Non-CO_2 Greenhouse Gases (NCGG-4), coordinated by A. van Amstel
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Role of government policies and regulation in curbing the emissions of non-CO_2-greenhouse gases in the Netherlands

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ABSTRACT: Government policies and regulation have played an important role in reducing emission of all greenhouse gases in the period 1990-2003 in the Netherlands. This paper shows that policies already in place before the specific non-CO_2 greenhouse (NCG) gas policies are predominantly responsible for reductions achieved so far. Roughly 20% of achieved reductions can be attributed to a specific Dutch Reduction Plan on NCG gases that has been introduced in 2000. Also this Plan reinforced reduction measures driven by policies already in place before the Kyoto target was set. Furthermore this paper shows that the threat of government regulation already leads to reductions of greenhouse gas emission, as firms want to avoid regulatory risks (e.g. the current shift towards alternative blowing agents and refrigerants).

1 INTRODUCTION

Several measures were implemented to reduce the emissions of NCG gases in the Netherlands over the period 1990-2003. This paper analyses the role of government policies in realizing these reductions in the Netherlands, and makes a comparison with the role of policies in other countries.

This paper will first provide an overview of achieved reductions, costs and government expenditure related to the reduction of NCG gas emission in the Netherlands over the period 1990-2003. Thereupon an overview will be given on the role of government policies in reducing emissions, followed by an overview of the role of government policies in other countries and the future role of policies.

2 ACHIEVED REDUCTIONS AND COSTS

2.1 *Emission reductions*

Measures implemented in the period 1990-2003 resulted in emission reductions of approximately 11 Mton in 2003 compared to the reference situation. This means that without the implementation of these measures emissions of NCG gases in 2003 would have been 51 Mton instead of 40 Mton of CO_2-eq. Figure 1 shows that large reductions were achieved with respect to (Harmelink et al, 2005):

- The emissions of HFC-23 through the implementation of an after burner with the manufacturer of HCFC-22,
- The emissions of PFC through the modernisation of the production sites with both aluminium producers in the Netherlands,
- The emissions of CH_4 through the implementation of several reduction measures with the oil and gas industry,
- The emissions of CH_4 through the collection, and utilisation of landfill gas at waste dumping sites.

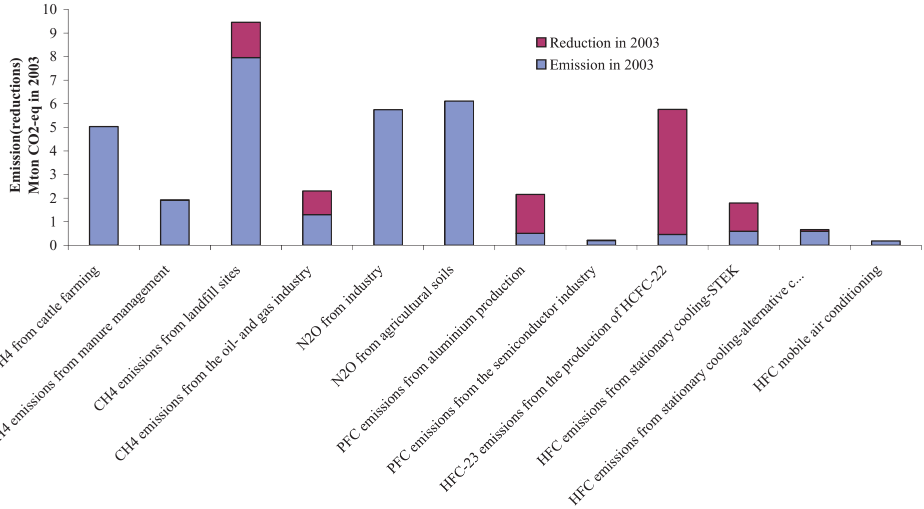


Figure 1. Annual emissions in 2003 and achieved gross reductions through the implementation of reduction measures by the end of 2003 compared to reference situation. Source: Harmelink et al (2005)

2.2 *Costs*

Total investments aimed at reducing emissions of NCG gases amount to approximately 149 million euro in the period 1990-2003 (1 euro = 1.24690 US Dollar). It must be stressed that investment figures involves large uncertainties as a result of, limited and partly unreliable data. For some sectors no estimates could be made at all because of lack of data. The most important investments missing in our overview are the investments in the oil and gas industry. From our analysis the top-4 of measures accounting for 85% of the investments over the period 1990-2003 is:

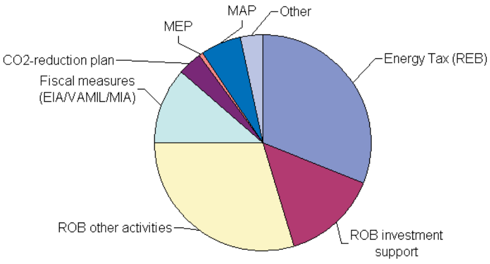
1. Reductions of PFC emissions in the aluminum industry.
2. Collection and utilization of landfill gas
3. Switch to natural cooling agents with stationary cooling installations
4. Good housekeeping measure in the cooling sector

2.3 *Government expenditure*

Total government expenditure in the period 1990-2003 is estimated at about 40 million euro. Figure 2 provides an overview of the split-up of the government expenditures for the period 1990-2003 over the different government instruments and over the different sectors.

- Approximately 70% of the budget went to investment support in reduction measures, whereas 30% was used to finance all kind of activities to initiate, stimulate and/or facilitate the implementation of reduction measures (this is the chart pie ‘ROB other activities’ in Figure 2).

- More than 40% of the government expenditure went to support implementation of reduction measures at landfill sites. Most of these costs were made in the beginning of the ’90. This is also the sector with the third largest reductions achieved over the period 1990-2003.
- Almost 17% of the government expenditures were to support the market transition to natural cooling agents, which so far led to limited reductions.



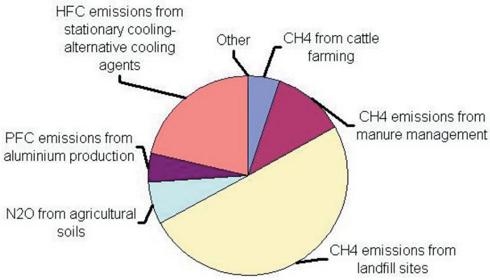


Figure 2 Split of government expenditures over different government programmes (left) and emission sources (right). Source: Harmelink et al (2005)

3 ROLE OF GOVERNMENT POLICIES IN ACHIEVING REDUCTIONS

3.1 *Reduction of CH_4 emissions*

Figure 1 shows in the period 1990-2003 emissions of CH_4 have been reduced by ~2.5 Mton CO_2-eq at the end of 2003 compared to the situation in which no government policies would have been in place. These were achieved by measures implemented with landfill sites and the oil and gas industry.

Measures within the waste sector mainly follow from government regulations regarding collection and utilisation of landfill gas that came into force in the beginning of the ’90s. The government substantially supported these investments with tax exemption from the energy tax and grants within the Environmental Action Plan of the energy distribution companies. Measures with the oil- and gas industry were triggered by environmental and energy efficiency covenants as a result of which the sector investigated reduction options, which on average turned out to be very cost-effective.

Emission reductions in the agricultural sector are still lagging behind. Reduction options are still in the research phase (enteric fermentation by cattle) or are hampered by strict regulation with respect to use of the remains from co-digestion, long lead times to obtain environmental and building permits (anaerobic co-digestion of manure) and low profitability of investments. The government financially supported investments and research, but very limited reductions have been achieved up to now.

3.2 *Reduction of N_2O emissions*

The absolute level of N_2O emissions has decreased by 10% over the period 1990-2003. This decrease resulted from structural changes in the agricultural sector (changes in the application of manure and a decrease in the number of animals) and reductions in production volumes in the chemical industry.

So far no reduction measures have been implemented with sources of N_2O emissions. Efforts were aimed at getting a better understanding of emissions and feasibility of reduction measures in the agricultural sector and the industrial sector. Total governments costs amount to ~3.7 million euro.

3.3 *Reduction of Fluorinated-gases emissions*

Reductions of Fluorinated-gases accumulated to approximately 8 Mton CO_2-eq. at the end of 2003. The largest reduction has been achieved by installing an after burner with the producer of HCFC-22. Further, large reductions were achieved through good housekeeping measures with cooling installations and through the modernization process in the aluminum industry.

Almost all reductions were achieved within sectors that already had measures planned (through requirements in their permits) or in place (long) before specific NCG gas policies came in place (i.e. before the Climate Change Action Plan (CCAP) was published (VROM, 1999)). Activities initiated within the Reduction Plan on NCG gases however turned the actions toward the climate change aspect of these measures and resulted in speeding up the process of implementation of reduction measures. What furthermore can be noticed is that the government expenditures for sectors where large reductions have been achieved were relatively low.

Total government expenditures for the period 1990-2003 accumulated to approximately 11 million euro. Main part of the expenditures went to grants that stimulated the use of alternative refrigerants.

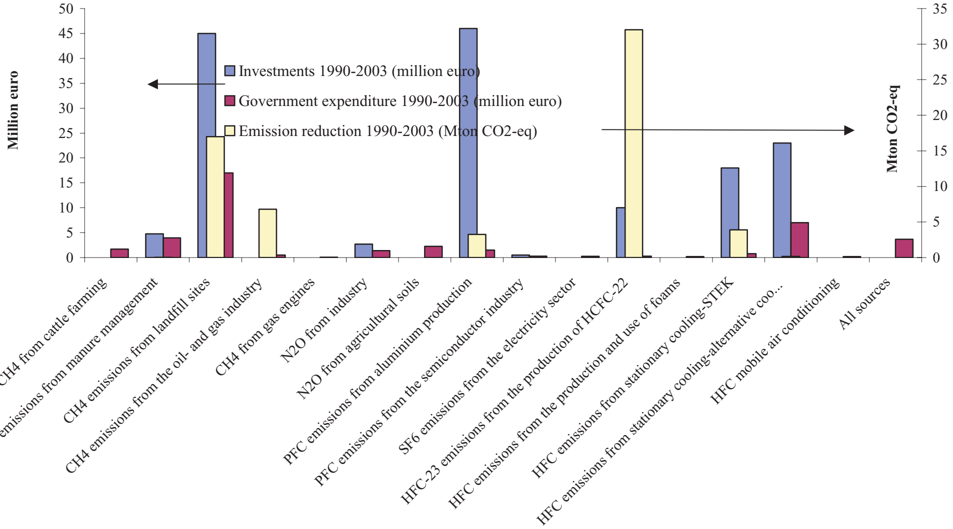


Figure 3 Gross *cumulative* investments, government expenditure and gross achieved reductions for the period 1990-2003 aimed at reducing emissions of NCG gases.
All sources includes government budget for assignments within the NCG gas policy which cannot be attributed to specific emission sources or measures.

3.4 *Overall picture*

Government policies have played an important and crucial role in the realization of emission reductions in the Netherlands. Main part of the reductions in the period 1990-2003 were triggered by government policies already in place (or well under way) before specific attention was paid to the impact of these substances on climate:

- Environmental permit requirements for the producers of HCFC-22 and aluminium to limit emissions of fluoride and other pollutants, resulting in reductions of HFC and PFC emissions.
- Voluntary agreements with the oil and gas and the aluminium industry to improve their energy efficiency, resulting in reductions of CH_4 and PFC emissions.

- Dumping regulations to reduce emissions of methane from landfill site, which were introduce to reduce local safety hazards from the potential build up and explosion of methane and also reduces odours associated with landfill sites.
- Introduction of good housekeeping measures through obligatory training and usage log within the cooling sector to reduce emissions of substances regulated under the Montreal Protocol (CFCs), which also applied to HFC emissions before their large scale applications.

Characteristic of these policies is that all of them were not introduced with the specific aim to reduce the emissions of NCG gases but to solve other environmental and health issues. With the publication of the Climate Change Action Plan in 1999, which held the policies for the Netherlands to achieve its Kyoto targets, the Reduction Plan on NCG gases. This plan aims to speed up the implementation of measures to reduce the emissions of NCG gases. To achieve this it primarily (i) enforces the effectiveness of instruments already in place (e.g. with the producer of HCFC-22 resulting in an additional reduction of 2 Mton compared to the reference situation in 2003, and the aluminum industry), (ii) removes barriers for the implementation of reduction measure (e.g. with respect to rules for co-digestion) and (iii) raises awareness and increasing knowledge on reduction measures.

On the other hand government regulations also hampered the implementation of reduction measures in the Netherlands. Because of lack of transparent regulation with respect to substances that can be used to co-digest with manure and long lead times to obtain the necessary permits. In countries with transparent regulation in place (like e.g. Denmark and Germany) market penetration of anaerobic co-digestion of manure is significantly higher.

Specific policy development to limit emissions from fluorinated-gases used in production processes and installations is still in an early phase. In 2006 the European Fluorinated-gas Regulation is expected to be introduced and some other countries introduced or will introduce specific policies. Effect of these policies are not yet discernible in the emission inventories as most of them have long transition periods to provide the sector with opportunities to develop alternatives.

4 COMPARISON WITH POLICIES IN OTHER COUNTRIES

The Netherlands already achieved large reductions in the field of NCG gases, such as the reductions in the field of methane from landfill gas and HFC-23 from the production of HCFC-22. However in some sectors the implementation of reduction measures in the Netherlands is lagging behind. Main sectors were policy development and market conditions in other countries are more favorable than in the Netherlands for the implementation of reduction options are:

- *Co-digestion of manure*. The implementation context of anaerobic co-digestion of manure is due to different government policies and structure of the sector more favorable in Germany and Denmark. The cost-effectiveness of co-digestion of manure is due to higher levels of financial support from the government in Germany and Denmark better than in the Netherlands. Rules regarding the use of remains from the co-digestion process have been clearly defined for a number of years and due to the large number of installations already in place there is a lot of experience with authorities and procedure run more smoothly. A further advantage compared to the Netherlands is that the average size of farms in Germany and Denmark are larger and they have more land to spread the manure (Tijmensen et al, 2002).
- *Alternative cooling agents*. Use of natural cooling agents in stationary cooling equipment was not a focus in Dutch climate change policies. The Netherlands mainly focused on reducing leakage rates and no regulations were announced or introduced to stimulate the shift to natural cooling agents like e.g. in Germany, Austria and Denmark. According to experts only the treat of government regulations in these countries led to the shift towards the use of natural cooling agents. Because of lack of data this can however not yet be substantiated with numbers.
- *Alternative blowing agents*. The same counts for alternative blowing agents. The treat of government regulations on HFC in other countries made producers turn toward alternatives. Because of lack of data this can however not be substantiated with figures.

5 CONCLUSIONS AND RECOMMENDATIONS

Government policies were the most important driver for the implementation of emission reduction measures in the period 1990-2003 in the Netherlands. With the exception of the aluminium industry, measures to reduce emissions of NCG gases are not profitable and would most likely not have been implemented in the absence of government policies. In the absence of government policies most measures would not have been implemented because there is no 'autonomous' drive to implement these measures. It can be concluded that most reductions (about 80% of total reductions) were mainly driven by policies already in place before the Kyoto target was set, and which were reinforced with the introduction of the Reduction Plan on NCG gases. Roughly 20% of achieved reductions in 2003 can be attributed to this specific Plan.

On the other hand the lack of clear policies was an important barrier for the implementation of reduction measures. Co-digestion of manure in the Netherlands was e.g. hampered by lack of clear policies on the use of the remains from the co-digestion process (which was recently solved with the publication of the white list) and long lead-time for obtaining permits. In countries with clear policies like Denmark and Germany market implementation is significantly higher.

Examples from other countries show that also the threat of government policies, e.g. in the cooling and foam sector, already drove sectors to implement reduction measures.

Government policies will also have to play a crucial role in achieving further reductions in coming years. In this case it is important to keep in mind that government policies often have long lead times before their effect is visible in decreasing emissions on the national level. This is also the reason that the effect of new policies initiated under the reduction plan for NCG gas emissions is up to now only partly visible in reductions on a national level. Time has been too short for the policies to fully result in actual implemented reduction measures.

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