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# State of affairs on Biomethane in the Netherlands

## National Roadmap

### ***Introduction***

The Netherlands is a country with a strong gas history. Based on the country's own gas supplies, gas makes up nearly 50% of the primary energy source for all energy applications. Furthermore, 98% of all households are connected to the gas grid.

Since 1987, the Netherlands has experience in the upgrading of biogas from landfill sites, to a natural gas quality, and injecting this into the gas grid. From the more extensive energy transition platform, a start was made in 2006, with a more generic approach for the production of green gas.

The history and experience related to landfill gas projects mean that a great deal of experience has already been acquired with the technique involved in the upgrading of biogas, and several specialised companies are active in the area of gas treatment in general, and the upgrading of biogas, in particular.

Partly based on its own gas supplies, the Netherlands holds a strong position with regard to the supply of gas in North-western European countries. These gas supplies are limited, however, and the gas supply of the future is already being anticipated now, for this reason. Green Gas therefore plays an important role in the development of the gas roundabout, and thus in the security of the gas supply. Green gas also contributes to increased sustainability of the energy supply in the Netherlands.

### ***Organisation***

From 2005, energy transition platforms were opted for, in the ambit of public-private cooperation. One of the platforms paid specific attention to the transition of the gas supply. In 2006, a working group was established based on this for the development of the green gas market in the Netherlands. In December 2007, this working group presented a Vision Document to the former Minister of Economic Affairs ([http://www.iea-biogas.net/download/publi-task37/publi-member/netherlands\\_11\\_Full\\_Gas.pdf](http://www.iea-biogas.net/download/publi-task37/publi-member/netherlands_11_Full_Gas.pdf)).



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The most important recommendations herein included the establishment of a certification system for green gas, comparable to certification of renewable electricity and the utilisation of a specific subsidy system for the production of green gas.

The development of the certification system was taken up afterwards and the Vertogas organisation was established based on it, which has, since July 2009, facilitated the trade in green gas certificates. Furthermore, a separate feed-in subsidy scheme was developed (SDE programme) whereby a separate category was included in support of green gas production. This programme was first published in 2008, and is updated annually. The current link for biomass projects in 2013 is: <http://www.agentschapnl.nl/programmas-regelingen/biomassa-sde-2013> (English information available).

Work must be conducted at various levels with the development of green gas projects:

### **Project development**

In 2011, a new public-private cooperation was established, giving shape to the stimulation of green gas in the Netherlands: the Stichting Groen Gas Nederland (Dutch Green Gas Foundation). This foundation's goal is to support green gas project initiators. The foundation's primary themes are also green gas applications in the mobility sector and mono-digestion of manure (large-scale and small-scale). More information is available on the website: [www.groengas.nl](http://www.groengas.nl).

### **Government**

A working group was established within the national government, comprising representatives from all Ministries that are involved in the development of the green gas market, in view of their policy responsibility. This working group (*Versnellerteam groen gas*) focuses on streamlining the impediments caused by laws and regulations.

### **Grid / network operators**

The upgraded biogas is, for the most part, injected into the natural gas grid. To prepare for a communal approach by all grid / network operators, a 'green gas' working group is established, in which all grid / network operators (Gasunie as TSO, and all regional grid / network operators, as DSO) are represented.

## Current state of affairs

In April 2013, 21 production locations for green gas were operating in the Netherlands, with an overall production capacity of 11900 Nm<sup>3</sup>/hour; annual production approximately 90 million Nm<sup>3</sup>/year. A current look at the state of affairs, concerning bioenergy projects in the Netherlands, and therein also our green gas projects, is available through the website [www.b-i-o.nl](http://www.b-i-o.nl).



Figure 1: Overview of Green Gas production in the Netherlands from [www.b-i-o.nl](http://www.b-i-o.nl)



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## **Biomass potential for Bioenergy**

A biomass potential study was conducted in 2010, which evaluated the biomass potential for the production of bioenergy. The focus of the study was directed at the systematic evaluation of Dutch biomass in the context of the demand for renewable electricity and heat, but also in the context of alternative applications and sustainability requirements, now and in the future. The focus was therefore not directed at green gas production in particular.

Assessments are made for the availability of Dutch biomass streams, prepared under four scenarios derived from the well-known IPCC scenarios. The emphasis, in this regard, is placed on two driving forces, namely (1) the extent to which markets are open or closed (EU), and (2) the extent to which sustainability (mitigation of global warming) plays a role versus security of supply.

It was concluded that, in 2020, approx. 13.4 to 16.4 million tonnes of dry biomass material would be available from the Netherlands for the generation of energy. This is 30 to 40% of the biomass used within the Netherlands on an estimated annual base. This can ensure the generation of 53 to 94 PJ of final energy, with which 101 to 157 PJ in fossil energy can be avoided.

This study can be downloaded from:

<http://groengas.nl/wp-content/uploads/2011/09/Beschikbaarheid-van-Nederlandse-biomassa-voor-warmte-en-elektriciteit-in-2020.pdf>

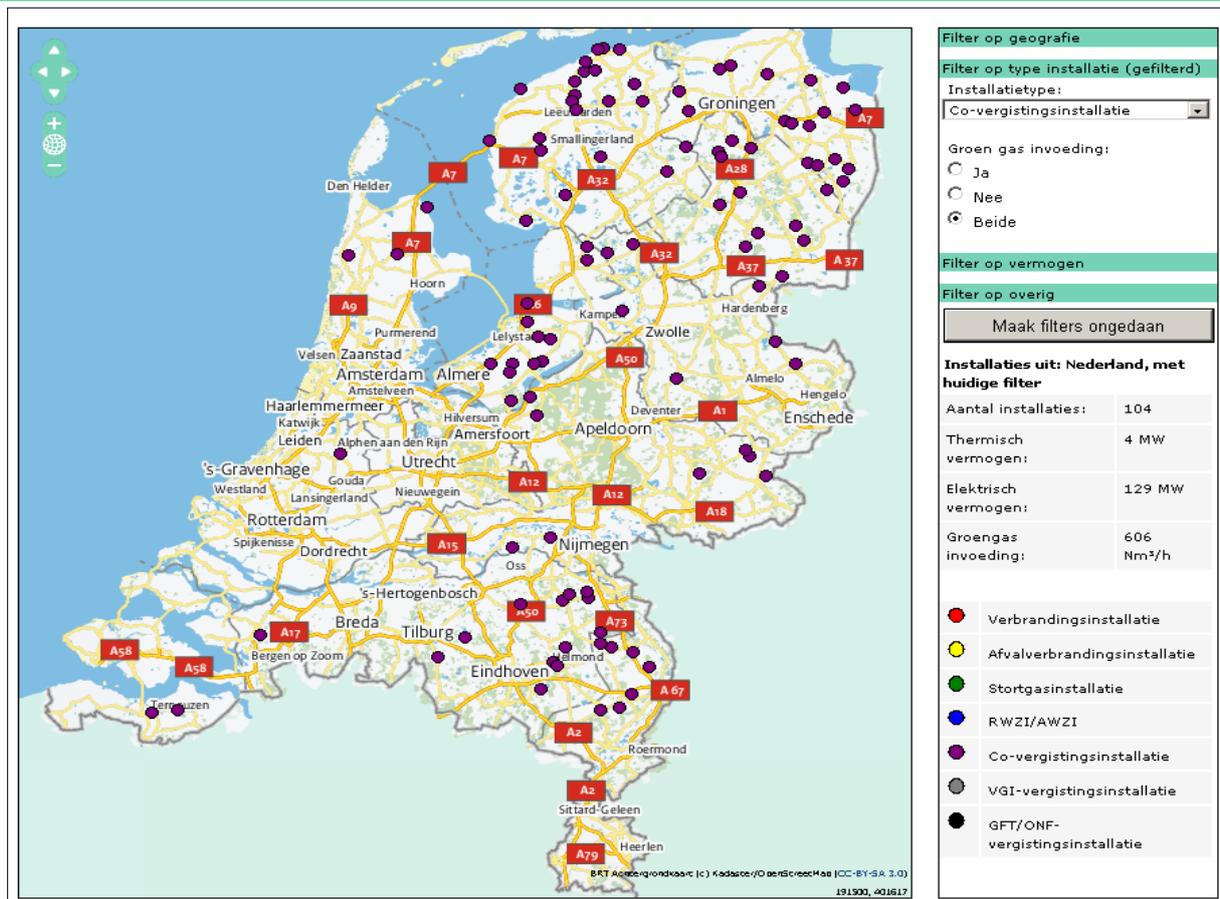


Figure 2: Overview of co-digestion installations in the Netherlands from [www.b-i-o.nl](http://www.b-i-o.nl)

Figure 2 portrays co-digesters. It is clear from this figure that a concentration of initiatives is in place in the northern part of the country. The accent, in this case, is placed specifically on farm digesters in the dairy farm industry. In the south of the country, the accent is placed on large-scale digestion, with focus on the utilisation of manure from the pig farming industry. For this region, in particular, the future for green gas production is embedded in a combination of the processing and digestion of manure (also refer to Figure 4 for the regional distribution of manure production).

## Green gas development in the agricultural sector

Biomass is required for the production of green gas. This biomass is made available from biogenic waste streams, such as organic waste from households, or from the agricultural sector.

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The biomass which is made available from the agricultural sector, which can be used for digestion, can originate from various sources, such as: Animal manure, energy crops and residual animal feed streams, for example, or other waste streams within an agrarian company.

Within the Netherlands, the focus is placed on the utilisation of waste streams, and not on the utilisation of energy crops.

In agriculture, the digestion of manure (mono-digestion) or co-digestion is an option for the production of green gas. For co-digestion (at least 50% animal manure as the base), substances from the 'positive list' may be utilised as co-substrate.

(<http://www.drloket.nl/actueel/nieuwsitem/nieuwsbericht/2022481/meer-producten-voor-co-vergisting>).

If these conditions are complied with, the digestate from the digestion installation may be used as fertiliser in agriculture.

The development of green gas in the agricultural sector is strongly intertwined with the fertiliser issue. All fertilisers from the used substrate for co-digestion that end up in the digestate, , are designated as originating from animal manure. More manure is therefore produced because of co-digestion. according to EU regulations, however, there are utilisation limits for companies. If the volume of manure exceeds the company's utilisation limit, the manure must be transported from the companies in question. This leads to extra expenses and results in a less attractive business case for digestion. If manure and / or digestate from digesters are processed and may then be utilised as a substitute for artificial (chemical) fertilisers, added room will be created for the development of digestion in agriculture.

This issue is described in detail in: G.L. Velthof e.o.; Proceedings No: 716 of the IFS (International Fertiliser Society: Agronomic potential of mineral concentrate from processed manure as fertiliser) and in the report from Wageningen University: Mineral Concentrates Pilot; synthesis of the results of 2011 (<http://content.alterra.wur.nl/Webdocs/PDFFiles/Alterraraapporten/AlterraRapport2363.pdf>)

An evaluation of the digestion sector in the Netherlands, in which these matters are dealt with, can be found through the following link:

<http://www.agentschapnl.nl/sites/default/files/bijlagen/Evaluatie%20van%20de%20vergisters%20in%20Nederland%20november%202011.pdf>

# GREEN GAS GRIDS

Dutch agricultural areas are portrayed through the information below:

<b>Core numbers in the Dutch agricultural sector: Source CBS stat line 14/02/2013</b>	
Total area of arable farming	520,803 ha
Total area of horticulture in full ground	86,421 ha
Area of horticulture in greenhouses	9,962 ha
Area of grassland	986,524 ha
Area for cultivation of fodder	237,989 ha

More detailed information is available through the link below:

[http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=80780NED&D1=23-24,32,50-51,59,64-65,79,86-88,155-156,167,170,180,194,295-296,317,320-321,384,388,399-404,406,417-418,427,440,444,451,500,504,512,518-519,526&D2=0&D3=0,5,\(I-2\),\(I-1\),I&HDR=G1,G2&STB=T&VW=T](http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=80780NED&D1=23-24,32,50-51,59,64-65,79,86-88,155-156,167,170,180,194,295-296,317,320-321,384,388,399-404,406,417-418,427,440,444,451,500,504,512,518-519,526&D2=0&D3=0,5,(I-2),(I-1),I&HDR=G1,G2&STB=T&VW=T)

Considering the relatively large concentration of livestock in the Netherlands, quite a high volume of manure is also produced, which could be utilised as a source for the production of biogas and green gas.

The next two figures illustrate the manure production situation. Figure 3 illustrates the total volume of manure and Figure 4 illustrates the distribution of manure production per region. An assessment of the potential for green gas production, based on digestion, can be derived from this information.

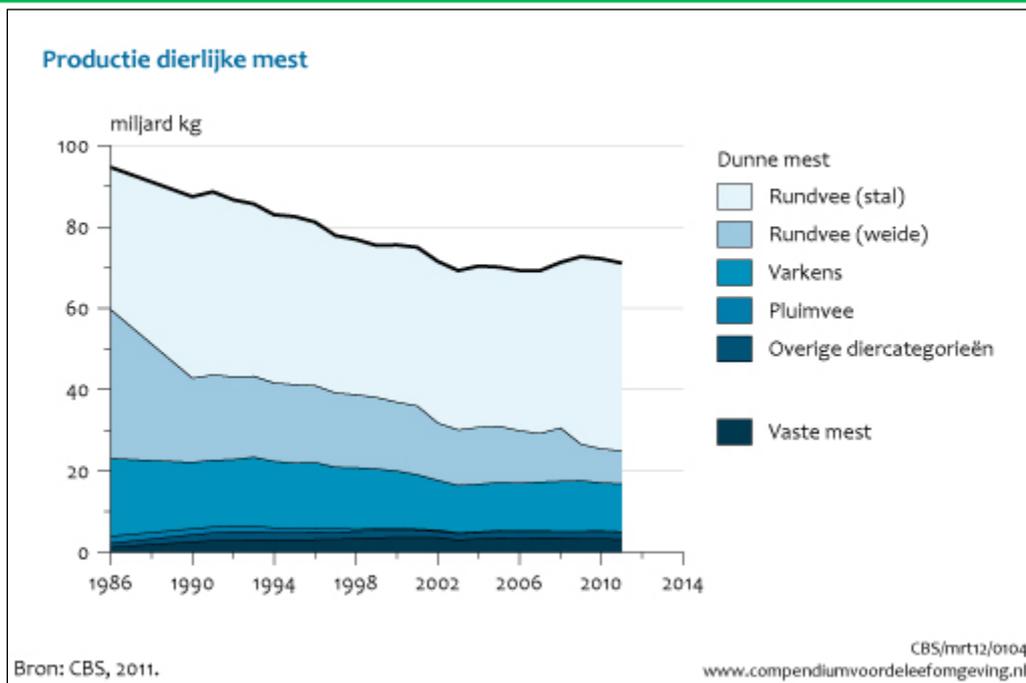


Figure 3: Production of animal manure per year, per animal category

Figure 3: translation

**Production of animal manure**

Scale in billion kg

Semi-liquid manure

- Cattle (stable)
- Cattle (pasture)
- Pigs
- Poultry
- Other animal categories

Solid manure

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Based on the available volume of manure (70 million tonnes), a maximum green gas production of 1.5 billion Nm<sup>3</sup>/year is possible. With the utilisation of available waste streams, this production could be doubled once more. This is based on the assumption that energy crops, such as corn, are only used to a limited extent. This, pursuant to the relatively high prices for energy crops, which increased significantly during the past years.

The next figure illustrates the regional distribution of the production of (the most important) N and P minerals from animal manure, per region.

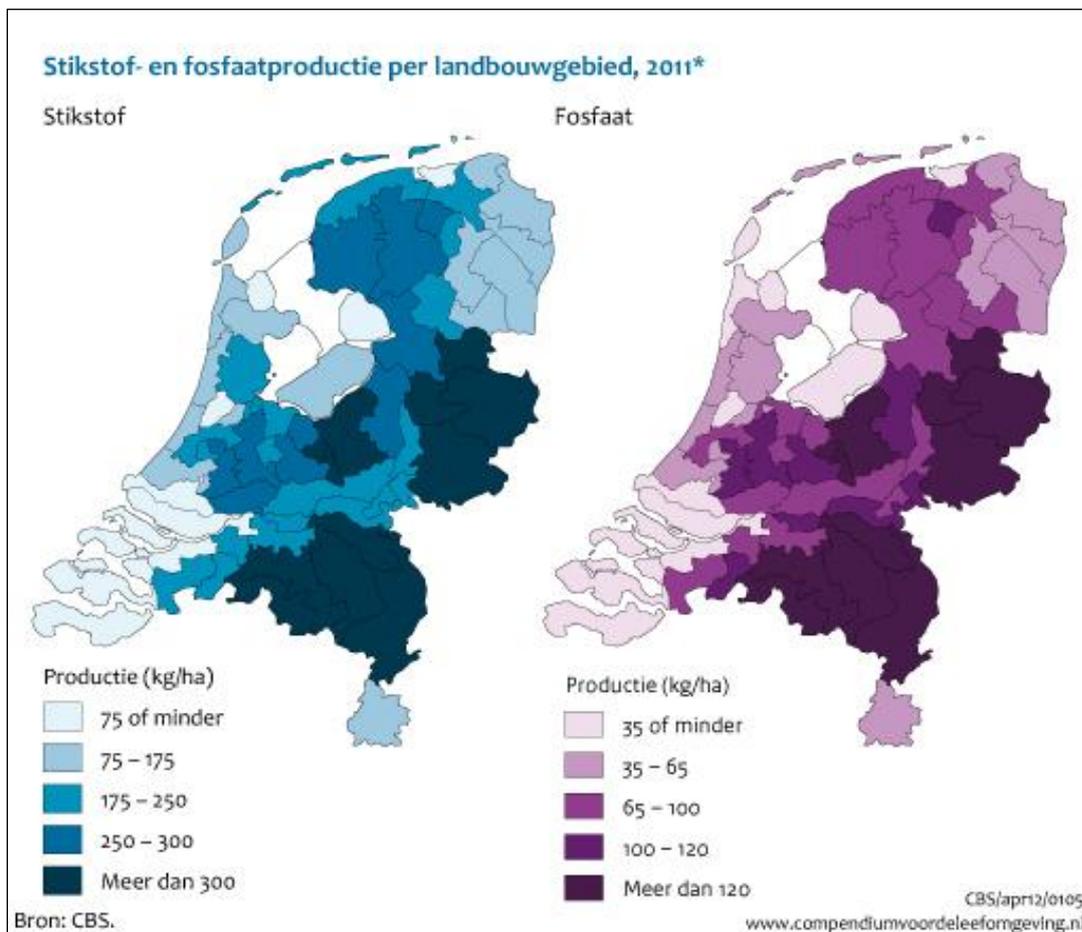


Figure 4: Overview of regional N and P production from animal manure

Figure 4: translation

**Nitrogen and phosphate production per agricultural area, 2011\***

Nitrogen Production (kg/ha)	Phosphate Production (kg/ha)
 75 or less	 35 or less
 75 – 175	 35 – 65
 175 – 250	 65 – 100
 250 – 300	 100 – 120
 More than 300	 More than 120

## Stimulation framework

The unprofitable top of green gas production, in the case of injection into the gas grid, is supported by the SDE+ scheme, to make the production of green gas profitable. This feed-in tariff is guaranteed for a period of 12 years.

Furthermore, work is being carried out on innovations within the green gas production chain, by way of a special top sector policy within the gas sector. The most important objective hereof is improvement of cost-effectiveness. By way of this route, green gas production must, in time, become independent of production subsidies.

Biotickets can be implemented for the stimulation of green gas production in the mobility sector. More information on this is available through the link: <http://groengas.nl/tag/biotickets/>

## Ambitions of the Netherlands

The ambitions of the Netherlands are expressed in the National Renewable Energy Action Plan, in the area of renewable energy. In this action plan, calculations are based on a gross final energy demand for renewable energy, amounting to 51 Mtoe (2.1 EJ) in 2020, of which renewable heat will contribute a total of 2.2 Mtoe (91 PJ). For this purpose, it is expected that bioenergy will make the largest contribution. To achieve this, the Netherlands expects a significant contribution from the direct feed-in of biomethane into the natural gas grid ('green gas'), of 0.58 Mtoe (24 PJ) in 2020.



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More information is available in the 'National Renewable Energy Action Plan (*Nationaal actieplan voor energie uit hernieuwbare bronnen*, Directive 2009/28/EC', on, amongst others, page 105 and page 109, table 11. This action plan is available from the following link:  
[http://www.agentschapnl.nl/sites/default/files/bijlagen/Nationaal\\_actieplan\\_voor\\_energie\\_uit\\_hernieuwbare\\_bronnen\\_tcm24-338435.pdf](http://www.agentschapnl.nl/sites/default/files/bijlagen/Nationaal_actieplan_voor_energie_uit_hernieuwbare_bronnen_tcm24-338435.pdf)

### **Scenarios on green gas production and grid injection**

Two different techniques will be employed for the production of green gas, namely:

- Digestion based on 'wet biomass and energy crops'
- Gasification of dry biomass

The digestion technique is presently well-developed and available. The gasification technique has not yet been developed to its full potential, but will, in time, provide the largest perspective for green gas volume.

Pilot projects are currently being carried out, and the technique can be further developed and scaled up, based on this.

Besides the development of individual green gas projects, attention is also paid to the development of biogas hubs and biogas grids. Overflows can be installed, for when the local production capacity for green gas exceeds the transport capacity of the local gas grid. This will facilitate the injection of gas to a gas grid with a higher pressure level. The initial preparations for such projects are in the development stage.

Two documents are currently being prepared for the on-going strategy for further implementation of Green Gas in the Netherlands:

- A chain map for digestion (Dutch Green Gas Foundation: [www.groengas.nl](http://www.groengas.nl)). This document provides, in particular, an extensive state of the art of the current digestion chain.
- A roadmap for green gas. This is a document which is prepared in cooperation with several stakeholders. A long-term vision will be described in this document, and attention will be paid to: potential, preconditions, etc., in order to achieve this. The roadmap will also focus on green gas production from digestion and green gas production from gasification. It is expected that the document will be ready at the end of 2013. The result of this project can be considered as a final National roadmap of the Netherlands.