Workshop 1: "Managing shortage of groundwater"– transnational exchange on governance challenges

Friday, 9th March 2018, 09.30 – 12.00, MARUM, Bremen

Background & Objective:

The workshop has been set up by the Transnational Governance Team in TOPSOIL to provide a platform for transnational learning and exchange on governance issues linked to water abstraction and managing water shortage. Starting point of the workshop was a case study presented by Province of Drenthe, The Netherlands. This approach has been set up by the Transnational Governance TOPSOIL Team for good transnational exchange and learning on governance issues.

Objective: This workshop provided the floor for consultation and discussion on: **What are the experiences in the other four TOPSOIL countries in dealing with a situation like in the Dutch Drentse Aa case on managing shortage of groundwater?** After an introduction to the Drentse Aa case, one responder per country provided their input. Each input was discussed, and special aspects were highlighted.
This document provides a summary of the discussions during the meeting. It includes the feedback on an earlier draft by the responders and Province Drenthe.

Due to different national settings, issues were raised which may not always be considered relevant or applicable to the case study owner. From a TGT point of view exchange and inspiration in between all partner countries is valuable, thus the summery tries to cover all issues central to more than one partner country.

Agenda, presentations and also this summary can be found at TOPSOIL midtrum/WP6/ DrentsCaseWorkshop.

The Drentse Aa Case "Managing shortage of groundwater" (Jan den Besten, Hunze en Aa's)

Currently, the Drentse Aa area is characterized by small brooks and groundwater dependent nature areas (N 2000) next to agricultural used land. With the changing climate, it is expected that farmers increase their need for irrigation. Until now, this is not a challenge. However, there are concerns that increased irrigation from groundwater might impact the N2000 areas negatively. Modelling the impact of irrigation, the results indicate that irrigation below 50 mm/yr and outside a buffer zone of 500 m will only lead to neglectable impact on the N2000 areas.

The challenge is now to how to transfer the modelling results into permits. In general, in The Netherlands, farmers can apply for new wells / drilling boreholes if they follow so called "general rules". Individual licences / permits for abstracting a maximum amount of water are not required. Hunze en Aa's looks for options to accommodate the results of the drilling within the licences for farmers. This could be by adapting the general rules to the regional.

<u>The most central questions now from Hunze en Aa to the TOPSOIL participants are:</u>

- How to make the map where boreholes can be allowed
- How to decide how much can be extracted
    - In m^3/s per borehole?
    - Per request?
    - Per sub-area (total amount extracted)?
- How to describe general rules,-(or: how to formulate conditions in a permit)?

- How to organize control in a time & cost effective way?
- How to make control effective?

Response from Elisabeth Schulz (Chamber of Agriculture) and Jörg Martens (Dachverband Feldberegnung Uelzen), Germany

In Lower Saxony, the counties are responsible for both: approving licences, and implementing water policy. Farmers can apply as individuals or organized in irrigation boards for licences to abstract groundwater. If they apply for a larger amount (> 500.000 m^3/yr) they have to submit an Environmental Impact Assessment on the additional abstraction. In any case, a hydrological model has to show the impact of the abstraction on groundwater dependent ecosystems, agricultural land use and the groundwater body itself. Lower Saxony (the LBEG) has issued guidelines for developing the model, and for assessing the impact. Further, the water demand has to be justified, the farmers have to proof their need (in dependence with the soil quality).

Permits are issued considering Natura 2000 restrictions and the "defined groundwater availability" (= amount of water which can be additionally abstracted without overexploitation of the groundwater body). Part of the permit is often a monitoring obligation to proof potential impact of the water abstraction, and sometimes compensation schemes.

Response from Dieter Vandevelde , Vlaamse Milieumaatschappij,

In Belgium, the last experience with water shortage was in 2017. As a consequence comprehensive restriction on drinking water use and were implemented. Also, Belgium has got some overexploited confined aquifers where water abstraction is only permitted for high-quality use and water-savings and the increased used of different sources (surface water, rainwater, phreatic groundwater) is encouraged, so that existing licences for the use of confined groundwater can be phased out.

There are two different permits in Flanders (environmental issues are a regional competence in Belgium): perpetual and temporary environmental licences. Normally perpetual licences are given, but in certain cases (like extraction of groundwater) the licensing authority can decide to give a temporary licence. If a groundwater body is in a bad quantitative status, our agency (which is an advisory agency) can propose to limit the duration of the permit (6 or 20 years). Duration can also be limited due to other reasons like risk of salinization, effects on groundwater dependent nature, … .

Water licenses are issued based on abstraction rate, hydraulic heads and groundwater quality (status of GWB). The permits link to the requirement of the WFD as well as the Natura 2000. The abstractors have to monitor and report the water they pump out. Charges are levied on the basis of abstracted amount and the aquifer from which the water is drawn. The general status of the GWB's is monitored by the Flemish Environment Agency. When applying for a licence, farmers have to justify their need. If the need decreases, e.g. because a different source for water becomes apparent (e.g. abstraction from surface water), the licences can be phased out. Else, a normal licence is valid for longer than 20 years, except for groundwater bodies in bad state. Here they don't exceed 6 years.

For irrigation and other low-quality use, abstraction licences mainly refer to shallow groundwater.

Response from Paul Bradford and Barry Bendall, The Rivers Trust, UK

In UK, if you must apply for a water abstraction licence to take more than 20m3/d. The quantity (for irrigated agriculture) must be justified based on the climate zone, the soil type and the crops grown Water resources (groundwater and surface water) are modelled and tightly controlled by the

Environment Agency (UK govt. body). A licence will only be issued if there is enough water available in the catchment and the local environmental impacts are acceptable. The Environment Agency determines the resource availability. The abstractor has to demonstrate that local impacts are acceptable. Maps showing water availability, by sub-catchment, are published on-line by the EA.

No new groundwater licences have been issued in the east or south east of the UK since the 1980's because the available water is already used up. Before this resource availability was not always fully considered so the UK has some over-exploited aquifers.

Since about 20 years there is the legal option of taking away licences if the abstraction causes damages (time limited licences). However, widespread reductions have only been implemented it in the past year 2017-18. This is currently raising difficult socio-political questions.

Nowadays, the emphasis starts to be more strongly on sustainable abstraction and catchment based water sensitive planning. Some measures have been tested (e.g. MAR, Water sensitive farming, see presentation). However, they include no immediate benefit to the farmers, and have not yet been officially recognized as compensation measures.

Water regulation is funded by the licence charge. Enforcement is carried out as farm visits/inspections to check meter (quantities) and abstraction point/pump. The visit frequency depends on risk to environment (size/location) and the compliance record.

Response from Jacob Birk Jensen, Consultant, Denmark

In Denmark (Central Region of Denmark), there is very little experience with managing water shortage, as they suffer more from abundance of groundwater, considering it pumping outside the area. There are only a few present examples of overexploitation, and there are no actions related quantitative exploitation in the latest WFD action plan

Still, abstractions are highly regulated and permits are issued for 10-15 years, considering mainly soil types. To control and enforce of the abstractions are the responsibility of the regional government. However, this is – due to lack of urgency / pressure- mainly a desktop revision of the monitoring data reported by the abstractors.

The link between abstractions to the ecological status of rivers is currently under revision. A report on the impact of Q_{min} on ecological status of rivers studied the relation mainly for large rivers. It has led to a review of approval practice which requires a specific minimum flow to be ensured. Currently, the statistical relation between ecological status and Q_{min} is studied, to adapt the practice. There was some interest in the resulting report. J.B. Jensen will check if it is available on English.

Conclusions: What have been your major lessons learnt on governance related to groundwater shortage?

The case owners were rather satisfied with the workshop as they learnt many details about permits from the other countries. Directly after the responses, several issues were raised which are summarized above in the different response. A particular focus was put on the scope of licences and their enforcement.

Scope of licences

The other countries obviously have established a system of permits on individual application, i.e. for each of the applications the impacts on nature or water bodies are considered. However there seem to be different thresholds in terms of comprehensiveness of the proof on impacts. Countries differ in the extend they consider impacts on Nature 2000 or WFD water bodies.

This differs from the Dutch approach of general rules and provided much inspiration for the design of their own approach.

In Germany there is a system of two different permits: the water abstraction consent (Entnahme - Bewilligung) is in general of longer validation, e.g. for 30 yrs., and has got a strong legal status. Water providers (or other users with high investments) aim for this kind of permit to protect their investments. The other one (Erlaubnis) is weaker, more of an allowance, which can be taken away or change at any way. In general, farmers get the latter one, and thus in general risk that the allowance can be taken away more easily. However, this has not yet taken place. In Flanders, there are also two different permits (environmental issues are a regional competence in Belgium): perpetual and temporary environmental licences. Normally perpetual licences are given, but in certain cases (like extraction of groundwater) the licensing authority can decide to give a temporary licence. If a groundwater body is in a bad quantitative status, the VMM (which is an advisory agency) can propose to limit the duration of the permit (6 or 20 years). Duration can also be limited due to other reasons like risk of salinization, or effects on groundwater dependent nature. In the UK the experience is that too much water was given away and it is difficult to cut permits because there management is based on the availability of irrigation water.

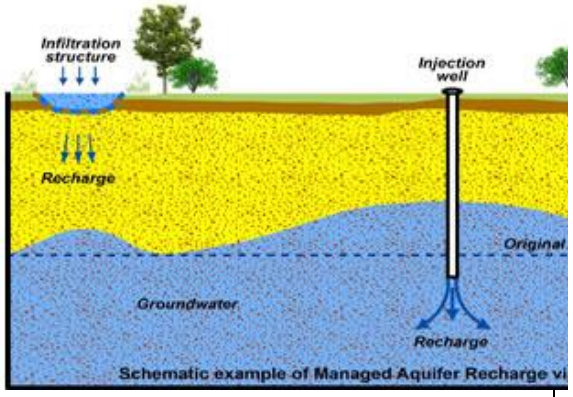
Monitoring and (Costs of) Enforcement

Much interest was in who monitors the correct implementation of the licences, and how the monitoring costs are covered. In UK, farm visits are financed with the abstraction fee. In Denmark, monitoring is more of a desktop job, and does not require much effort because of the abundance of available groundwater. It became obvious that the more shortage, the more emphasis is put on enforcement, and on applying restrictions to the permits.

Table 1: Overview on Responses by Country (copied from presentations).

Country	Responsibilities	Basis for permit	Impact on WFD and Nature 2000	Compensation / Technical Solutions
Guiding Questions	Responsibility for the groundwater table in your region? Who is responsible for extracting groundwater in your region?	How to make the map where boreholes can be allowed How to decide how much can be extracted • In m³/s per borehole? • Per request? • Per sub-area (total amount extracted)? How to describe general rules,-(or: how to formulate conditions in a permit)? How to organize control in a time & cost effective way? How is the amount of groundwater regulated and controlled (on paper and what are the practical experiences)?	How do you evaluate the effect the effect on the WFD-waterbodies and the nature2000 area (using explicit goals, historical reference etc?) Do you only consider the effect of the added quantities for which permission is asked or do you also look to the total amount of extracted groundwater?	Is there a combination thinkable in which the farmers are allowed to use more groundwater because of positive action there his side (kind of a positive reward)? Any innovative solutions to add water to the groundwater system?
Lower Saxony / Germany	Counties issue permits for water abstraction, based on individual application. There are some considerations that abstraction for all farmers in a county are	Farmers have to proof their need based on soil quality and crops. Permits on limited amounts per well **and**	Discussion between no-deterioration acceptable based on 1990 and good potential for N2000 based on 2018.	Pilot example: example in our area: - Infiltration of annually ca. 350.000 m³ of cleaned wastewater on 35 hectares of coniferous forest (ca. 25 m distance to water table) => Extra permit on abstraction (85

Country	Responsibilities	Basis for permit	Impact on WFD and Nature 2000	Compensation / Technical Solutions
	considered together.	per year in total (e.g. average 75 mm within 10 years **and** below 120 mm in one year) for > 250 TSD m^3/yr.: hydrological modelling required. For agricultural use, permit can be taken away again (has not happen yet) Controlling takes place by measuring the wells. If total amount has been used than shortening per well.	In cases of low reserve (based on calculated groundwater availability), restrictions apply. In vulnerable area's total amount of recharge is limited.	percent of infiltrated water). => Irrigators pay for the investment and the pumping **Pilot** on rewarding change of coniferous forestry to deciduous forests not finished yet (ecosystem service) No "deals" on improving river / stream as compensation for low flow due to abstraction. In some cases pay for the investments are possible.
Belgium / Flanders	Municipalities and province issue licences; VMM = advisory agency	Total amount per day and per year is approved, based on purpose, depth, pumping rate, location (i.e. nature 2000). River Basin Management Plans prescribe conditions for groundwater extraction.	-Status of GWB: GWATE – test (GWATE= Groundwater dependent terrestrial ecosystems) -Impact of individual abstraction on Nature 2000 area: calculation of the range of influence of groundwater abstraction -In the near future: online screening, appropriate assessment (https://www.milieuinfo.be/voortoets/#welkom)	Innovative solutions → will be investigated in the TOPSOIL project
UK	Environment Agency issue	EA uses the	Envir. Agency published	MAR

Country	Responsibilities	Basis for permit	Impact on WFD and Nature 2000	Compensation / Technical Solutions
	abstraction permits (licences); Natural England authorises operations near Natura 2k sites. (consultee in permitting) More than 20m^3/d requires an **abstraction licence** – This specifies Licence holder (occupier), Expiry date, period of abstraction (e.g. April to Oct), Quantity (per day, per year), Purpose (eg. irrigation), Any other condition (e.g. restrictions)	Environmental Flow Indicator (EFI), based on modelled 'naturalised flow' flow duration curve. The EFI shows the lowest flow acceptable along flow duration curve. Abstraction is sustainable if depleted flow remains above the EFI.	Abstraction Licensing Strategies: where water is available and How the EA will manage licences	 Water sensitive farming ("Wonderwheels") Problem: no immediate benefit to farmer and not yet officially recognized as means of reducing impact / improving water balance New: Water Resources East – multi sector long term water resources planning. A Regional Strategy for long-term planning including reservoirs, water transfer, desalination….
Denmark	Municipalities are responsible for permits for the abstraction of groundwater.	Permits based on crop and soil type (1000-1200 m3/ha/yr.) and are normally given for 10 years (in the mid90ties were permissions given from 10-15 years in	No official critical lowering of groundwater table in use (in practice between 5 and 25 cm). Currently no operational method: Rivers (2015-): Environmental	BEST River & nature • decision support tool • Calculates individual and accumulated response from all wells • Red, yellow, green characterization based on defined "limit values" • dialogue platform for groundwater, nature and watercourse authorities

Country	Responsibilities	Basis for permit	Impact on WFD and Nature 2000	Compensation / Technical Solutions
		order to give a more reasonable load of permissions to be handled pr. year after two very dry summers in the mid 80-ties, where a lot of farmers established their irrigation system and had a 10 years permission). Yearly controlled as part of the municipality check.	Protection Agency guidance from 1979 is too restrictive (no correlation between Q_{min} and ecological status). A new statistical approach that correlate hydrograph characteristics with ecological quality ratios **Rivers:** Accumulated effects from the entire permit from all wells are considered. Reference = no abstraction **Groundwater dependent nature:** *Nature2000 areas:* Accumulated effect from the entire permission from all wells are considered *§3 (Nation Environmental Protection) areas*: Accumulated effect from added quantities from all wells. **Added quantities** =	

Country	Responsibilities	Basis for permit	Impact on WFD and Nature 2000	Compensation / Technical Solutions
			permit – actual abstracted amount in a reference period. (sounds simpler than it is☺)	

The Drentse Aa case

German response

Landwirtschaftskammer Niedersachsen

How would you deal with the situation in your area? => Lower Saxony

- Individual licenses => given to local irrigation boards (or to single farms) for defined fields
  => limitted amounts per well **and** per year in total (e.g. average 75 mm within 10 years **and** below 120 mm in one year)

- Prohibition of **local effects** to nature and habitats by the individual wells => check

- Calculatoric check of „defined groundwaterbalance“ of the (sub-)catchment („Nutzbare Dargebotsreserve“). In cases of low reserve => restriction of allowed abstraction
  (no complete prohibition in Lower Saxony, but in other Länder)

- Important: for agricutural use any time later a restriction could be aggravated.
  (Never happened until today. But old legal decision, that all simular applicants must share the stock!)

- > 250.000 m³ p.a. in gravel aquifers => hydrogeological instationairy flow model is obligatory (by applicant)

(2) How would you deal with the situation in your area? => Lower Saxony

Recently a new process begun in 4 Lower Saxony regions of extensive abstraction for irrigation:

the numerous local irrigation boards (plus „independant“ individual farmers) **had/have to**

- organize themselves (=> DFU !)
- produce a regional hydrogeological model,
- deliver a professional demand analysis
- produce an evaluation of possible cumulative effects (environmental impact study)
- produce a compensation plan and a monitoring plan
- report on monitoring and evaluation

Persons to contact / references

- GeoBerichte 15 - Leitfaden für hydrogeologische und bodenkundliche Fachgutachten bei Wasserrechtsverfahren in Niedersachsen
  https://www.lbeg.niedersachsen.de/karten.../geoberichte/geoberichte_15/878.html
- No persons at the moment, still in controverse discussion and ongoing proceedings
- In Lower Saxony among several large scale legal proceedings no dicision was published until today.
- Monitoring and evaluation will be paid by abstractors

Who is responsible for extracting groundwater?

- Permits are given by county (=Untere Wasserbehörde)
- County is responsible for accurate check of hydraulic and nature protective aspects.
- Nature NGOs and public bodies must be involved at permits for large extractions
- Necessairy information has to be delivered by applicant, if not existent (which is the normal case).
- The Lower Saxony „Service for Waterbodies“ (Gewässerkundlicher Landesdienst, GLD) must be involved. GLD is a combination of hydrogeological and hydraulical authorities.

How is the amount of groundwater regulated and controlled?

- Measuring the extractions at the well head → basis for payment for water
- All permitted quantities are recorded in the Lower Saxony online „Waterbook“
- Legal right for „decent“ water use, but…
- …but Counties decide on regional **waterpolitics** = distribution
  (for instance: give more water to high added value per m^3 ?)

Do you only consider the effects of added quantities?

No, if the complete abstraction of a groundwaterbody is > 5 Mio m³ p.a.

Yet open legal question in Lower Saxony, if historical abstractions **before** introduction of the EU Environmental Impact Directive (1989) shall be neglected

Combination?
Are farmers rewarded with additional groundwater for positive actions?

- **Yes**,
  example in our area:
  Infiltration of annually ca. 350.000 m³ of cleaned wastewater
  on 35 hectares of coniferous forest (ca. 25 m distance to watertable)
  => Extra permit on abstraction (85 percent of infiltrated water).
  => Irrigators pay for the investment and the pumping

- **No**,
  „deals“ have not been made until today
  such as improving a riverbed physically
  to compensate less flow due to abstraction)

- **Pilot** on rewarding change of coniforous forestry
  to decidious forests not finished yet (ecosystem service)

Innovations to add water to the groundwatersystem?

1. See last sheet: infiltration of 350.000 m³ p.a. of cleaned wastewater

But only a pilot.
„qualifield acceptance“ with fear of micro – contaminants such as medical residues

2. Pilot Study *„Wasserwald“* to find out about forest change:
   - amount of additional groundwater (which (combination of) trees)
   - effective period(s) of arriving at the aquifer?
   - effected waterbody (which aquifer…)

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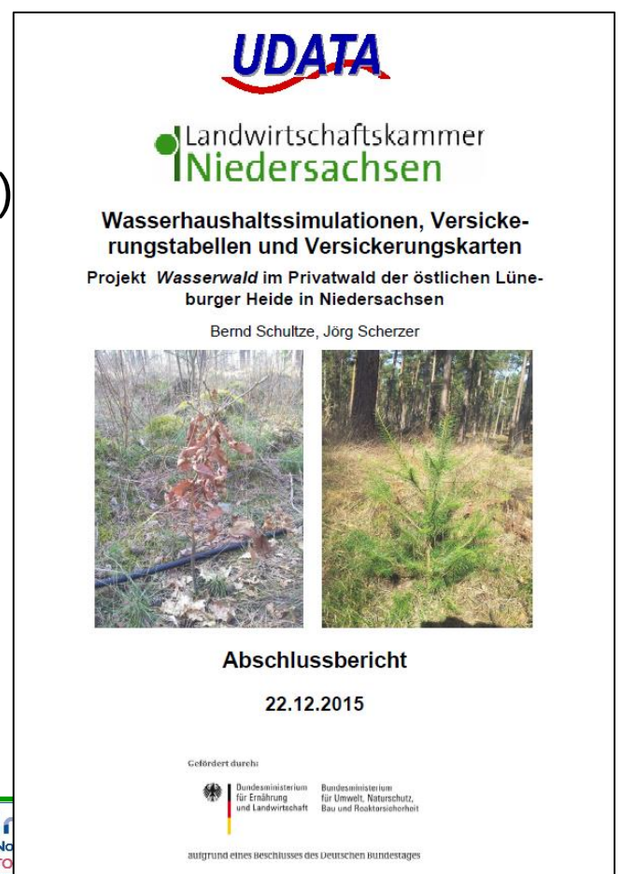
UDATA

Landwirtschaftskammer Niedersachsen

Wasserhaushaltssimulationen, Versickerungstabellen und Versickerungskarten

Projekt *Wasserwald* im Privatwald der östlichen Lüneburger Heide in Niedersachsen

Bernd Schultze, Jörg Scherzer

Abschlussbericht

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How do you evaluate the effects on WFD-waterbodies and Nature 20000 goals?

WFD:

- Last EU reported state = reference state (but political discussion ongoing on „Zero-State“)
- No deterioration acceptabel (experiences with compensation yet to be made…)
- Future achievement of good state mustn´t be endangered.
- Problem: „Good potentials“ lack to be discribed yet, while most waterbodies **are** HMWB …!

FFH: => groundwaterdependant protected ecosystems

- No deterioration
- If FFH- objectives have not been achieved yet (= most cases)
  => their achievement mustn‘t be endangered