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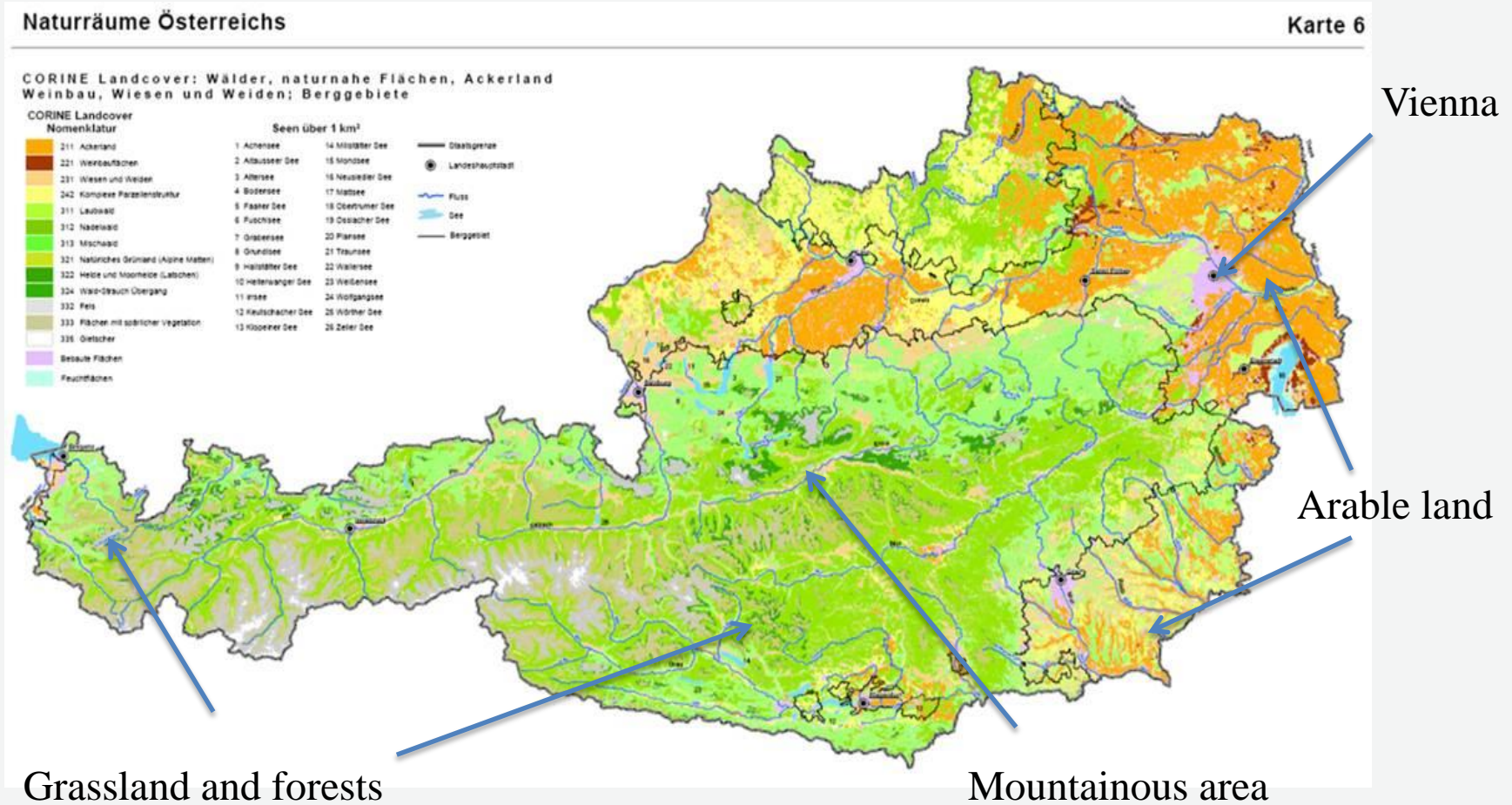
# DROUGHT MANAGEMENT IN AUSTRIA

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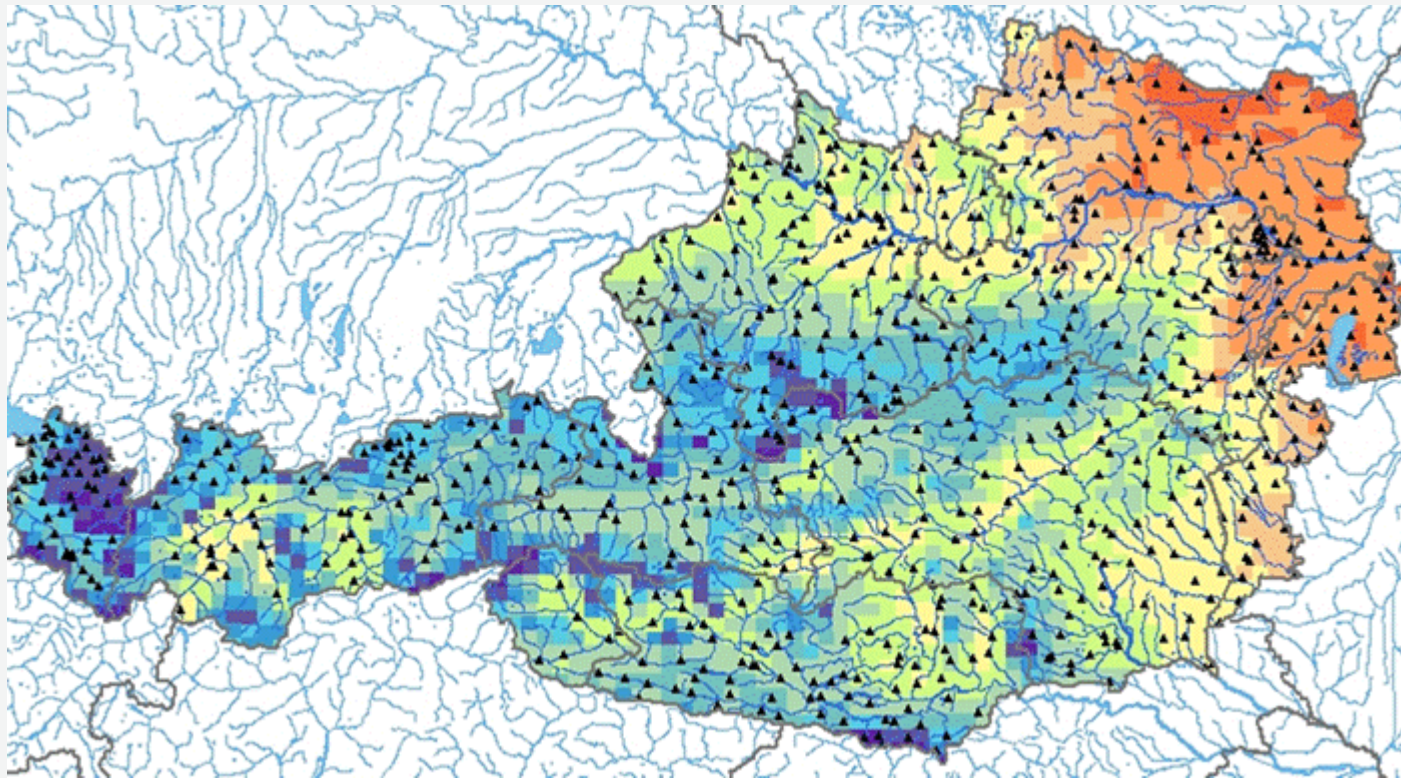
# BACKGROUND - LANDUSE




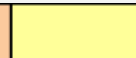







2/3 of Austria is mountainous



# BACKGROUND - PRECIPITATION

- **Mean precipitation:** 1000 mm (from <500 mm up to 3500 mm)
- **<4%** of available resources are used! Mountainous country with abundance of water



Precipitation											
mm/a	< 500	- 600	- 700	- 850	- 1000	- 1250	- 1500	- 1750	- 2000	- 2500	- 3500



# INTRODUCTION

## Drought management required?

- based on general figures about water availability: **no**

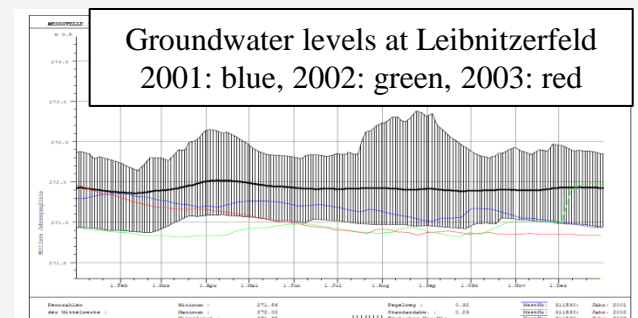
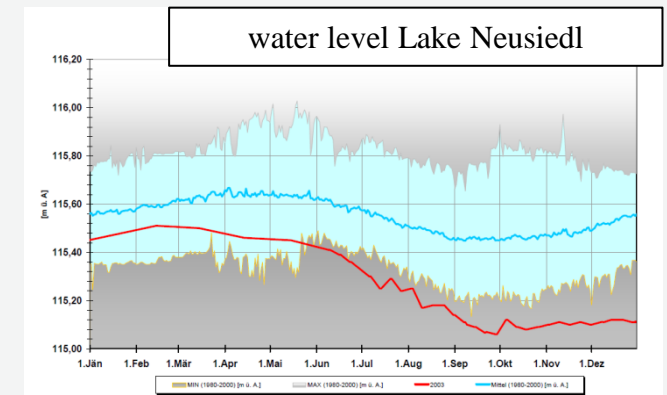
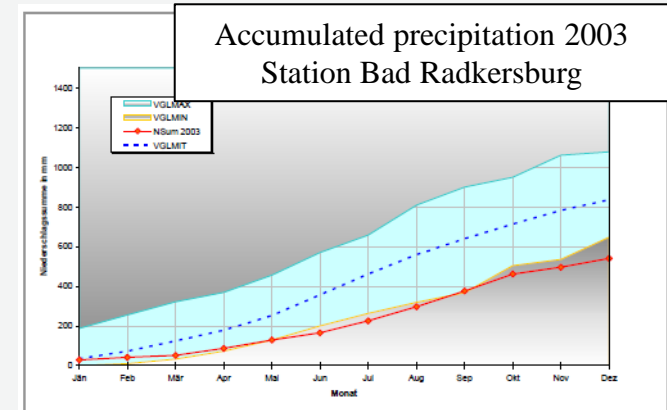
but...

- water resources are **distributed very unevenly**
  - regions with **negative climatic water balance** in north-eastern and south-eastern parts of Austria (annual precipitation partly < 500 mm;)
  - regions are predominantly under **agricultural use**
    - ➔ irrigation required for selected crops (e.g. vegetables)
    - ➔ Impacts on groundwater quality (e.g. Nitrates)
- climate change is likely to **affect resource availability**

# EXPERIENCED DROUGHTS

## Drought 2003

- Mean annual precipitation was about 80% of long-term average (regionally <70%)
- lack in precipitation was aggravated by high summer temperatures (one of the hottest summers since the beginning of measurements)
- river discharges, groundwater and lake levels were considerably below long-term average (except rivers fed by glaciers)
  - regionally lowest ever recorded values for precipitation, river discharges and groundwater levels

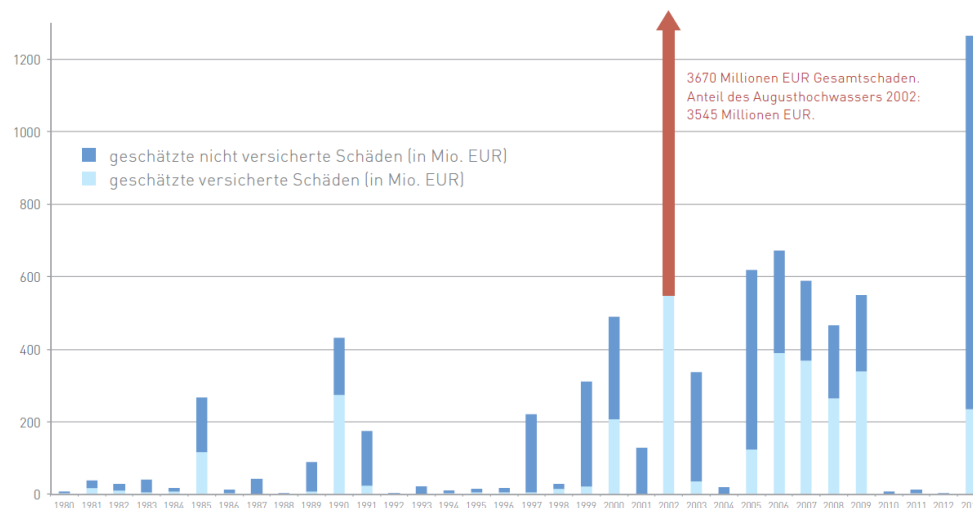


# EXPERIENCED DROUGHTS

## Drought 2003

- first significant drought event since 1970s → documentation very limited (no experiences)
  - Major effects:
    - damages in agriculture
    - reduced hydropower generation (-30%)
    - problems with water supply...
- two consecutive heat waves caused 2003 most cases of death in Austria
- reported damages vary considerably...

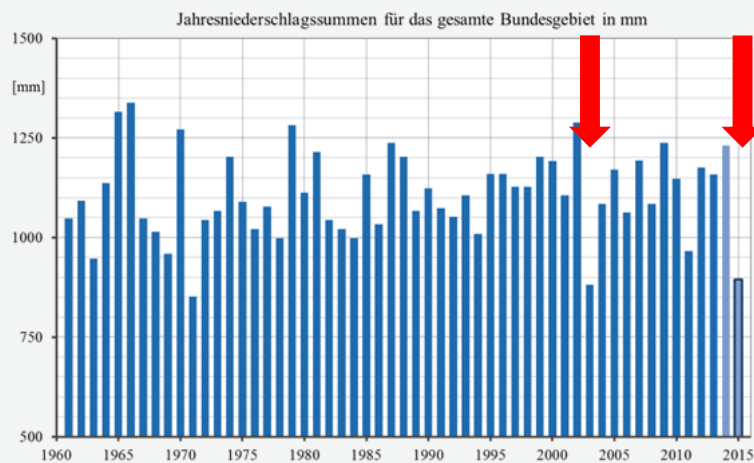
Development of Damages  
1980-2013 (in Mio. €)



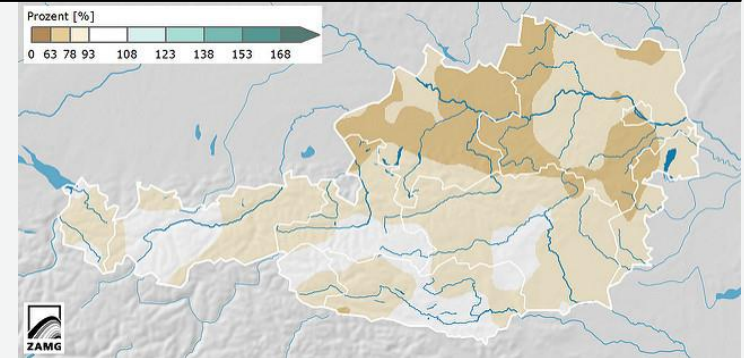
# EXPERIENCED DROUGHTS

## Drought 2015

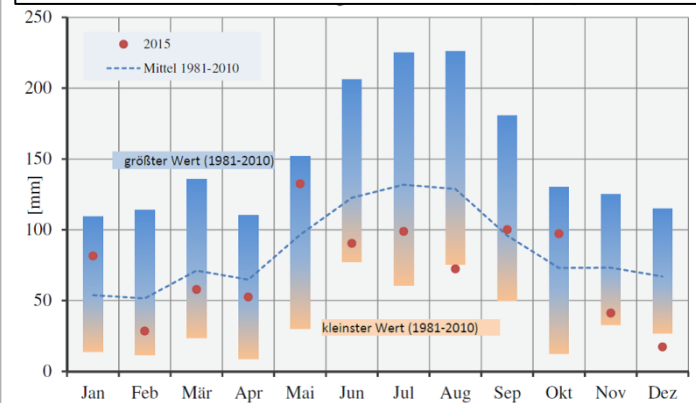
- **Situation** (extraordinary warm and dry) was **comparable** in terms of precipitation and temperature **to situation in 2003**
- after summer, drought conditions continued till early 2016 (precipitation deficit in December down to -80%)



Spatial distribution of annual precipitation 2015 deviation from average annual precipitation (1981-2010)



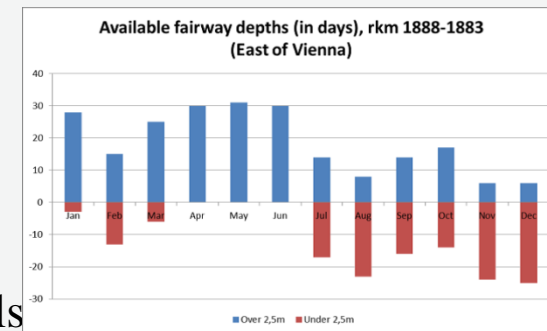
Monthly accumulated precipitation in Austria (compared to long term average and its variance (lowest and highest value) for the period 1981-2010)



# EXPERIENCED DROUGHTS

## Drought 2015 – Effects:

- in almost all water-dependent sectors with different intensity
  - for rivers and lakes, elevated temperatures and low discharges/water tables have been observed but with **little and regional effects on ecology** only
  - **damages in agriculture** were estimated (Sep. 2015) up to 175 Mio.€ but could only partly be supported by crop statistics (reflect average situation, differences between areas with or without irrigation)
  - **navigation** registered critical fairway depths east of Vienna; reduced transport volumes and level of capacity of ships, but no interruptions
  - increased **water demand in water supply** (swimming pools irrigation); resources availability was not affected, **only minor limitations** in water supply **due to introduced mitigation measures as a result of 2003 drought**
  - **reduced hydropower generation** (-10%)

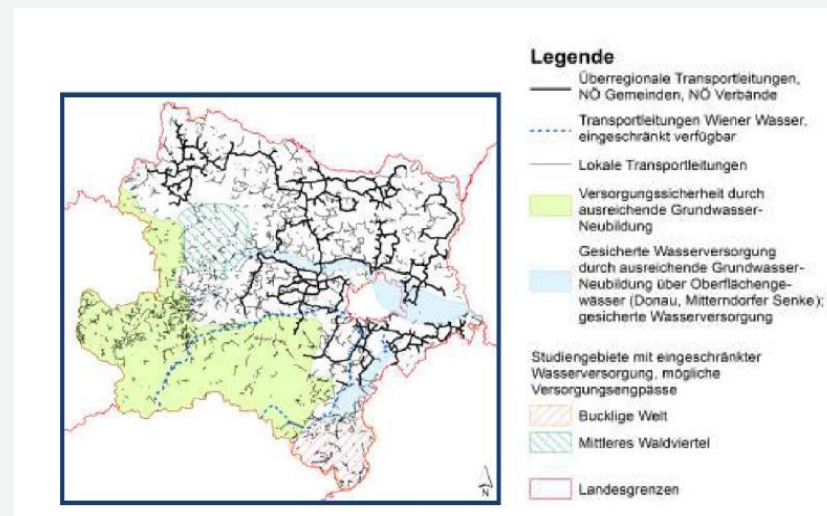




# RESPONSE - GOOD PRACTISES

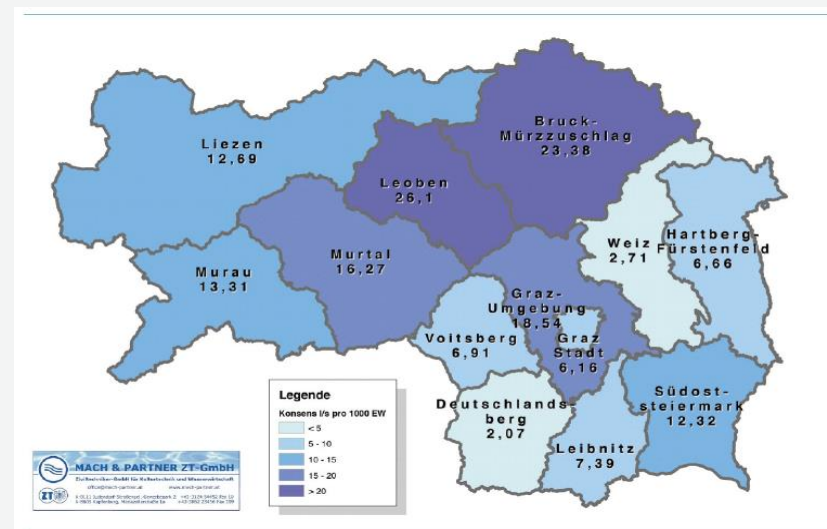
## Province Lower Austria

- established a **concept to secure water supply** based on experiences of the 2003 drought which was published 2013
- outlines regions with potential shortages in water supply due to longer drought periods



## Province Styria

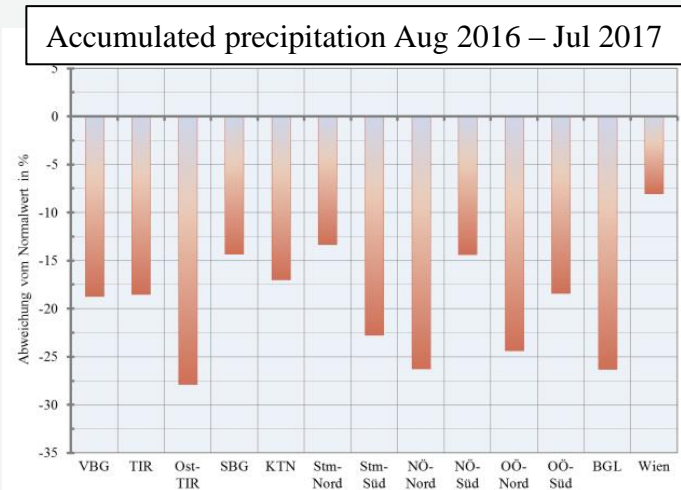
- published a **water supply plan** in 2015 based on evaluations of permissions for water abstraction
- outlines regions where limited (own) water supply is likely for periods of high water demand



# CURRENT SITUATION

## Situation July 2017

- All mean monthly temperatures (except January and April) above long-term average (1981-2010)
- Negative precipitation balance for last 12 months (-20% compared to long-term average 1981-2010) with regional variation
- River discharges below long-term average for 2017 (-20%) as well as for last 12 months (-15%)
- decreasing groundwater levels due to scarcity of snow in winter 2016/17 in east and southern parts
  - ➔ drying wells reported regionally
  - ➔ no restrictions to water supply due to interconnections, but calls to save water in vulnerable regions



# SUMMARY AND CONCLUSIONS

- Droughts have been registered in the past with **different regional and sectoral intensity of effects**, but there is a lack of historical data (statistics) for evaluation
- Presence in media only by occasion
- **Documentation of events** is state of the art for natural hazards/floods but not (yet) for droughts, but is essential for strategic planning
- **introduced measures in water supply** sector as a result of the 2003 drought (**interconnections** between service networks between regional service providers; **multiple resource use** as basis for supply security) in regions vulnerable to resource limitations **have proved their effectiveness in 2015**
- However, the establishment of country-wide **drought risk management plans** is **not considered as necessary** in general due to its regional and time-limited relevance

# OUTLOOK

- droughts appear regionally and periodically in future → **potential conflicts for (permitted) water uses** (e.g. artificial snow making) in periods of limited resource availability → strategic planning
- the **situations in 2003 and 2015** (and 2017?) seem to be a **good blue print to shape action for the adaptation to climate change** (conditions of the 2003 and 2015 droughts seem to be quite close to situations which are forecasted for the future)
- the **river basin management plan 2015** specifies some **further options for actions** to **enhance the natural water retention** in catchments and to **strengthen the sustainability of different water uses** which support also the **resilience against future droughts**
  - efficiency in agricultural irrigation
  - artificial groundwater recharge
  - preparation of separate management plans...



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Thank you for your attention!

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