Calculating the room for deposition under the Dutch Integrated Approach to Nitrogen, using AERIUS

Translating policy choices into room for growth at the right location

Liesbeth Maltha
Mireille de Heer
Mark Wilmot
Room for deposition is a central concept within the Integrated Approach to Nitrogen (PAS). It is the room for new economic development, expressed in nitrogen deposition (mol/ha/year). The issuing of room for deposition removes barriers to economic growth due to stringent nature conservation regulations. The room for deposition is however issued only on strict preconditions: Natura 2000 objectives are not to be jeopardised. This is guaranteed by the PAS, which ensures a decrease in total nitrogen deposition (also if and when all the room for deposition has been issued), in combination with the implementation of ecological restoration measures in Natura 2000 areas. The decrease in total deposition is achieved by the implementation of both existing environmental policy and additional PAS-related source measures in agriculture.
Starting point in determining the amount of room for deposition is the political choice of a coupling between this amount and the desired and expected economic growth within the Netherlands. The policy decision has been made to use the PAS in creating sufficient room on a national level for a high economic growth scenario. In addition, half of the additional reduction in deposition realised by agricultural PAS measures will be made available for new developments.

The challenge for AERIUS

AERIUS is the PAS’ calculation tool. The above-mentioned policy framework presented AERIUS with the challenge of calculating the total deposition and the amount of room for deposition. Three issues played an important role:

1. How to ensure that the desired high economic growth is taken into account in deposition calculations for the future, and how to determine which part of this future total deposition could be the ‘room for deposition’?
2. How to ensure that such room for deposition becomes available at the locations where it is needed?
3. How to distribute the available room for deposition over the various segments that are distinguished by the PAS?

In order to solve these issues, additional policy choices were made for the implementation of the concept of deposition room, in close collaboration between the AERIUS team and the policy staff of national and provincial authorities involved. On this basis, AERIUS Monitor, one of the AERIUS products, was used for making a quantitative and spatial elaboration of the total room for deposition.

Facilitating high economic growth: how does that work?

Results from projections of economic growth in the Netherlands are always within a certain range. The general policy choice for the PAS to offer room for high economic growth has been elaborated by basing deposition calculations on the upper limit of this range. This was done using the CPB growth scenario that is also applied for the projections of large-scale concentrations and deposition of for example nitrogen, used by RIVM to compose the annual GCN/GDN maps (maps of large-scale concentrations and deposition in the Netherlands). This scenario, also called the ‘upper-range policy projection’, is based on a high economic growth of 2.5% and on the implementation of current and proposed nitrogen policy.

AERIUS, calculation tool of the PAS

AERIUS consists of a number of products that jointly support the development and implementation of the PAS:

- **AERIUS Calculator** is used for calculating the emission and deposition of nitrogen on Natura 2000 areas that is related to economic activity. Calculator is used in permit issuing.
- **AERIUS Register** is used by the competent authorities for keeping a register of the issued room for development. It functions as a balance book for the PAS.
- **AERIUS Monitor** is used for calculating the available room for development and deposition under the PAS, as well as for following the trend in nitrogen deposition.
- **AERIUS Scenario** supports the development of spatial plans and policy with respect to nitrogen-related issues.
- **AERIUS Connect** facilitates the collaboration between the AERIUS products and the exchange of data with third parties.
Under the high growth scenario, deposition will decline over time; emission reductions due to current environmental policy and innovations in the economic sectors are larger than emission increases due to economic growth. This is shown in Figure 1 by the first two tubes. The second tube is less full than the first; deposition has gone down over time, despite the projected high economic growth.

Part of the future deposition under the high growth scenario consists of contributions to deposition that result from new or expanding economic activities. This is the so-called growth share within the total future deposition. This growth share can be allocated as room for deposition. In order to determine the size of this growth share, AERIUS has calculated a hypothetical growth scenario of 0% growth. Under this 0% scenario, the deposition level is lower than under the high growth scenario. This lower deposition level is indicated by the additional line (‘without growth’) in the second tube of Figure 1. The difference between this line and the one that belongs to 2.5% growth is the growth share.

Because the PAS involves the implementation of additional source measures in agriculture, deposition levels will go down even further. This is illustrated by the third tube; the additional PAS measures cause a further drop in the content of this tube. Half of this reduction will be made available as room for deposition for new developments. This is illustrated by the fourth tube, which is filled with half of the additional reduction, which thus shows the end result, with the upper part of the tube representing the total room for deposition that is made available under the PAS.

Spatial allocation of growth: room for deposition where it is needed

A very important yet also complex part of the puzzle was to ensure that the room for deposition would be allocated at the locations where the growth would actually be expected. The solution to this issue can be found in the spatial distribution of growth emissions in AERIUS.

An effective spatial distribution of the growth emissions has partly been realised by fine-tuning the national growth scenario for a number of relevant sectors and areas through the input of data on local economic growth. This was for example done for the Port of Rotterdam, a number of larger airports and for large infrastructural government projects. The location and the amount of the desired growth of these projects are well-known. By taking these data as a starting point in emission and deposition calculations, there will be enough room for these developments without consequences for other developments.
Figure 2: The waterbed method of AERIUS compared with the GCN/GDN method. The two top layers show how for both methods the same emission growth is added via the measuring cup to the sector’s existing emissions (in this case: power plants). For GCN/GDN, all growth emissions are distributed over the existing plants. In AERIUS, the growth is first allocated to the proposed new power plant, and only if there is any growth remaining this is distributed over the existing plants. The bottom layer shows the effect of the two methods on deposition. For GCN/GDN, the deposition is calculated at the level of 1×1 kilometre and increased growth is evenly distributed over the existing deposition pattern. In AERIUS, deposition contributions are per hectare and growth leads to a new peak around the new emission source, while there is no increase at the existing plants.
The emission growth level under the national scenario, in principle, applies to all other sectors, similar to how it is used by RIVM in the GCN/GDN. In the GCN/GDN, these national growth emissions are equally distributed over the existing emission sources in the sector concerned. For example, if emissions from industry in the Netherlands increase by 10%, then each of the existing industrial sources is allocated 10% more emissions in the GCN/GDN.

For the PAS, however, such an even distribution of national growth emission over only existing emission sources presents a problem. Under this method, the growth and thus also the room for deposition will only end up in locations with existing emission sources. Let us assume that the Netherlands would propose to build three new power plants. If the future emissions from these new plants would be distributed over the current power plants in the Netherlands, there is no room for deposition calculated for the locations of the new plants. At the same time, deposition room that would not be used would be created at the existing plants.

To distribute the national growth emissions of a certain sector in such a way that the room for deposition actually will end up at the locations where new developments are expected, AERIUS uses the ‘waterbed method’. The waterbed is filled with growth emissions. In locations where much growth is expected within a certain sector, the waterbed is in fact being pulled up. More growth in this sector is then taken into account for this location, thus ensuring that more room for deposition will become available. In this way, because the total growth for the Netherlands remains the same, this automatically leads to less growth becoming available at other locations.

The waterbed method in AERIUS has been worked out on the basis of an elaborate list of proposed projects and developments in the Netherlands. This will determine where growth within a certain sector will occur and, therefore, where the waterbed must be pulled up. National growth emissions will always serve as the starting point. If, after subtracting the emissions from proposed developments, a certain amount of growth emissions still remains for the rest of that sector, this is then distributed evenly over the existing emission sources, conform the GDN/GDN method. In sectors where the emissions from all proposed developments are projected to be higher than the total projected national growth, this growth is capped to ensure that the national growth in emissions is not being exceeded. For example, if the total in emissions from all proposed developments within a certain sector is 120% of the national emission growth in that sector, then in order to determine the room for deposition, the contributions from all those proposed developments will be brought down to ensure the national growth total is not being exceeded.

### Distributing the room for deposition

The calculated room for deposition applies to all new developments together. The PAS distributes this room over four ‘segments’. This distribution is also calculated by AERIUS (Figure 3). Calculations are carried out on hectare level; thus, the distribution over the four segments can differ per hectare.

![Figure 3: Distribution of the room for deposition over four segments.](image)
The first part of the room for deposition concerns an amount reserved for developments that cannot be managed; the autonomous developments, such as population growth (more household emissions) and increases in traffic. In AERIUS, this reserved amount equals the expected growth in emissions from the so-called autonomous sectors.

The second part of the room for deposition is reserved for all developments with a deposition below the limit value of 1 mol/ha/year, as set by policy, and therefore only require submission of a so-called notification. In order to determine how large the reserved amount below the limit value should be, AERIUS uses calculation results from so-called high priority projects (see below) and a rule of thumb for all other developments. The rule of thumb is based on an analysis of existing permit applications and means that 30% of the total expected desired growth that is neither autonomous nor high priority will be reserved for developments below the limit value.

The remaining room for deposition is the so-called room for development under the PAS: the share of the deposition room that is available for new or expanded activities that require a permit. Part of this room for development is reserved for so-called high priority projects (‘Segment 1’). These, for example, are large infrastructural government projects or key provincial projects. AERIUS determines the size of this reservation on the basis of the calculated deposition contributions by the high priority projects. The share that remains is the freely available room for development (‘Segment 2’).

Room to grow, with assurances and care for nature

With the working method described, the PAS’ policy choices have been operationalised and translated, using AERIUS, into a concrete amount of room for deposition and room for development. The amount and spatial distribution of the room for deposition are in keeping with the expected demand from economic sectors. The final question still to be addressed is that of how the PAS guarantees that the use of this room for deposition will not have a negative impact on Natura 2000 objectives. Here, there is an important role for the AERIUS calculations of the trend in total nitrogen deposition. As described above, the room for deposition is already part of this trend. Expert ecologists have assessed, for each area, whether or not nature objectives are likely to be impacted by the combination of decreasing nitrogen deposition and the planned implementation of ecological restoration measures. The results of these assessments were positive for all PAS areas. This means that, in principle, with the PAS, all developments that would fit within the room for deposition can go ahead, at least as far as the issue of nitrogen deposition is concerned.

Liesbeth Maltha (liesbeth.maltha@tauw.nl) from Tauw Consultancy was the project leader of AERIUS Monitor 2014. Mireille de Heer (mireille@deheer.co) from De Heer & Co. Communications is communications adviser of AERIUS. Mark Wilmot (mark@wing.nl) from Wing Consultancy is AERIUS team leader and thus responsible for the overall development of AERIUS.

Design: Taco Zwaanswijk (taco@stainlessmedia.com)

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