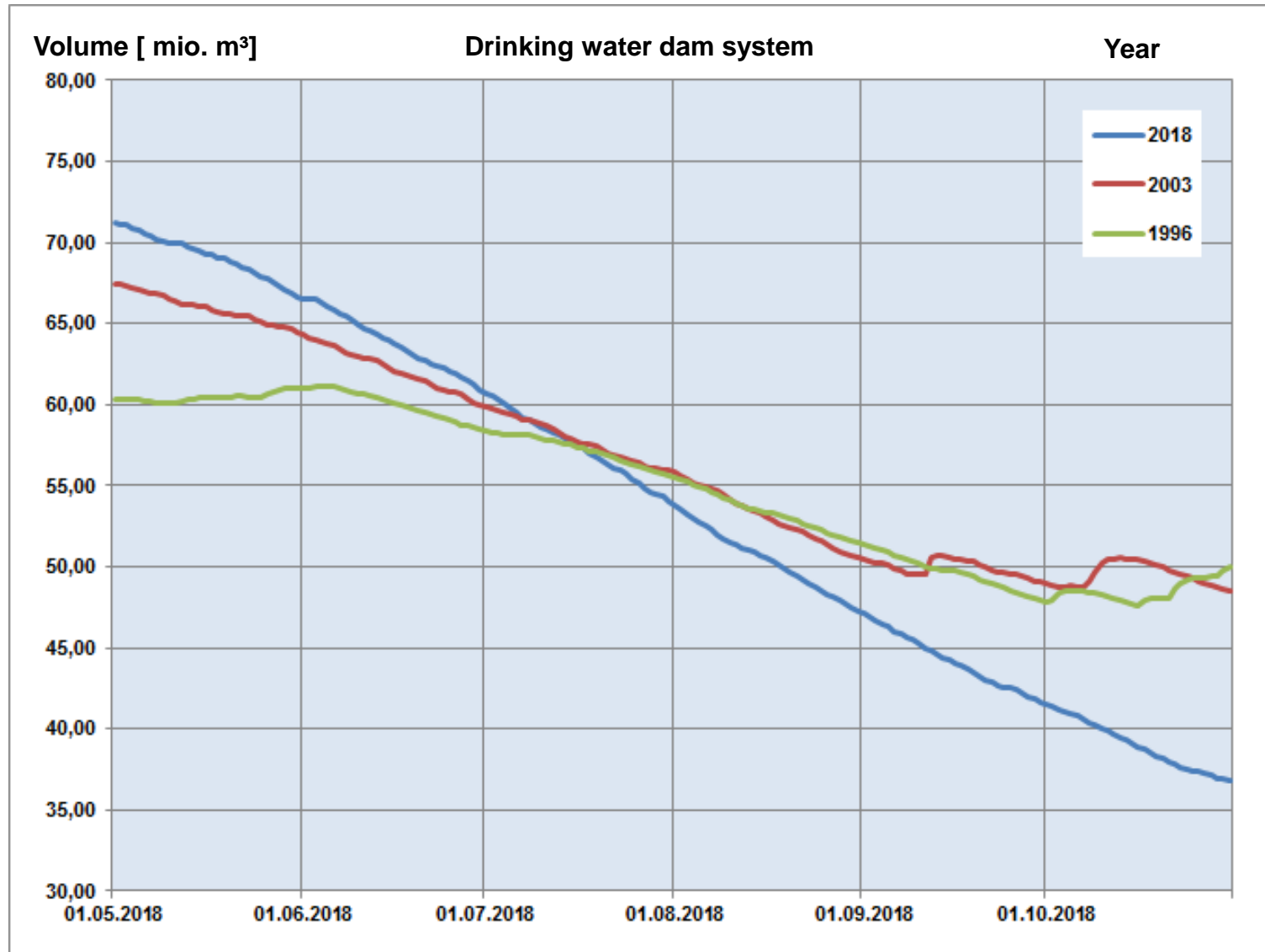


**Total dam  
volume  
(21.01.2019)  
123.69 M m<sup>3</sup>  
68 %**

# Decrease comparison of water output of the drinking water dam system (may – october)



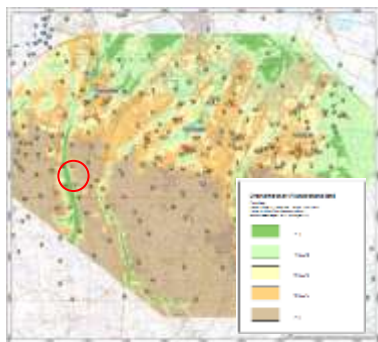
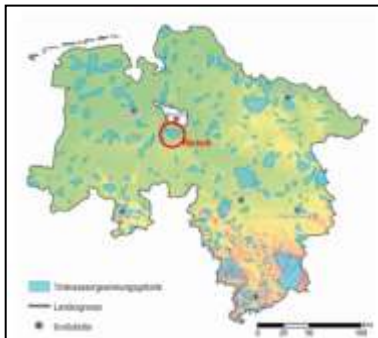
Real-time effect on surface water demand



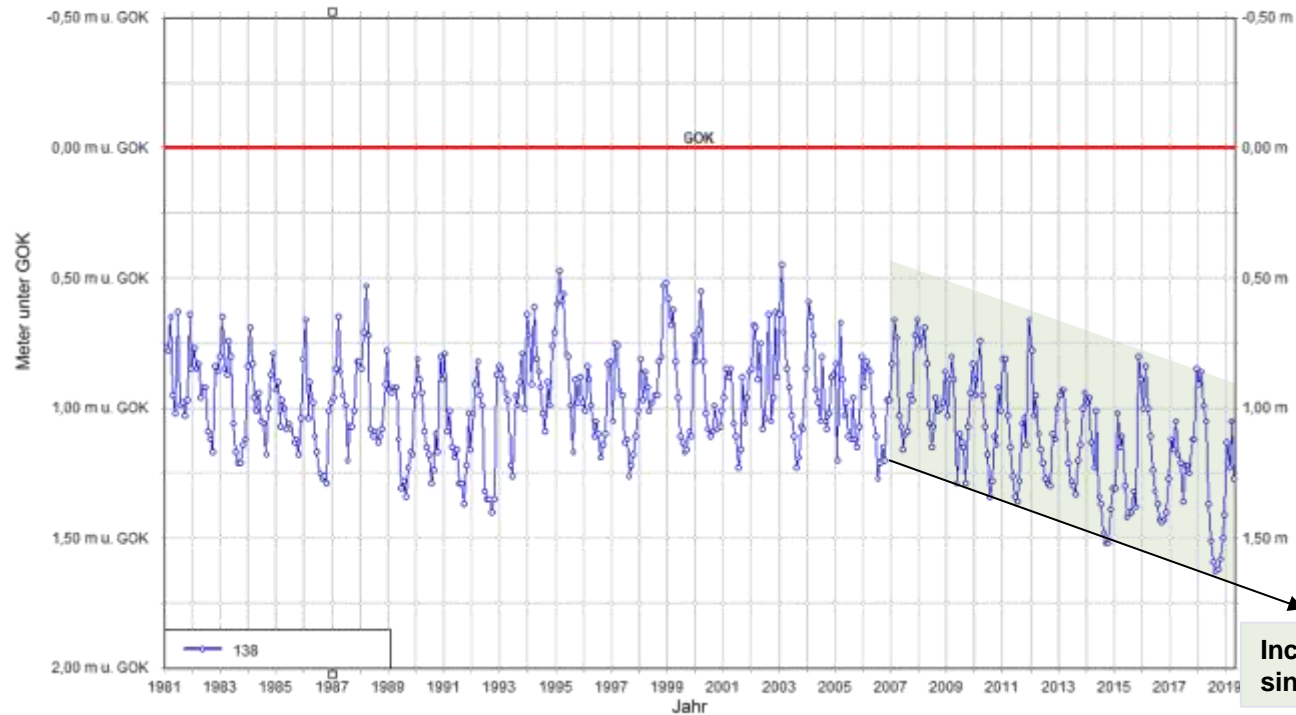


# Security of supply Groundwater

## Long-term effect on groundwater situation



Harzwasserwerke GmbH  
Wasserwerk Ristedt  
Grundwassermessstelle 138, Kirchseelte

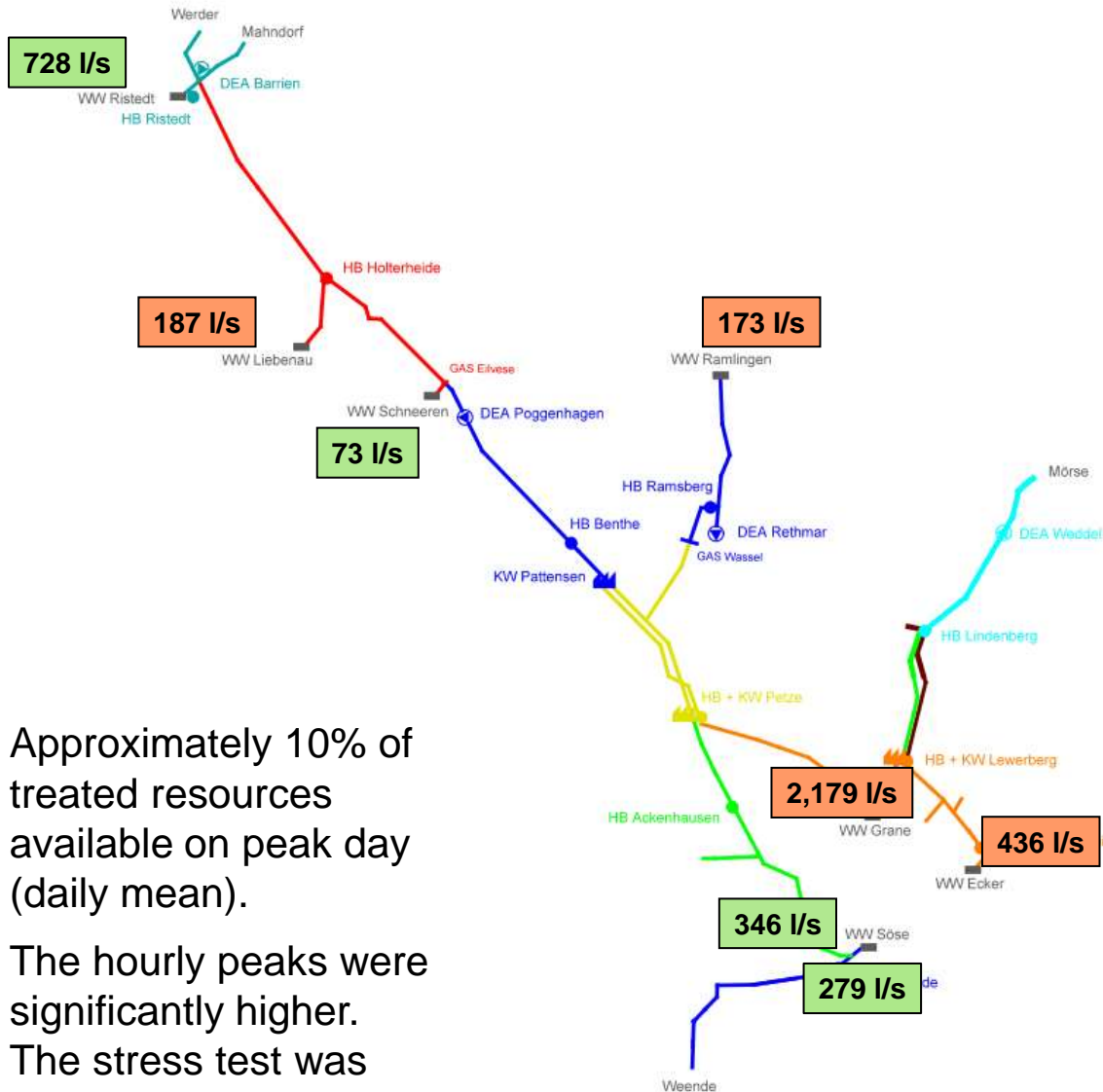


Groundwater decrease  
02. bis 09. 2018  
0,80 m

Increasing dryness  
since 2007 / 2008

# Security of supply on peak day

## Situation on 26.07.2018 (daily means)



- Approximately 10% of treated resources available on peak day (daily mean).
- The hourly peaks were significantly higher.
- The stress test was passed.

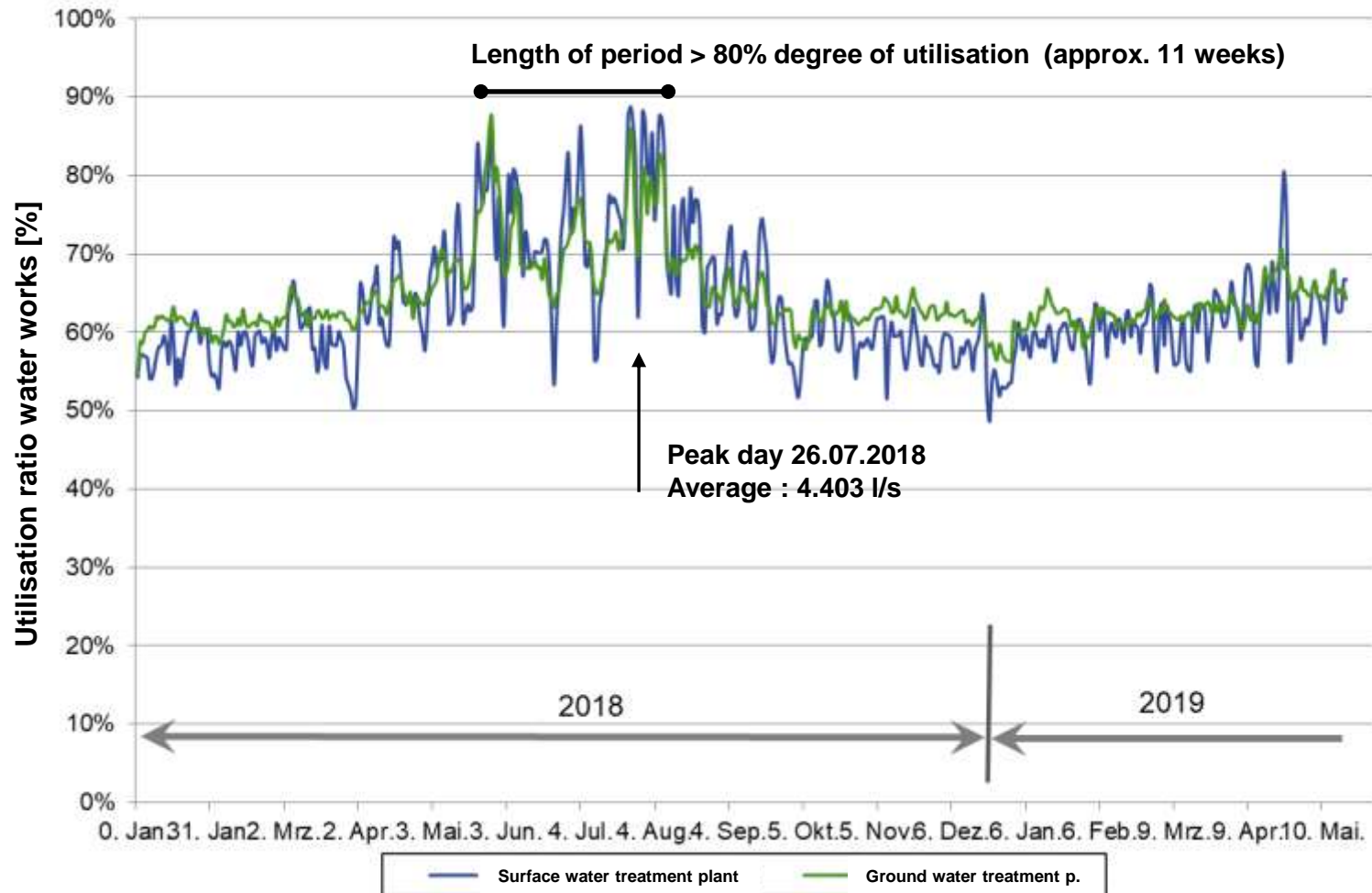
WW	Q <sub>d</sub> [l/s]	max. Q <sub>WW</sub> [l/s] *)	Utilisation rate [%]
Grane	2,179	2,200	99
Ecker	436	450	97
Söse I	346	500	69
Söse II	279	500	56
<b>Harz</b>	<b>3,240</b>	<b>3,650</b>	<b>89</b>
Ristedt	728	900	81
Ramlingen	173	190	91
Schneeren	73	100	73
Liebenau	187	160**)	117
<b>Ground water</b>	<b>1,161</b>	<b>1,350</b>	<b>86</b>

\*) max. production capacity for raw water conditions in July 2018

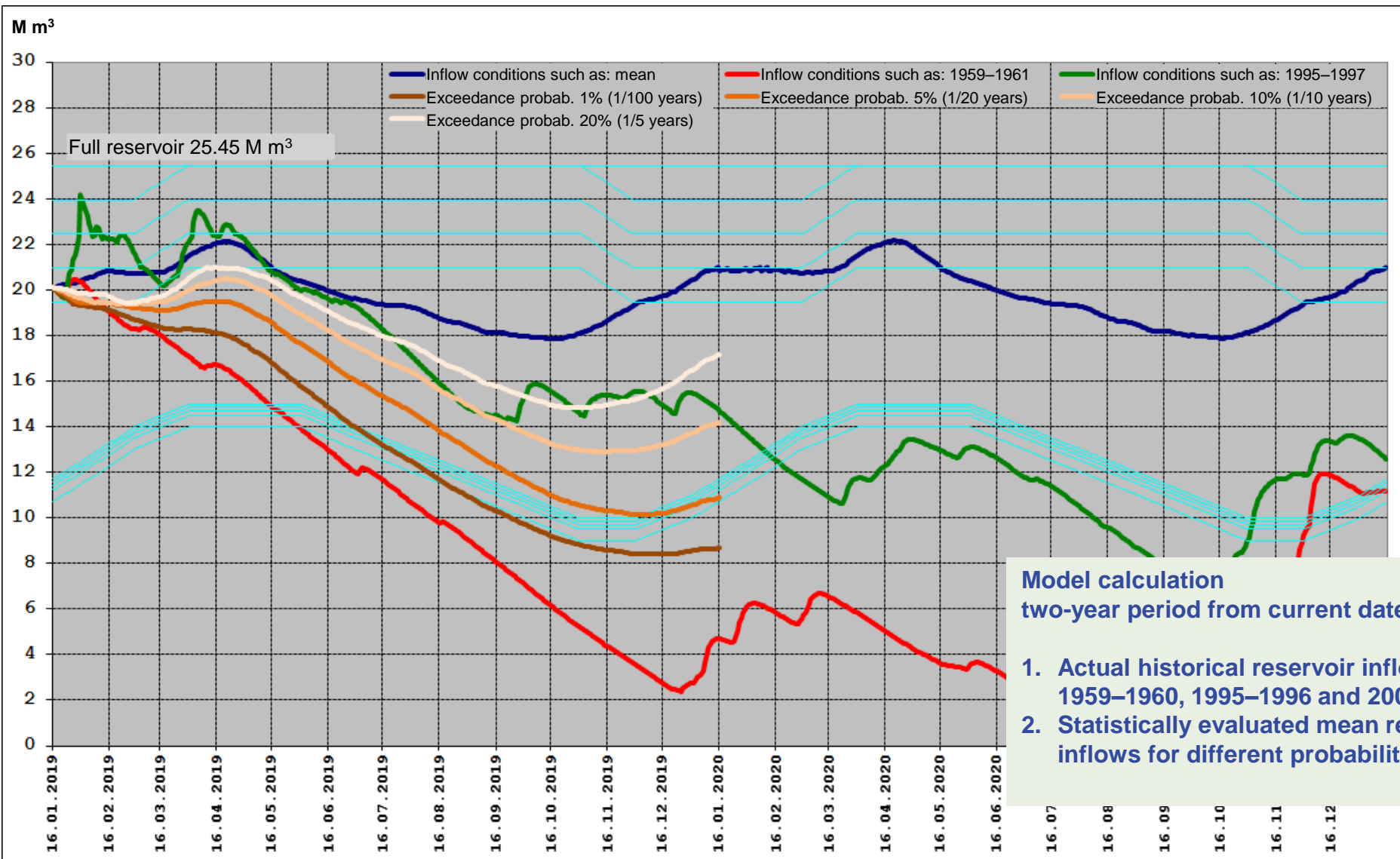
\*\*\*) max. volume in compliance with international target nitrate concentration 30 mg/l reached approx. 35 mg/l

# Security of supply on long term

## Situation summer 2018



# Forecasts and model calculations



# Multi-stage action plan for 2018–2019



Stage	Action
Stage 1	<ul style="list-style-type: none"> <li>➤ Shifting of loads in drinking water production within the Harzwasserwerke network</li> <li>➤ Reduction of underwater release at Söse dam through authorised special operation plan</li> <li>➤ Drainage of Morgenbrodstaler Graben (Morgenbrodstal Ditch) in Oberharzer Wasserwirtschaft (Upper Harz Water Management System) into Söse area</li> </ul>
Stage 2	<ul style="list-style-type: none"> <li>➤ Reduction of underwater release at further dams through authorised special operation plans</li> <li>➤ Special operation for water transfer between connected reservoirs</li> <li>➤ Use of the pond reservoirs of the UNESCO World Heritage Site Oberharzer Wasserwirtschaft</li> </ul>
January 2019	<ul style="list-style-type: none"> <li>➤ Review of the situation and all-clear for 2019</li> <li>➤ Stepwise transition to normal operation</li> </ul>

**Guaranteed contract obligations were met through actions taken in 2018.**

# Communications on drought in 2018–2019



## Objectives of communications on drought in 2018–2019:

- > Making the public aware of the current situation while preventing panic
- > Sensitising the public to climate change in the Harz region

## Guidelines for communications on drought 2018–2019:

- > Proactive
- > Transparent
- > In close cooperation with MU (Lower Saxony Ministry of the Environment, Energy and Climate Protection) and NLWKN (Lower Saxony Water Management, Coastal Defence and Nature Conservation Agency)

The collage consists of several news snippets:

- Top Left:** NDR.de logo and navigation menu.
- Top Middle:** Article titled "Harzwasserwerke planen für Doppeltrockenjahr" with a photo of a dry landscape. Text: "In diesem Jahr hat es in Niedersachsens...".
- Top Right:** Article titled "Historischer Tiefstand" with a photo of a reservoir. Text: "Doppel-Trockenjahr Die Harzwasserwerke gehen von einem trockenem Winter und einem trockenem Jahr 2019 aus...".
- Middle Left:** Video player showing a dry landscape with a play button. Text: "Dritte: Harzwasserwerke sorgen vor".
- Middle Right:** Article titled "Die Zümling von Wasserwerken muss schneller erfolgen" with a photo of a man speaking. Text: "Wieder Abgleichstellen haben die Harzwasserwerke die Wasserwerke...".
- Bottom Left:** Article titled "Kaum noch Wasser: Wanderer an der Odeortaltalsperre im Harz" with a photo of people at a reservoir. Text: "2018 könnte das Jahr mit dem geringsten Niederschlag sein...".
- Bottom Right:** Article titled "Harz-Wasser könnte im Ernstfall knapp werden" with a photo of a man in a suit. Text: "Der Harzwasserwerke...".

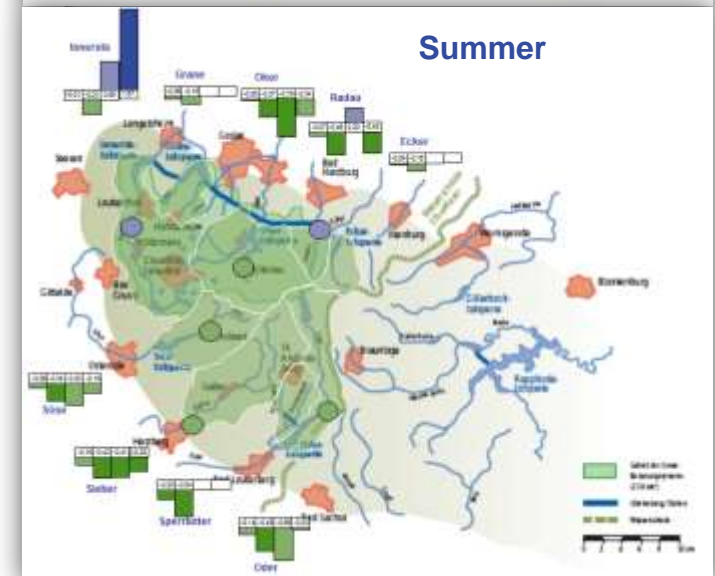
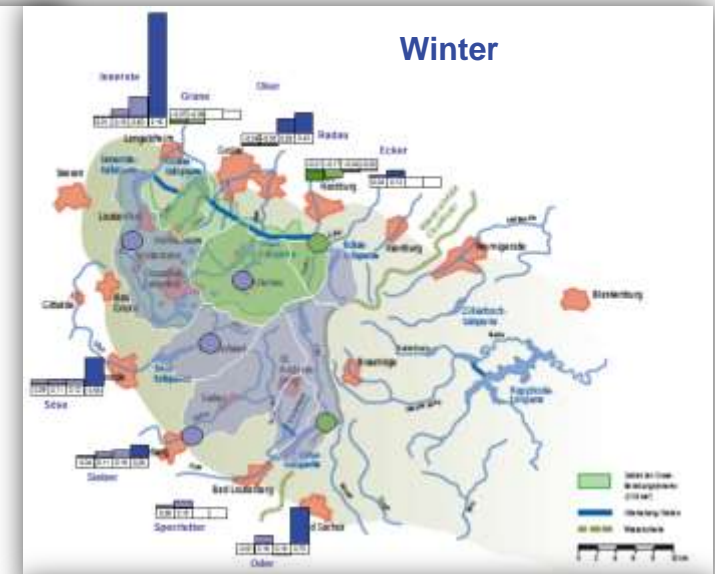
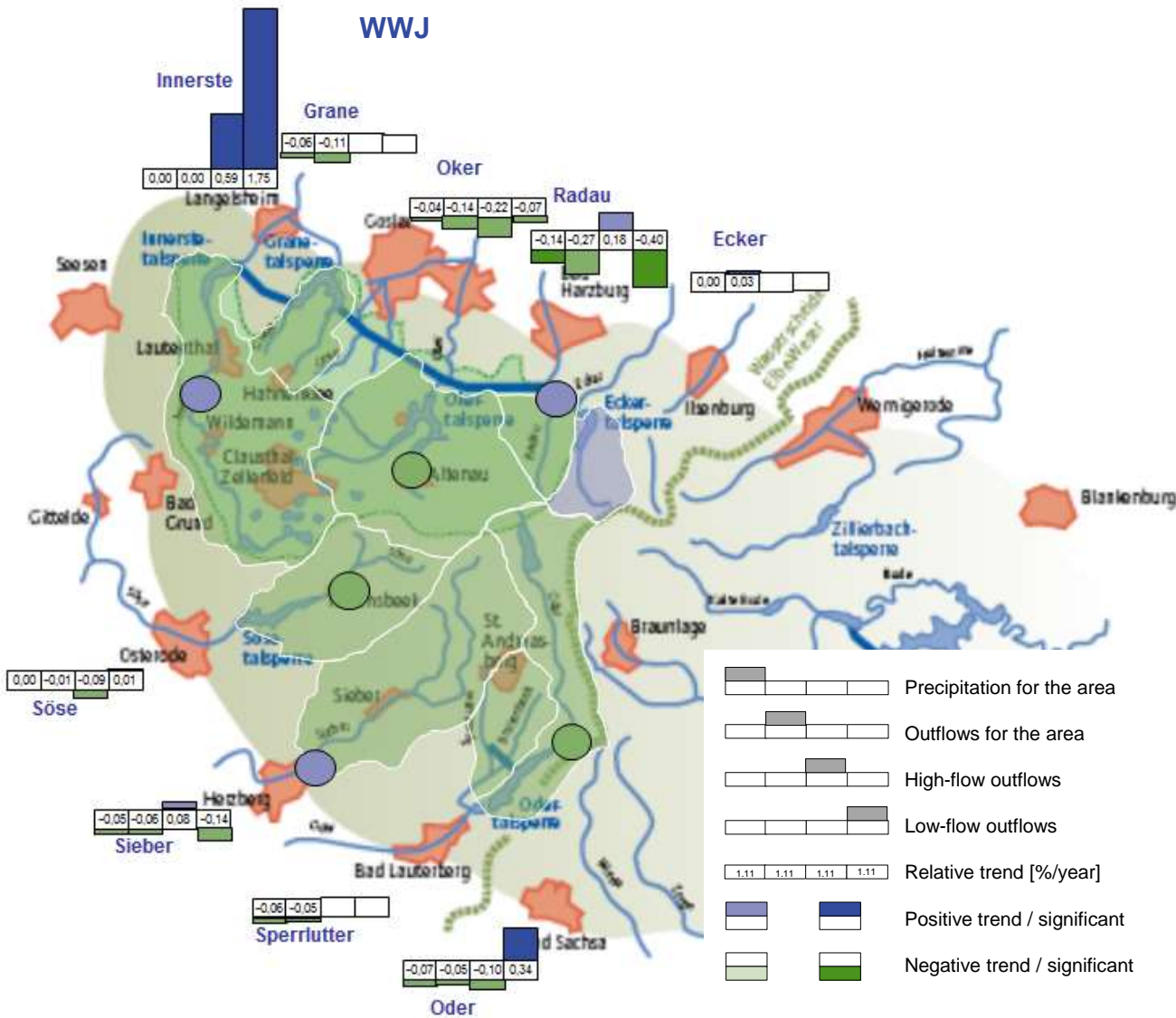
# Multi-stage communication plan for 2018–2019



Stage	Action
Stage 1: to September 2018	<ul style="list-style-type: none"><li>➤ Preparation of contents and handling of queries from the press received since August</li><li>➤ Announcement of the topic and completed actions at a press conference</li></ul>
Stage 2: To November 2018	<ul style="list-style-type: none"><li>➤ Handling of incoming press queries</li><li>➤ Harzwasserwerke customer information event</li><li>➤ Announcement of further actions and the current situation at a press conference</li></ul>
Stage 3: to January 2019	<ul style="list-style-type: none"><li>➤ Publication of further actions (UNESCO World Heritage Site Oberharzer Wasserwirtschaft) in a press release in consultation with MU, NLWKN and the district of Goslar</li><li>➤ Handling of incoming press queries</li><li>➤ Announcement of the all-clear for 2019 in a press release</li></ul>

**Objectives of communications on drought in 2018–2019 were achieved.**

# Climate change in the Harz region in the period 1941–2018





# Conclusion



**What steps should and could be taken in a comparable situation which does not ease?**

- > Call for water saving in specific supply areas?
- > Optimisation of the drinking water supply at the expense of ecology and economy?
  - > Further reduction of underwater release until inflow equals outflow?
  - > Reduction of drinking water production?
  - > “Non-discriminatory load shedding” like electricity?
- > Emergency water supply?

# Conclusion



## Which framework conditions must be met?

- > Operational optimisation and expansion of return pump stations
- > Development of resources and an end to restriction of water rights
- > Adaptation of infrastructure to climate change
- > Expansion of smart meters for greater transparency
- > Research of water re-use

## Who will finance the framework conditions?

- > Water customers via water price → Support of policy with respect to state competition authorities?
- > Taxpayers via public funding?