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Challenges facing N-regulation in Germany, The Netherlands and Denmark

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Nitrogen regulation is not easy and it takes time to get results
Several EU countries are fighting to reduce nitrogen levels in surface- and groundwater as well as ammonia emissions. This poster compares briefly the challenges and the policy approaches adopted in the three countries. Will the expected changes be enough to reach the goals? The path from targets to change in the environment is often longer than anticipated.

Introduction
EU countries are facing requirements linked to both the Water Framework Directive (WFD) and the National Emission Ceiling Directive (NEC). The work has been going on for years but there are still major challenges.

The Netherlands
The agriculture in The Netherlands is based on large inputs and large outputs. On a European scale, the N-surplus is still much higher than many other EU countries (Denmark and Germany). The former N-surplus accounting in the Netherlands was found not to deliver the improvement in water quality needed as the surplus reduction was too little and too late. The intensive production also gives a high NH3-deposition in some areas (see fig. 1). Around 85% of the NH3 emissions come from agriculture.

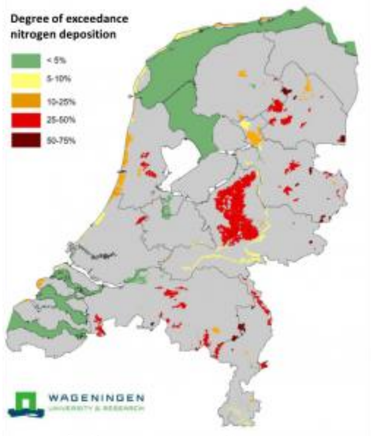

Figure 1. Degree of exceedance of nitrogen deposition.

Problems
Nitrate levels in groundwater in sandy areas exceed targets. Geographical conditions challenge the ability to meet WFD targets where 60-95% of the waters will probably not comply with WFD targets in 2027 (Planbureau voor de Leefomgeving, 2014). NH3 depositions are high even though emissions have been reduced significantly (see fig. 2). The PAS-based NH_3 allowance system has been stopped due to the Administrative Court of the Council State ruling. This is partly because the deposition levels seem to be higher than expected and so a 50% reduction by 2030 is now the aim.

Possible Causes
High livestock intensity has put pressure on N and P regulation and this has required strict transport control and expensive processing of slurry, but improvements take time. For ammonia perhaps the effect of past NH_3 measures has been overestimated?

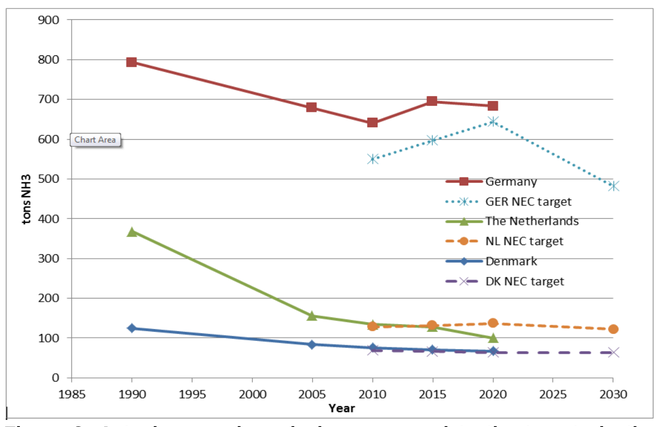

Figure 2. Actual ammonia emission compared to the targets in the National Emission Target (NEC) Directive. (Jacobsen et al., 2019)

What now?
Strict measures to reduce NH_3 and NO_3 emissions have been implemented. They include; not allowing an increase of dairy farms, and a buy- out program for swine, poultry and cattle farms. How many will go for this and how much will the production be reduced? The regulation from 2020 also included speed limits on roads and not expanding airports, as the focus is also on NOx emissions. A limit on protein feed was proposed but rejected. The new Nitrogen law from December 2020 set new targets for NH3 deposition based on the actual depositions in nature areas, not based on future reductions as in the PAS system. Further reduction of N-losses from sandy soils to the water might be required and it might have an impact on the size of the strong farming sector.

GERMANY

Problems
N-levels in groundwater are too high in 20-35% of the area (red area in fig 3) The farm N-surplus has been too high (80 kg N/ha) since 2005 and target has been 70 kg N/ha. Germany has been required to increase efforts following an EU-court decision in order to avoid a large fine. With respect to NH_3 emissions they have not been reduced since the year 2000 and so a reduction of over 25% towards 2030 is now required (fig. 2.).

Possible Causes
N-surplus accounting has not included all N-input (biogas) and yields have in some cases been overestimated. Could it be that some of the challenges facing N-surplus accounting in Germany and The Netherlands are the same? Is this due to a too high allowance of the N-surplus and “loopholes”? The nutrient balance is now replaced by plot specific recording of the applied fertilizer to capture better the compliance with the fertilizer need derived in the fertilizing planning:
- Control with N-surplus accounting has until now been limited.
- Measures towards reducing NH_3 emissions have been limited, but in some Länder there are tough requirements for some new livestock farms.

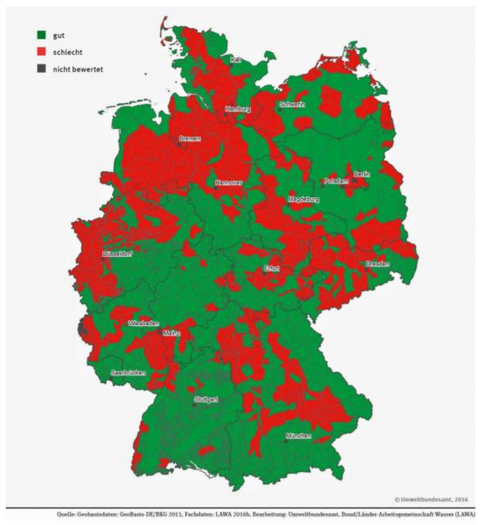

Figure 3. Share of area with bad (red) and good (green) chemical quality in groundwater mainly due to high nitrate levels.

Source: Umweltbundesamt (from 2017)

What now?
- A 20% lower than optimum N-application has been adopted in the red areas just as Denmark has had for some years.
- Stricter requirements on the application of slurry (+10% units) and cover on storage tanks (as DK and NL have had for years) to reduce NH_3 emissions from livestock as well as higher penalties for non-compliance.
- Compulsory injection of slurry and a ban on the use of Urea as well as increased feeding efficiency on dairy farms could be future options
- Implementation of acidification of slurry (Danish technology) to reduce NH3-emissions is an option.

It seems very difficult for Germany to reach the required NH_3-emission already by 2030 unless a very large effort with new requirements and control is made. For groundwater, increased set-a-side in the red areas might also be required to protect groundwater.

DENMARK

Problems
No decrease in N-losses to the aquatic environment since 2003 has been observed (fig 5). Now N-losses have to be reduced much more to meet the WFD target as new requirements are much stricter (37,000 tN) than previous targets (see fig. 5). Changes in regulation from a general approach to a targeted approach have been successful (fig. 4), but the potential for more measures is limited.

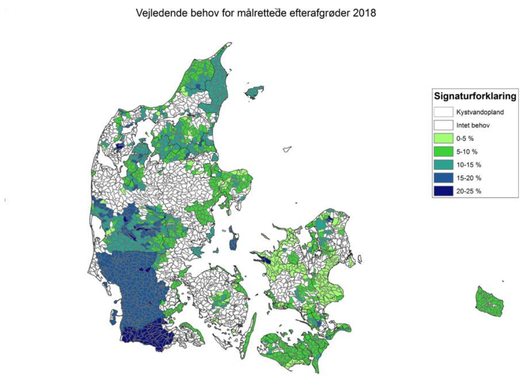

Figure 4. Targeted regulation in Denmark and the requirements regarding additional catch crops (% of area) in 2019. Source: The Agricultural Agency.

Possible Causes
Implementation of collective measures (mini wetlands and wetlands) have had a slow start as collective measures take longer to implement and the political objectives are often unrealistically high. The NH_3 emission target in 2020 was not met as new technologies were not adopted as expected. The NH_3 depositions in Denmark have been reduced, but Denmark would benefit further if the projected reductions in NH_3 emissions from Germany and the Netherlands were accomplished.

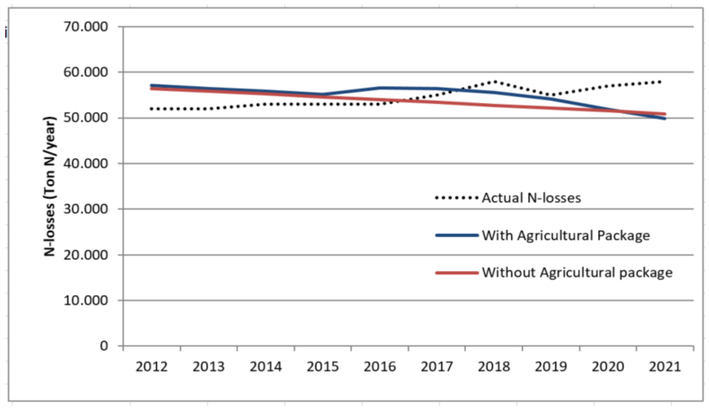

Figure 5. Estimated national nitrogen losses to the sea since 2012 (with and without the Agricultural Package from 2015). This is compared with the actual N-losses in the period. Target was 44,500 tN, but is now 37,000 tN. Source: Danish Ministry of the Environment

What now?
The NH_3 emissions target for 2030 is likely to be reached as the closing down of the mink sector (17 million animals) (covid-19 risk) has decreased the emissions. Further measures include feeding and obligatory cover (tent) on slurry tanks. Further measures to reduce N-losses to surface water towards 2027 will be negotiated, but more time will probably be needed and not all catchments will probably reach the target.

CONCLUSION
Farmers in the three countries find that they pay a high price for the emission reductions. Furthermore, farmers all find that they will get tougher regulation than the neighbouring countries! The comparison of the three countries shows large challenges where the targets might not be met, but also an underestimation of the time it takes to see changes in behaviour and the even longer time it takes for this to translate into improved water and air quality. The focus will now be on achieving synergies as future measures will have to reduce Green House Gas Emissions as well as the nitrogen loading.

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