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# Natural Gas production in the Wadden area: evaluation an essential component of Environmental Assessment



In 2006, after years of discussion of whether or not to extend natural gas production in the Wadden area, the Dutch government granted Nederlandse Aardolie Maatschappij (NAM) permission to produce natural gas from three existing locations in six gasfields under the Wadden Sea, under a strict stipulation. The gasfields were estimated to have exploitable reserves of about 40 billion m<sup>3</sup> gas.

The strict stipulation was that the dynamic ecology in and around the Wadden Sea would not suffer damage from the subsidence resulting from the gas production. Should such damage occur, then the gas production would be restricted or halted. This is known as the 'hand on the tap' principle. In order to ascertain whether the precondition is being met, NAM measures the subsidence, monitors features of ecological value and reports on this to the government every year. NCEA acts as independent auditor and advises the ministers annually on NAM's report, by means of an advisory report that is publicly available.

To date, evaluation has been treated as somewhat of a poor relation in the Dutch Environmental Assessment (EA) system. The Wadden project is the first in which evaluation has played a decisive role in EA, the decision and the legal procedure relating to this decision. This contribution describes the case and the experiences of the audit, and looks ahead to the possible future role of evaluation in EA.

## The impacts of producing natural gas

The subsidence resulting from the gas production may have adverse impacts on nature because the features of ecological value (e.g. bird populations) in the Wadden area are largely determined by the availability of food on the mudflats exposed at low tide. If there is subsidence, the area of such mudflats shrinks and hence the features of ecological value decrease. So, the Environmental Impact Assessment (EIA) report published in 2006 had to answer the following questions:

- How much subsidence is occurring as a result of gas production?
- What is the anticipated – possibly accelerated – rise in sea level?
- To what degree will natural processes such as accretion of sand and silt compensate for these impacts?

The EIA report gives detailed information on the morphology of the Wadden Sea, sea level rise and subsidence.

The sea level rise/subsidence component is broken down into:

- The scenarios for sea level rise for the next century, assuming a worst-case scenario with a rapid rise.
- The autonomous subsidence in the study area: for many centuries there has been a net import of sediment to the Wadden Sea from the North Sea. Despite the rise in sea level that has occurred, the area of the characteristic sandbanks and saltmarshes in the Wadden area has not shrunk.
- The subsidence bowl and the annual subsidence that will occur:
  - solely as a result of gas extraction via the new wells;
  - as a result of the gas extraction via new and existing wells.

On the basis of the historical natural developments and assuming additional sand supplementation, the EIA report concluded that the import of sediment in the area influenced by the gas wells is high enough to somewhat retard the combined impact of subsidence and sea level rise (also the accelerated sea level rise in the future). The EIA report refers to this as the natural limit. Natural limits were formulated for two areas:

- a maximum of 6 mm / year for the Pinkegat area;
- a maximum of 5 mm / year for the Zoutkamperlaag area.

This natural limit determines the scope there is – including the autonomous subsidence and the sea level rise – for subsidence resulting from new and existing gas wells. As soon as the monitoring clearly shows that there is a risk of the natural limit being exceeded, the gas tap must be adjusted or turned off.

In its review of the EIA report the NCEA opined that these natural limits were arrived at very plausibly, as they were based on the most recent and best scientific insights. The NCEA also deemed as plausible the conclusion that on the basis of the research conducted and the ‘hand on the tap’ principle, new gas wells would themselves not have any significant impact on the Natura 2000 area.

### The government’s decision and the Supreme Court ruling

In 2006 the Dutch government decided to permit gas production at the three locations on the basis of the ‘hand on the tap’ principle. In the decision it is stated that the hand on the tap principle is primarily guided by the rate of subsidence resulting from the gas production and that the monitoring of the abiotic and biotic parameters serves as an additional warning signal.

The decision assumes:

1. that it is expected that impacts on the ecology can occur only if the natural limit (= critical subsidence) is exceeded;
2. that the monitoring must be set up in such a way as to establish whether there is a threat of damage to the

natural characteristics and valuable features of the Wadden Sea from the gas production alone or in combination with other influences.

The way in which subsidence must be measured is described in the subsidence measuring plan. The monitoring programme focuses on the ecologically valuable features (abiotic and biotic parameters). Thus, the measuring plan states how measurements of subsidence must be taken, and at what frequency.

Numerous abiotic and biotic parameters are included in the monitoring programme (see the box on the next page), such as:

- sedimentation and mudflat area;
- water quality and quantity;
- saltmarsh vegetation;
- sediment dwellers;
- breeding birds;
- waders and waterfowl.

NAM is responsible for implementing the measuring plan and the monitoring, and carries out some of the research itself. The remainder of the research is done by research institutes commissioned by NAM. In addition, there are links to existing monitoring programmes.

Every year, the results of this monitoring are submitted to an independent audit committee. The government requested the NCEA to fulfil this role. This was laid down in the decision.

Some environmental organisations appealed against the government’s decision to allow the gas production. They argued that on the basis of the EIA report it was impossible to be certain that there would be no significant consequences. In August 2007 the highest court of law in the Netherlands, the Council of State, ruled on this. It dismissed the objections as unfounded. The following considerations were important for the court:

- The best available scientific knowledge was used in the research and from this it could be concluded that no significant consequences could be expected.
- Even though the subsidence cannot be predicted with 100% certainty, the ‘hand on the tap’ principle provides an additional guarantee that the natural characteristics of the Wadden Sea will not suffer any damaging consequences.
- The decision provides for an extensive evaluation programme that is subjected to independent audit.

So, in the court ruling the corrective mechanism whereby adequate measures can be taken in the case of adverse environmental effects also played an important role. This was thus a unique ruling.

### The experiences in the audit

The gas production started in 2006. So far, the audit

committee has twice issued advisory reports. According to the NCEA, the set-up and implementation of the measuring of the subsidence produce the appropriate information to be able to ascertain whether the subsidence lies within the natural limits of 6 and 5 millimetres per year. These limits were not exceeded in 2007. The early warning measurements did not indicate that the gas production had consequences for the ecological features.

The audit committee was critical of the determination of the baseline situation and the set-up of the early warning measurements. It opined that the baseline situation should consist of more than one measurement taken prior to the gas production. The baseline situation must also shed light on trends in previous years.

The early warning measurements still lack some of this information. The basis for the set-up of the programme for early warning measurements lies in a sound analysis of the relations in the successive links of the biological chain. The decision to include certain parameters in the programme but exclude others was not sufficiently substantiated. It

has not yet been adequately worked out in what way and to what degree changes in these parameters can be related to gas production. This analysis is crucial. After all, the decision does say that the gas tap must be adjusted or turned off if a negative change in a parameter is observed, unless it can be convincingly demonstrated that this has not been caused by the gas production.

In its reaction to Parliament the government announced that the baseline measurement of the programme of early warning measurements for the year ahead would be improved.

### For other projects too?

This was the first project in which evaluation was an essential component of the impact assessment and the decision taken. It has since been followed by another major project, the seaward extension of Rotterdam harbour. In that project the ability to meet the air quality standards was an important aspect in the EA report. In that project too, the most recent and best available scientific knowledge was used when describing the impacts in the EA report. But it was also acknowledged that models have large margins of

## Box: Measuring plan and monitoring

Measuring plan	
<b>Subsidence</b>	<b>Measuring frequency</b>
Rate of subsidence	12x / year
Gas pressure	12x / year
Production volume	12x / year
Modelled subsidence volume	1x / year
<b>Biotic monitoring</b>	<b>Measuring frequency</b>
Erosion/sedimentation Wadden Sea	1x / 5 – 6 years
Erosion/sedimentation North Sea coast	1x / 5 – 6 years
Sedimentation measurements - saltmarsh - mudflat transects - Wadden area measuring stations - location near Moddergat and Ameland-Oost	2x / year 2 / 2 - 3x / year 1x / 3 years continuous
Areal measurements Wadden Sea (incl. cliff erosion)	1 - 2x / year
<b>Abiotic monitoring</b>	<b>Measuring frequency</b>
Saltmarsh vegetation	1 - 2x / 2 years
Sediment dwellers - All species plots monitoring network - Shellfish	2x / year 1x / year 1x / year
Breeding birds (incl. spatial distribution of nesting sites)	1x / year
waders and waterfowl	3 - 5x / year

Source: NAM monitoring protocol and Nature Conservation Act permission.

uncertainty. Extra mitigating measures were described that can be applied if evaluation reveals that norms are indeed exceeded. The monitoring is anchored in the land-use plan. In an 'air agreement' for this land-use plan, the municipality, province and central government commit themselves to taking these measures if required.

Meanwhile, NAM is preparing the EIA procedure for new gas production under the Wadden Sea, and for this is also drawing on the experience acquired to date.

At present there is much debate in the Netherlands on the wisdom and folly of extensive model-based calculations and descriptions of impacts. Administrators want to speed up the preparation of plans, but at the same time want to be sure that their projects will not be dealt a death blow by the judge. Stakeholders want to be certain that they will not be confronted with adverse consequences. Scientists cannot guarantee 100% certainty: they can indicate which impacts are probable. This dilemma could be resolved by an effective evaluation that is linked with the taking of additional measures if necessary. In the near future it will become clear how this will be put into effect in EA practice.

#### Role of the NCEA

- The NCEA advised on the Terms of Reference of the EIA for gas production in the Wadden Sea in 2005.
- The NCEA reviewed the quality of the EIA report for gas production in the Wadden Sea and issued its advice in 2006.
- The permits for the gas production stipulate that an evaluation report will be submitted to the NCEA every year. The NCEA, as an independent audit commission, will issue an advisory report once a year.
- Since the start of gas production in 2007, the NCEA has issued two advisory reports.

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#### More information

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