



National emissions cap for the Effort Sharing Regulation (ESR) sectors

Elaboration of policy instruments
providing safeguards for climate targets



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This report has been prepared by:

Katja Kruit, Martijn Blom, Ward van Santen, Ellen Schep, Arno Schroten, Marianne Teng, Joukje de Vries and Maarten de Vries

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Summary

In March 2023, the Interdepartmental Policy Study (Interdepartementaal Beleidsonderzoek, IBO) Climate Report made proposals for additional climate policy in order to achieve the government's ambition of a 60% reduction in greenhouse gases by 2030 compared to 1990, in order to meet the legal reduction target of 55% by 2030 with sufficient certainty. One of these proposals was a national emissions cap for the sectors covered by the Effort Sharing Regulation (ESR), which are the built environment, mobility, small industry and agriculture. In its spring 2023 decision, the government indicated that it wanted to examine whether and in what way this instrument could contribute to achieving the climate targets.

In this report, we examine how a national emissions cap for ESR sectors, the 'ESR cap', could be introduced as an effective safeguard mechanism for national emission reduction targets. Although there are currently several policy measures for the ESR sectors, there is no instrument that provides certainty on the achievement of the targets.

Structure of the ESR cap: three variants

An ESR cap is additional to the existing policy mix. There is currently no instrument that provides national safeguards for ESR sectors. An ESR cap can also function as an early warning: a rising CO₂ price can be a signal for policymakers to strengthen other policies. While the ESR cap will interact with other policies, existing policies will remain in effect and retain their own function. Additional instruments are required to increase the perspective for action and remove barriers that an ESR cap does not address.

Three variants of an ESR cap were developed in this study:

1. **An overarching cap with trade.** In this variant, the maximum allowable emissions are set by law. In our elaboration, we include CO₂ from fuels and non-CO₂ from livestock farming within the scope of the cap. Parties subject to the cap (i.e., natural gas and fuel suppliers and livestock farmers) are required to surrender allowances for all their emissions to a competent authority. Emissions trading will create a market price, the 'ESR price'. Parties in the system can choose between purchasing allowances and reducing emissions. This will encourage the reduction of emissions via the most cost-effective measures. As parties themselves have limited reduction potential, it is expected that they will pass on the price of emission allowances to end users. This creates an incentive to reduce emissions by end users.
2. **Separate caps per sector.** This variant is similar to Variant 1, but instead of a single cap, it works with separate caps determined on the basis of sectoral targets, with more scope for adjustment by sector. However, this is less cost-efficient than an overarching cap, resulting in higher ESR prices on average. On top of this, the implementation is more complex because of the need to differentiate between groups of end users. It is very complex to precisely delineate sectors according to climate targets. It is possible, though, to make a split between natural gas for the built environment and small industry, natural gas for greenhouse farming (based on self-reporting), transport fuels and livestock farming.
3. Unlike other variants, **an emission tax with dispensation allowances** does not specify the maximum allowable emissions, but rather the emissions on which no emission tax is payable, much like the current CO₂ tax for industry. The tax therefore applies to marginal emissions. The emission tax acts as a maximum price and is set in advance by the government. As a result, the effect of the safeguarding mechanism is lower than in



Variants 1 and 2. The implementation of this variant is also complex, as the number of dispensation allowances, their allocation and the tax rate have to be determined by the government. The Netherlands Environmental Assessment Agency (Planbureau voor de Leefomgeving, PBL) could advise on the tax rate.

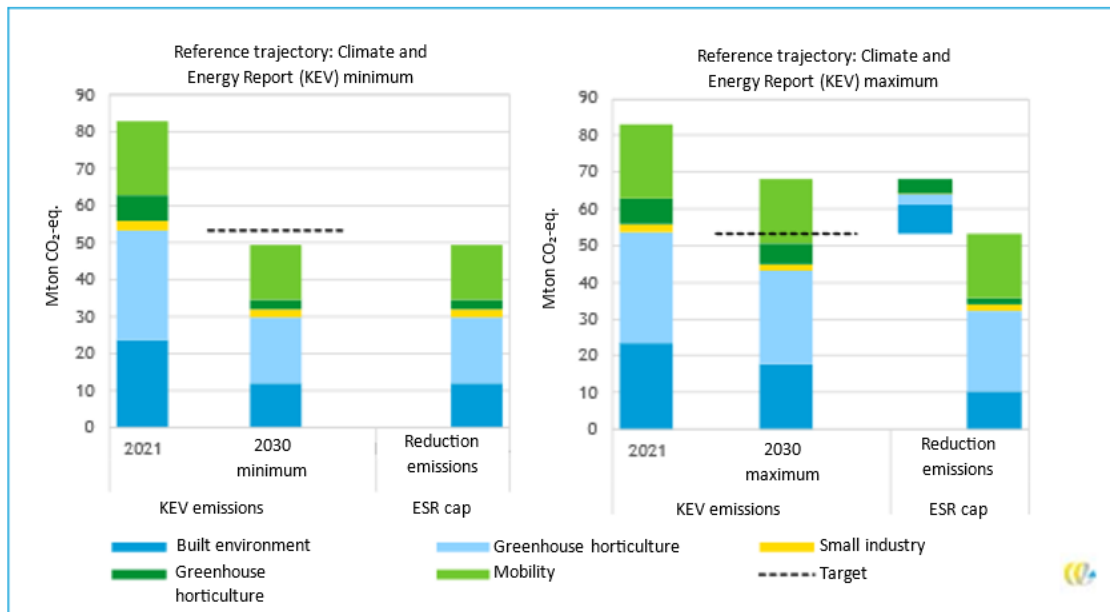
There are specific implementation complications in the livestock farming sector because emissions are not linked to fuel use. This involves a large number of small-scale entities (more than 20,000 livestock farmers) for whom the administrative burden will increase significantly. In addition, it is currently impossible to measure emissions in livestock farming, which means that a fixed-rate system based on averages will need to be developed.

Impact of each variant in 2030

Using a modelling analysis, we estimated the effects of an ESR cap on emission price, emission reduction, energy prices and competitiveness. We considered two scenarios (minimum and maximum residual emissions in 2030), see Figure 1. In the most optimistic scenario, in which the other policy instruments meet the 55% emission reduction target in 2030, no additional emission reductions are needed below the cap. The ESR cap does not lead to a substantial CO₂ price but does guarantee that the target will be met.

In the scenario with maximum residual emissions, the emission cap does provide additional reductions.

Figure 1 - Emissions in 2021, 2030 (reference scenario) and in 2030 with overarching ESR cap. The reduction due to the ESR cap is relative to the scenario with minimum (on the left) and maximum residual emissions



In this case, the estimated ESR price with an overarching cap is € 200/ton CO₂-eq., leading, for example, to a natural gas price increase of € 0.36/m³ and a petrol price increase of € 0.47/litre (see Table 1). This price increase makes extra reduction measures profitable.

Table 1 - CO₂-eq. price and impact on natural gas price, average energy bill, petrol price and costs for livestock farming, base variant, 2030

Reference scenario	CO ₂ -eq. price (€/ton CO ₂ -eq.)	Impact on natural gas price (€/m ³)	Impact on average energy bill (€/year)	Impact on petrol price (€/l)	Impact per litre of milk
Climate and Energy Report (KEV) minimum	€ 0	€ 0	€ 0	€ 0	€ 0
Climate and Energy Report (KEV) maximum	€ 200	€ 0.36	€ 416	€ 0.47	€ 0.09

According to the analysis, the additional reduction under a overarching cap would take place mainly in the built environment and in greenhouse horticulture, as the unprofitable margin of measures is lowest in these sectors. Reductions also occur in mobility, but they are relatively small compared to total mobility emissions. In livestock farming, no additional emission reduction takes place compared to the reference scenario: The reference already includes most technical measures and the remaining measures are not cost-effective at this emission price. Livestock farming, mobility and small industry would thus fail to meet their sector targets under this scenario.

On the contrary, an ESR cap with separate caps per sector does drive towards sectoral targets. As a result, the price of emission allowances varies by sector. Indicatively, this would be € 100/tCO₂-eq. in the built environment, € 300/tCO₂-eq. in mobility, € 223/tCO₂-eq. in small industry, 0 in greenhouse horticulture and € 430/tCO₂-eq. in livestock farming. In livestock farming, this will lead mainly to livestock reductions as livestock farmers cease their business operations. The effect of an emission tax with dispensation allowances is similar to the other variants provided the CO₂ tax level is sufficiently high (i.e. at least the marginal reduction costs) and the number of dispensation allowances is equal to the target residual emissions. In that case, the emission reduction will also be the same as in the other variants. If tax levels are too low, climate targets will not be met.

Caveats and risks

There are important caveats to the above analysis. In the analysis we assume that both participants and end users have the ability to take measures. However, any measure may face constraints, such as financing options, availability of personnel, materials and equipment (e.g. heat pumps), grid congestion or long realisation times. This may not allow the most cost-effective measures to be applied, resulting in the ESR price rising to potentially undesirable levels.

Without political intervention, this could result in only very expensive measures or demand-reducing measures, such as heating less, reducing car journeys or shutting down production, being able to be taken. These options may have undesirable social and economic consequences, such as energy poverty, carbon leakage, deterioration of international competitiveness, risks of refuelling over the border. Similarly, not all end users have the same ability to take action, which means that some groups will be disproportionately affected. Mitigating policies can alleviate these price effects, such as by encouraging measures among parties that have no ability to take action themselves, through buy-out schemes and by creating the right parameters. Auction revenues could be used to pay for such measures.

Key choices

While there are several considerations in the structure of an ESR cap, three fundamental choices stand out. Balancing the various interests will require political choices:

1. **Balancing the maximum price against safeguarding climate targets.** To counteract undesirably high prices, a maximum price can be introduced. However, this means that the cap is no longer safeguarded by law. The higher the maximum price, the stronger the safeguarding effect.
2. **Balancing efficient emission reduction (overarching cap) against sector-based steering (separate caps).** Separate caps make the system less efficient and implementation more complex, and it is impossible to precisely delineate sectors on the basis of climate targets. However, separate caps do give more control over the distribution of emission reductions and burden sharing among sectors.
3. **Allocation of allowances by auction or free allocation.** At an auction, the auction revenues accrue to the government. While the free allocation of allowances leads to lower burdens for system participants, it is unlikely that this will apply to end users as energy and fuel suppliers will pass on the ESR price. This will result in excess profits. If they do not pass on the ESR price, there will be insufficient incentive to take the necessary reduction measures and the ESR price will continue to rise.



1 Introduction

1.1 Background

In March 2023, proposals were made in the Interdepartmental Policy Study Climate Report to strengthen climate policy to achieve the government's ambition of a 60% reduction in greenhouse gases by 2030. In its spring 2023 decision, the government indicated its intention to examine whether and in what way a national emission cap for the sectors covered by the Effort Sharing Regulation (ESR), which are the built environment, mobility, small industry and agriculture, could contribute to achieving the climate targets.

In preparation for the new Climate Plan, the 2023 Spring Memorandum announced that the government will study the impact of the different variants and outlined what would be required to introduce such a national emission cap. This study elaborates on this.

1.2 Purpose and research questions

The purpose of this study is to provide the Ministry of Finance (ministerie van Financiën) and the Ministry of Economic Affairs and Climate Policy (ministerie van Economische Zaken en Klimaat) with information that will act as an input for a new government and in preparation for the new 2024 Climate Plan. The study is intended to provide a basis for politicians to decide whether to further develop and introduce a national emission cap for the ESR sectors and, if so, which variant.

The main question is:

“How can a national emission cap for ESR sectors be introduced as an effective safeguard mechanism for national emission reduction targets, taking into account factors including the existing policy system and feasibility?”

The research questions are:

1. **Structure:** How could a national emission cap for ESR sectors be specifically designed? What are some of the different possible policy alternatives, how do these alternatives compare, and what are the advantages and disadvantages of each option?
2. **Interaction:** How do the emission cap and the other policy instruments interact with each other? What are the biggest trade-offs, bottlenecks and opportunities?
3. **Implementation:** How can such an emission cap be introduced? What elements are needed for this? What is a realistic timeline?
4. **Impact:** What is the impact for the Netherlands of different variants of a national emission cap? What is the additional emission reduction and the resulting price per CO₂-equivalent per sector?

The sub-questions and research methods are explained for each section.

1.3 Definitions and scope

Definition of an emission cap

- We define an emission cap as a policy instrument consisting of an emission budget and a trading system ('cap-and-trade system').
- An emission cap sometimes refers to an emissions target, which is not the case here.

Intended purpose of an emission cap

The intended purpose of an emission cap is to safeguard climate targets: increase the certainty that targets will be met, in addition to other policies. An emission cap can also serve as an instrument to achieve emission reductions.

Scope of instrument

The policy instrument to be analysed should have the following scope:

- emissions in the Netherlands;
- ESR sectors;
- in principle, CO₂ and other greenhouse gases, based on a pragmatic approach depending on feasibility.

This study does not address targets for circularity, nitrogen reduction or other policy goals. However, any possible interaction with other targets is indicated, where relevant.

Target year 2030 and look ahead to 2040

There is still much debate about what exactly climate neutral in 2050 means. This is precisely why the intermediate targets are important: not only 2030, but also intermediate targets for 2035 and 2040. Binding targets currently exist for 2030 and 2050, and a proposal for a European intermediate target for 2040 is due soon. Next summer, the Ministry of Economic Affairs and Climate is required to present a climate plan in which they look ten years ahead (to 2035). It is useful if this report can also provide input for this plan. In addition to 2030, 2040 has also been considered.

No legal analysis

This study focuses on the design, policy interaction, implementation and effects of an emission cap. A legal analysis is out of scope.

1.4 Overview

This report is structured as follows:

- **Chapter 2: Policy context** addresses the rationale and policy context of a national emissions cap.
- **Chapter 3: Structure and choice of variants** describes the general operation of the instrument, structural aspects and choices, variants for further analysis and their operation.
- **Chapter 4: Interaction with other policies** provides an overview of other key policies per sector and an analysis of the interaction with an ESR cap.
- **Chapter 5: Implementation** elaborates on how a system can be set up, which actors have what role, the timeline with which it can be implemented and how the burden of implementation of different variants differ.
- **Chapter 6: Impact** provides an estimate of the emission reduction, allowance price, energy prices and competition and leakage effects due to an ESR cap.
- **Chapter 7: Conclusions** provides a synthesis of the main findings.



2 Policy context

The Netherlands is committed to national and international climate targets. Several policy instruments have been introduced to achieve these targets. A national emission cap, in addition to existing instruments, needs to safeguard the climate targets and operate within this policy context. In this chapter, we describe these targets and policy instruments.

2.1 Why a national emissions cap?

Existing and proposed European and national sectoral policies contribute to achieving the Netherlands' climate targets. According to the latest Climate and Energy Outlook (Klimaat- & Energieverkenning 2023, KEV), the targets are within reach for the first time. However, achieving the targets is uncertain and depends on many factors, some of which are extraneous to the government, such as increasing prosperity, changing preferences and geopolitical developments.

An emission cap is a policy instrument that can legally safeguard emission reductions and therefore provide greater certainty of achieving the target. The current EU ETS acts as a safeguard for the ETS sectors at European level. The announced ETS-2 will operate in a similar fashion with regard to European targets for the built environment, road transport and small industry. However, a European emission cap does not safeguard national targets. First of all, emission reductions will occur where they are most cost-effective; that need not be in the Netherlands. Secondly, the scope of the European ETS-2 is not the same as the scope of the Dutch targets (ESR target and indicative sectoral targets).

These national targets could nonetheless be secured by a national emissions cap for the ESR sectors. Similarly, a national ESR cap could enhance the efficiency of achieving emission reductions if trading opportunities included under the cap.

2.2 The European policy context

The Netherlands is bound by European climate targets. There are currently three major pillars in EU climate policy: the Emissions Trading Scheme for energy-intensive industry (ETS-1), the Effort Sharing Regulation (ESR) for the built environment, mobility, agriculture, waste treatment and small industry sectors, and the Land Use, Land Use Change and Forestry (LULUCF) regulation for land use. This study focuses on the sectors under the ESR. For part of the ESR sectors, a second emissions trading system (ETS-2) will come into force from 2027.

European climate targets

In 2015, the Paris Agreement was adopted by all countries that are a party to the United Nations Framework Convention on Climate Change (UNFCCC). The main target of this binding agreement is limiting the rise of global temperatures to well below 2 degrees Celsius, with a goal of limiting warming to 1.5 degrees Celsius. The Paris Agreement has been signed and ratified by the European Union and all member states.

The European Climate Law was passed in June 2021. This is an established framework for the gradual reduction of greenhouse gas emissions in the European Union. The European Climate Law includes a binding target that net emissions of greenhouse gases must be at least 55% lower than in 1990 by 2030. On 14 July 2021, the *Fit for 55 package* was presented by the European Commission. This package consists of a large number of legislative proposals through which the European Commission aims to implement the binding target of reducing net emissions of greenhouse gases by at least 55% by 2030, compared to 1990 levels. The package also aims to pave the way for the European Union to become the world's first climate-neutral continent by 2050. The tightened greenhouse gas reduction target has been translated into targets for different sectors (Table 2). In the meantime, almost all proposals under the Fit for 55 package have been addressed by lawmakers and enacted.

Table 2 - EU targets for the three main pillars of EU climate policy

Regulation	Sectors	Previous target	New target Fit for 55
Emissions Trading System (ETS)	Industrial plants, power generation, intra-European Economic Area (EEA) aviation and including shipping from 2024.	43% reduction by 2030, compared to 2005.	62% reduction by 2030, compared to 2005.
Effort Sharing Regulation (ESR)	Mobility, built environment, smaller industry outside the ETS, agriculture and waste treatment.	30% reduction by 2030 compared to 2005 at EU level, binding targets per member state.	40% reduction by 2030 compared to 2005 at EU level, binding targets per member state.
Land use, land use change and forestry (LULUCF)	Land use and forestry.	No deterioration of net emissions from land use in the territory of each member state.	310 Mt CO ₂ -eq. net removal by 2030 at EU level with binding targets at national level.

Under the ESR, the European 40% reduction target is achieved through binding national targets; for the Netherlands, this is 48% greenhouse gas emission reduction (increased from 36%) in 2030, compared to 2005. The national targets are a cumulative target between 2021-2030, making the trajectory by which emissions are reduced important.

Emissions trading scheme for buildings and road transport: ETS-2

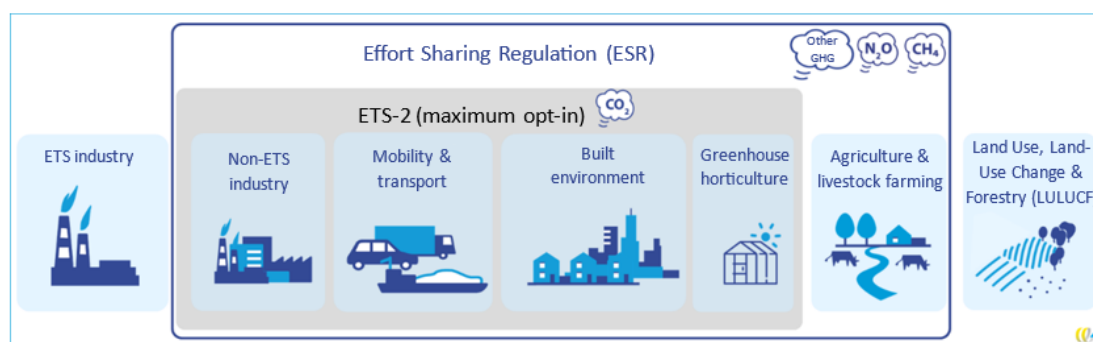
A second emissions trading scheme (ETS-2) was also adopted as part of the Fit for 55 package. From 2027, this system will apply to fuel suppliers serving road transport and the built environment (heating and cooling), and small industry. By 2030, emission reductions from sectors in ETS-2 must reach 42% compared to 2005.

Emissions that will not fall under ETS-2 are those under ETS-1, greenhouse gas emissions from agriculture and land use (these fall under LULUCF), the waste sector, inland navigation and rail transport, and emissions of other greenhouse gas emissions (non-CO₂), such as nitrous oxide, methane and F-gases in industry.



Member states can choose to extend ETS-2 to include fuel use in additional sectors. In the pre-Spring Memorandum consultations (Ministerie van EZK, 2023c) (Parliamentary paper 32813, no. 1230), the government announced its intention to introduce ETS-2 as widely as possible by 2027 in order to ensure that all fossil fuels in the Netherlands are covered by the new trading system. Final decision-making is scheduled for spring 2024.

Figure 2 - Scope of emissions under ESR and ETS-2



2.3 The Dutch policy context

The Climate Act (Klimaatwet)

In 2019, the Dutch Climate Act came into force. This sets out national climate targets. These targets were tightened in 2023. According to the Climate Act, greenhouse gas emissions must be net zero in the Netherlands by 2050 (climate neutrality) and reduced by at least 55% by 2030 compared to 1990. The Climate Act also defines the policy framework with regard to climate targets. For example, the five-year Climate Plan must include measures to achieve these targets. The first Climate Plan was prepared in 2019 and focuses on the period 2021-2030. The next Climate Plan is due in 2024.

Increased targets from the Coalition Agreement (Coalitieakkoord) and Climate Policy Programme (Beleidsprogramma Klimaat)

The Coalition Agreement 2021-2025 further increased the climate ambitions of the Netherlands. In order to be climate-neutral no later than 2050, the government increased the 2030 target to at least 55% CO₂ reduction. To ensure that this target is achieved, the government increased the target to 60% by 2030. As a result of this increase in climate ambitions, the Climate Act has been further tightened to a 55% greenhouse gas reduction by 2030. The **Policy Programme on Climate** prepared in July 2023 complements the Climate Plan and elaborates on the climate policy in the Coalition Agreement. It sets out the main lines of the climate policy for the next ten years with the aim of achieving the tightened targets set out in the Climate Act. Emission reduction targets for different sectors have also been converted into indicative residual emission targets.

3 Structure and choice of variants

A national ESR cap can be structured in several ways. Different design choices can be made for different structural aspects, such as the scope of the instrument or how emission allowances are allocated. Variants of the ESR cap can be constructed based on combinations of these choices. For this study, we defined six main variants of the ESR cap, three of which were selected for further examination in the follow-up to the study.

In this chapter, we first describe the general operation of a national emission cap for ESR sectors. This is followed by a comprehensive overview of the various structural aspects and the choices that may be involved. Based on this overview, we then define six main variants, three of which were selected for further analysis in this study. Finally, we explain how these main variants work and what the main differences are between them.

3.1 General operation of a national emission cap

The basic premise for the design of a national ESR cap is an emissions trading scheme, such as the European Emissions Trading Scheme (EU ETS) in force since 2005 (see Figure 3). An emissions trading scheme consists of a number of core elements:

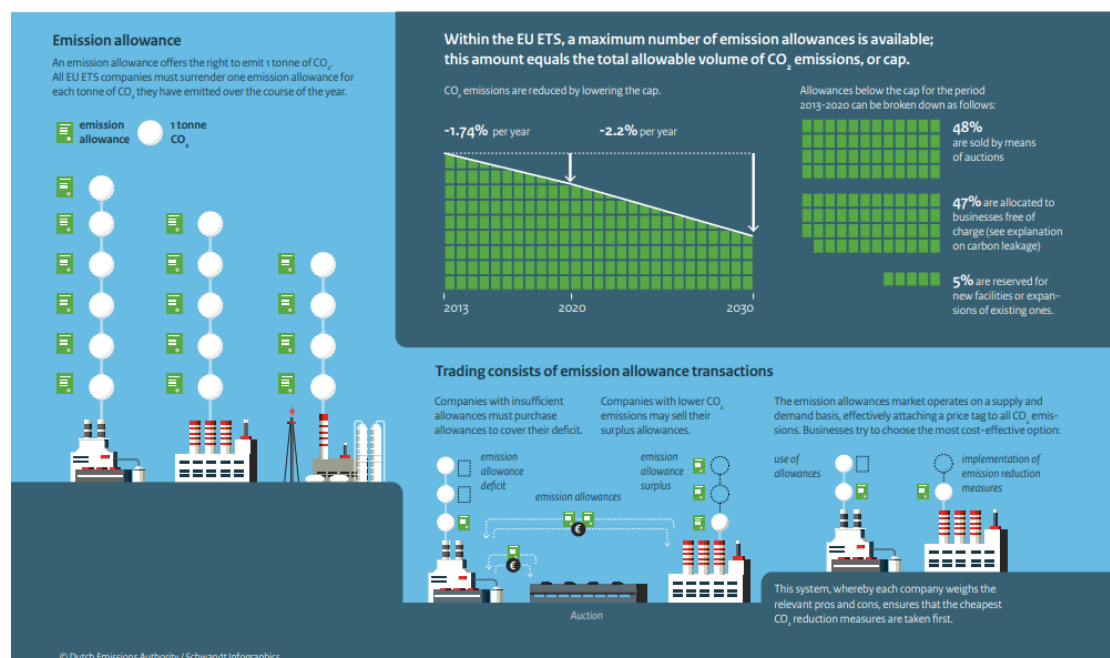
- **The cap.** The maximum allowable emissions for the scope of the emissions trading system are determined based on the applicable reduction target. This applies not only to the target year of that target, but also for all intermediate years. The outcome is an absolute limit on emissions: the cap. The cap therefore safeguards the reduction target. Usually, the cap slopes linearly towards the target year. A national ESR cap is therefore a cap on emissions in the Netherlands, applicable to those ESR sectors to which the instrument applies. Which sectors these are is part of the structure of the instrument.
- **Emission allowances.** All participants (i.e. the parties covered by the ETS) are required to have emission allowances in order to emit greenhouse gases. They are required to surrender emission allowances corresponding to their emissions to a competent authority, usually annually. There are various methods of allocating emission allowances to entities, such as by freely allocating them based on historical emissions or production benchmarks, or by auctioning them. The total number of allowances available each year is determined by the cap.
- **A trading system.** Emission allowances can be traded between entities in the system. As emission allowances become scarce, a market price is created. Parties in the system can choose between purchasing allowances and reducing emissions. As a result, the level of the price for emission allowances corresponds in theory to the marginal cost of emission reduction within the scope of the ETS.
- **Price effect for end users.** If the price of emission allowances is passed on to end users, indirect emission reduction options also become attractive to these end users. For the ESR sectors, this could involve insulating homes, switching to biofuels or reducing meat and dairy consumption.



Figure 3 - Infographic on the European Emissions Trading Scheme (EU ETS) illustrating the main elements of an emissions trading scheme

How does the EU ETS work?

Emissions trading is the trade in emission allowances, which grant the right to emit a specific quantity of CO₂. The EU ETS operates on the 'cap and trade' principle.



Source: [Infographics: How does the EU ETS work?](#) | [Publication](#) | [Dutch Emissions Authority](#).

An emission cap sets emission targets by law and therefore provides certainty about the achievement of targets. Instead of imposing a solution, the system gives the market flexibility to achieve emission reductions or purchase emission allowances. Emissions trading also promotes cost-effective emission reductions. An emission cap also has a number of risks: see Textbox 1.

Textbox 1 - Risks related to the operation of an emission cap

In theory, a cap-and-trade system leads to the desired emission reduction at the lowest cost. In practice, there are circumstances that can put pressure on the system's operation. In the short term, prices in such a system may fluctuate widely, for instance due to volatile gas prices, which may be undesirable. Stability and price control mechanisms can be included in the instrument to prevent price fluctuations (see hereafter).

In addition, undesirably high prices may arise due to practical obstacles. Although the cheapest measures are taken in theory this may not take place in practice, e.g. due to insufficient information among the parties involved or obstacles such as the lack of personnel, lack of funding, not looking forward to a rebuild, grid congestion or the turnaround time. This can lead to prices becoming very high, including in the long term, leaving parties that do not have a perspective for action facing high costs. Undesirably high prices are detrimental to affordability for end users. This could negatively affect the level of public support for the instrument and climate policy in general. It can also affect the competitiveness of companies operating internationally. Should the CO₂-eq. price rise sharply for a prolonged period, additional policies can be implemented to encourage the desired measures. The ESR price could function as a signal to tighten other policies.

3.2 Structural aspects

Table 3 shows the structural choices we identified in the context of this study. We have compiled the most important aspects of the structure of an emission cap and the related design choices under four headings:

1. Purpose of the instrument and structure of the cap.
2. Scope of the instrument and point of intervention.
3. Trade and allocation of allowances.
4. Flexibility, stability and price control mechanisms.

For each aspect, we indicate which choices are possible and what the main considerations are. Not every aspect can be considered an essential structural choice for the ESR cap; in some cases it concerns a political choice or a more secondary structural choice. We therefore also indicate for each aspect whether or not we included it as a variable in our main variants.

Table 3 - Potential structural options for a national ESR cap

Aspects of a national cap	Structural options
Purpose of the instrument and structure of the cap	<ul style="list-style-type: none"> – Purpose of the instrument: safeguarding mechanism – Setting cap level, reduction trajectory and target year – Sector-overarching cap or separate caps per sector – Geographical limitation of where the reduction takes place – Emission cap or emission tax with dispensation rights
Scope of the instrument and point of intervention	<ul style="list-style-type: none"> – Scope options for a national ESR cap – Greenhouse effect of other greenhouse gases – Point of intervention
Trade and allocation of allowances	<ul style="list-style-type: none"> – Trading opportunities – Monitoring, reporting & verification (Monitoring, Reporting and Verification, MRV) – Allocation of allowances
Flexibility, stability and price control mechanisms	<ul style="list-style-type: none"> – Flexibility mechanisms – Stability and price control mechanisms

3.2.1 Purpose of the instrument and structure of the cap

Purpose of the instrument: Safeguarding mechanism

The basic premise of this study is that the overall purpose of the ESR cap is to safeguard reduction targets for ESR sectors. Putting a hard cap on the number of emission allowances can ensure that emissions do not exceed the agreed target.

Setting cap level, reduction trajectory and target year

The level of the ESR cap is directly related to the reduction target that the cap is designed to safeguard. It can be set as equal to the Dutch ESR target for 2030 (48%) or higher and corrected for the scope of the instrument (see Section 3.2.2). Precisely what the reduction target is, is an external choice based on political considerations and not a design choice for the instrument.

Because the reduction target must be safeguarded, it is necessary to set not only the final target, such as 48% emission reduction in 2030 compared to 2005 for the ESR sectors, but also a reduction trajectory to achieve it. Otherwise, there is a risk that insufficient emission reductions will be achieved in the period up to the target year and the target will not be achievable. Similarly, cumulative emissions over the period up to the target year are then likely to be higher. In the case of an emissions trading system, this condition is normally automatically met because there is a descending emission cap¹.

Similarly, the target year of the cap is not a design choice but a policy decision. In this study, we focus on the years 2030-2035-2040.

Sector-overarching cap or separate caps per sector

The 'national ESR cap' instrument covers multiple sectors, which means that different reduction targets can be chosen for each sector or an overarching target for all sectors within the instrument. In the first case, different emission caps will apply to different sectors by inserting different 'partitions' in the trading mechanism, while in the second case, there is one emission cap. If there is free pricing, this also implies different prices² per sector or one overarching price, respectively.

According to economic theory, a single cap for all sectors is the most cost-effective way to achieve reductions, which is a clear advantage of this choice. However, different sectors may have different trade perspectives and emission reduction costs. As a result, a system with a single cap for all sectors may have the effect that most of the reduction measures provisionally take place in one of the sectors because that is where marginal reduction costs are lowest, and that there is initially less reduction in other sectors despite paying the same emission price. This may be seen as undesirable based on 'fair effort sharing' considerations and may also result in the safeguards for some sectoral targets being compromised because the reduction is implemented late. Another argument in favour of multiple separate caps could be that this would also encourage sectors with high marginal reduction costs to take action on emission reduction, especially with a view to creating learning effects and economies of scale, which could make emission reduction cheaper over time.

Geographical limitation of where the reduction takes place

It is possible to structure a national ESR cap so that emission reductions achieved outside the Netherlands can offset emissions in the Netherlands³. The advantage of this is that entities that fall under the cap have more flexibility in how they reduce their emissions. The disadvantage is that this no longer safeguards Dutch reduction targets. Since this is the purpose of the ESR cap, the option of achieving reductions abroad is out of the question. The cap should be structured to ensure that reductions take place in the Netherlands.

¹ In this context, 'cap' refers to a target rather than a policy instrument. The ESR also functions with absolute annual emission caps per member state, even though it usually only refers to the final target in 2030 in terms of the percentage of emission reduction compared to 2005.

² This is the price of an emission allowance or dispensation right under the relevant cap or shared cap; exactly what this looks like depends on other design choices.

³ For instance, in earlier ETS-1 trading periods it was possible to meet part of the obligations through international credits (CDM and JI).



Conclusion regarding the main variants

Since both options have advantages and disadvantages, the choice of applying a single overarching cap or a shared cap per sector has been used as a variable for designing the main variants.

Emission cap or emission tax with dispensation rights

Finally, the safeguard instrument could take the form of an emissions cap, as in ETS-1 and ETS-2, or an emission tax with dispensation allowances, as in the current CO₂ tax system for industry. Such a system functions with a decreasing number of dispensation allowances on which no emission tax has to be paid. As a result, the emission tax actually only taxes emissions above the set target (the dispensation cap).

Textbox 2 - Differences between an emission cap and an emission tax with dispensation allowances

The main difference between the two systems is that an emission cap sets a legal cap on emissions, while an emission tax with dispensation allowances continues to allow emissions above the cap against payment of the tax. In addition, an emission cap requires surrendering allowances for all emissions, while the emission tax with dispensation allowances applies only to emissions above the dispensation cap (the marginal emissions).

As a result, the safeguarding effect of the two systems differs. In the case of an emission cap, this safeguarding effect is provided by the fact that the cap imposes an upper limit on the number of available emission allowances and it is not permitted to emit greenhouse gases without surrendering emission allowances. In the case of the emission tax, the safeguarding effect is provided by the level of the tax: it needs to be sufficiently high, at least higher than the marginal costs of emission reduction, to make emission reduction a more attractive option than paying the tax. However, there is no guarantee that parties will not choose to pay the tax anyway and no emissions reductions will take place. For this reason, safeguarding an emission tax with dispensation allowances is less harsh than that of an emissions cap.

In practice, both systems function the same way under normal conditions. Both systems offer a participating party a choice between reducing emissions or paying when emissions are marginal⁴. If parties always choose to pay rather than embrace sustainability, for whatever reason, the emission tax applies as a maximum price: nothing in excess of the tax is required to be paid for marginal emissions. This differs in the case of an emission cap: the decreasing cap makes emission allowances increasingly scarce, and therefore the price higher. Ultimately, parties have no choice but to reduce emissions in order to purchase fewer allowances.

Both systems may of course differ in practice in other aspects, such as the manner in which emission or dispensation allowances are allocated, but these are choices that are covered elsewhere in this section (for example, see Section 3.2.3).

For parties subject to an emission tax with dispensation allowances, the advantage of this system is that there is a maximum price for marginal greenhouse gas emissions. One drawback is that this reduces the safeguarding effect. Also, the price of the emission tax needs to be set periodically by the government, making the instrument less flexible and more politically vulnerable than in the case of an emissions cap with a trading system, where the price is set by the market. A considerable amount of information is needed to determine an accurate level for the tax and some components, such as the price of gas, are constantly changing. Political pressure can also arise in a trading system, for example if

⁴ Later, we address the practice of the ESR cap in general terms where, for example, fuel suppliers themselves have few reduction options. In any case, parties will try to pass on the costs - both the costs of sustainability and the costs of emission allowances - to their customers as much as possible.



the price of emission allowances becomes very high. However, legislating the reduction cap by introducing a national ESR cap based on the target in the Climate Act, makes this system less politically vulnerable.

Conclusion regarding the main variants

A disadvantage of an emission tax with dispensation allowances, compared to an emissions cap, is that the reduction target is not fully safeguarded. Moreover, the government must set the amount of the tax and this cannot be left to the market. Advantages of an emission tax are that the price (the amount of the tax) is fixed in advance and that the tax acts as a maximum price (for those parties subject to the emission tax). We have included in the main variants the option of a tax with dispensation allowances instead of an emission cap.

3.2.2 Scope of the instrument and point of intervention

The scope of the national ESR cap is divided into two parts: scope in terms of greenhouse gases and scope in terms of sectors. These are closely related, as different greenhouse gases play a key role in different sectors.

Overview of current emissions by sector

Table 4 provides an overview of current emissions by sector⁵. In agriculture, especially livestock farming, non-CO₂ greenhouse gases are particularly important (methane and nitrous oxide). In other sectors, the combustion of fuels and therefore CO₂ is particularly important, but there are also small emissions of non-CO₂ greenhouse gases.

Table 4 - Estimated emissions by sector and type, 2021, Mton CO₂-eq.

Category	CO ₂	Other GHG	Total
Built environment:	23.9*	0.6*	24.2
Mobility:	29.9	0.6	30.5
<i>of which road transport</i>	25.2		
<i>of which other transport</i>	4.8		
Agriculture:	7.8**	19.3**	27
<i>of which greenhouse horticulture</i>	6.5	1.1	7.6
<i>of which other agriculture</i>	1.3	18.2	19.5
Industry:	47.1	6.1	53.2
<i>of which ETS</i>	41.9	0.19	42.1
<i>of which non-ETS (excl. water and waste)</i>	2.2	2.9	5.1
<i>of which water and waste</i>	3	3	6
Total	108.7	26.6	135.3

Source: (PBL, 2022b)

Other GHG = Other greenhouse gases.

^ Differences in figures due to rounding.

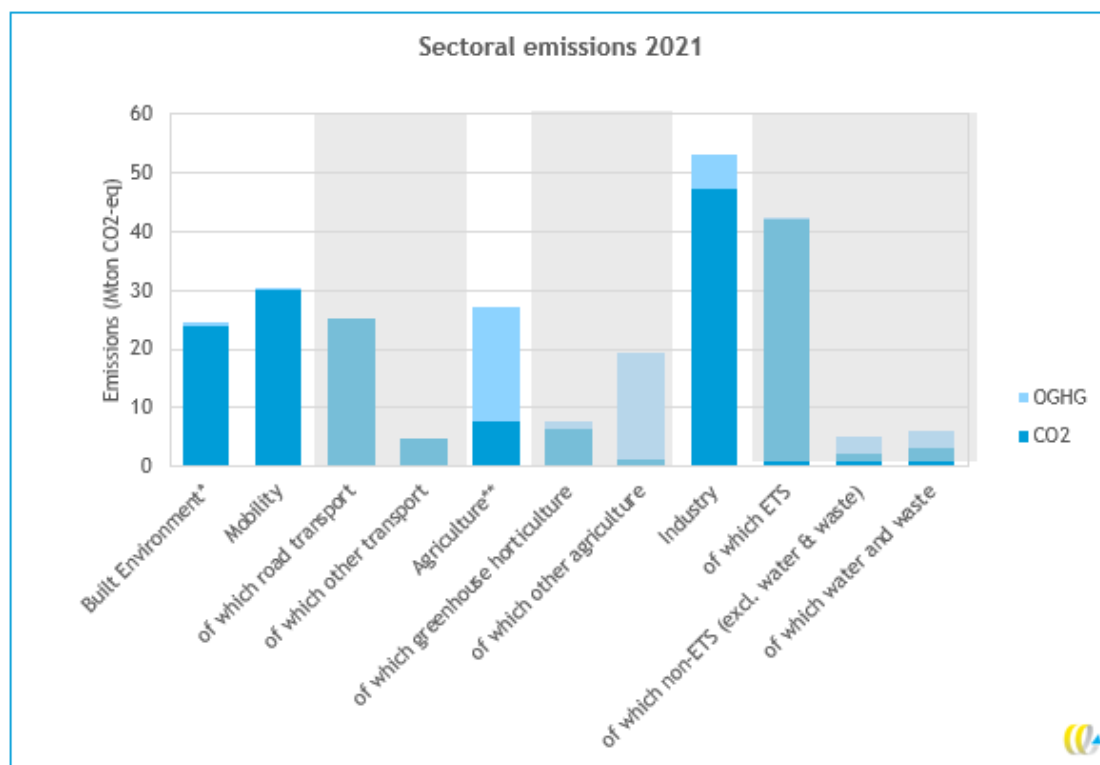
* Including ETS (0.3 Mton).

** Including ETS (0.1 Mton).

⁵ The 2021 emissions are the most recent final figures; the 2022 emissions are still provisional according to the 2023 Climate and Energy Report.



Figure 4 - Graphical representations of emissions from Table 3



OGHG = Other greenhouse gases.

Overview of the scope of existing instruments

Table 5 lists the scope of existing instruments for the ESR sectors. Here we distinguish between ESR, ETS-2 and ETS-2 with maximum opt-in:

- The ESR (Effort Sharing Regulation) covers all sectors and greenhouse gas emissions not covered by ETS-1 or LULUCF.
- ETS-2 is the European emissions trading system for road traffic, built environment and small industry that will be introduced from 2027. In terms of greenhouse gases, this includes only CO₂ from fuel combustion.
- It is possible for member states to extend the operation of ETS-2 to CO₂ from fuel use in other sectors (opt-in).

Table 5 - Scope of the ESR, ETS-2 and ETS-2 with maximum opt-in, in terms of greenhouse gases and sectors

Instrument	Scope in greenhouse gases	Scope in sectors
ESR	CO ₂ and non-CO ₂ :	Anything not covered by ETS-1 or LULUCF:
	CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs, NF ₃ , SF ₆	Transport (except aviation and international shipping), agriculture, GO, small industry (non-ETS), waste treatment and non-combustion-related emissions from energy and product use.
ETS-2	CO ₂ from combustion processes	Fuels in road transport, GO, energy industry, manufacturing and construction.

Instrument	Scope in greenhouse gases	Scope in sectors
ETS-2 with maximum opt-in	CO ₂ from combustion processes	<p>All fuels. (For example, including non-road machinery, inland navigation, fuel use in agriculture).</p> <p>Opt-in: all member states may extend the scope of ETS-2 to include fuel use in 'other sectors' outside ETS-1, as long as approved by the EU (Article 30j of Directive (EU) 2023/959 of the European Parliament and of the Council of 10 May 2023 amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union and Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading system).</p>

The ESR target, the EU's 55% target and the national sector targets do not assume negative emissions: for all these targets, the underlying assumption is that this can be achieved via emission reduction. It is therefore not logical to permit allowances to be earned under the ESR cap by achieving negative emissions (carbon removal). In addition, the development of negative emissions is highly uncertain (CE Delft, 2023b). Therefore, from the perspective of climate targets, it makes sense to steer loosely towards emission reduction, rather than providing one system with the option to offset carbon removal.

Scope options for a national ESR cap

Two options for the scope of a national ESR cap are either aligning with the scope of ETS-2 or aligning with the scope of ESR.

To align with ETS-2 would mean a limited scope in terms of greenhouse gases (only CO₂ from combustion processes). In this case, the instrument would mainly be a national top-up of ETS-2 and could not play a role in securing emission reductions of non-CO₂ greenhouse gases. The advantage of this choice would mainly be in the area of implementation: since ETS-2 will definitely be introduced in 2027, companies will have to start reporting all their fuel deliveries to the Dutch Emissions Authority under ETS-2. As a result, an ESR cap in line with ETS-2 would involve little in the way of an extra administrative burden.

In the 2023 pre-Spring Memorandum consultations, it was announced that the government intends to choose a maximum opt-in when introducing ETS-2 in the Netherlands, following the advice of the IBO Climate report (Ministerie van EZK, 2023b). In this study, we therefore assume that the scope of ETS-2 in the Netherlands will be extended to fuel use in all non-ETS-1 sectors. Therefore, aligning with ETS-2 then effectively means aligning with ETS-2 with a maximum opt-in.

Fully aligning with the ESR would mean that all greenhouse gas emissions not regulated in ETS-1 or the LULUCF Regulation would fall under the national ESR cap. As such, this is an obvious advantage because all emissions could be safeguarded under the ESR. A disadvantage, however, is that the instrument would involve many different entities (see Table 5), making it difficult to deploy and implement. It also follows from Table 4 that some sectors, such as mobility and the built environment, emit relatively little non-CO₂ greenhouse gases, meaning that for these sectors an extension in scope from just CO₂ greenhouse gases to all greenhouse gases has little added value.

It is also possible to design the scope to choose the middle ground between that of the ESR and ETS-2 with maximum opt-in, combining the benefits of both extremes. This would allow the scope to include greenhouse gases other than just CO₂ from fuels, but exclude sectors or greenhouse gases that contribute relatively little to total emissions from the instrument for feasibility reasons. The client has indicated that it considers it important that a variant is also developed where (non-CO₂) emissions from livestock farming are regulated by the national ESR cap. It follows from Table 4, that livestock farming as part of the agriculture sector is responsible for most of the other greenhouse gas emissions. For these reasons, we propose a scope for the ESR cap consisting of CO₂ from fuels for all non-ETS-1 sectors and emissions of other greenhouse gases from livestock farming.

Conclusion regarding the main variants

We chose a *customised scope* as the basis for the main variants for the ESR cap: CO₂ from combustion processes for all non-ETS-1 sectors (in line with ETS-2 with maximum opt-in), combined with non-CO₂ emissions from livestock farming (particularly nitrous oxide and methane). This could be varied within the main variants by choosing only CO₂ from fuels as the scope, excluding livestock farming.

In this base scope, emissions of other (non-CO₂) greenhouse gases from all sectors except livestock farming are not covered by the ESR cap. Based on the contribution of these emissions to the overall Dutch climate target, this is a defensible choice. It follows from Table 4 (and Figure 4) that emissions of other greenhouse gases in the built environment and mobility sectors are small, especially compared to CO₂ emissions. In greenhouse horticulture and non-ETS industries, the share of other greenhouse gases in total emissions from those sectors is significant, but still relatively small compared to total emissions in ESR sectors. In greenhouse horticulture, reduction of CO₂ via a CHP (combined heat and power) also ensures a proportional reduction of methane. Including other greenhouse gases from industry in the ESR cap would create a comparatively large number of challenges with regard to monitoring and/or perspective for action⁶. Moreover, CO₂ emissions from waste treatment with this scope are also not included in the ESR cap, but are likely to be covered by ETS-1 from 2028.

⁶ Methane originates from waste dumps (little reduction potential) and from natural gas infrastructure (difficult to allocate to a participating party), among others. Other greenhouse gases such as nitrous oxide and F gases have various sources where an allowance system as with CO₂ is difficult to implement. Several processes of nitrous oxide emissions (N₂O) are included in ETS-1 and are therefore not included in the ESR.

Greenhouse effect of other greenhouse gases

According to the scope defined above, the ESR cap would include several greenhouse gases. This means that emission allowances could include emissions from various greenhouse gases⁷. It is common to express this as CO₂-equivalent, i.e. CO₂-eq. One emission allowance then represents the emission of 1 ton of CO₂-eq. The Global Warming Potential (GWP) of non-CO₂ greenhouse gases is expressed as CO₂ (by definition, the GWP of CO₂ equals 1).

A point to note here is that Global Warming Potential values depend on the time period being considered, as different greenhouse gases disappear from the atmosphere at different rates. For example, the Global Warming Potential of methane is much higher over a 20-year period than over 100 years.

The most common timeline is 100 years. In this study, we therefore assumed Global Warming Potential values corresponding to this period. If a shorter timeline is chosen, such as because the instrument's target year is much nearer than 100 years, this would have implications for the level of the target in CO₂-eq. and for the relative contributions of non-CO₂ greenhouse gas emission reductions compared to those of CO₂.

Point of intervention

The ESR cap point of intervention refers to the parties (entities) covered by the obligation. The point of intervention for the ESR cap is closely linked to the choice of scope. For each sector or type of emission, there are several options for the point of intervention.

In theory, it is possible to choose an upstream/midstream approach (fuel producers or suppliers) or a downstream approach (fuel consumers) for CO₂ emissions from fuel use. The latter option is complex to implement because it involves a large number of entities that would have to surrender emission allowances (at least all home and car owners). In addition, it makes sense to align these emissions with ETS-2 as much as possible to maximise implementation synergies. We therefore choose the same point of intervention used for ETS-2 for CO₂ emissions from fuel use, namely energy suppliers (to the built environment and industry) and fuel suppliers (to the mobility sector). These have already been identified by the Dutch Emissions Authority. Natural gas suppliers known to the Netherlands Authority for Consumers & Markets (Autoriteit Consument & Markt, ACM) comprise some 80-90 parties⁸. In addition, some 60-70 large liquid petroleum suppliers and 60-70 small liquid petroleum suppliers are known to Dutch Customs. There are also a number of small suppliers, such as suppliers of coal and gas in tanks. In total, about 250 parties are involved.

Multiple point of interventions are also possible for non-CO₂ emissions from livestock farming. Based on the position in the chain, there are the following options:

- upstream: suppliers of livestock feed (concentrate) and fertiliser;
- midstream: livestock farmers;
- downstream: processing industry: slaughterhouses/dairy industry;
- downstream: retail.

⁷ If one emission cap is chosen for all sectors, there is one type of emission allowance that can therefore represent both CO₂ emissions and non-CO₂ emissions and is expressed in terms of CO₂-eq. If a sectoral cap is chosen, there are different types of emission allowances. For the sectors where only fuel use is covered by the ESR cap, an allowance only represents CO₂ emissions. For the agricultural sector, both CO₂ from fuel use and non-CO₂ greenhouse gases from livestock farming would fall under the cap and thus the allowance is expressed as CO₂-eq.

⁸ Delineation is slightly different from Energy Tax because the scope also differs.



As Table 6 shows, the number of entities is lowest if either the feed industry or the processing industry (slaughterhouses/dairy industry) is chosen. However, there are a number of reasons for still opting for a midstream approach and choosing livestock farmers as the point of intervention for the ESR cap (Trinomics, 2023), (CE Delft, 2023c):

- In principle, most of the action options to achieve emission reductions are with livestock farmers, such as by changing the number of cattle per farm, animal feed, stall systems or the way manure is processed. The upstream and downstream parties each monitor only part of these reduction options.
- Moreover, for both upstream parties (concentrate feed and fertiliser) and processors, there are opportunities for easy fall-back options abroad. If the point of intervention falls to the upstream parties and they try to pass the costs on to livestock farmers, these livestock farmers may purchase concentrated feed and fertiliser elsewhere. If the processing industry becomes the point of intervention and passes on the costs, it can also move abroad for the slaughter or processing of dairy. This is not how emission reduction in Dutch livestock farming can be safeguarded.
- The relationship between concentrated feed, fertilisers and livestock (methane) emissions is not straightforward, as with the relationship between fuels and CO₂ emissions, and is not easy to determine. As a result, it is unclear how many allowances upstream parties would have to surrender and there is also a risk that not all emissions are included in allowances at this level.
- Although methane emissions from livestock are currently not easy to measure, this could potentially change in the future (interview Ministry of Agriculture, Nature and Food Quality). Measuring may be possible in the long-term, especially for closed stall systems (pigs and veal calves). Measurability of emissions would be a major advantage of choosing livestock farmers as a point of intervention. Until then, emissions can be determined on the basis of a fixed rate, as currently occurs in the permit process. Fixed rates are pre-set standards based on standardised calculations rather than on actual measured emissions that are used to set usage standards, such as for animal manure, nitrogen and phosphate.

However, it is worthwhile briefly reflecting on why the above reasoning for livestock farmers above has not been followed for CO₂ emissions from fuels. Fuel suppliers, such as animal feed and fertiliser suppliers, are obviously not the entities with the most action options, although energy and fuel suppliers were chosen as the point of intervention for CO₂ emissions from fuel use. Firstly, the number of end users, which is particularly where the perspective for action on fuel use lies, is so high that for feasibility reasons it is not desirable to choose end users as the point of intervention. Secondly, in principle the CO₂ price or the price of a more sustainable fuel mix is passed on to the customer by the fuel suppliers, which means that it does not matter where the point of intervention of the ESR cap is for the customers with regard to their perspective for action. Moreover, the choice of fuel suppliers is consistent with ETS-2, which facilitates implementation. In addition, as indicated above, there is a direct correlation between fuel emissions and quantity delivered, which is not the case for animal feed and fertilisers. With fuel, the chain is thus much more transparent and emissions can be traced back accurately to the fuel suppliers.

Conclusion regarding the main variants

In terms of CO₂ emissions from fuel use, we choose fuel suppliers as the point of intervention for all variants.
In terms of non-CO₂ emissions from livestock farming, we choose livestock farmers as the point of intervention.



Table 6 - Estimated number of entities at possible point of intervention

Sector	Possible point of intervention	Number of parties
Built environment	Energy supplier	80-90
Mobility	Fuel suppliers (to end user)	120-140
Greenhouse horticulture	Energy supplier	80-90
Agriculture (livestock farming)	Upstream: animal feed suppliers, fertilisers	Animal feed industry: 130 in 2023 Wholesale of hay and roughage, compound feed, other animal feed: 345 Fertiliser suppliers: dozens
	Midstream: livestock farmers	Cattle and dairy farms: 18,785 in 2023 Pig farms: 2,700 in 2023
	Downstream: butchers/slaughterhouses and dairy industry	Dairy industry: 385 in 2023 Slaughterhouses (not poultry): 355 in 2023
	Downstream: retail	Thousands
ESR industry	Energy suppliers (delineation energy tax) Installations (in the case of greenhouse gases)	80-90

Source companies: [StatLine - Companies; branch of industry \(cbs.nl\)](#); personal communication Dutch Emissions Authority.

3.2.3 Trade and allocation of allowances

Trading opportunities

From the perspective of economic theory, allowing emissions trading or dispensation allowances leads to more cost-effective emissions reductions. This is because, by allowing trade, measures are taken where the marginal cost of reducing emissions is lowest. The reduction target is therefore achieved through the most cost-effective route.

Choosing a single cap in the ESR instrument would allow trading between all sectors covered by the instrument, for example also between mobility and livestock farming. If a system of separate caps is chosen, trading can take place within the sector or sectors subject to the shared cap, e.g. only between livestock farmers or only between fuel suppliers. In this case, a separate price arises for each shared cap that theoretically corresponds to the marginal reduction costs in the sector or sectors subject to the shared cap⁹.

Therefore, while trading generally leads to more cost-effective emission reductions, there are a number of caveats. Firstly, there are implementation costs associated with setting up a national trading system (in addition to those of ETS-2) and the administrative burden for participants will increase as a result. There must also be enough trading parties for the market to function properly. This is particularly relevant for the separate caps variant, if these are applied to sectors where only a limited number of parties may be active.

⁹ In theory, entities outside the sectors, which have no obligation under the instrument, could also be allowed to trade in the emission allowances. For example, natural persons can also purchase ETS allowances. However, we will not discuss that possibility further here and mainly discuss the difference between trading with one cap and with multiple separate caps.



In principle, if each sector has its own shared cap and the reduction options are more or less the same for all participants, the ESR cap can work well even without mutual trading¹⁰.

Conclusion regarding the main variants

Allowing trading in emission allowances theoretically leads to more cost-effective emission reductions. However, there are some caveats. We therefore include allowing trading as a variable for the main variants.

Monitoring, Reporting and Verification (MRV)

An emissions trading system, like the national one, presupposes a system of Monitoring, Reporting and Verification (MRV) involving the surrendering and trading of allowances. In order to achieve a reliable trading system, the Monitoring, Reporting and Verification (MRV) should be of good quality (watertight, non-fraudulent, limited, etc.). We consider this a parameter for a well-functioning emissions trading system, and have therefore not included it as a variable for the main variants. To make maximum use of synergies in implementation, the Monitoring, Reporting and Verification system can be aligned with that of ETS-2 as much as possible.

Allocation of allowances

Allowances can be allocated in various ways, e.g. by auction, freely (such as based on benchmarks or historical issues) or a combination of the two. Auctioning is the most efficient form of allocation in this regard. It avoids the need to collect data to determine benchmarks. It is also easier for new players in the market. This means that transaction costs are the lowest at auction. It does not matter whether auctioning or free or partly free allocation is used to achieve the reduction target, as the reduction target is fixed. A disadvantage of auctioning is that an auction has to be organised periodically; in ETS-1 it takes place daily. Particularly in the case of livestock farming, which has a large number of participants, this could lead to an additional burden of implementation for participants.

An advantage of auctioning for the government is that the proceeds of the auction accrue to the government. The government can then use these funds in a targeted way to exempt certain groups or mitigate the effects of the accumulation of burdens. Subsequently, a redistribution of funds between companies takes place through trade. When allowances are allocated freely, redistribution only takes place between companies and no proceeds go to the government.

Textbox 3 further discusses the effects of the allocation method on the burdens of fuel suppliers and end users.

¹⁰ Another concern is that a national ESR cap with trading options will interfere with ETS-2, as the most cost-effective measures in the Netherlands will differ from those in the EU as a whole. If this interference is considered to undermine the useful functioning of the ETS-2, there are legal risks in introducing a national ESR cap (Ministerie van I&W, 2023). However, in consultation with the client, it was decided not to include legal aspects in the scope of this study. See also the section on Interactions.

Textbox 3 - Allocation of allowances and effects on burdens

In this context, we analyse the effect of the allocation method on the burdens of participants and end users. We compare a full auction situation with a situation where allowances are allocated partly freely based on a benchmark that gets stricter every year. By a benchmark, we mean an energy/fuel benchmark (emissions per unit of energy/fuel sold)¹¹. We focus on energy and fuel suppliers in this example.

If allowances are partly freely allocated, this results in lower burdens for energy and fuel suppliers (the participants in the ESR cap) than if they are all auctioned. Participants have the same type of incentive to reduce their emissions (the CO₂ price) as they only have to pay for their emissions above the benchmark. Because the reduction opportunities among suppliers are limited (there is little additional potential for green gas and biofuels), the scope for action under the ESR cap lies largely with energy and fuel end users, in other words citizens and businesses. Higher prices should encourage them to invest in insulation, a heat pump or an electric car, for example.

For citizens and businesses, however, it will make little difference to their burden whether allowances are fully auctioned or partly freely allocated. If suppliers have to pay for all the energy and fuel emissions, it is obvious that they will pass this on to end users. This gives end users an incentive to take action. If allowances are allocated partly freely, the question is how energy and fuel suppliers will pass this on:

- They can **pass on the marginal costs**, in other words the price they have to pay for allowances above the benchmark. In this case, the burden on end users is the same as at an auction. The marginal incentive also remains the same, and will therefore result in the necessary measures being taken to meet the emission target. This creates excess profits among energy suppliers.
- They can also divide the total costs they have to pay by the energy or fuel sold, thereby passing on the **average cost**. In this case, the burden on citizens and businesses is lower than with auctioning. However, it does mean that there will also be insufficient incentive to take the necessary reduction measures. This will result in the CO₂ price going up further until the burden passed on to citizens and businesses equals the marginal reduction costs. This therefore means the same burden.
- It is also possible that one sector does **not pass on the burden** (e.g. energy suppliers for the built environment) and another does (fuel suppliers for mobility). Under one cap, this will result in the system becoming less efficient: although burdens for the built environment will remain low, certain cost-effective measures will not be taken. Burdens for mobility will become higher, leading to expensive measures being taken.

It follows from the literature that it is most likely that energy and fuel suppliers will pass on marginal costs (Cludius et al., 2020; Woerdman et al., 2009). After all, they can also choose to sell their allowances in the market (opportunity costs). This assumes that energy and fuel suppliers have market power and set their own prices without any price competition. This is less obvious in the case of livestock farming because livestock farmers are price takers (dairies and slaughterhouses set the price).

Ideally, with partly free allocation, energy suppliers, for example, would only pass on the burdens for marginal emissions. This can be done, for example, by giving each household a benchmark in terms of gas consumption and only charging allowances if this benchmark is exceeded. This will keep the overall burden lower but maintain the same marginal incentive. This system is likely to have snags in legislation and implementation, and it is doubtful that energy suppliers will adopt it. There is also currently no consensus in the literature regarding whether households base their sustainability behaviour on average or marginal energy costs (CE Delft & Ecorys, 2021) and it is therefore questionable whether the desired sustainability measures will be taken in this way.

¹¹ There are several ways to set a benchmark. EU ETS uses product benchmarking, in other words CO₂ emissions per unit of final product produced. If a product benchmark has not been set, we have used a fuel benchmark as suggested for the ESR cap. Alternatives include a benchmark for gas consumption per household or dwelling, which may or may not depend on the energy label.

We conclude that the ESR cap *must* lead to a higher burden, otherwise no action will be taken by end users. In markets that function normally, whether allowances are auctioned or freely allocated has no effect on the level of burdens for end users.

From Textbox 3 we conclude that, in principle, the allocation method has no effect on end user burdens. Auctioning emission allowances has the advantage that auction proceeds allow the government to partly adjust the burden for end users. Similarly, under ETS-2, emission allowances will be allocated by auction. We have therefore assumed a full auction for the main ESR cap variants with emission allowances.

In the case of the variant with an emission tax and dispensation allowances, these are allocated on the basis of benchmarks. A benchmark can take many forms: both ETS-1 and the CO₂ tax for industry involve a production benchmark, but this does not apply to entities under the ESR cap. For fuel and energy suppliers, this could include, for example, emissions per litre of fuel or unit of energy sold, and for livestock farming, a benchmark by type of animal. These benchmarks may become more strict each year.

Alternatives are also possible such as allocation based on an energy supplier's customer base, but there are risks involved. For example, customers who are not attractive to an energy supplier may no longer be able to find an energy supplier. Or risks associated with implementation and privacy, if energy suppliers need to access certain data of their customers. There may also be conflicting policy objectives here: for example, granting free allowances to poor households would also mean that it is precisely homes with a poor energy label that would often be granted free allowances.

Conclusion regarding the main variants

We have assumed a full auction in all main variants based on an emission cap. For the option with an emission tax and dispensation allowances, we have assumed free allocation based on benchmarks.

3.2.4 Flexibility, stability and price control mechanisms

Flexibility mechanisms

Flexibility mechanisms are designed to allow participants in an emissions trading scheme to temporarily meet part of their obligation in an alternative way instead of surrendering emission allowances. This can be done, for example, by allowing allowances from another trading system to be used, allowing allowances to be 'banked' (i.e. saved for the benefit of subsequent years) or, conversely, allowing an obligation to be partly carried forward to a subsequent year (deferred). The advantage of this is that participants do not immediately run into problems if they temporarily struggle to reduce sufficient emissions. For example, it is also administratively easier to allow banks because otherwise each allowance would require a record of the year in which it was issued.

Which flexibility mechanisms are possible and useful depends on the scope and trading system and the political desire to introduce flexibility. We therefore do not consider them as primary variables in the design of the ESR cap.

Stability and price control mechanisms

These types of mechanisms include, for example, a Market Stability Reserve (MSR), as exists in ETS-1 and ETS-2, and a minimum or maximum price.

In particular, a Market Stability Reserve is designed to make the number of allowances in the market more predictable and their withdrawal more gradual, for example by withdrawing a pre-determined portion of this surplus from the market when there is a certain surplus of allowances. This is also expected to make the price of allowances less erratic. A surplus of allowances may arise, for example, because too many allowances were initially added to the system (as happened in the first years of ETS-1) or because of an unexpectedly rapid change in sustainability (e.g. because a sustainable alternative to a commonly used production process becomes available).

Minimum and maximum prices are mainly intended to stabilise the price in a direct manner and prevent price spikes or falls, such as in the case of market failures or to prevent carbon leakage. Market failures can arise, for example, because information on the most cost-effective reduction measures does not reach the parties properly, or because companies do not respond or respond only to limited price incentives due to practical barriers or certain perceptions. A minimum price serves to ensure a minimum financial incentive in the trading system, while a maximum price is precisely to protect system participants and end users from high burdens and prevent carbon leakage¹².

Setting a cap may come at the expense of the safeguarding effect of the ESR cap. Indeed, when a cap falls below the level of marginal reduction costs, the functioning of the emissions trading system is disrupted. With increasing scarcity of emission allowances, the price will no longer rise, making parties reluctant to sell emission allowances and bringing the trade in emission allowances to a halt. For parties that need emission allowances and are unable to reduce emissions in the short term, it may mean that they cannot meet their legal obligation. To solve this, the emission cap must be abandoned. In an emissions trading system, setting a maximum price is therefore at the expense of the legal safeguard of the reduction target. In the variant with an emission tax and dispensation allowances, this is precisely what is deliberately chosen: the emission tax acts as a maximum price, but the safeguarding effect becomes weaker.

Similar to flexibility mechanisms, we do not consider stability and price control mechanisms as primary design variables, but as measures that can be applied within the system if there is a political desire to do so. In particular, the client indicated that it considers the option of a maximum price desirable. The emission tax and dispensation allowances system provides this option. No maximum price is adopted in the other variants.

Conclusion regarding the main variants

We do not consider flexibility and stability mechanisms as primary design variables for the main variants.
The variant with an emission tax and dispensation allowances has a maximum price, the other variants do not.

¹² A national ESR cap could mean increased burdens for companies, while their competitors abroad do not have these burdens. Limiting these extra burdens via a maximum price can prevent companies from leaving the Netherlands and relocating their emissions rather than reducing them.



3.3 Variants for further analysis

Based on the design aspects we used to define the main variants, we arrived at six main variants in this study. These are shown schematically in Table 7.

Table 7 - Main variants for a national ESR cap

Variant emission cap	Scope	Cap	Trade	Allocation	Selected
Emissions trading scheme					
Base	CO ₂ emissions from fuel (ETS-2 with maximum opt-in) and all GHG emissions from livestock farming.	1 overarching cap.	Yes, within and across all sectors.	Auction of allowances.	Yes
Base without livestock farming	CO ₂ emissions from fuel (ETS-2 with maximum opt-in).	1 overarching cap.	Yes, within and across all sectors.	Auction of allowances.	No
Base with split cap	CO ₂ emissions from fuel (ETS-2 with maximum opt-in) and all GHG emissions from livestock farming.	1 cap for ETS-2 and 1 for livestock farming.	Yes, within and across all sectors under a cap.	Auctioning allowances for both fuel and livestock farming.	No
Base with separate caps	CO ₂ emissions from fuel (ETS-2 with maximum opt-in) and all GHG emissions from livestock farming.	Cap per sector.	Yes, but only within sectors.	Auction of allowances per sector.	Yes
Alternative system					
Base with separate caps and with no trading	CO ₂ emissions from fuel (ETS-2 with maximum opt-in) and all GHG emissions from livestock farming.	Cap per sector.	No.	Auction of allowances per sector.	No
Emission taxes with dispensation allowances	CO ₂ emissions from fuel (ETS-2 with maximum opt-in) and all GHG emissions from livestock farming.	Dispensation cap per sector.	Yes, from dispensation allowances, within sectors.	Free allocation based on benchmarks by sector.	Yes

In consultation with the client, three diverse variants have been selected from these for the follow-up of the study. We discuss their functioning in more detail hereafter.

The variants chosen are:

1. **Base:** An overarching cap leads to the most efficient savings with the lowest overall cost. It is in line with European ESR targets.
2. **Base with separate caps:** Partial caps by sector are most consistent with Dutch sectoral policies and encourage action in all sectors.
3. **Emissions tax with dispensation allowances:** This system works in the same way as the industry's current target-based CO₂ tax. This means that there is experience in implementation and relatively more certainty that it can be realised legally and practically. The system gives certainty about the maximum emission price but has a lower safeguarding effect. In this variant, we also assume free allocation of dispensation allowances, which is an extra difference to the other two variants.



The other three variants will not be discussed further below for the following reasons:

1. **Base without livestock farming:** The clients wish to include livestock farming in all variants.
2. **Base with split cap:** This variant is neither the most efficient (that is the base variant) nor does it follow sectoral policy (the shared cap variant). Variants 1 and 4 include more of the corners of the playing field. Moreover, this variant is in fact a shared cap variant with only two separate caps, so many conclusions are likely to be similar to those of the shared cap variant.
3. **Base with separate caps without trade:** A system without trading leads to a less cost-effective reduction and there are enough entities in all sectors for the market to function well.

3.4 Functioning of the three main variants

1: Base option

In this variant, the scope of the national ESR cap consists of CO₂ emissions from fuels from all sectors except those under ETS-1 (ETS-2 and maximum opt-in) and non-CO₂ emissions from livestock farming. The system works with one emission cap for all sectors. Emission allowances represent emissions of 1 ton of CO₂ equivalent. All emission allowances are auctioned and trading is possible between all entities subject to the obligation (fuel suppliers and livestock farmers).

This creates a single 'ESR price' for all sectors subject to the cap. This price is theoretically equal to the marginal reduction cost, or the price of the most expensive measure to meet the target. By applying a single cap, emission reductions take place most cost-effectively. However, with an overarching cap, sectors that would already meet their sectoral target without an ESR cap are still subject to extra taxation.

Under ETS-2, fuel suppliers must pay the price of these allowances on top of energy tax, excise duty and CO₂ price. This does not apply to livestock farmers as they are not covered by these schemes. The direct incentive to reduce emissions lies with the participant, i.e. the livestock farmer or fuel supplier. The fuel supplier will pass on the cost to the end user, giving the end user an incentive to take action. Livestock farmers are less able to pass on their costs to the end user because of competition in the European single market. They are therefore more likely to have to take action themselves.

2: Base with separate caps

In this variant, the scope of the instrument as a whole is the same, but separate caps are used for the different sectors. Per separate cap, emission allowances are auctioned and can be traded. Under the separate caps where only CO₂ from fuels is regulated, the emission allowances represent CO₂ emissions: under the shared cap covering livestock farming, multiple greenhouse gases are regulated and the emission allowances are therefore represented in CO₂-eq. Different prices emerge depending on the marginal reduction costs in different sectors. In theory, the cheapest measures are taken by sector. These are not necessarily the cheapest measures within the overall scope of the instrument. See Chapter 5 on implementation with regard to the choices that can be made about the number of separate caps and their scope.



3: Emission taxes with dispensation allowances

This variant is based on the operation of the current CO₂ tax for industry. The major difference with the other variants is that there is no emission cap (with associated emission allowances), but rather an 'ESR tax' as a steering mechanism. This tax needs to be determined externally, which in principle is performed by the government. In theory, the target reduction is achieved by setting this tax equal or higher than the marginal reduction cost. As with the CO₂ tax for industry, the 'ESR price' can be set gross, after which the ETS-2 price of the tax may be deducted for the net tax to be paid. The idea behind this is that the ETS-2 already safeguards the EU-level reduction envisaged therein and that the national ESR cap serves to safeguard any further national reduction target.

This variant uses dispensation allowances, making part of the emissions untaxed¹³. These dispensation allowances can be granted to individual participants based on benchmarks and reduced annually to move towards a certain target value of industry-wide residual emissions. For this, the emission taxes have to be higher than the marginal reduction costs.

We have assumed in this variant that the allocation of dispensation allowances and the determination of the incidence of the number of these (the dispensation cap) takes place sector by sector and not jointly for all sectors within the scope of the instrument. This is because existing policies need to be properly taken into account to determine the correct allocation of dispensation allowances and the correct level of emission taxes (see also Chapter 4, Interactions). Because policies vary by sector, this can take place with greater precision if there is a dispensation cap and emission tax for each sector, rather than one cap and tax for all sectors jointly.

As in the other variants, the direct incentive lies with the participant, e.g. the fuel supplier. The participant receives a perspective for action to use more green gas, for example. It can also pass on the cost of the tax to the end user, especially if its potential to take action is limited. It is clear from the economic theory and empirical basis of EU ETS that participants pass on marginal costs, i.e. opportunity costs, to the end user (CE Delft, 2010; Cludius et al., 2020). In this case these are the full tax costs, despite a part being exempted through dispensation allowances. These dispensation allowances reduce the burden on system participants compared to the other two variants, but do not necessarily reduce the burden on end users (see Textbox 1). Indeed, if the CO₂ price is only partially passed on to end users, there is insufficient financial incentive for them to take more measures. The price must then rise until the extra burden equals the marginal reduction costs.

Therefore, if participants pass on their burdens in full, this variant offers no opportunity to keep burdens low for specific groups, e.g. homeowners and tenants. Giving energy suppliers a lot of dispensation allowances does allow them to make money by trading. Incidentally, it is also conceivable that there are situations where participants do not pass on the full costs, for instance due to strong competition or if they want to generate additional market share, but this is not steered by the system.

¹³ Incidentally, it is also possible to introduce an emission tax without dispensation allowances. However, this differs so much from the design of an emission cap that we will not discuss it further here.



4 Interaction with other policies

This section describes the interaction of the national ESR cap with other policy instruments. We describe the interactions qualitatively, on two levels:

1. What role does the ESR cap play in the overall policy mix? Where does the ESR cap overlap in scope and operation with other policy instruments and what are the implications?
2. What is the impact of the ESR cap on existing national policy instruments? We consider the implications for the effectiveness and efficiency of these instruments, and for the accumulation of burdens.

Our aim is to provide insight into the implications of adding a national ESR cap to the existing policy mix, and what opportunities and challenges this would provide.

In this chapter, we examine interactions in terms of how the instruments *function*, i.e. reasoned from their policy objective. Synergies and challenges specifically related to the implementation and execution of the ESR cap are addressed in Chapter 5 on feasibility.

Below, in Section 4.1, we first discuss the policy mix as a whole and the possible consequences of an overlap between the national ESR cap and existing policy instruments. In Section 4.2, we summarise the analysis of the impact of the ESR cap on existing instruments in detail. The analysis itself can be found in Annex B (only available in Dutch report). This analysis focuses on *national* policy instruments; the influence of EU policy instruments is discussed in the section on the policy mix. Finally, the conclusions.

4.1 Role of the national ESR cap in the policy mix

Policy mix for ESR sectors

In terms of function, climate policy instruments can be divided into those that stimulate or generate emission reductions and those that ensure emission reductions, in the sense that they provide certainty about target attainment¹⁴. The clients have indicated that they view the national ESR cap primarily as an instrument to ensure the safeguarding of the national reduction targets for ESR sectors. The safeguards may relate to the target imposed on the Netherlands under the ESR (-48% by 2030 compared to 2005), but also to any higher target used nationally.

No other safeguarding instruments for ESR sectors exist in the current Dutch policy mix. For the built environment, mobility and small industry sectors, there are standardised instruments, pricing instruments and subsidies that steer towards reducing fossil energy consumption and therefore indirectly towards CO₂ reduction (see paragraph 4.2). For greenhouse horticulture, a CO₂ tax will be introduced in 2025 to ensure that, together with the other measures in the coherent package, the sector target is safeguarded. In this case, however, emissions above the sector target continue to be possible.

¹⁴ In theory, an instrument would have a pure safeguarding effect if the expected reductions from all other instruments combined achieve the reduction target and the safeguarding is only necessary if this expected reduction is not achieved for some reason. In practice, it is not always possible to determine exactly which instrument provides the incentive for sustainability and the ESR cap itself will also have a reducing effect.



Livestock farming does not yet steer greenhouse gas emissions, although instruments that steer towards phosphate and nitrogen emissions can have a side effect on greenhouse gas emissions. A safeguarding instrument would therefore be a functional addition to the existing national policy mix.

At European level, from 2027 onwards there will be ETS-2 which, although it has a safeguarding effect does not apply to emissions in the Netherlands (see the section on overlapping instruments hereafter). In addition, a large number of other standard-setting instruments exist at EU level for the ESR sectors, such as CO₂ emissions requirements for passenger vehicles and vans,¹⁵ and energy saving requirements for the built environment¹⁶. There are also specific sectoral targets, such as for renewable energy use for transport and the built environment¹⁷. A proposal to bring the energy tax more in line with the CO₂ emissions of the fuel is still under discussion¹⁸.

Both at national and European level, there are therefore several instruments that encourage emission reductions in ESR sectors in the Netherlands. The introduction of a safeguarding instrument in this policy mix could lead to discussions about whether these standardising instruments and subsidies are still needed. This may reduce support for tightening these instruments (CE Delft, 2021a). Similarly, a combination of standardising instruments and a safeguarding emissions trading system does not necessarily lead to the most cost-effective reduction trajectory, because actors are forced to take certain measures through standardisation when other cheaper reduction measures may have been possible. On the other hand, there are also good reasons to use a mix of different types of instruments. An emissions trading system is technology-neutral, while standardising instruments or subsidies can encourage the development of certain sustainable techniques. These types of instruments can provide certainty that all actors have to take the same steps, such as phasing out the internal combustion engine, which steers innovation. Other instruments can also serve purposes that a safeguarding instrument simply does not, such as addressing market failures, redistributing burdens or creating perspective for action for specific groups or sectors. Conversely, through the price of emission allowances, the ESR cap can act as a signal towards other policies: if the price becomes very high, it is a signal to tighten other policies.

Textbox 4 - Interaction with circularity, nitrogen and other policy objectives

This study focuses on how to safeguard the Dutch greenhouse gas reduction target for ESR sectors. It therefore does not address targets in adjacent policy areas, such as the nitrogen challenge and the circular economy. However, there may be interactions between an ESR cap and these targets.

For nitrogen, the main interaction is that reductions in emissions of other greenhouse gases from livestock farming are also likely to lead to reductions in nitrogen emissions. This in turn contributes to biodiversity and nature restoration targets. In particular, it is expected that if separate caps with emission or dispensation allowances are chosen, the impact on the nitrogen challenge will be significant. Instead, with an overarching cap, there is a risk that relatively little action is taken by livestock farming and the positive side effect on nitrogen emissions therefore fails to materialise (see further Chapter 6).

¹⁵ Regulation on CO₂ emission standards for cars and vans (Regulation (EU) 2019/631).

¹⁶ Energy Efficiency Directive (EED) and Energy Performance of Buildings Directive (EPBD).

¹⁷ Renewable Energy Directive (RED).

¹⁸ Amendment of the Energy Taxation Directive (ETD).



In addition to nitrogen reduction, reducing emissions of other greenhouse gases in livestock farming could also have a positive side effect on air quality.

The interaction between the ESR cap and circularity in the industry is limited. The industry faces a major task to defossilise not only the energy required, but also the feedstock. For example, by recycling raw materials. However, this is particularly prevalent in the chemical industry, which is excluded from ESR. However, there is overlap with the renewable raw materials theme in that many reduction options in the ESR sectors, especially mobility, depend on raw materials such as sustainable biomass and components needed for battery production in electric cars. For the latter category, recycling is important to meet rising demand.

Overlap between the national ESR cap and other instruments

The ESR cap is a standardising pricing instrument targeting part of the ESR sectors. As a result, there is mainly overlap with ETS-2 at European level, and at national level with the energy tax, excise duty legislation and the CO₂ tax on greenhouse horticulture. These instruments partly steer towards the same reduction measures, but not completely and not all at national level. The overlap between the functioning and scope of instruments can be useful as instruments can be mutually reinforcing, but in the case of the national policy mix, it can also be a reason to evaluate it and consider whether other instruments could possibly be abolished or phased out¹⁹.

In the following, we describe in more detail the overlap of the national ESR cap with ETS-2, the energy tax (ET), fuel excise duty and the CO₂ tax on greenhouse horticulture. Although ESR also has a partial safeguarding effect, since binding annual emission caps per member state apply²⁰, in this study we consider ESR mainly as a reduction target and not as a policy tool to achieve the reduction. This is because the target applies at member state level and therefore does not directly affect entities that emit greenhouse gases.

ETS-2

ETS-2 has a strong overlap with the national ESR cap, as both instruments share the same target of securing emission reductions in ESR sectors. The instruments do differ in scope: ETS-2 applies only to CO₂ emissions from fuels, while the main variants of the national ESR cap in this study also include other greenhouse gases from livestock farming. As such, neither instrument covers the entire scope of ESR. By choosing a maximum opt-in, the Netherlands can expand the scope of ETS-2 in the Netherlands, but this will not lead to safeguards at national level: after all, the extra emissions from the additional sectors will fall under the European cap for ETS-2. ETS-2 only safeguards the reduction target at EU level, while the ESR cap is intended to safeguard the Dutch target.

¹⁹ In theory, of course, this could also be achieved for EU-level instruments, but this would require gathering sufficient support within the EU. We have therefore assumed a range of instruments at EU level as a given.

²⁰ In this respect, ESR differs from the national target which does not have a binding annual emission cap.



Because there is considerable overlap between ETS-2 and the national ESR cap, the two instruments also interact. Actors covered by both systems (fuel suppliers) will have to pay emission allowances twice for the same emissions. Theoretically, the total price paid by fuel suppliers (i.e. CO₂ price under ETS-2 plus the 'ESR price') will correspond to the marginal reduction costs within the Netherlands. As the Dutch reduction target is more stringent than the European target²¹, the ESR price will be a relatively larger share of the total price that fuel suppliers have to pay since more reduction measures have to be taken in the Netherlands. The marginal cost and therefore the ESR price then become higher. Only where the ESR cap functions with subsectors and Dutch sector targets are already met will the ESR price be zero and fuel suppliers will only have to pay the CO₂ price for ETS-2. Livestock farmers will only pay the price of emission allowances under the Dutch cap. This corresponds to the cheapest reduction option for all sectors under the ESR cap (if working with a single cap) or in livestock farming (if separate caps apply).

The introduction of the national ESR cap may cause Dutch fuel suppliers or their customers to take measures that are more expensive than reduction measures elsewhere in the EU. As a result, reductions under ETS-2 do not entirely follow the most cost-effective path. The national ESR cap could therefore negatively affect the effectiveness of ETS-2 and theoretically cause higher costs at EU level. However, this applies not only to a Dutch ESR cap, but to all national policies that the Netherlands or other member states implement to meet their ESR target.

Under current legislation, the ETS-2 cap will be zero by 2044. This means that at that time, no more emissions from fossil fuel use are allowed in ETS-2 sectors. At such time, a national ESR cap would no longer be useful as far as fuel use is concerned since there would no longer be a need for national safeguards or a more stringent national target²². However, a national cap could still be used for livestock farming.

Energy tax

Although energy tax primarily targets energy savings and the ESR cap targets CO₂ reduction, both energy tax and the ESR price will be part of the energy bill of the end users of natural gas. This means that there is an overlap in the pricing of natural gas by both instruments. Later in this chapter, we describe how the ESR cap interacts with energy tax by examining the potential effect on the efficiency of energy tax, the efficiency of energy tax and the accumulation of burdens for end users. An increase in the energy tax leads to a lower ESR price and a lower energy tax leads to a higher ESR price.

Due to the overlap of energy tax and the ESR cap, and the fact that the ESR price responds to rate changes in the energy tax which safeguards the ESR target except in the variant with dispensation allowances, it could be examined whether energy tax could be partially phased out. This could include trade-offs on whether, for example, energy tax is phased out only for ESR sectors or also for non-ESR sectors. Without presenting an exhaustive analysis, we mention some possible pros and cons of partially phasing out energy tax in Textbox 5.

²¹ However, this cannot be compared 1-to-1 because the ETS-2 cap is only defined at European level.

²² That is, unless carbon removal is somehow allowed in ETS-2 to offset emissions, meaning that emissions in 2044 must be net zero across the EU or the national target is already negative in 2044, but we do not assume this.



Textbox 5 - Pros and cons of phasing out energy tax to minimum rates

Potential benefits of the phase out of energy tax to minimum rates:

- **All sectors priced equally (in the case of one ESR cap for all sectors).** In the current design of the energy tax, which has a degressive rate structure, bulk consumers pay a lower tax rate on natural gas than small consumers. In the case of one ESR cap and therefore one ESR price, reducing energy tax to minimum rates would equalise the cumulative pricing of energy tax and ESR cap for all ESR sectors. This is also in line with the present EU proposal to revise the Energy Taxation Directive, under which degressive rates would in principle no longer be allowed.
- **Preventing overpricing.** While it is implausible at the current energy tax rates which will not be sufficient to meet the ESR target, phasing out energy tax can ensure that *overall* no more is paid than necessary to meet the ESR target, although this may vary by sector. Indeed, it is theoretically possible that, at some point, so much CO₂ is reduced that the ESR price becomes 0: in that case, energy tax may be higher than needed to meet the ESR target. If energy tax is abolished, the ESR cap could be used to ensure that *overall* the right price is paid to secure the ESR target: again, it may well vary by sector.

Possible drawbacks of phasing out energy tax to minimum rates:

- **Government revenue more uncertain.** Energy tax has fixed tax rates per unit of energy. By doing so, it provides a certain degree of certainty in terms of government revenue from this instrument. Reducing the natural gas energy tax to minimum rates will generate more revenue from the ESR cap. However, revenue levels are more uncertain as the market sets the price of ESR allowances. Eventually - when the ESR cap switches to zero emissions - these revenues will disappear altogether.
- **Uncertain energy prices for customers.** The energy bill for energy users (households and businesses) also becomes more uncertain, as it is determined to a larger extent by the price of ESR allowances and to a smaller extent by fixed rates.
- **Less focused steering of policy.** Because it would simplify the instruments for pricing natural gas consumption, it limits the possibility of more focused steering through various instruments. Indeed, because the energy tax rate system is divided into different tax brackets, the government could steer towards large and small consumers in a more focused way than if pricing only takes place through the ESR cap and minimum rates.
- **Phasing out cannot be done across the board.** Since energy tax also applies to other energy carriers (electricity) and non-ESR sectors, phasing it out would be only partial anyway. By doing so, phasing out of energy tax would lead to more rather than less complexity in implementation.

Excise duty legislation

- The main purpose of excise duties is to provide revenue for the state. Excise duties are also used to discourage consumption of certain items. Fuel excise duty is levied per litre of petrol and diesel. Excise duty must also be paid on biofuels. Higher excise duty could discourage car use and encourage a switch to electric transport. However, this could lead to an erosion of the revenue base or, in other words, government revenues would decrease as less and less fuel is sold. Higher excise duties reduce the uneconomic top for switching to electric transport, which will lead to a lower CO₂ price with an ESR cap.
- The adoption of an ESR cap would allow excise duties to be reduced to the European minimum rate set out in the Energy Taxation Directive. This would lead to a higher CO₂ price, as the uneconomic top of measures increases. In general, this impact will therefore be limited for burdens of citizens. However, there could be an increased drive towards CO₂ reduction as a result of the lower tax on biofuels. Under an overarching cap, if fuel excise duty rates are reduced proportionately, the burden of climate policy may also shift from the mobility sector to other sectors covered by the cap. This may be a choice based on redistribution considerations. Lowering excise duties will accelerate erosion of the revenue base. This could be compensated through auction proceeds. This is conditional on the CO₂ price being sufficiently high.



CO₂ tax on greenhouse horticulture

- The CO₂ tax on greenhouse horticulture will be deployed as a safeguarding instrument from 2025. It is assumed that the proposed rates will achieve the sector target. If this is the case, in a shared-cap variant where greenhouse horticulture has its own shared cap, no additional CO₂ reduction will be needed and no CO₂ price will arise.
- In a single-cap variant, the introduction of a national ESR cap could mean that greenhouse horticulture would exceed the intended sector target if reduction costs in greenhouse horticulture are lower than in other sectors. If a positive CO₂ price arises under the ESR cap, it means that greenhouse horticulture faces extra burdens on top of the CO₂ tax. Depending on the relative reduction costs in the sector, this leads to additional reductions on top of the sector target.

4.2 Impact of the ESR cap on existing national policy instruments

In this section, we describe the main interactions of the ESR cap with other national climate policy instruments, assuming they remain in force at the same time. Since the ESR cap would be added to existing policy instruments, we look at the expected impact of the ESR cap on existing instruments, and not the other way around.

In doing so, we distinguish between three types of national policy instruments:

- standardising instruments, such as requirements in terms of measures to be taken based on energy performance or payback periods;
- pricing instruments;
- subsidies and tax schemes.

Annex B (only available in Dutch report) provides a non-exhaustive list of the different instruments under these three types, where we looked at the different sectors that would be covered by the ESR cap.

For each type of instrument, we describe the impact of the ESR cap on the other instruments in terms of:

- **Effectivity.** We assess the effect of the ESR cap on the effectiveness of the instrument in question. In our assessment, we define effectiveness as the extent to which an instrument (e.g. energy tax) contributes to achieving its target (e.g. energy savings). If there is clear evidence that a cap with a price incentive enhances the effectiveness of existing instruments, this results in a '+'.
- **Efficiency (government policy).** We assess the impact of the ESR cap on the efficiency of the instrument in question. In our assessment, we define public policy efficiency as the effectiveness of the instrument compared to the budget of the instrument in question ('bang for the buck'). This may require a smaller budget, in which case we rate the interaction as positive ('+') assuming no change in effectiveness.
- **Accumulation of burdens.** We assess the extent to which the ESR cap together with the instrument in question leads to an accumulation of burdens in the end user costs. In the case of higher total charges, we rate the interaction with a '-'.

We describe the interaction *per type of instrument* using a *model instrument*, because qualitatively the interactions will turn out to be largely the same for a given type of instrument: it is not so much the specific instrument that is relevant for the interactions, but mainly whether it is a prescriptive, pricing or subsidising instrument.

Table 8 shows an overview of the interaction of the ESR cap with a number of model instruments. The interaction is qualitatively assessed²³: positive effect (+), negative effect (-), no effect (0) or a mix of positive and negative effects (+/-). The detailed analyses can be found in Annex B (only available in Dutch report). For each type of instrument, we also describe to what extent the outcome of the model instrument is representative of this type of instrument.

Overall, we do not expect negative effects on the effectiveness of other policy instruments when the ESR cap is introduced. For each type of instrument, we provide the main findings of the analysis of model instruments.

Pricing instruments:

- In general, it seems unlikely that the ESR cap will have a strong effect on the effectiveness of pricing instruments. This does not mean that the interaction of the ESR cap with different pricing instruments works exactly the same way. For example, excise duties (but also the ESR cap and ETS-2) provide an incentive for all reduction options, while vehicle taxes and also a kilometre charge only provide an incentive for specific reduction options.
- However, the ESR cap does lead to an accumulation of burdens (see further Chapter 6), but this is partly unavoidable because the ESR cap must have a safeguarding effect. In the case of the CO₂ tax for greenhouse horticulture, the ESR cap may lead to a financial incentive higher than what is needed (under the basic premises of the CO₂ tax) to meet the sector target.

Subsidies:

- In the interaction between the ESR cap and subsidies, we have both a carrot (the subsidy or tax scheme) and a stick (the ESR cap, which standardises and prices). According to the literature, this can lead to reinforcing synergy effects (Vollebergh, 2012). For many sectors a 'stick' is already in place (in the form of the standardisation/pricing from the ETS and ETS-2); the ESR cap will increase this standardisation/pricing effect and therefore the potential synergy effect.
- The introduction of an ESR cap could lead to an increase in the effectiveness of subsidies. The extent to which this happens may be compressed by a possible increase in the number of free riders. Whether this is an issue depends on the form of the subsidy.
- It is important for subsidies that lists of techniques or measures are updated. After all, some of these techniques or measures will no longer have an uneconomic top (or it will become lower) or the payback period has decreased to such an extent that it can be taken off the list, such as in the case of the energy-saving investment credit (EIA), the environmental investment credit (MIA) and the arbitrary depreciation of environmental investments (Vamil).
- While the ESR cap provides an incentive to invest in sustainable technologies, it does not directly remove the barrier of high investment costs. This is where subsidies can help.

Standardising instruments:

- For standardising instruments, we see that the effectiveness and efficiency of payback-related instruments is expected to increase. We do not expect the ESR cap to have a strong effect on effectiveness and efficiency for standardising instruments related to energy performance and fuel requirements.

²³ If the elaboration differs by sector, the interaction is described separately.

- More generally, standardising instruments effectively allow the government to mandate one or more measures, regardless of whether they are the most cost-effective. This removes some of the market forces from the cap. This can lead to a lower ESR price, but also to higher indirect charges for end users. As a result, standards that address specific market failures not addressed by the ESR cap can also add value to the ESR cap. This could include a barrier of high purchase costs or a barrier for producers to bring certain technologies to market.

Table 8 - Overview of the impact of an ESR cap on model instruments

Instrument type	Model instrument	Effectivity	Efficiency (government policy)	Accumulation of burdens
Pricing	Energy tax	0	-	0
Subsidy	ISDE, SDE++	+	+/-	0/+
Standardisation - related to Technology Verification Tool (TVT)	Energy savings duty	+	+	+/-
Standardisation - energy performance	Label C requirement for offices	0	0	0/+
Standardisation - fuel requirements	Green gas blending obligation	0	0	-

Broadly speaking, the conclusions of this analysis are not dependent on the variant of the ESR cap. However, the variant with separate caps per sector does allow better steering with standardising sectoral policy (in line with current sectoral climate policy) than the variant with a single cap. In particular, when determining the level of the emission taxes in the variant with dispensation allowances, it is important to take into account other sectoral policies and other policy developments; after all, these together determine the degree of sustainability. The level of the emission tax combined with the benchmarks set ultimately determines the extent to which the cap is safeguarded. In this policy variant, identifying the policy context and the interaction of the ESR cap with other policies is therefore more relevant for cap safeguards than in the other variants.

4.3 Conclusions

Policy mix and overlap of instruments

There is currently no safeguarding instrument at national level in the ESR sectors. From 2025, a CO₂ tax will be introduced in greenhouse horticulture, which, along with other instruments, should safeguard the sector target. From 2027, ETS-2 will be a safeguarding instrument, but only at EU level and only for CO₂ from fuel use.

Other instruments in the policy mix in the ESR sectors encourage or generate emission reductions through standardisation, pricing or subsidies. In particular, the need for stricter standardisation may be questioned if a safeguarding instrument is introduced. Similarly, reductions may not proceed in the most cost-effective manner with a combination of safeguards and other policies. At the same time, other instruments can be used to steer towards targets that a safeguarding instrument does not have, such as countering market failures or providing perspective for action to certain groups or sectors. Conversely, a high ESR price can act as a signal to tighten sectoral policies.

A national ESR cap can therefore fulfil a function in the policy mix that is currently not being fulfilled. An ESR cap may lead to higher burdens for end users and the obligation for fuel suppliers to pay allowances twice when they are also covered by the ETS-2, but that is a consequence of the desire to safeguard a national reduction target, possibly more ambitious than the European one.

The ESR cap is a standardising pricing instrument targeting part of the ESR sectors. As a result, there is mainly overlap with the ESR and ETS-2 at European level, and with energy taxation, excise legislation and the CO₂ tax for greenhouse horticulture at national level.

- **ETS-2.** There is considerable overlap between ETS-2 and the ESR cap as they have the same function, albeit at EU and Dutch level respectively. This also creates interaction between the two instruments. It is possible that price movements under ETS-2 are less efficient due to the introduction of a Dutch ESR cap. However, this is also already the case as a result of other national policies required by the Netherlands and other member states in order to meet their ESR target.
- **Energy tax (ET).** Both energy tax and the ESR cap price fuel use: however, energy tax prices volumes and is therefore mainly focused on energy savings, while the ESR cap focuses on CO₂ emissions and therefore also on green gas or biofuel blending. Because of the overlap, consideration could be given to partially phasing out energy tax. This offers both advantages such as equal pricing of all actors and avoiding overpricing, as well as significant disadvantages such as more uncertain government revenues and fewer policy steering options. Moreover, the phasing-out of energy tax would not apply to energy carriers other than gas and electricity carriers or to sectors outside the ESR.
- **Excise duty legislation.** As with energy tax, the level of fuel excise duty and the CO₂ price under an ESR cap are communicating vessels. A reduction in excise duty would allow more steering towards biofuel use, but erosion of the revenue base is a risk. If necessary, lower excise duties could be used in an overarching cap to redistribute the burden between sectors.
- **CO₂ tax for greenhouse horticulture.** If this has a sufficiently safeguarding effect, no CO₂ price for greenhouse horticulture arises under a shared cap system and there are therefore no extra burdens. Under a system with an overarching ESR cap, it may lead greenhouse horticulture to reduce more than necessary and face additional burdens on top of the CO₂ tax.

Impact of the ESR cap on existing national policy instruments

It follows from our analysis of interactions of the ESR cap with existing national policy instruments that we do not generally expect negative effects on the effectiveness of other policy instruments. In the case of subsidies, there may even be an increase in effectiveness, as literature shows that synergies can emerge when a 'carrot' (the subsidy) and a 'stick' (the ESR cap) are combined. Some instruments become more effective and others less so, but there are no instruments whose functionality would be severely compromised if a national ESR cap were introduced.

In fact, standardising instruments allow the government to mandate one or more measures, regardless of whether they are the most cost-effective. This removes some of the market forces from the cap. However, standard-setting instruments may have a function that is also positive for the functioning of the ESR cap, such as addressing market failures that the ESR cap cannot address.

Higher burdens on end users are not necessarily a negative side effect of introducing a national ESR cap. In part, these burdens are precisely the intention of the instrument, as emissions are priced and the reduction target needs to be safeguarded. However, the burden increase should be proportional to the emissions and distributed fairly across sectors. See further Chapter 6 with regard to the effects of the accumulation of burdens.



5 Implementation

In this chapter, we provide an analysis of the implementation of the three policy alternatives. In doing so, we answer the following key questions:

- Which actors can play which role in the implementation?
- What steps are needed to set up the system and what is a realistic timeline?
- How can the feasibility for different actors be assessed for the different policy alternatives?
- What are the areas of concern and potential bottlenecks in implementation?

There are several options to allocate the implementation of various components to the parties. The starting point in this analysis is to tie in as much as possible with existing parties and instruments, such as ETS-2, phosphate allowances, fuel excise duties and the energy tax, so that implementation can take place as efficiently as possible and use can be made of possible synergies. We will also consider the main aspects of the implementation. The actual implementation will ultimately have to be decided in the policy draft. We have based the analysis in this chapter on insights from interviews (see Table 9), supplemented by public data and our own expertise. In this section, we provide insight gained during the interviews.

Table 9 - Interviews conducted

Discussion partner	Subject
Dutch Emissions Authority (Nederlandse Emissieautoriteit, NEa)	Implementation of, and possible synergy with, ETS-2 implementation.
Ministry of Agriculture, Nature and Food Quality (Ministerie van Landbouw, Natuur en Voedselkwaliteit)	A phosphate allocation system for livestock farming, parallel to the ESR cap.
Engie	Implementation of, and possible synergy with, ETS-2 implementation.
Agora Energiewende	The German Brennstoffemissionshandel (BEH), a variant of a national emissions trading system.

We start this section with an analysis of the actors involved, then provide insight into the possible timeline in which the ESR cap could be implemented. We then assess the feasibility of each policy variant for different actors. Finally, in the last part of this chapter, we draw conclusions on the feasibility of the different variants of the ESR cap and identify the main bottlenecks.

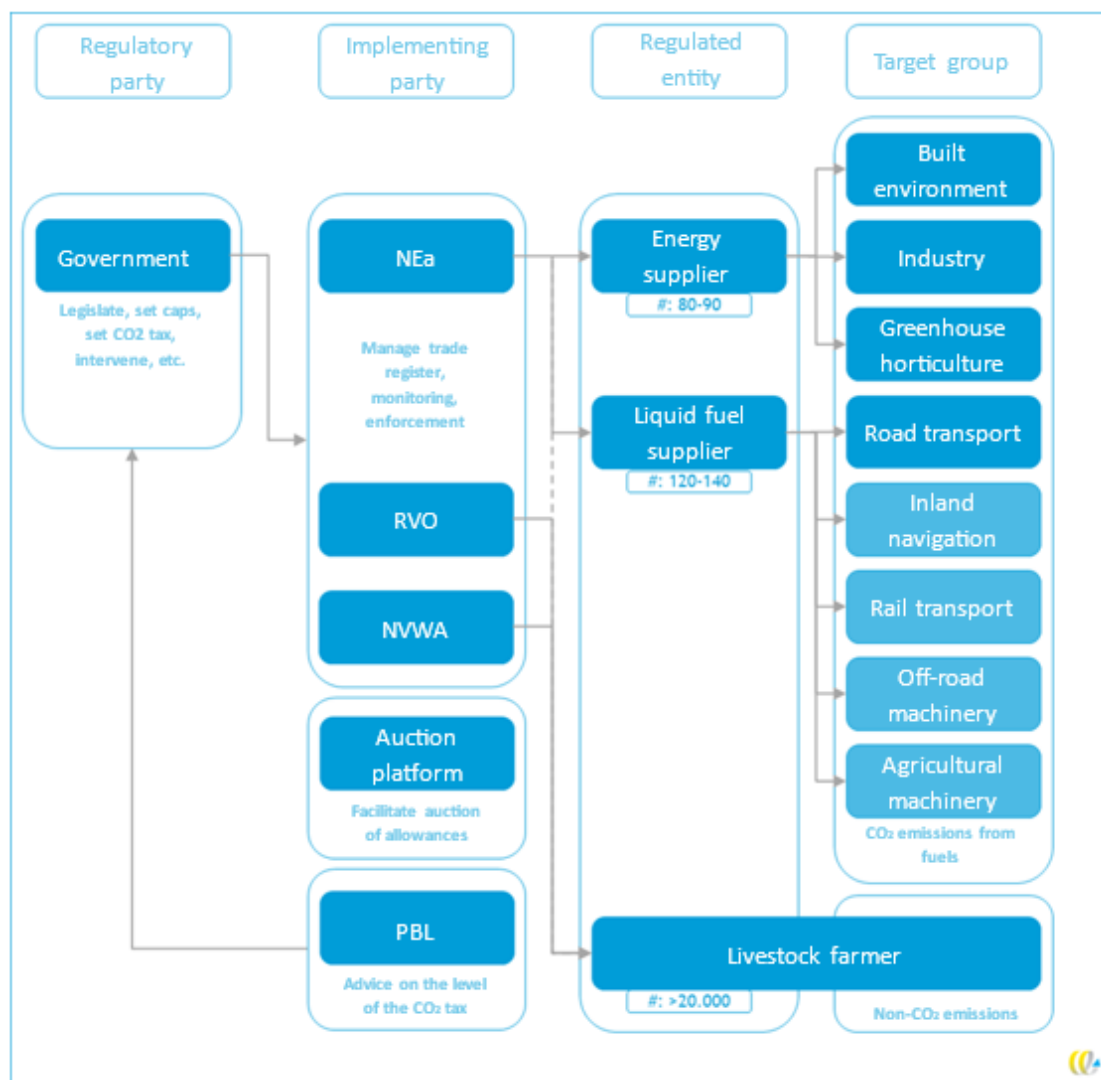
5.1 Analysis of actors

In this section, we provide an overview of the possible parties involved in implementing the ESR cap. An overview of these actors and their roles can be seen in Figure 5. As shown in the figure to the right, we distinguish between end users of fuels: the built environment, industry, greenhouse horticulture, road transport, inland navigation, rail transport, 'off-road' machinery and machinery in agriculture and livestock farmers.

We briefly describe below the roles and responsibilities of different actors with regard to the implementation of the ESR cap.



Figure 5 - Overview of ESR cap actors



Government

The government has the regulatory role. It makes the legislation and determines the design of the policy instrument. The government should in any case take the following steps:

- **Initially.** Making any necessary legislative changes and instructing the parties in question.
- **Setting targets.** The cumulative ESR target for the period 2021-2030 has been set at 833 Mton CO₂-eq. for the Netherlands. (PBL, 2023); the 2040 target is not yet known. The cap per year should be set based on these targets. Moreover, in the case of separate caps, the level of these separate caps should be determined. If an emission tax with dispensation allowances is chosen, the government should also set the amount of the tax.
- **Later/periodically.** Monitor and evaluate, such as the efficiency and accumulation of burdens, and adjust if necessary if undesirable effects occur.

Dutch Emissions Authority (Nederlandse Emissieautoriteit, NEa)

The Dutch Emissions Authority supports and oversees the implementation of ETS-1 and ETS-2 in the Netherlands. Its roles include licensing, managing the Dutch part of the EU ETS registry, monitoring and enforcement. This also makes it a very logical implementer/regulator for the ESR cap.

The interview with the Dutch Emissions Authority shows that, as long as the same implementation and scope as the ESR-2 is used, allowances under the ESR cap can be expected to be treated in a similar way to those under ETS-2. Two allowances should then be obtained for all emissions in the new situation: one under ETS-2 and one under the ESR cap. The same monitoring and reporting system could be used for CO₂ emissions from fuels, and enforcement could also follow the same line. This is not the case for non-CO₂ emissions from livestock farming, as these are not covered by ETS-2. This would therefore require joining another system or setting up a new system (this is discussed hereafter and later in the chapter).

Netherlands Enterprise Agency (Rijksdienst voor Ondernemend Nederland, RVO)

As described in Textbox 6, the Netherlands Enterprise Agency is responsible for the management and monitoring of phosphate allowances (for dairy cattle) and manufacturing allowances (for pigs and poultry)²⁴. Under these schemes, the Netherlands Enterprise Agency operates registers that record the allowances of each company. The experience that Netherlands Enterprise Agency has with this could be used to set up and manage a similar new register for ESR allowances for livestock farming (as explained later, this is more obvious for separate caps). This would extend its responsibility to the management of ESR allowances, which is more or less the same scope as the management of phosphate and manufacturing allowances jointly²⁵.

Textbox 6 - Phosphate allowances

Livestock farmers are required to have phosphate allowances if they keep dairy cattle. These allowances were distributed free of charge to dairy livestock farmers at the start of the system in 2018. The number of phosphate allowances (where one phosphate allowance equals one kilogram of phosphate) determines how much phosphate dairy cattle are allowed to produce and needs to be determined annually. The phosphate allowance system has a cap that determines the maximum annual phosphate production in the Netherlands. A dairy livestock farmer can trade (buy or sell), lease or lease out phosphate allowances or let them expire. This is done bilaterally or through an intermediary. Trade must be reported to Netherlands Enterprise Agency. For phosphate allowances, the livestock farmer has administrative burdens only if allowances are traded; if the situation remains unchanged, the number of allowances need not be reported on a periodic basis.

The Netherlands Food and Consumer Product Safety Authority (Nederlandse Voedsel- en Warenautoriteit, NVWA) monitors and enforces. If the Netherlands Food and Consumer Product Safety Authority finds an infringement, an official report is drawn up and sent to the Public Prosecution Service (Openbaar Ministerie, OM). The criminal court determines the fine and its amount.

²⁴ Other relevant schemes implemented by Netherlands Enterprise Agency include the CO₂ scheme for greenhouse horticulture and, eventually, the CO₂ tax for greenhouse horticulture.

²⁵ The Ministry of Agriculture, Nature and Food Quality stated that the vast majority of livestock farmers already work with either phosphate allowances or manufacturing allowances (source: interview the Ministry of Agriculture, Nature and Food Quality). The number of farms that only have animals that do not require allowances (e.g. sheep or goats) is negligible.



Production allowances

Pig and poultry (chicken and turkey) farmers are required to have manufacturing allowances to keep these animals. Different types of animals are linked to different amounts of manufacturing allowances (e.g.: a piglet corresponds to 0.37 pig units and a fattening pig to 1 pig unit). There is a fixed number of manufacturing allowances available in the Netherlands, which decreases over time as livestock farmers can choose to let manufacturing allowances expire. As with phosphate allowances, a pig or poultry livestock farmer can trade (buy or sell), lease and lease out or allow manufacturing allowances to expire. This must also be reported to Netherlands Enterprise Agency. For manufacturing allowances, a livestock farmer has administrative burdens only if allowances are traded; if the situation remains unchanged, the number of allowances need not be reported on a periodic basis. Monitoring and enforcement also takes place through the Netherlands Food and Consumer Product Safety Authority.

Dutch Food and Consumer Product Safety Authority (Nederlandse Voedsel- en Warenautoriteit, NVWA)

In the current system of phosphate and manufacturing allowances, the Dutch Food and Consumer Product Safety Authority has a monitoring and enforcement role. The Dutch Food and Consumer Product Safety Authority currently carries out 'risk-focused' monitoring, using records of the Dutch Enterprise Agency to identify companies that may need extra attention (source: interview LNV). It is obvious that the Dutch Food and Consumer Product Safety Authority will play a similar role, extended to greenhouse gas emissions monitoring, under the ESR cap.

Auction platform

An auction platform will need to be set up for auctioning emission allowances. The government will have to decide which party this will eventually be allocated to. There is a joint auction platform for ETS-1, on which a set amount of allowances is auctioned every day. The auction platform will be tendered for five years and is currently allocated to the European Energy Exchange (EEX).

Dutch Environmental Assessment Agency (Planbureau voor de Leefomgeving, PBL)

In the variant with dispensation allowances, the government must periodically set the level of the CO₂ tax and benchmarks. In this variant, the Dutch Environmental Assessment Agency could be made responsible for advising on this, both periodically and by sector. The Dutch Environmental Assessment Agency previously conducted an analysis on the level of the CO₂ tax rate for industry (PBL, 2022a). With regard to agriculture, Wageningen University & Research (WUR) could also have a role in this.

Energy supplier

In this context, energy supplier means energy companies that supply natural gas (such as Eneco, Essent, Vattenfall, etc.). These are regulated entities. According to the Dutch Emissions Authority, this involves about 80 to 90 entities in the Netherlands that are identified through permits at the Netherlands Authority for Consumers & Markets and data from grid operators. Under the ESR cap, energy suppliers must buy ESR allowances for the amount of natural gas they sell on an annual basis. The costs for this can be passed on to the end user covered by the ESR cap: the built environment, (non-ETS) industry and greenhouse horticulture.



Liquid fuel supplier

In this context, a supplier of liquid fuels means a company registered as a storage location of goods subject to excise duty. These are regulated entities. These include companies such as Esso, Shell and Total. According to the Dutch Emissions Authority, there are about 120-140 such companies operating in the Netherlands, of which 60-70 are large and 60-70 small suppliers. Under the ESR cap, these suppliers have to buy ESR allowances for the amount of fuel they sell on an annual basis. These costs can be passed on to the end user. This largely concerns road transport (84% of emissions).

End user (CO₂ emissions from fuels)

The end user (company, organisation, household, vehicle owner, etc.) to which the ESR cap applies ultimately pays for the ESR allowances purchased by the energy or liquid fuel supplier. As described further in this chapter, nothing changes for the end user in terms of the burden of implementation: the costs can be expected to be passed on in a manner similar to other instruments such as ETS-2, fuel excise duties and energy tax.

Livestock farmer

For livestock farming, assuming a design of an emissions cap in which livestock farmers are the point of intervention, the livestock farmer is subject to both the ESR cap (and therefore pays for emissions) and the point of intervention. There are approximately 21,500 livestock farmers operating in the Netherlands²⁶. As explained further below, a trade register similar to the one currently in place for phosphate and manufacturing allowances could potentially be set up for the ESR cap. However, one difference is that phosphate and manufacturing allowances are allocated only once and emission allowances must be purchased and surrendered on an annual basis.

5.2 Timeline

For the implementation of the ESR cap, it is obvious to choose similar steps and a similar deadline as for the implementation of ETS-2 (see Figure 6); this was confirmed in interviews with the Dutch Emissions Authority and Engie.

- An agreement on the creation of ETS-2 was reached in late 2022.
- Under ETS-2, regulated entities are required to submit an application for a permit to the Dutch Emissions Authority by 1 August 2024.
- After this, they are obliged to start monitoring emissions from 1 January 2025:
 - there is therefore a two-year gap between the final European decision-making regarding ETS-2 (December 2022) and the permit requirements (from 1 January 2025).
- From 2025, regulated entities are obliged to report their emissions by 30 April each year.
- From 2027, ETS-2 emission allowances will be auctioned.
- From 2028, the allowances must actually be surrendered each year:
 - therefore, between 2025 and 2027, a two year period has been scheduled to allow companies to get used to the monitoring and reporting obligations.

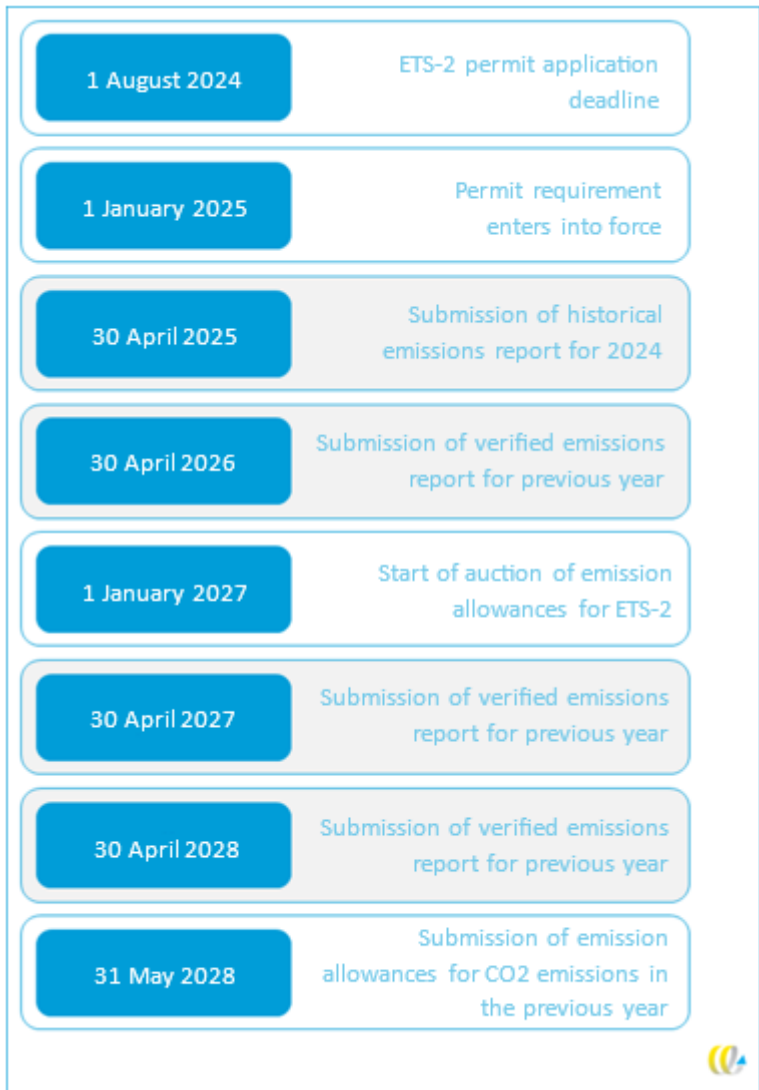
²⁶ Cattle and dairy farms: 18,785 in 2023. Pig farms: 2,700 in 2023 (CBS, 2023b).



Regulated entities under ETS-2 (energy suppliers and liquid fuel suppliers) are also regulated entities under the ESR cap. The emissions to be monitored and reported are also the same as those under the ESR cap. As decision-making regarding the ESR cap is expected to take some time and communication to regulated entities needs to be timely, the possible implementation date is still uncertain. Similar turnaround times could possibly be applied to the different steps.

The final timeline and turnaround times required will depend on the final design of the ESR cap. For instance, the complexity of implementation increases as separate caps and dispensation allowances are introduced into the design, potentially requiring more preparation time. More preparation time may also be required for livestock farming. As regulated entities (livestock farmers) are not covered by ETS-2, a new system may need to be set up for them, possibly in a similar format to the trade register for phosphate and manufacturing allowances. This is explored in more detail later in this section.

Figure 6 - Implementation timeline ETS-2



5.3 Assessment of the burden of implementation

This section discusses the most relevant findings in terms of the burden of implementation for the various actors for each variant. This is broken down into CO₂ emissions from fuels, which includes emissions from the built environment, industry, greenhouse horticulture, road transport, inland navigation, 'off-road' machinery and machinery in agriculture, as well as non-CO₂ emissions from livestock farming. For all variants, we have qualitatively assessed the feasibility for different actors; where 0, *, ** and *** indicate an increasing burden of implementation. The burden of implementation assessment is *actor-specific*²⁷ and *compared to a situation without an ESR cap*.

5.3.1 Base option

CO₂ emissions from fuels

For the feasibility assessment with regard to CO₂ emissions from fuels, the following basic premises are important (under the base variant):

- there is one cap, meaning that the price for an ESR allowance is the same across all sectors;
- same scope as ETS-2 (with maximum opt-in) in terms of sectors;
- same scope as ETS-2 in terms of type of emissions.

Feasibility assessment (relative to a situation without an ESR cap):

- **Government (*)**. The government is responsible for preparing the necessary legislation, instructing the parties involved and periodically setting the cap level for each year (based on the ESR targets for 2030 and 2040). Furthermore, the government is responsible for monitoring and evaluating, including the efficiency and accumulation of burdens, and making adjustments where necessary if unwanted effects occur.
- **Dutch Emissions Authority (*)**. The work and responsibilities of the Dutch Emissions Authority will be expanded under the ESR cap, but are expected to increase to a limited extent:
 - During our interview with the Dutch Emissions Authority, it indicated that 10-15 FTEs are ultimately expected to be needed to implement ETS-2. As it is expected to be possible to link up with the monitoring and reporting requirements and enforcement for ETS-2, this could potentially lead to synergy benefits. According to the Dutch Emissions Authority, the degree of synergy depends on the extent to which the ESR cap mirrors ETS-2 in terms of implementation and scope. Consequently, we expect the additional burden of implementation to increase by less than 10-15 FTEs. In this respect, we assume that the Dutch Emissions Authority for livestock farming only manages the allowances in the trade register and that Netherlands Enterprise Agency and the Dutch Food and Consumer Product Safety Authority will be responsible for setting up the fixed-rate system and for enforcement, respectively.
 - The process of identifying the regulated entities for the ESR cap overlaps with the regulated entities under the ETS-2 with regard to CO₂ emissions from fuel. Suppliers of liquid fuels are involved via customs because they store goods that are subject to excise duty. Natural gas suppliers are involved via grid operators (suppliers of bulk

²⁷ In other words, the assessment of the burden of implementation for different actors is not comparable on a 1-to-1 basis. Since the nature of the burden of implementation is different, such as those of the Dutch Emissions Authority and all livestock farmers, they are therefore difficult to express in the same unit.



consumers) or via the Dutch Authority for Consumers & Markets (suppliers of small consumers).

- A trade register needs to be set up where regulated entities can surrender and transfer allowances. The turnaround time for setting up such a registry depends on the level of complexity of the system. The Dutch Emissions Authority indicated that it would be relatively simple to set up a register for the CO₂ tax for industry and would take about six months. The turnaround time to set up a register for the ESR cap is expected to be longer, but is impossible to estimate precisely at this time.
- **Liquid fuel supplier (*)**. The administrative burden of fuel suppliers will increase under the ESR cap. The new situation means that two allowances have to be obtained for all emissions: one under the ETS-2 and one under the ESR cap. Depending on whether the auction platform is organised by the same party as the ETS, it may or may not be under the same cap. The cost of allowances can be passed on to the end user. In terms of monitoring and reporting of emissions, this involves the same scope as under the ETS-2; the ESR cap will therefore not create any extra administrative burden. The overall extra burden on liquid fuel suppliers is therefore limited.
- **Energy supplier (*)**. The impact on energy suppliers is more or less the same as for liquid fuel suppliers. It is expected that costs can be passed on to the end user in a similar manner as currently takes place with energy tax. However, during the interviews with the Dutch Emissions Authority and Engie it was indicated that determining the final natural gas consumption for bulk consumers (even now, with the energy tax) is a bottleneck²⁸. Energy suppliers receive the data for the first half of the previous year in April and the data for the second half of the previous year in October. The bottleneck in this regard is primarily with the regional grid operators; it is not expected that this process can be significantly accelerated. Adhering to the ETS-2 timeline, whereby emission allowances for the previous year have to be surrendered in May, could result in energy suppliers actually surrendering more or fewer emission allowances than they eventually have to. A correction mechanism could possibly be set up for this²⁹. One way to avoid this is that emission allowances do not have to be surrendered until later in the year.
- **End user (0)**. For the end user, nothing changes in terms of feasibility compared to a situation without an ESR cap. According to Engie, it is not yet known whether there will be a requirement for ETS-2 to state this separately on the invoice or whether the costs involved will become part of the supply price.

Non-CO₂ emissions (livestock farming)

For the feasibility assessment with regard to non-CO₂ emissions from livestock farming, the following basic premises are important (under the base variant):

- there is one cap, meaning that the price for an ESR allowance is the same across all sectors;
- larger scope than phosphate and manufacturing allowances in terms of the number of livestock farmers;
- different scope from phosphate and manufacturing allowances (greenhouse gas emissions instead of manure production).

²⁸ This is not an issue for ETS-1 as this takes place at the installation level.

²⁹ In the case of energy tax, a correction invoice can be sent up to five years after the fact. However, this differs from energy tax as these are fixed rates, while the price of ESR allowances can fluctuate over time.



Feasibility assessment (relative to a situation without an ESR cap):

- **Livestock farmer (**).** The vast majority of livestock farmers are already required to hold phosphate or manufacturing allowances. They will be required to use a new system (the trade register organised by the Dutch Emissions Authority). In addition, the difference is that allowances are auctioned under the ESR cap and must be surrendered on an annual basis. In the case of phosphate and manufacturing allowances, livestock farmers only have administrative burdens if allowances are traded; if the situation is unchanged, the number of allowances does not need to be reported on a periodic basis³⁰. The overall administrative burden increases significantly as it involves more than 20,000 livestock farmers. The ESR cap will also require livestock farmers to report the number of animals annually, possibly supplemented by data on barn type, animal feed, etc. Farmers currently already fill in the Combined Declaration each year; the data from this could potentially be used for the ESR cap.
- **Netherlands Enterprise Agency (*).** There may be a role for the Netherlands Enterprise Agency in setting up the fixed-rate system (see Textbox 7), as livestock farmers are already registered with them in the context of phosphate and manufacturing allowances. It is obvious that they could be supported in this role by Wageningen University & Research (WUR), which has a lot of experience in determining emissions for livestock farming.
- **Netherlands Food and Consumer Product Safety Authority (*).** If the Dutch Food and Consumer Product Safety Authority is responsible for enforcement, as in the case of phosphate and manufacturing allowances, the burden of implementation will increase. The scope in terms of the number of livestock farmers is largely the same, since most livestock farmers already have to deal with either phosphate or manufacturing allowances. The scope does expand as the ESR cap focuses on greenhouse gas emissions.

Textbox 7 - Fixed system

It is currently not possible to measure emissions from livestock farming. Therefore, a fixed-rate system can be chosen (whether or not for the first few years), in which the average emissions per animal species can be used to determine the number of emission allowances required. As an extension to this, it could be differentiated by type of shed systems, animal feed, etc. Eventually, emissions could be measured with smart sensors in the barn, but this would increase the burden of implementation. In addition, this is less feasible for measuring emissions from dairy cattle, as dairy cattle are not often permanently housed in sheds (while pigs and poultry often are).

5.3.2 Sharing cap variant

This section discusses the differences in feasibility with the base variant for the different actors. Because the separate caps require different emission allowances to be passed on to different end users, differentiation by end users is a key issue in this variant. This is explained in detail in the next paragraph.

³⁰ By way of reference, one-off burdens for livestock farmers covered by the phosphate allowance system in 2016/2017 were estimated at around € 3.5 million. These include: response to receipt and monitoring of the advance notice calculation of manufacturing allowances and latent scope, as well as any objections and appeals. The structural administrative burden was estimated at around € 300,000 (Tweede Kamer der Staten-Generaal, 2016).



CO₂ emissions from fuels

For the feasibility assessment with regard to CO₂ emissions from fuels, the following basic premises are important (under the shared cap variant):

- there is one cap per sector, which means that the price for an ESR allowance also varies by sector;
- the same scope as the base variant in terms of sectors and type of emissions.

Feasibility assessment (relative to a situation without an ESR cap):

- **Government (**)**. The burden of implementation is largely the same as for the base variant. However, in the case of separate caps, the level of these separate caps must also be determined.
- **Dutch Emissions Authority (**)**. The complexity of the work and responsibilities of the Dutch Emissions Authority will increase compared to the base variant. The main difference from the base variant is that the trade register, where regulated entities can surrender and transfer allowances, becomes more complex. This is because separate caps require different allowances to be maintained for different groups. Therefore, the turnaround time for setting up the register will be longer than that for the trade register required for the base variant.
- **Liquid fuel supplier (*)**. The burden of implementation for the supplier of liquid fuels remains the same as the base variant, as only the mobility sector is supplied³¹ and therefore only one type of allowance needs to be purchased. The only thing that will differ is that the costs are passed on.
- **Energy supplier (**)**. For energy suppliers of natural gas the complexity increases significantly with separate caps, since energy suppliers are required to distinguish between end users from the different sectors (because different emission allowances apply to the different sectors). Textbox 8 explains the issue.
- **End user (0)**. The burden of implementation for the end user remains the same as in the base variant. Only the end users costs will vary per sector.

Textbox 8 - Determining the sector in which the end user falls

In general, energy suppliers supply natural gas to the following sectors: the built environment (households and utilities), industry, non-ETS industry³² and greenhouse horticulture. Therefore, if compliance with this sector classification is followed, the supplier must distinguish between the different allowances that can be passed on to the end users of these three groups. However, it is by no means self-evident that a energy supplier knows whether it is supplying energy to the built environment, industry or greenhouse horticulture:

- The process of identifying greenhouse horticulture farms is quite feasible. In fact, greenhouse horticulturists are required under the reduced energy tax rate for greenhouse horticulture to indicate to the energy supplier that they are greenhouse horticulturists; this information could be used under the ESR cap. However, this does involve self-reporting.
- It is not possible to make a completely clear distinction between the built environment and non-ETS industry. This could possibly be done by using SBI codes or self-declarations, but these each have drawbacks (see explanation later in this textbox). Alternatively, one could choose to drop the distinction between the built environment and non-ETS industry and make a distinction based on commercial and residential users or, for example, bulk and small consumers (see explanation further in this textbox).
- It is not possible to make a clear distinction between natural gas consumption for office buildings and greenhouses/industrial processes. This is explained further below using two examples: the energy tax exemption for metal industries and the reduced energy tax rate for greenhouse horticulture.

³¹ We assume that the amounts supplied by liquid fuel suppliers to non-mobility sectors will be negligible.

³² For ETS-2, energy suppliers must also distinguish between ETS-1 and ETS-2 customers. Engie expects this to be determined once and then updated periodically (source: interview Engie).

Self-declarations could be a possible solution to this. Alternatively, one can choose to drop the distinction between emissions for office buildings from greenhouse horticulture and industry on the one hand and emissions from greenhouses/industrial processes on the other. In that case, all that matters for energy suppliers is *who* they supply to, not *what for*. However, this may need to take into account state aid frameworks; after all, natural gas consumption for office buildings in utilities would then be taxed differently from natural gas consumption for office buildings in non-ETS industry and greenhouse horticulture.

In the context of existing schemes, a distinction should also already be made between what part of natural gas consumption goes to office buildings and what part to processes. Examples:

- **Exemption energy tax for the metal industry.** Part of natural gas consumption is for metal processing which is exempt from energy tax, while energy tax does have to be paid on the remainder of natural gas consumption. This distinction is currently based on an Annual Declaration indicating what proportion of natural gas is used for certain a purpose (office or process). This means the energy supplier has to rely on what the customer indicates, while the energy supplier is ultimately responsible.
- **Reduced energy tax rate for greenhouse horticulture³³.** Again, a distinction must be made between how much natural gas flows to greenhouses and how much to office buildings. This takes place in a similar manner to the metal industry, although the Declaration for greenhouse horticulture is for an indefinite period rather than for a period of one year.

Below, we describe some possible solutions (each with its own drawbacks) to distinguish between natural gas supply to different types of end users. These are possible solutions whose elaboration and implementation require further study.

- **SBI codes.** One possible route for being able to distinguish between different sectors could be the use of SBI (Standard Business Classification) codes. If SBI codes have not yet been requested by energy suppliers from customers, this can be ascertained via their Chamber of Commerce number. However, Engie contends that a Chamber of Commerce number regularly has multiple SBI codes (such as a company with multiple industries) and/or business entities (such as a holding under which several types of companies fall) attached to it, and each business entity may also have different SBI codes attached to it. To make this possible solution workable, clear guidelines need to be drawn up regarding what part of natural gas consumption falls under which sector. In this regard, the concession will have to be made that it is impossible to split natural gas consumption perfectly between buildings and processes/greenhouses.
- **Self-declaration.** As described above in relation to energy tax exemption for the metal industry and the reduced energy tax rate for greenhouse horticulture, a self-declaration could possibly be used that could also be combined with the SBI code system described above. This would require end users to indicate which sector they fall under and/or what proportion of natural gas consumption falls under which sector. An advantage of this method is that it is already used in practice (see examples above) and seems workable. One concession to be made here is that it may be prone to error and/or fraud. Again, it is not possible to split natural gas consumption perfectly between buildings and processes/greenhouses.
- **Commercial and residential end users.** As a possible alternative to the split between the built environment and non-ETS industry, a split could also be made between commercial and residential natural gas connections. One option is for energy suppliers to use the zoning plan of buildings and/or Chamber of Commerce registration (although there are also many Chamber of Commerce registrations at residential addresses) for this purpose. Another option is to simply ask whether users are commercial or private customers and check this via spot checks. The split therefore groups utilities (which have a wide variety of energy users) with non-ETS industry (where emissions arise mainly from processes). Because the group of business users is very diverse, the disadvantage of this 'cap for business users' is that it will result in less targeted steering. This could potentially lead to certain groups paying more or paying less ('free riders') than necessary. On the other hand, an advantage is that it does allow more targeted steering specifically for the group of residential users (private connections).

³³ This scheme will be phased out between 2025 and 2030 (Rijksoverheid, 2024).

- **Bulk and small consumers.** Another alternative to the split between the built environment and non-ETS industry, is a split between bulk and small consumers. The advantage is that it is easy to make a distinction based on natural gas consumption. The disadvantage of this is similar to the disadvantage of the split between commercial and residential users. This is because the bulk consumer group contains a wide variety of users (e.g. non-ETS industry, large offices, etc.), making it less easy to manage and leaving certain groups paying more or less than is necessary.

Non-CO₂ emissions (livestock farming)

Compared to the base variant, separate caps may make it more logical to allocate the management of emission allowances for livestock farming to the Netherlands Enterprise Agency.

Feasibility assessment (relative to a situation without an ESR cap):

- **Netherlands Enterprise Agency (*).** The Netherlands Enterprise Agency has experience with setting up a registry for allowances in connection with phosphate and manufacturing allowances. For reference, the one-off burden of executing and implementing the phosphate allowance system³⁴ was estimated at € 4.5 million for the years 2016 and 2017; the structural burden was estimated at € 2 million per year from 2018 onwards (Tweede Kamer der Staten-Generaal, 2016). However, the complexity of the registry for ESR allowances will be higher as these allowances are auctioned via an (external) auction platform and must be surrendered annually.
- **Dutch Food and Consumer Product Safety Authority (*).** In terms of enforcement and monitoring, little changes for the Dutch Food and Consumer Product Safety Authority compared to the base variant, except that information on allowances per livestock farmer must be obtained through the Netherlands Enterprise Agency instead of the Dutch Emissions Authority.
- **Livestock farmer (**).** Compared to the base variant, the main difference for the livestock farmer is that it may make more sense to allocate the management of the trade register to the Netherlands Enterprise Agency. In that case, livestock farmers can continue to use the Netherlands Enterprise Agency portal in the same way as they currently do for phosphate and manufacturing allowances. This would simplify implementation compared to the base variant, which requires registering with the Dutch Emissions Authority, applying for a permit from the Dutch Emissions Authority and using the trade register of the Dutch Emissions Authority.

5.3.3 Emission taxes with dispensation allowances

This section discusses the differences in feasibility of the basic and shared cap variants for the different actors.

CO₂ emissions from fuels

The following basic premises are important for assessing feasibility with regard to non-livestock farming (under the shared cap variant):

- the amount of the CO₂ tax should be determined;
- if the CO₂ tax follows the implementation of the CO₂ tax for the industry, there is no public market for trade in dispensation allowances, but rather it takes place bilaterally (which means there is little visibility on this);

³⁴ In relation to the adaptation of computer software, the issuance and handling of the advance notice and decision, and the communication of the impact of the law change on affected businesses.



- the benchmark for the number of dispensation allowances should be set;
- the scope is the same as the base variant and shared cap variant in terms of sectors and type of emissions.

Feasibility assessment (relative to a situation without an ESR cap):

- **Government (***)**. The burden of implementation is largely similar to that for the shared-cap variant. However, in this variant, the government should also determine the amount of the tax and the allocation of dispensation allowances. This is a complex trade-off that determines the extent to which the ESR target is met.
- **Dutch Emissions Authority (***)**. The burden of implementation is expected to increase compared to the separate caps variant. Instead of emission allowances, the Dutch Emissions Authority will now have to track and distribute dispensation allowances via the trade register. In addition, for the CO₂ tax for industry, the Dutch Emissions Authority is the party that collects the taxes and therefore keeps track of the financial transactions involved. If this is also allocated to the Dutch Emissions Authority in this policy variant, this will increase the burden of implementation.
- **Netherlands Environmental Assessment Agency (Planbureau voor de Leefomgeving, PBL) (**)**. The obvious solution is to make the Netherlands Environmental Assessment Agency responsible for advising, both periodically and per sector, about the level of the CO₂ tax. The Netherlands Environmental Assessment Agency previously conducted an analysis into the level of the CO₂ tax rate for industry (PBL, 2022a). The broader scope of the ESR cap (not one, but several sectors) also increases the complexity of the task. It is important that the Netherlands Environmental Assessment Agency has sufficient information to arrive at the correct advice about the level of the CO₂ tax. Advising on the benchmarks could also possibly be partly allocated to the Netherlands Environmental Assessment Agency³⁵.
- **Liquid fuel supplier (*)**. The burden of implementation for liquid fuel suppliers is expected to remain largely the same in the base and shared cap variants. In these variants, suppliers can trade in dispensation allowances instead of emission allowances. However, they may have to provide extra information for setting benchmarks.
- **Energy supplier (**)**. The burden of implementation for energy suppliers is expected to remain largely the same in the base and shared cap variants. If dispensation allowances are used, energy suppliers can trade in dispensation allowances instead of emission allowances. However, they may have to provide extra information for setting benchmarks.

Non-CO₂ emissions (livestock farming)

The burden of implementation will increase for livestock farmers for the base and shared cap variants. In these variants, they will have to deal with two instruments (tradable dispensation allowances and a CO₂ tax), which will increase complexity. If the dispensation allowances register is allocated to the Netherlands Enterprise Agency, the implementation for livestock farmers will change slightly (dispensation allowances have to be registered instead of emission allowances), but the burden of implementation is not expected to increase significantly. Implementation would remain the same for the Dutch Food and Consumer Product Safety Authority as in the shared cap variant; enforcement and monitoring do not need to change.

³⁵ The CO₂ tax for industry uses European benchmarks.



5.3.4 Assessment of feasibility

In this section, we have qualitatively assessed the feasibility for different actors for all variants; where 0, *, ** and *** express an increasing burden of implementation. Burden of implementation assessment *compared to a situation without an ESR cap*. The actors in Table 10 are not necessarily the actors that will carry out the implementation (for example, advice on the level of the CO₂ tax could be given by a party other than the Netherlands Environmental Assessment Agency), but these parties are the most obvious ones.

The base variant seems the most feasible for the actors involved. We envisage that the burden of implementation will increase by introducing separate caps and dispensation allowances into the design. When separate caps are used, the burden of implementation increases more significantly for energy suppliers of natural gas than for liquid fuel suppliers. In the case of separate caps, this is due to the fact that energy suppliers are required to distinguish between the end users to whom they supply natural gas. In all variants, the administrative burden on livestock farmers increases substantially compared to a situation without an ESR cap.

Table 10 - Assessment burden of implementation (relative to a situation without an ESR cap)

Scope of emissions	Sectors	Actor	Role	Base option	Separate caps	Emissions tax + dispensation allowances
All	All	Government	Regulatory party	*	**	***
		PBL	Advisor	0	0	**
		NEa	Regulator and enforcement agency	*	**	***
		Auction platform	Facilitate auction	*	**	**
CO ₂ emissions from fuels	Built environment, mobility, industry, greenhouse horticulture	End user	Target group	0	0	0
		(Liquid) fuel supplier	Regulated entity	*	*	*
		Energy supplier	Regulated entity	*	**	**
Non-CO ₂ emissions	Livestock farming	Livestock farmers	Target group/regulated entity	***	**	***
		RVO	Regulator	*	**	**
		NVWA	Enforcer	**	**	**

0 = No difference in burden of implementation.

* = Limited increase in burden of implementation.

** = Significant increase in burden of implementation.

*** = Very significant increase in burden of implementation.

5.4 Implementation bottlenecks and areas of concern

Based on the analysis in this section, we have identified the following as key bottlenecks and areas of concern.



Delineation of separate caps

If the choice is made to adhere to climate sectors for separate caps, energy suppliers will be required to distinguish between end users in order to properly pass on the different allowances (with different prices). Based on the classification by climate sectors, other emission allowances should be submitted for natural gas consumption from non-ETS industry, greenhouse horticulture and offices. However, such companies regularly have only one natural gas connection. A system with SBI codes or self-declarations (or a combination of both) could possibly be used to target climate sectors, but this needs to be studied further. In any case, it will be impossible to make a clear distribution of actual natural gas consumption to different sectors. Instead of distinguishing between non-ETS industry and the built environment, a distinction could be made between commercial and residential users or bulk and small consumers, for example.

As with any methodology, concessions will have to be made and weighed up against each other. For the sake of practicability, such concessions or choices have also regularly been made in other schemes. Examples include the implementation of ETS-2 in the Netherlands (where a maximum opt-in has been chosen), the green gas blending obligation (which is aligned with the scope of ETS-2) and the energy tax exemption for metal industry or the reduced energy tax rate for greenhouse horticulture (where self-declarations are used for the distribution of natural gas consumption to buildings and processes/greenhouses).

Determine emission taxes and benchmarks for dispensation allowances

In the variant with dispensation allowances, the level of the CO₂ tax combined with the benchmarks set ultimately determine the extent to which the instrument is able to achieve its intended target. If the price is too low, the target is unlikely to be achieved. Determining the CO₂ tax is a complex task. The Netherlands Environmental Assessment Agency previously conducted an analysis of the CO₂ tax for the industry. However, the ESR cap has a larger scope (namely not one, but several sectors), increasing the complexity of the task. It is therefore essential that the government (or: the implementing party, the Netherlands Environmental Assessment Agency) has sufficient information to arrive at the best possible advice on the level of CO₂ tax and benchmarks.

Measuring emissions in livestock farming

It is currently not possible to measure emissions from livestock farming. As discussed in this section, a fixed-rate system can therefore be chosen (whether or not for the first few years), in which the average emissions per animal species and taking into account the shed system can be used to determine the amount of emission allowances required. However, actual emissions depend on several factors, including the farmer's management measures and the animal feed used. A fixed-rate system is therefore inaccurate and does not encourage livestock farmers to switch to a barn system or animal feed that provides lower emissions. Eventually, emissions could potentially be measured with smart sensors in the barn, but that, compared to a fixed-rate system, does increase the burden of implementation. In addition, this is less feasible for measuring emissions from dairy cattle, as dairy cattle are not often permanently housed in sheds (while pigs and poultry often are).

Burdens of implementation for livestock farming

The large number of regulated entities (more than 20,000 livestock farmers) for livestock farming ensures that the overall administrative burden increases significantly in all variants. For all livestock farmers, the administrative burden will increase due to:

- **Use of the new system.** If the trade register is allocated to the Dutch Emissions Authority, which is the most obvious option at least in the base variant, livestock farmers will have to commission a new system specifically for them. If the trade register is allocated to the Netherlands Enterprise Agency, which is more obvious in the variant with separate caps and dispensation allowances, livestock farmers may be able to use the same portal.
- **Purchasing allowances via an auction platform.** In the phosphate and manufacturing allowances system, allowances are issued once, after which they can be traded. However, no auction of these allowances will take place. Under the ESR cap, however, livestock farmers will be confronted with an auction platform.
- **Annual report.** Under the ESR cap, livestock farmers will have to report the number of animals annually (possibly supplemented by data on barn type, animal feed, etc.). Farmers currently already fill in the Combined Declaration each year; the data from this could potentially be used for the ESR cap. In addition, livestock farmers currently operate with phosphate and/or manufacturing allowances and the only administrative burden for a livestock farmer is when the number of animals increases or decreases; in that case the livestock farmer has to trade allowances.

Determining final natural gas consumption

In all variants, the turnaround time for finalising the natural gas consumption of bulk consumers is a concern. Energy suppliers currently only receive the final natural gas readings for bulk consumers from the (regional) grid operators for the second half of the previous year in October; this is at least four months later than the date on which emission allowances for the ETS-2 must be surrendered (namely, by 31 May). This may result in energy suppliers having to make an estimate and they may end up surrendering more or fewer emission allowances than they should have. A possible solution to this could be a correction mechanism. Another solution to avoid this is to regulate that emission allowances do not have to be surrendered until later in the year.

5.5 Conclusions

In this section, we addressed the main questions:

- Which actors play which role in implementation?
- What steps are needed to set up the system and what is a realistic timeline?
- How can the feasibility for different actors be assessed for the different policy alternatives?
- What are the areas of concern and potential bottlenecks in implementation?

Structuring implementation

In terms of implementation, we assume that the processes and executing parties of existing instruments such as ETS-2, the phosphate allowances system (for dairy livestock farmers), the manufacturing allowances system (for pig and poultry livestock farmers), the energy tax, fuel excise duties and the CO₂ taxes for industry and greenhouse horticulture will be aligned as much as possible.

In that case, there will be no logical place for the following main aspects:

- For the purposes of recording the allowances for livestock farming, there is a choice of allocating this to the Dutch Emissions Authority (who manage ETS allowances) or the Netherlands Enterprise Agency (who also manage phosphate and manufacturing allowances). In the base variant, it would be more obvious to allocate this to the Dutch Emissions Authority; in the variants with separate caps and dispensation allowances, it might be better if this was allocated to the Netherlands Enterprise Agency.
- In ETS-2, the auction platform is allocated both internationally and privately to the European Energy Exchange, the EEX. For a national system, this task/role should be put out to tender.

Timeline

Regarding the timeline for the implementation of the ESR cap, it is expected that it can largely be aligned with the timeline/turnaround times for the ETS-2 implementation. There are two years between the final European decisions on ETS-2 (December 2022) and permit requirements (from 1 January 2025). In any case, this turnaround time seems necessary to implement the required legislative proposals or amendments, provide sufficient information to regulated entities and set up the appropriate (ICT) systems and caps. After that, companies will have to monitor and report for two years before ETS-2 allowances are auctioned from 2027 and must be surrendered from 2028.

These turnaround times also seem a good guideline for the ESR cap. However, the more the system deviates from ETS-2, the more complicated this will be and the more the turnaround times may have to diverge. For example, a design with separate caps and dispensation allowances increases complexity for multiple actors, which may require more time to implement ESR cap. The addition of livestock farming may also require different turnaround times in all policy variants; setting up monitoring and reporting standards may require more time.

In addition, it should be mentioned that our analysis was conducted under the current policy context. If the ESR cap were to take effect only after 2030, it is likely that the policy context will have changed significantly. This context and its interaction with the ESR cap will then have to be reanalysed.

Assessment of the burden of implementation per actor

Table 10 provides an overview of the assessment of feasibility for different actors. We note that the burden of implementation for the actors involved increases as separate caps and dispensation allowances are introduced into the design; the base variant therefore appears to be the most feasible. The burden of implementation will fall mainly on regulated entities (energy suppliers, liquid fuel suppliers and livestock farmers), regulators/enforcers and the government; for end users, there will be little change in implementation.

Bottlenecks in implementation

Several implementation bottlenecks have been identified. The most important are:

- **Delineation separate caps.** Being able to identify different types of natural gas end users (in the case of separate caps) is a big challenge. This could possibly be solved via a system in which SBI codes or self-declarations are used, but this needs further study. This system would not allow a precise breakdown of actual natural gas consumption by sector.



- **Determine the level of emission tax and benchmarks.** Determining the emission tax and benchmarks (in the case of dispensation allowances) for the ESR cap is a complex task. The Netherlands Environmental Assessment Agency previously conducted an analysis of the CO₂ tax for the industry. However, the ESR cap has a larger scope (namely not one, but several sectors), increasing the complexity of the task. It is therefore essential that the government (or: the implementing party, the Netherlands Environmental Assessment Agency) has sufficient information to arrive at the best possible advice on the level of CO₂ tax and benchmarks. It is therefore important to safeguard this as much as possible in the monitoring and reporting requirements for the regulated entities. However, it will not be feasible to determine taxes and benchmarks that accurately safeguard the ESR target.

There are several areas of concern in livestock farming:

- Measuring emissions from livestock farming is a complex task. At present, there is no method that can properly measure emissions from livestock farming. To overcome this, a fixed-rate system can be chosen, but this is an inaccurate method and it makes it more difficult to use it to encourage livestock farmers to take management measures or switch to more sustainable animal feed. Eventually, emissions could potentially be measured with smart sensors in the barn. However, this is not a solution for measuring emissions from dairy cattle, which are often not permanently in the barn (while this is often the case for pigs and poultry).
- Due to the large number of regulated entities (livestock farmers) and the increase in the administrative burden for this group, the total burden of implementation increases significantly. As long as the point of intervention lies with the livestock farmer, this cannot be fixed immediately.
- The turnaround time for determining the final natural gas consumption at bulk consumers. Energy suppliers are unable to determine final gas levels for the previous year for many bulk consumers until October. This is a bottleneck that also plays out in ETS-2, where emission allowances must be surrendered annually in May. Possible solutions include a correction mechanism or having to surrender the allowances later.

6 Impact

In this chapter, we estimate the impact of an emissions cap on emissions reduction by sector, the resulting price for ESR allowances, the effect on end-user costs, competitiveness and carbon leakage. We do this for the three variants of a national emission cap described. This allows us to understand the impact of certain design choices.

6.1 Method

We use a cost-minimisation model to identify the varying impact. This model brings together different sector models in order to identify the impact of an emission cap. Table 11 provides an overview of our determination of the impact and the method of analysis.

Table 11 - The impact determined and the method used

Impact	Method of analysis
CO ₂ reduction per sector	Cost minimisation model.
Price of emission allowances (ESR price)	
Energy rates	
Impact on the competitiveness of non-ETS industry and agriculture	Risk analysis based on key figures (Statistics Netherlands (CBS), ProdCom) for sectors and subsectors with sufficient data availability (impact on burdens, cost prices, trade intensity, possibility of passing on costs using the estimates of Armington elasticity). Other sectors qualitative.

Marginal cost reduction curve

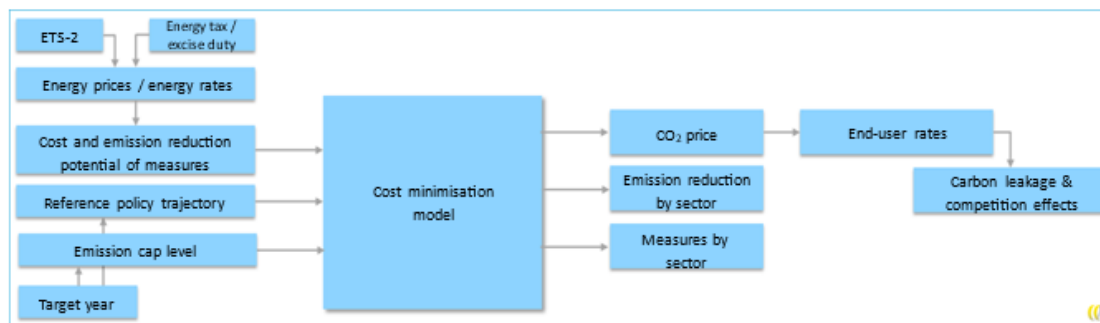
We identify the additional effects of the emission cap, compared to a situation without an emission cap. We use this method to approach how the instrument works:

1. Reduction targets are set. These are then the **input** for the calculation.
2. Emission allowances are auctioned and traded, creating an emission price. This price encourages participants (the market/sectors) to take reduction measures. The **output** of the calculation is the ESR price at which measures are profitable.

The structure of the calculation is set out in Figure 7. The main input values for the model are energy prices, investment costs and emission reduction potential of measures by sector, a reference scenario and the level of the emission cap.



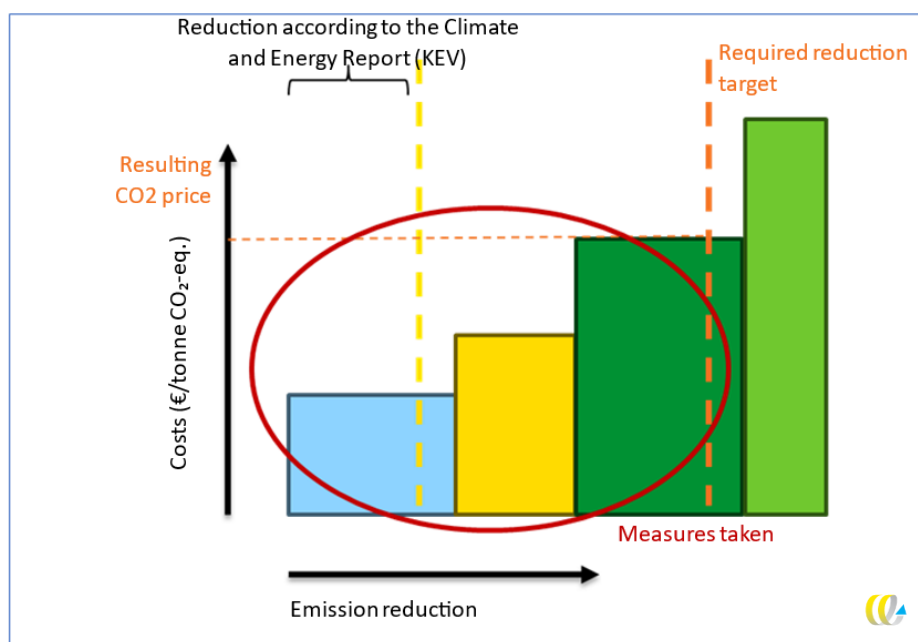
Figure 7 - Diagram of calculation method



The essence of the model is a marginal cost reduction curve (see Figure 8). The marginal cost reduction curve consists of measures with associated emission reductions and costs expressed in €/ton CO₂-eq. The measures are sorted by cost-effectiveness. Based on a reference scenario and the targets, we know how much additional reduction needs to be achieved. The cost curve shows which measures need to be taken to achieve this reduction. We then determine the marginal reduction costs; these provide an estimate of the expected ESR price per CO₂-eq. This ESR price is in addition to the ETS-2 price, energy tax, excise duty, etc.

We use a different model for each sector. These sector models calculate cost-effective emission reduction measures at a given energy price. This is based on the assumption that the cost-effective measures are taken in order of cost-effectiveness, with one cap incorporating measures from different sectors.

Figure 8 - Schematic overview of the marginal cost reduction curve. Each block represents a measure with associated emission reduction and costs expressed in €/ton CO₂-eq. Based on the targets, we determine the reduction required. We then obtain the resulting ESR price.



The model therefore provides an estimate of what the market will do to stay under the cap. Important caveats and parameters in this regard are:

- **Passing on a price effect.** We expect that the participants (fuel suppliers, livestock farmers) will pass on the price effect to end users (companies and consumers), and that end users will be encouraged by this price incentive to take action themselves (behavioural effects). If the price effect is not passed on, measures for end users will be cancelled and the only measures left will be more limited (and possibly more expensive) measures for participants, which would increase the ESR price to achieve the same reduction.
- **Perspective for action.** We also assume that both participants and end users have perspective for action to be taken. Parameters include investment capacity, grid capacity and availability of materials and personnel, etc. If these parameters are not present, the ESR price will go up further.
- **Target year.** We apply a target year. That means we only consider the situation in that year and not the period before. We assume that if the measure is profitable in the target year, the measure will be adopted. We also assume that the market will anticipate this. We apply the energy prices in the target year. We have not assumed cost reductions due to innovation because this is too uncertain.

We have aligned the sector models as best we can, but in certain aspects the sector models differ:

- **Resistance costs.** For housing, we take into account that households do not always make an economically rational choice. We do this by including ‘resistance costs’. Resistance costs are the non-financial costs of the inconvenience of a measure. For example, a household may forego a cost-effective insulation measure because it dreads the associated renovation. For resistance costs, we apply 57% of discounted investment costs (for a further explanation, see Annex C.2 (only available in Dutch report)).
- **Mobility behaviour.** We consider behaviour in two ways with regard to transport. First, we take into account behaviour of businesses and individuals via elasticities. This includes the extent to which these target groups adjust their behaviour due to price incentives. After that, we take into account ‘switching thresholds’ when switching to electric vehicles. Part of these switching thresholds include the resistance users feel for switching to an electric vehicle.
- **Natural moments.** In the mobility model, the potential reduction takes into account the time of purchase of a new car. We do not directly take into account the European ban on the sale of conventional vehicles from 2035. We do envisage that from 2035, almost all light vehicles purchased will be electrical vehicles. In the other sectors, development time or time of purchase was not taken into account.

Sources used

As a reference scenario, we use the emission reduction from the Climate and Energy Report 2023. This has a bandwidth: maximum and minimum residual emissions. We show the results for both scenarios from the Climate and Energy Report. For emission targets, we base ourselves on the 2023 Policy Document on Climate Change (Ministerie van EZK, 2023a). We determine the energy tariffs based on the wholesale price from the Climate and Energy Report 2022³⁶, the ETS-2 price from the Climate and Energy Report 2023 and the level of ET/excise duty/exemptions from the Tax Plan 2024.

³⁶ The Climate and Energy Report 2023 does not update wholesale prices; the Climate and Energy Report 2022 provides the most recent data.



Scenarios and sensitivity analyses

For all variants, we consider two scenarios: the maximum and minimum emission scenario from the 2023 Climate and Energy Report.

In addition, we conduct several sensitivity analyses of the base variant, these are:

- higher 2030 reduction target (60% instead of 55%);
- phase-out of energy tax and excise tax: energy tax to legal minimum under the Energy Taxation Directive (ETD);
- target year 2040 (particularly affecting reference scenario and reduction target).

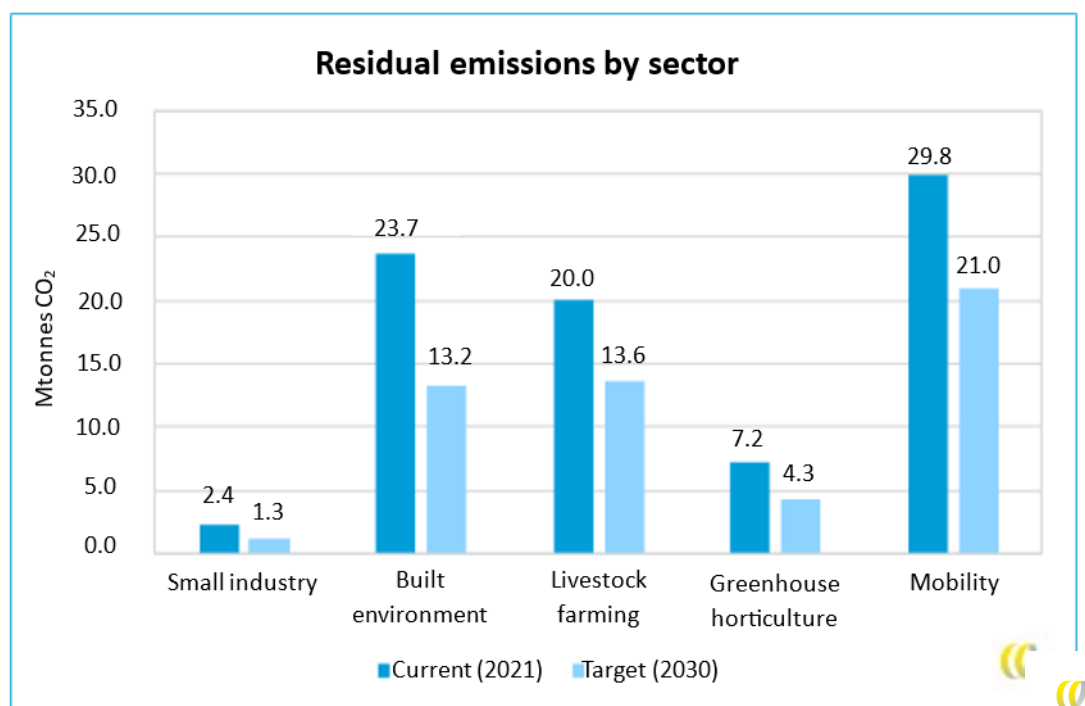
6.2 Impact on CO₂ costs, energy price and emission reduction

Several variants of an emission cap were examined in Chapter 3. Three variants were selected for further analysis. These are the base variant, the base with separate caps and the emission tax with dispensation allowances. This section describes the effects of these three variants.

Reduction target

The reduction target is an input for the calculations. For the reduction target in 2030, we base ourselves on the 2023 Policy Document on Climate Change (Ministerie van EZK, 2023a). Figure 11 shows emissions in 2021³⁷ and the 2030 target we use in this analysis. In total, nearly 30 Mton of CO₂ must be reduced by 2030 compared to 2021.³⁸

Figure 9 - Overview of current emissions (2021) and the residual emissions target used in 2030



³⁷ At the time of writing, the most recently established data is for emissions in 2021. The data for 2022 still has provisional status.

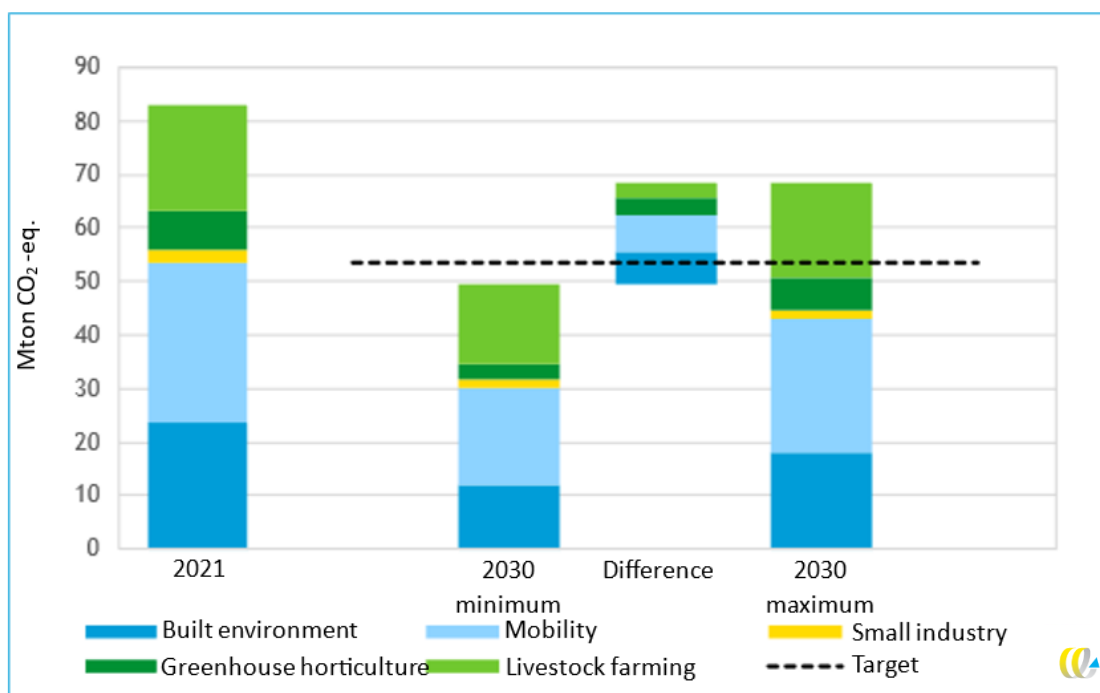
³⁸ The waste sector is outside the scope of the impact analysis. This sector pays the lowest CO₂ tax in the industry.

Reference scenario

For the 2030 reference scenario, we use the emission projections from the 2023 Climate and Energy Report, which has a bandwidth: the minimum and maximum emission scenario (also called Climate and Energy Report minimum or Climate and Energy Report maximum)³⁹. Figure 12 shows both reference trajectories alongside current emissions. In addition, we have also reflected the objectives in Figure 10.

In the minimum emissions scenario of the Climate and Energy Report, the target is already met and there is no additional reduction target. The reduction target in 2030 is 15 Mton extra compared to the maximum emissions scenario of the 2023 Climate and Energy Report.

Figure 10 - Reference path and 2030 target used in the analysis

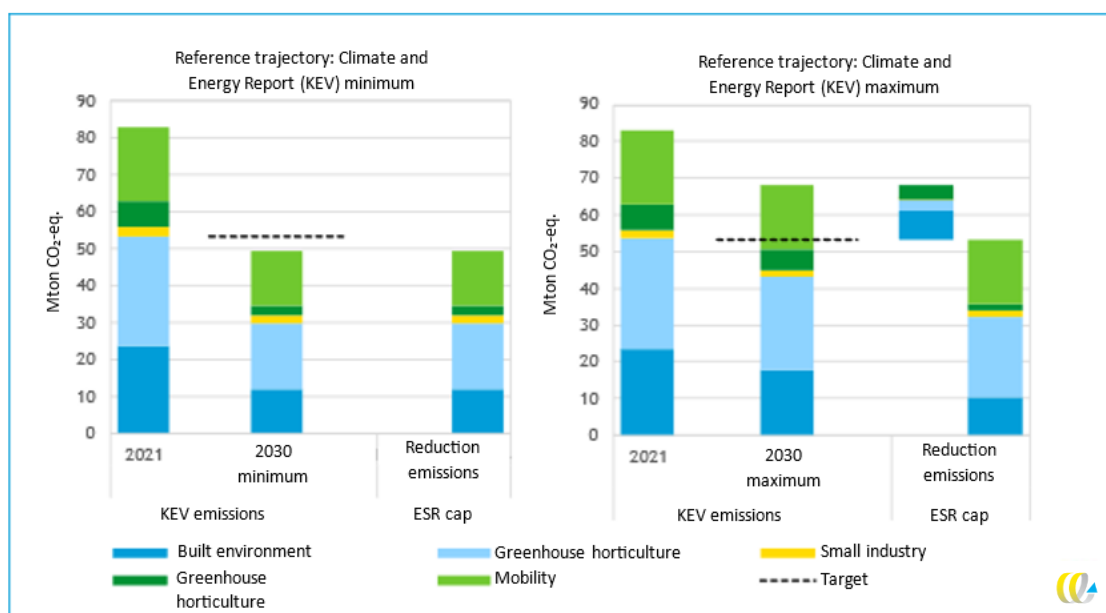


Impact of the base variant

First, we show the impact of applying the base variant: an emission cap with an overarching reduction target for all sectors within the system. The minimum emissions scenario from the Climate and Energy Report (Climate and Energy Report min) already achieves the total reductions required. In the Climate and Energy Report minimum scenario, where existing policies work well, this variant of the emission cap has no impact on CO₂ reduction. The Climate and Energy Report maximum scenario does see additional reductions due to the ESR cap. Figure 11 shows the emission reduction due to the emission cap for the two reference trajectories.

³⁹ Not all policies (such as the CO₂ tax in greenhouse horticulture) are included in the bandwidth of the Climate and Energy Report. As a result, the impact may still shift slightly.

Figure 11 - Emissions in 2021, 2030 according to the Climate and Energy Report and in 2030 in the base variant. The reduction due to the ESR cap is relative to the minimum (on the left) and maximum (on the right) emissions scenarios from the Climate and Energy Report



The reductions take place mainly in the built environment and in greenhouse horticulture. In these sectors, emission reductions are most cost-effective according to the sector models. This means that the unprofitable top of the measures in these sectors are lower than in the other sectors. Among other things, this is due to existing policies. For example, due to subsidies for making buildings more sustainable and the adjustments to the tax schemes for greenhouse horticulture, the uneconomic top of measures in these sectors is lower and this is where most of the reduction takes place when the ESR cap is introduced. Reductions also occur in mobility, but they are relatively small compared to total mobility emissions. As a result, the unprofitable top of measures in this sector are higher than in the built environment and greenhouse horticulture. In livestock farming, there is no emission reduction at all due to the emission cap. Most technical measures are already included in the reference scenario. The remaining measures have such a high uneconomic top that they are not profitable with the resulting emission price. For this reason they are not taken into account in the modelling.

This distribution in emission reduction differs from the difference between the Climate and Energy Report minimum and the Climate and Energy Report maximum scenarios (see Figure 10). Especially in the built environment and greenhouse horticulture, the model emission reductions are higher than in the Climate and Energy Report. In livestock farming, the reduction is actually lower (zero) compared to the Climate and Energy Report. In principle, the analysis shows that reductions in built environment and greenhouse horticulture are more cost-effective than in the other sectors. There are two reasons why this does not match the Climate and Energy Report:

1. The policy does not drive the most cost-effective measures.
 2. Cost-effective measures are not feasible in practice, for example due to split incentives in rental housing and labour shortages. These aspects are not included in our model.
- The impact of this is further described in Section 6.4.

Textbox 9 - Comparison of calculated ESR price with damage

The environmental pricing per ton of CO₂ has been set by CE Delft at € 130 per ton in 2021 (CE Delft, 2023a). This price is also used in studies by the Netherlands Environmental Assessment Agency and others. This price is based on prevention costs, or the lowest cost to achieve a given target. The damage is assumed to be of similar order of magnitude. Although there are no unequivocal estimates of this, it can be reasoned that the cost of the efforts we want to make to meet a climate target corresponds to the cost of avoided damage. For 2030, this price is estimated at € 195. This is slightly lower than the price resulting from our calculation. This is due to differences in scope. Environmental pricing is based on meeting the global CO₂ target, while this study is only concerned with the Dutch climate target in the ESR sectors.

In the minimum emissions scenario, there is no impact of the ESR cap. The CO₂-eq. price of this cap is then € 0/ton CO₂-eq. In the maximum emissions scenario from the Climate and Energy Report (Climate and Energy Report maximum), the emission cap does provide additional reductions. In this case, the resulting ESR price is € 200/ton CO₂-eq., leading to a gas price increase of €0.36/m³ and a petrol price increase of € 0.47/litre (see Table 12). In Section 6.5, we elaborate on the impact on end users.

Table 12 - CO₂-eq. price and impact on natural gas price, average energy bill, petrol price and costs for livestock farming, base variant, 2030

Reference scenario	CO ₂ -eq. price (€/ton CO ₂ -eq.)	Impact on natural gas price (€/m ³)	Impact on average energy bill ⁴⁰ (€/year)	Impact on petrol price (€/l)	Impact per litre of milk ⁴¹
Climate and Energy Report minimum	€ 0	€ 0	€ 0	€ 0	€ 0
Climate and Energy Report maximum	€ 200	€ 0.36	€ 416	€ 0.47	€ 0.09

In this Climate and Energy Report scenario, government revenues from auctioned allowances (and therefore the total burden increase for citizens and businesses) are € 10.7 billion with over 53 Mton residual emissions in 2030 and an ESR price of € 200/ton CO₂-eq. In doing so, we have assumed that the auction price approximates the market price. The total burden by sector due to the ESR price is shown in Table 13.

Table 13 - Total burden by sector due to ESR price, base variant, 2030

Sector	Residual emissions (Mton)	Charges by sector (€ billion)
Built environment	10.1	2.0
Mobility	22.2	4.4
Small industry	1.7	0.3
Greenhouse horticulture	1.9	0.4
Livestock farming	17.5	3.5
Total	53.4	10.7

⁴⁰ Assuming an average gas consumption of 1,169 m³ (Milieu Centraal, 2023).

⁴¹ Assuming emissions of 0.442 CO₂-eq. per kg milk (methane). According to Statistics Netherlands (CBS), a cow produces on average about 9,148 kg of milk per year.

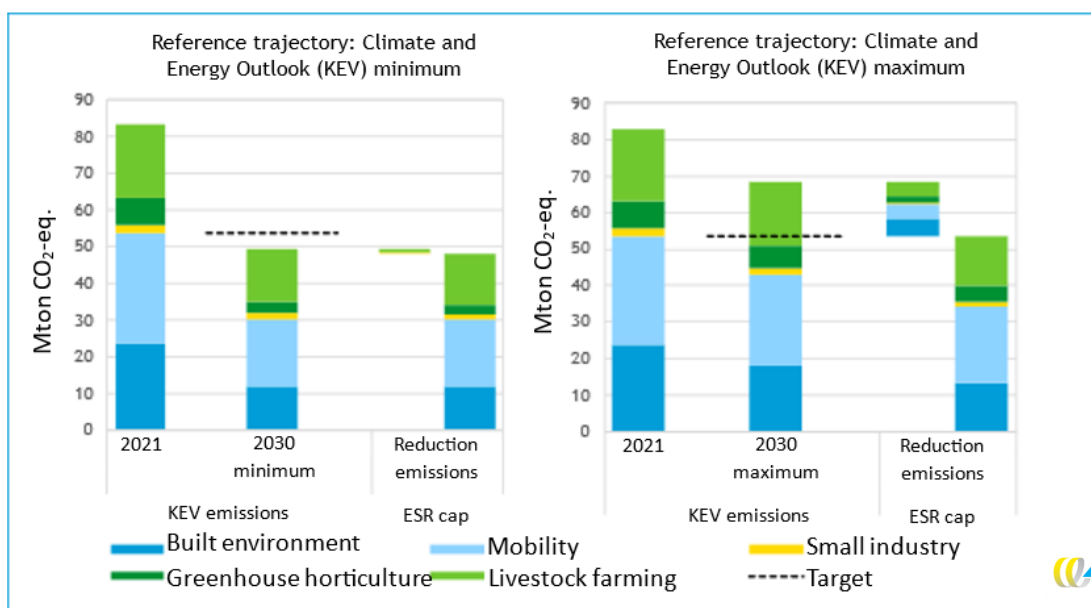
Impact of separate caps

In the shared-cap variant, the same total reduction must be achieved as in the base variant, but now an emission cap is set per sector. We set the caps per sector equal to the indicative residual emissions from the 2023 Policy Document on Climate Change (Ministerie van EZK, 2023a).

Figure 12 shows emission reductions by sector. Using the Climate and Energy Report minimum scenario as a reference scenario, the overall target is met for all sectors although additional reductions are still needed in small industry and livestock farming to meet the sector targets.

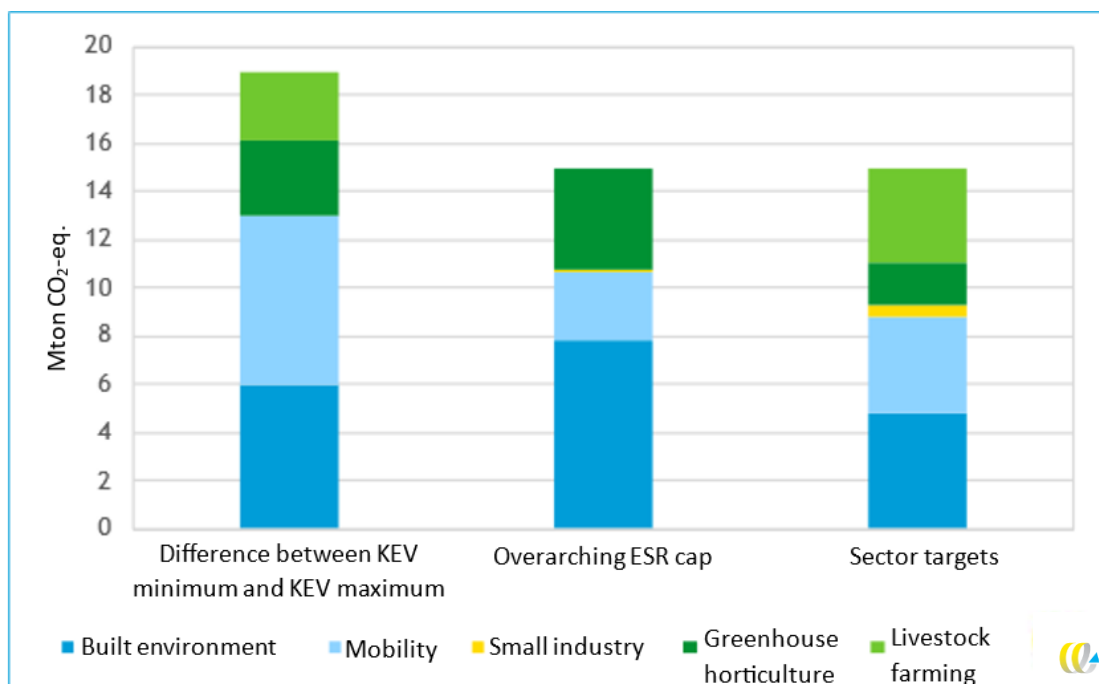
Using the Climate and Energy Report maximum scenario as a reference scenario, emission reductions are needed in all sectors to meet the sector targets. The total reduction due to the emission cap is the same as in the base variant, but the distribution across sectors differs. Compared to the base variant, more reductions take place in mobility, livestock farming and small industry in this variant.

Figure 12 - Emissions in 2021, 2030 according to the Climate and Energy Report and 2030 in the variant with separate caps. The reduction due to the ESR cap is relative to the minimum (on the left) and maximum (on the right) emissions scenario from the Climate and Energy Report.



For comparison, we show in Figure 13 the difference between the Climate and Energy Report minimum and the Climate and Energy Report maximum scenarios, the emission reduction in the base variant and the emission reduction targets by sector. This shows that the emission reductions that take place as a result of the separate caps variant are more in line with the reductions expected in the Climate and Energy Report minimum scenario.

Figure 13 - The distribution of additional emission reductions compared to the reference scenario Climate and Energy Report maximum across sectors, 2030 in the variant with separate caps



A variant with sector caps leads to different CO₂-prices per sector. In the Climate and Energy Report minimum scenario, the reduction target is not met in every sector. As a result, the emission cap with separate caps provides additional emission reductions in small industry and livestock farming. The resulting CO₂ prices are € 223 and € 430/ton CO₂-eq., respectively. In the Climate and Energy Report maximum scenario, emission reductions are required in each sector to meet the sector targets. The resulting CO₂ prices are in Table 14. The ESR price in greenhouse horticulture is € 0/ton CO₂-eq. This means that the measures to be taken in greenhouse horticulture are cost-effective according to our modelling. This is mainly due to the changes in the tax plan (see Annex C.2, only available in Dutch report).

Table 14 - Calculated ESR price and impact on natural gas price, average energy bill, petrol price and costs in for livestock sector. ESR price is additional to price increases by existing policy, variant with separate caps, 2030

Reference scenario	Sector	ESR price (€/ton CO ₂ -eq.)	Impact on natural gas price (€/m ³)	Impact on average energy bill ⁴² (€/year)	Impact on petrol price (€/l)	Impact per litre of milk (€/kg) ⁴³
Climate and Energy Report minimum	Built environment	€ 0	€ 0	€ 0	-	-
	Mobility	€ 0	-	-	€ 0	-
	Small industry	€ 223	€0.40	-	-	-
	Greenhouse horticulture	€ 0	€ 0	-	-	-
	Livestock farming	€ 430	-	-	-	€ 0.19
Climate and Energy Report maximum	Built environment	€ 100	€ 0.18	€ 210	-	-
	Mobility	€ 300	-	-	€ 0.71	-
	Small industry	€ 223	€ 0.40	-	-	-
	Greenhouse horticulture	€ 0	€ 0	-	-	-
	Livestock farming	€ 430	-	-	-	€ 0.19

The revenue for the government from auctioned allowances (and therefore the total increase in the burden for citizens and businesses) in this Climate and Energy Report scenario is € 13.7 billion with over 53 Mtons of residual emissions in 2030 and the resulting ESR price per sector. In doing so, we have assumed that the auction price approximates the market price. It follows that this variant is less efficient than the overarching cap variant. The total burden by sector due to the ESR price is shown in Table 15.

Table 15 - Total burden by sector due to ESR price, separate caps, 2030

Sector	Residual emissions (Mton)	Charges by sector (€ billion)
Built environment	13.2	1.3
Mobility	21.0	6.3
Small industry	1.3	0.3
Greenhouse horticulture	4.3	0.0
Livestock farming	13.6	5.8
Total	53.4	13.7

Impact of emission taxes with dispensation allowances

The effect of an emission tax with dispensation allowances is similar to the emission cap variants when the CO₂ tax level is chosen is sufficiently high (i.e. at least the marginal reduction costs)⁴⁴ and the number of dispensation allowances is equal to the intended residual emissions. In that case, the emission reduction will also be equal to the reduction

⁴² Assuming an average gas consumption of 1,169 m³ (Milieu Centraal, 2023).

⁴³ Assuming emissions of 0.442 CO₂-eq. per kg milk (methane).

⁴⁴ The ESR price in the emission cap variants has been set to equal the marginal reduction costs. Therefore, the tax rate should be at least the ESR price of the other variants.



in the other systems. The price for dispensation allowances will be equal to the marginal reduction costs.

Table 16 - The minimum tax level, emission tax, 2030

Reference scenario	Sector	Minimum tax level (€/ton CO ₂ -eq.)
Climate and Energy Report minimum	Built environment	€ 0
	Mobility	€ 0
	Small industry	€ 223
	Greenhouse horticulture	€ 0
	Livestock farming	€ 430
Climate and Energy Report maximum	Built environment	€ 100
	Mobility	€ 300
	Small industry	€ 223
	Greenhouse horticulture	€ 0
	Livestock farming	€ 430

If the set price of the emission tax is lower than the marginal reduction costs, the intended reduction will not be achieved.

In theory, allocating the free dispensation allowances will not affect the distribution of emission reductions as they will occur where it is most cost-effective. It is also not expected to reduce costs for households (see also Textbox 3). However, it may lead to a transfer of revenues from free dispensation allowances if parties sell them within the industry (windfall profits). This would also be the case with an emission cap if free allocation of emission allowances is chosen.

6.3 Sensitivity analyses

We have conducted a number of sensitivity analyses. These reveal areas of uncertainty or robustness in the results. In addition, sensitivity analyses can provide additional insights. We have conducted the following sensitivity analyses:

- **Higher reduction target 2030 (60% instead of 55%).** What are the additional costs/ CO₂ price at a higher target and in which sectors is there additional reduction potential?
- **Phase-out of energy tax and excise tax.** What is the breakdown in emission reductions across sectors if the cost increase for consumers is limited? Does the resulting CO₂ price actually ensure lower energy costs for consumers?
- **Target year 2040.** Where does the additional reduction take place according to the modelling if the reduction target is substantially higher and there is more time to achieve the reduction?

We have applied the sensitivity analyses to the base variant of the ESR cap. It is therefore an emission cap with an overarching target across sectors, in which trade between sectors is possible.

Level of the cap based on reduction target 60%

With a higher reduction target of 60% instead of 55%, reductions do take place in all sectors in the base variant (see Figure 14 and Table 17). Most of the additional reduction occurs in small industry, where less than 20% of emissions remain when the emission cap is applied. There is also additional reduction in the built environment and in mobility, as well as a very limited reduction in greenhouse horticulture and livestock farming. The additional emission reduction in mobility is about the same in absolute terms as in the built environment, however the total emissions from mobility are much larger. Relatively speaking, the additional emission reduction from mobility is therefore smaller than in the built environment.

Insights from this sensitivity analysis:

- Much of the emissions reduction in small industry falls outside the modelling reduction with a 55% reduction target, but within it with a 60% reduction target. Because there are uncertainties in the model, this also means that it is uncertain how much reduction in small industry is achieved with an ESR cap. This could also be higher in the base scenario with a 55% reduction target.
- That relatively little reduction is achieved in mobility and livestock farming is still true with the 60% cap. This is therefore a very robust conclusion.

Figure 14 - Emissions in 2021, 2030 according to the Climate and Energy Report and in 2030, 55 and 60% emission reduction, base variant

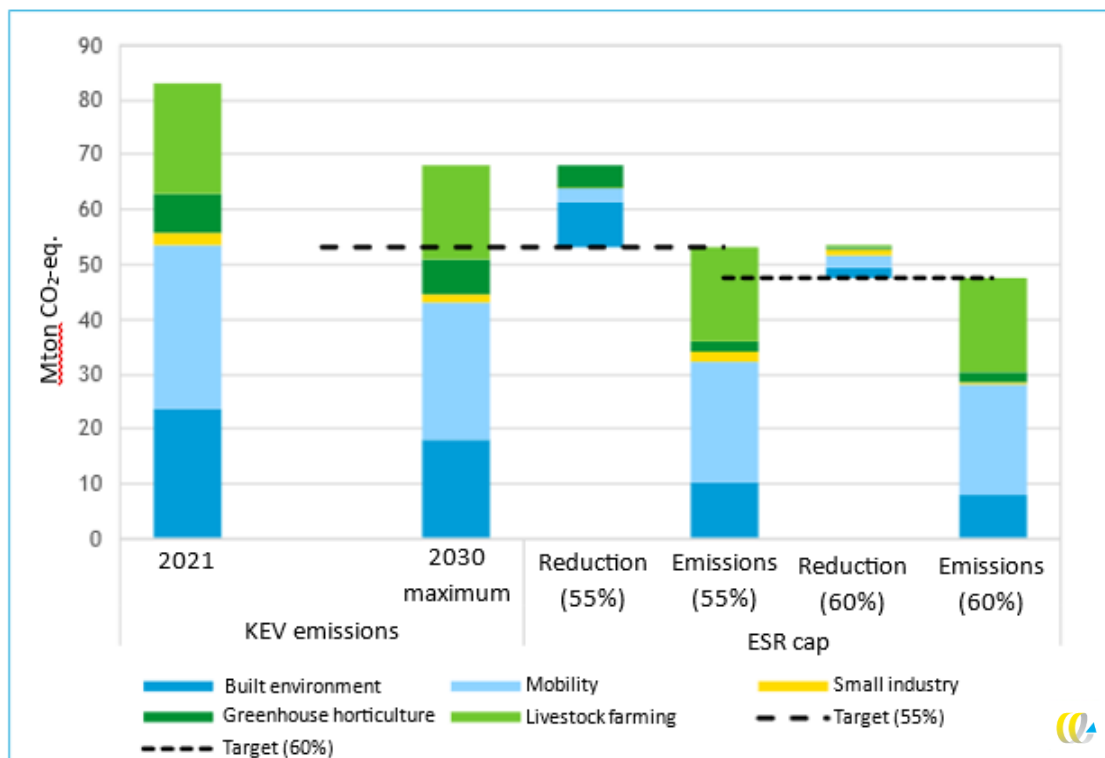


Table 17 - Residual emissions in Mton when applying emission cap by sector, 55% and 60% emission reduction

Sector	Emissions 2021	Emissions 2030 (reduction target 55%)	Emissions 2030 (reduction target 60%)
Built environment	23.7	10.1	8.1
Mobility	29.8	22.2	20.0
Small industry	2.4	1.7	0.4
Greenhouse horticulture	7.2	1.9	1.7
Livestock farming	20.0	17.5	17.2

The resulting CO₂ price at a higher reduction target is € 430/ton CO₂-eq. This is more than twice the price in the base scenario.

Table 18 - CO₂-eq. price and impact on natural gas price, average energy bill, petrol price and cost in for livestock farming, base variant, 2030

Reference scenario	CO ₂ -eq. price (€/ton CO ₂ -eq.)	Impact on natural gas price (€/m ³)	Impact on average energy bill ⁴⁵ (€/year)	Impact on petrol price (€/l)	Impact per litre of milk ⁴⁶
Climate and Energy Report maximum	€ 430	€ 0.77	€ 900	€ 1.01	€ 0.19

Phase-out of energy tax and excise duty

The price of emission allowances below the ESR cap increases energy prices and leads to higher burdens for end users. To ease these burdens, energy taxes and excise duties could be reduced. We examined the effect this has on emission reductions in different sectors. In doing so, we have assumed that energy tax and excise duty will be reduced to the minimum allowed by law under the Energy Taxation Directive (ETD).

When energy taxes and excise duties are phased out, gas prices in the built environment and greenhouse horticulture will fall and fuel prices will also fall. As a result, measures in these sectors less likely to be profitable. This means that the marginal reduction costs of these measures become higher. In the event of an equal reduction target, this results in a higher ESR price and a different distribution of reduction across sectors. In reality, the reference scenario for emission reduction may also differ, but as no alternative reference scenario is available, we also assume the Climate and Energy Report reference in this case.

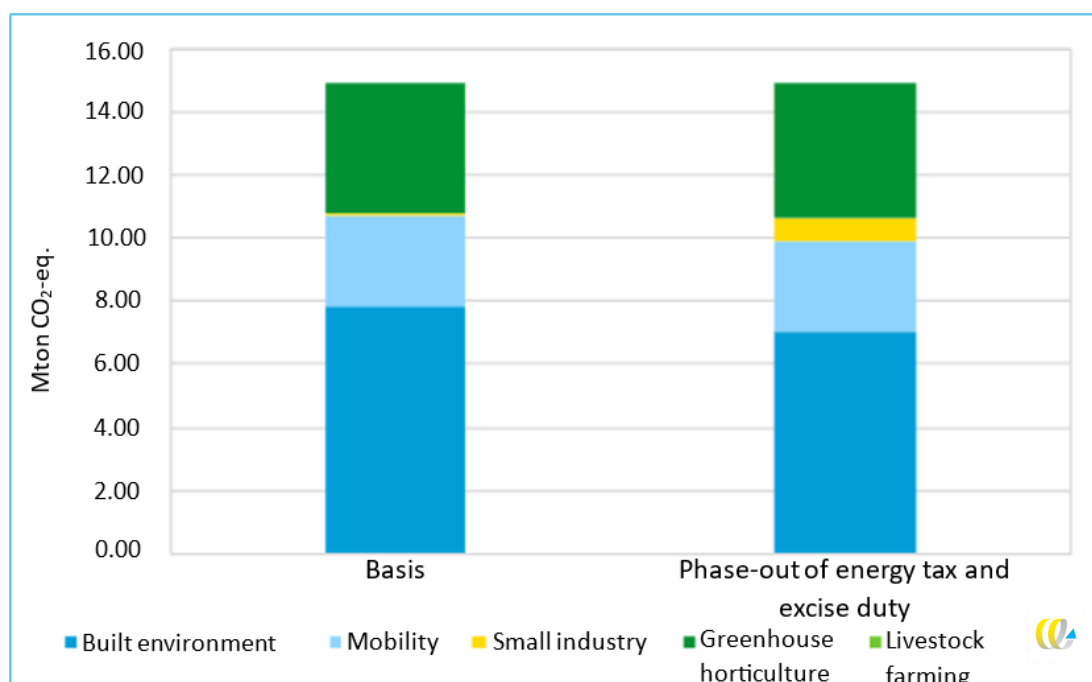
Figure 15 shows for both the base scenario and the scenario with the phased-out energy tax and excise duty, the additional emission reduction compared to the Climate and Energy Report maximum reference scenario. With the energy tax and excise duty phased out, the emission reduction in the built environment is 0.8 Mton lower than in the base scenario. As explained before, this is a consequence of higher marginal reduction costs. The lower reduction in the built environment is offset by higher emission reductions in small industry (0.7 Mton) and greenhouse horticulture (0.1 Mton). In these sectors, the energy tax phase-out has less of an impact, as some of the energy consumption is subject to lower rates or no

⁴⁵ Assuming an average gas consumption of 1,169 m³ (Milieu Centraal, 2023).

⁴⁶ Assuming emissions of 0.442 CO₂-eq. per kg milk (methane). According to Statistics Netherlands (CBS), a cow produces on average about 9,148 kg of milk per year.

energy tax. The emission reduction from mobility increases very little in this scenario. In livestock farming, there is also no emission reduction in this scenario due to the ESR cap.

Figure 15 - Additional emission reduction compared to the Climate and Energy Report maximum-reference scenario due to the ESR cap in the base scenario and in the scenario where energy tax (ET) and excise duty are phased out to the minimum allowed by law according to the Energy Taxation Directive (ETD), 2030



In addition, the phasing out of energy tax and excise duty affects energy prices for end users. The ESR price in this scenario is € 354/ton CO₂-eq. and thus considerably higher than in the base scenario (€ 200/ton). Reduced energy taxes and excise duties mean a higher ESR price is needed to make measures profitable. Nevertheless, the resulting natural gas price for small consumers in the scenario with minimum energy tax is about € 0.40 per m³ lower than in the base scenario (see Table 19). The energy bill for households will thus be lower in the scenario with minimum energy tax. For fuels, the minimum excise scenario leads to lower costs only for petrol (see Table 20). This is because in the Netherlands, excise duty on petrol is relatively higher than on diesel.

Table 19 - Natural gas price in 2030 in the base and minimum energy tax scenarios (€/m³)

	Base	Minimum energy tax
Natural gas price including Energy tax excluding ESR price	€ 1.26	€ 0.58
ESR price	€ 0.36	€ 0.61
Total natural gas price including ESR price	€ 1.61	€ 1.20

Table 20 - Fuel prices in 2030 in the base and minimum energy tax scenarios (€/litre)

	Petrol		Diesel	
	Base	Minimum excise duty	Base	Minimum excise duty
Fuel price incl. excise duty	€ 2.38	€ 1.61	€ 2.08	€ 1.69
ESR price	€ 0.47	€ 0.83	€ 0.52	€ 0.93
Total fuel price including ESR price excluding VAT	€ 2.86	€ 2.45	€ 2.61	€ 2.61

Government revenues were not calculated for this scenario because the model outputs include only CO₂ and not energy consumption. Compared to the baseline scenario, energy tax and excise duty revenues are significantly lower, offset by higher revenues from auctioning emission allowances. In this scenario, energy prices, including the ESR price, are lower or equal to the energy prices in the base case. In contrast, the energy consumption of the built environment and mobility are higher (because there is less reduction).

Target year 2040

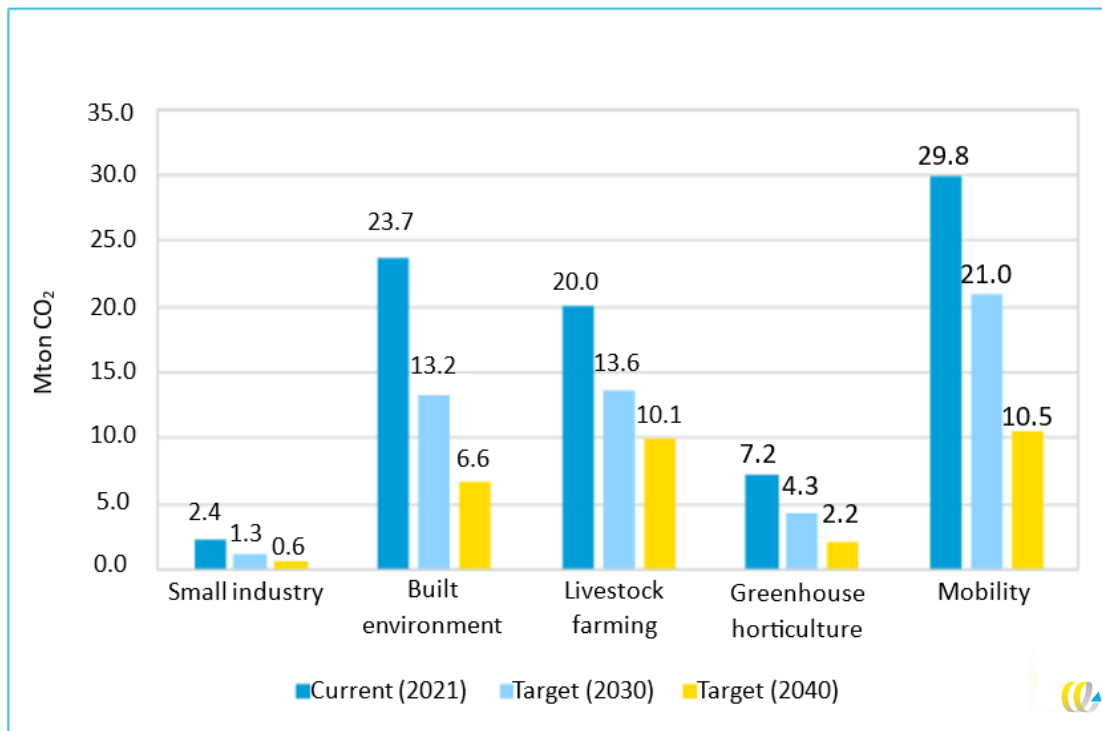
To get an idea of the effect of the ESR cap beyond 2030, we did a sensitivity analysis using 2040 as the target year. This sensitivity analysis differs from the base scenario with regard to:

- the reduction target;
- the reference scenario;
- the time available to implement measures (especially important for mobility, see Annex C.2 only available in Dutch report);
- the tax rates in greenhouse horticulture.

The policy context is very likely to be different in 2040 than in 2030. We do not have enough information on this to include it in the modelling. We have therefore assume the policy as it is currently known.

The 2023 Policy Document on Climate Change does not set a reduction target for 2040. We have therefore determined the reduction target by linear interpolation between the residual emission targets in 2030 and 2050. For 2050, we assume that there should be no more emissions in all sectors except livestock farming. For livestock farming, we assume that the target in 2050 is 6.5 Mton CO₂-eq. (Netbeheer Nederland, 2023). Emission targets for 2040 are shown in Figure 16.

Figure 16 - Overview of current emissions (2021) and the residual emissions targets for 2030 and 2040



The reference scenario is based on the Climate and Energy Report. While the Climate and Energy Report 2023 does not give a forecast for 2040, the Climate and Energy Report 2022 does. We have therefore compiled the reference scenario based on data from the Climate and Energy Report 2022 and the Climate and Energy Report 2023. We have set the maximum emissions scenario for 2040 as equal to the 2040 forecast from the Climate and Energy Report 2022. We have set the minimum emissions scenario for 2040 as equal to the minimum emissions scenario for 2030. In 2040, there is an additional reduction target in both reference scenarios.



Figure 17 - Reference path and targets used in the analysis

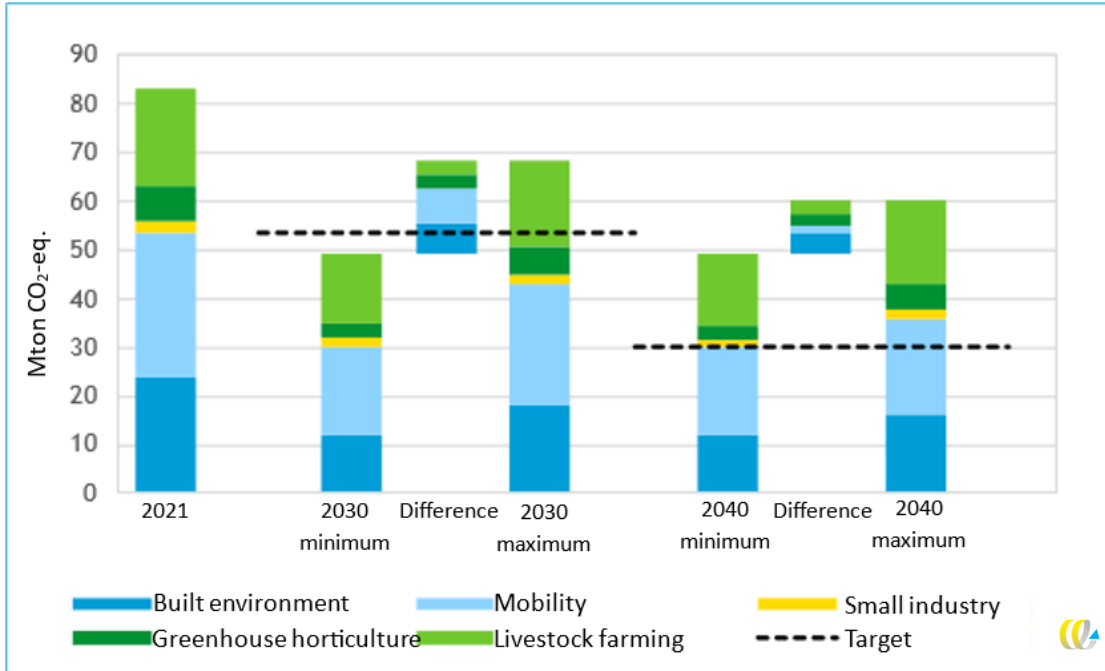


Figure 18 shows the emission reduction we expect by sector in 2040 due to an ESR cap with an overarching cap. The total emission reduction is higher in 2040 than in 2030 because the target is more demanding in 2040. Especially in the mobility, small industry and livestock farming sectors, many additional emission reductions will take place compared to 2030. Emission reductions in the built environment and greenhouse horticulture are increasing to a limited extent.



Figure 18 - Emissions in 2021, 2040 according to the Climate and Energy Report and in 2040, base variant The reduction due to the ESR cap is relative to the minimum (on the left) and maximum (on the right) emissions scenario from the Climate and Energy Report.

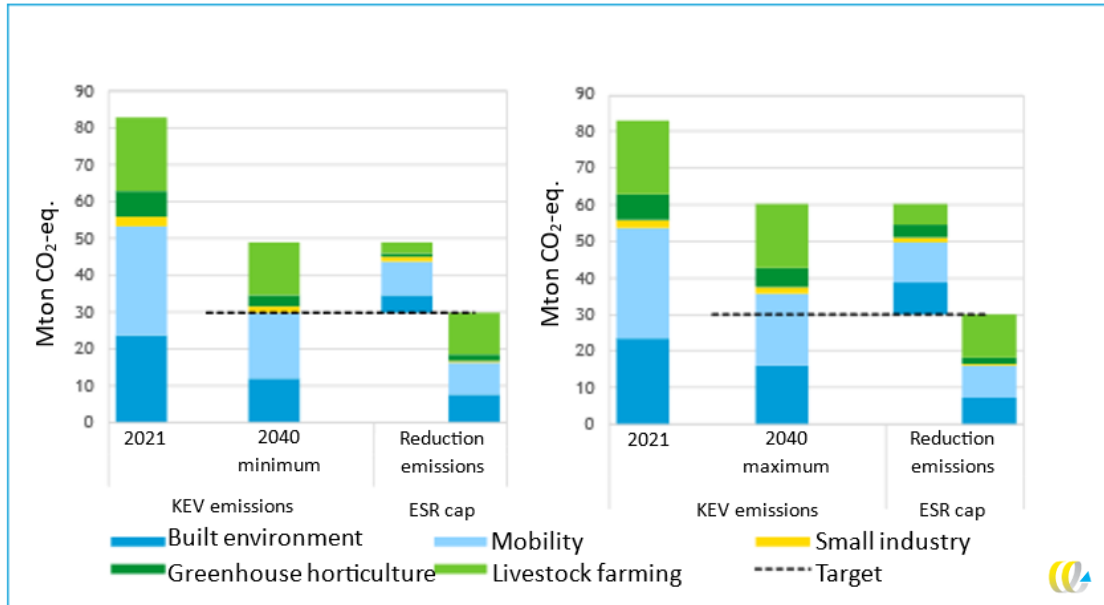
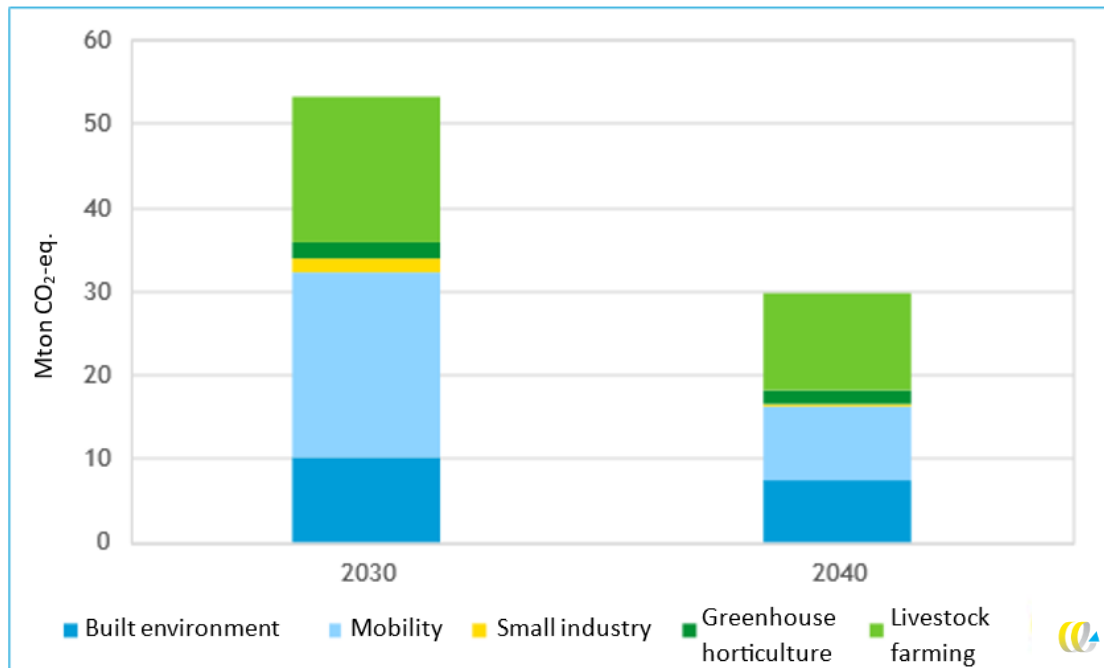


Figure 19 places residual emissions in 2030 and 2040 side by side. This shows that between 2030 and 2040, many additional reductions are expected in mobility, livestock farming and small industry.

Figure 19 - Residual emissions base variant in 2030 and 2040



The estimate of the ESR price in 2040 is €500/ton CO₂-eq. This is more than double the price in 2030. However, this price is a rough estimate as innovation and possible future policies cannot be properly accounted for in the analysis.

Table 21 - ESR price and impact on natural gas price, average energy bill, petrol price and livestock farming costs, base variant, 2040

	ESR price (€/ton CO ₂ -eq.)	Impact on natural gas price (€/m ³)	Impact on average energy bill ⁴⁷ (€/year)	Impact on petrol price (€/l)	Impact per kg of milk (€/kg)
Increase resulting from ESR cap	€ 500	€ 0.89	€ 1,042	€ 1.18	€ 0.22

Compared to the reference, much reduction still needs to be achieved by 2040. This is spread fairly evenly across sectors with the ESR cap, although the share of livestock farming is relatively small.

In the Climate and Energy Report minimum scenario, in 2030 the ESR cap does not yet create an additional emissions price, but it does in 2040. That means an ESR price will emerge sometime between 2030 and 2040. Reductions as a result of this will occur in all sectors, with reductions in livestock farming being relatively the lowest. In the Climate and Energy Report maximum scenario, in 2030 there is already an ESR price and this ESR price is higher in 2040. The ESR price will therefore rise between 2030 and 2040.

6.4 Impact of limited perspective for action on the operation of the instrument

In the impact analysis we assume that both participants and end users have perspective for action to take measures. However, with every measure there are parameters that can make it difficult or impossible to implement a measure. These include:

- split incentive in the rental sector (the landlord has no incentive to take action because benefits accrue to the tenant);
- investment capacity/financing opportunities;
- availability of materials and equipment (e.g. heat pumps);
- availability of personnel;
- net congestion;
- resistance among citizens or businesses to take action (face clutter).

Measures can also have a long initial period, requiring a decision to be made in time to achieve a certain CO₂ reduction in the target year. These constraints may cause the cost of a specific measure to increase, such as if more expensive personnel have to be deployed. If this measure is the marginal measure, the ESR price will increase. Also, due to constraints, a measure may not be realised or may be only partly realised. In such a case, other, more expensive, measures will have to be taken to meet the emission target and the ESR price will also increase. If this applies to a large proportion of measures, it could lead to a sharp increase in the ESR price. Without political intervention, this could mean that only very expensive measures or demand-reducing measures can still be taken. In the latter case, turning off the heating, far fewer recreational car trips or shutting down production in industry or greenhouse horticulture could be considered. These options have undesirable

⁴⁷ Assuming an average gas consumption of 1,169 m³ (Milieu Centraal, 2023).

social and economic consequences. Incidentally, high prices can also spur innovation and encourage the development of new measures.

6.5 Impact on end users

Pricing effect leads to an increase in costs for end users

If the instrument leads to the creation of a CO₂ price, then these costs must be borne by a party. We expect energy and fuel suppliers to pass on costs to the end user, pushing up prices for natural gas and fuels. In livestock farming, the additional costs could be partly reflected in the prices paid by customers, but in the case of strong foreign competition, the burden could also remain with the livestock farmer.

Higher buyer prices and/or less supply will eventually drive up prices for end users as well. Citizens and businesses will face higher costs depending on the extent to which they consume natural gas, electricity, fuels and agricultural products. The previous paragraphs show that end user costs can increase substantially, interacting - and overlapping - with existing policies.

Benefits accrue to parties that can take sustainability measures

By taking emission reduction measures, participants or end users can partly mitigate their increased costs. For example, investments in insulation or an electric car can become cost-effective with a sufficiently high CO₂ price. This can also have positive side effects, such as on comfort or health. However, these benefits are not distributed evenly across society but only reach groups with perspective for action. It has already been indicated in Section 6.4 that there may be parameters why some measures cannot be taken. If a household or business has no perspective for action to take a technical measure, the only measures left are behavioural ones such as turning down the heating or using the car less. At companies, production might have to be reduced.

Options for mitigation policies

Higher burdens on households or businesses without a perspective for action could lead to undesirable social and economic effects. For example, the accessibility of facilities may be at stake if people can no longer afford their use of fuel or households turn off heating leading to negative health effects.

Mitigating policies can alleviate these price effects. It is important, however, that mitigation policies do not hamper the incentive effect of the ESR cap, as a CO₂ price is needed to encourage parties to take mitigation measures. Reimbursing these costs generically, for example by reimbursing part of the purchase cost of the allowances, therefore makes no sense. However, targeted measures can relieve certain groups:

- Auction proceeds can be used to incentivise action among parties that do not have a perspective for action themselves. For example, these proceeds could be used to invest in making social housing or monuments more sustainable. Options for cushioning the impact on people with low incomes could also be explored.
- The impact analysis shows that in agriculture, a reduction in livestock numbers is needed to achieve the desired emission reduction. Buyout schemes can ensure that companies do not have to shut down due to bankruptcy, but can voluntarily cease



operations. The perspective for action within an emission cap could also be increased, for example by adding climate-positive measures such as carbon removal options (covered by Land Use, Land Use Change and Forestry (LULUCF)).

- If certain constraints hamper the taking of probability measures, policies can be aimed at creating the right parameters. Examples of such policies include encouraging labour and training, measures to reduce grid congestion or guaranteeing risky loans so that financing costs can be reduced.

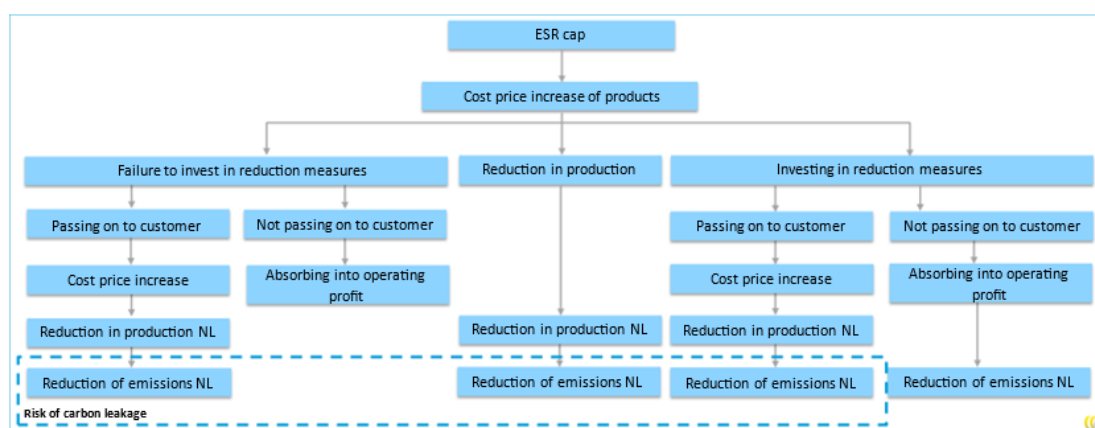
6.6 Impact on competitiveness

In this paragraph, we estimate the effects of the ESR cap on competitiveness and carbon leakage in small industry and agriculture (livestock farming + greenhouse horticulture). We also address the risks of refuelling over the border in the mobility sector. For this estimation, when sufficient data are available, we use quantitative estimates and supplement this with findings from literature.

When are there risks of carbon leakage?

In the case of carbon leakage, higher climate policy costs lead to negative effects on competitiveness and possibly displacement of production to countries with less stringent climate policies. This could increase net emissions. The ESR cap leads to higher costs for participants. If this leads to a cost price increase or direct reduction in production, some production from the Netherlands may be lost. This creates a risk of carbon leakage. The degree of risk depends on trade intensity and the extent to which greenhouse gases determine the cost price of a product, i.e. emission intensity. Incidentally, it should be noted that in some cases customers are willing to set a higher price for a more sustainable product. For example, farmers can also get a higher milk price if their operations meet certain sustainability criteria. In such a case, a cost increase need not be at the expense of production.

Figure 20 - When are there risks of carbon leakage?



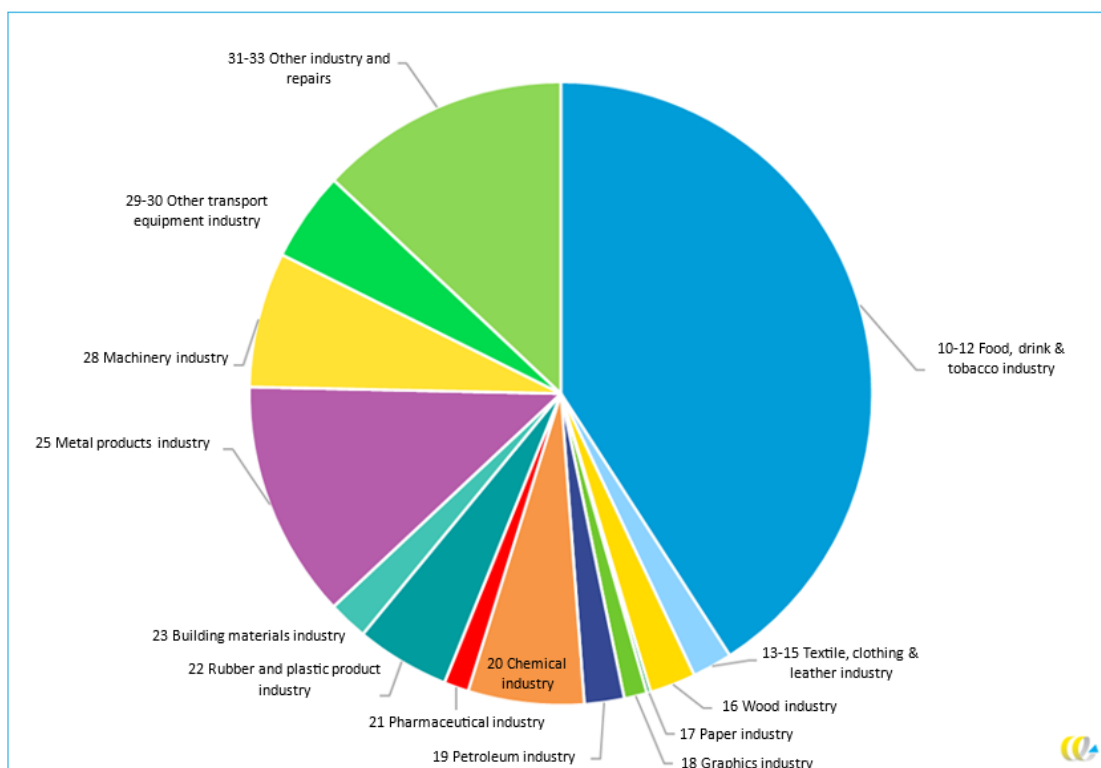
Findings based on literature

Trinomics (2022) compiled an inventory of competition and carbon leakage risks for the Netherlands' 615 different ESR sectors (CO₂ only). They found that one sector is at high risk. This is the non-ETS part of the plastics sector. This sector emits 0.1 MtCO₂. There is a risk for 207 sectors, but the extent of this risk is unknown. These sectors emit a total of 8.6 MtCO₂. Greenhouse horticulture is the biggest emitter, with three quarters of emissions. The remaining quarter is emitted by industry. 407 sectors have no leakage risk. They account for 91% of emissions. Due to the nature of their operations, they cannot easily relocate abroad. Examples include the transport, water treatment and service sectors. Leakage risks have not been quantified further.

Impact on small industry

To determine an estimate of the impact in small industry, we first need to understand the sectors where these emissions occur. No public data are available for this. Based on data from Statistics Netherlands (CBS) (2023a) and ETS emissions figures from the Dutch Emissions Authority, an estimate was made by sector. We see that the food industry is by far the most important sector in terms of emissions. This includes, for example, butchers, bakers and small beer breweries, but also larger food producers that are narrowly not covered by ETS. Other important sectors are the metal products industry and other manufacturing and repair. The latter category includes furniture makers, the manufacture of toys and games, social work facilities and the repair and installation industry.

Figure 21 - Distribution of non-ETS emissions in industry by sector



Some sectors are covered almost entirely by ETS. Examples include the paper industry and base metal industry. Other sectors are only partly covered by ETS. The food and beverage industry is the best example of this. The sectors listed below are mostly or entirely not covered by the EU ETS:

- 16 wood industry;
- 18 graphics industry;
- 22 rubber and plastic product industry;
- 25 metal products industry;
- 28 machinery industry;
- 29-30 other transport equipment industry;
- 31-33 other industry and repairs.

For these sectors, we can quantitatively estimate the effect on energy costs and production. For other sectors, insufficient data are available because CBS statistics cannot distinguish between ETS and ESR companies. The presence of a large proportion of ETS companies may lead to biased results. For example, the ‘baker on the corner’ might be expected to export less than a large dairy company covered by EU ETS, but the baker’s data falls under the same sector. For this estimate, we use data of Statistics Netherlands (CBS), which we translate to 2030 using growth projections from the Climate and Energy Report. Using ‘Armington elasticities’ (CE Delft, 2021b) we translate this into an impact on production. We have assumed that the costs are or should be fully passed on and use a price for ESR cap allowances of € 100/ton for our calculation. These higher costs lead to a decrease in trade and therefore a decrease in production. We do not include the printing industry because it is included in the data along with the much larger paper industry (which is almost entirely covered by EU ETS).

Table 22 - Results of analysis of competition effects at ESR price per €100/ton

Industry	Impact on energy costs	Impact on production
16 wood industry	1.4%	0.01%
22 rubber and plastic product industry	3.8%	0.14%
25 metal products industry	5.9%	0.06%
26-28 electrical and machinery industry	5.0%	0.04%
29-30 other transport equipment industry	5.3%	0.07%
31-33 other industry and repairs	4.3%	0.04%

In these six sectors, we see that the effects on energy costs are between 1 and 6%. The effect on production is very limited because energy costs are a limited part of operating costs. In the rubber and plastic product industry, production effects are relatively the largest. The calculation shows a loss of production of 0.14% in 2030 per €100/ton. This effect scales with the CO₂ price: therefore, at a price of €200/ton, the loss is 0.28%. This limited production loss also reduces the risk of carbon leakage.

Impact on greenhouse horticulture

Trinomics found that greenhouse horticulture is one of the sectors where there is a risk of carbon leakage (Trinomics, 2022). The same analysis as above for greenhouse horticulture results in a 1.3% production loss at an ESR cap price of € 100. This is therefore a substantially greater risk than small industry. This could lead to carbon leakage. However, production could also be moved to warmer countries.

In that case, less heating is needed and greenhouse gas emissions may decrease, while other environmental impacts may be greater. In the shared-cap variant, the ESR price is 0 and therefore there is no risk of carbon leakage.

Impact on livestock farming

In agriculture, we see that no measures are taken in the base variant. The issue price is not high enough to overturn the business case of livestock farmers. In the variant with sector caps, the emission price leads to a reduction in livestock and therefore less production. Without demand reduction measures, this will lead to additional production abroad. According to Wageningen University and Research Centre (WUR), other livestock-dense areas also face restrictions due to European environmental and climate regulations. These include areas in Belgium, Denmark and Germany, the Po Valley in Italy and Brittany (Nieuwe Oogst, 2023). The main competitors for the dairy industry are Ireland, Germany and Poland (CE Delft, 2021c). Mazzetto A. (2022) compared the carbon footprint of dairy products in different countries. The carbon footprint of Germany and Ireland is slightly higher than in the Netherlands: the carbon footprint of Poland has not been calculated.

Moving production to Germany and Ireland could therefore lead to carbon leakage. Investment in mitigation can lead to a 'premium product'. Buyers may be willing to pay higher prices for this. For example, FrieslandCampina members can receive a maximum allowance on their milk price if they score well on the Climate component (FrieslandCampina, 2024). However, the impact analysis shows that all possible/available mitigation measures are already included in the reference scenario.

Risks of refuelling over the border

A sharp increase in fuel costs relative to Belgium and Germany could lead to refuelling over the border. Econometric research by the Ministry of Finance shows that excise tax differences of around € 0.10 between the Netherlands and Belgium and Germany led to significant additional fuel sales in the country where total fuel costs were lowest at that time (Ministerie van Financiën, 2023). A unilateral ESR price moving toward € 0.70 will therefore lead to an even greater effect. The magnitude of these effects has not been estimated because it is unclear whether they are linear. Therefore, a high ESR price has a negative effect on the competitive position of gas stations near the border. This could result in additional refuelling over the border. Refuelling over the border leads to reduced emissions attributed to the mobility sector⁴⁸. As such, this could also contribute to the emissions target, but it is undesirable from a climate and economic perspective.

6.7 Conclusions

Impact of the base variant

The ESR cap in the base variant is a safeguarding instrument. When sufficient reductions are achieved with other policy instruments, there is no additional impact (and no extra CO₂ price, etc.). This is the case for the base variant in the minimum scenario of the Climate and Energy Report.

⁴⁸ Emission calculations for the mobility sector are based on fuel sales in the Netherlands.

If sufficient reductions are still not achieved, the ESR cap comes into effect. Under the maximum scenario of the Climate and Energy Report, another 14.9 Mton emission reduction is needed in 2030 on top of the reduction already expected according to the Climate and Energy Report. In the base variant, the additional reductions take place mainly in the built environment and greenhouse horticulture.

The base variant of the ESR cap is expected to lead to a CO₂-eq. price of € 200/ton CO₂-eq.

Impact of separate caps

The variant of the ESR cap with separate caps works differently. In this variant, the reduction is set by sector. In the minimum scenario of the Climate and Energy Report, some sectors do meet the target (the built environment, mobility and greenhouse horticulture). The small industry and livestock farming sectors still have a limited additional task that creates a CO₂-eq. price of € 223 and € 430/ton CO₂-eq., respectively.

In the Climate and Energy Report maximum scenario, each sector has an additional task. The distribution of this task across sectors differs from the distribution that follows from the base variant. The task is lower for the built environment and greenhouse horticulture, and higher for mobility, livestock farming and industry. This variant also leads to a higher CO₂ price in mobility and livestock farming (and small industry).

Impact of emission tax with dispensation cap

In this variant, the tax rate should be set at a minimum of the marginal emission price. Trade of dispensation allowances creates the same marginal price.

The allocation of free dispensation allowances does not affect the distribution of emission reductions; this will take place where it is most cost-effective. However, it may lead to a transfer of revenues from free dispensation allowances if parties sell them within the industry (windfall profits).

Sensitivity analysis phasing out energy tax and excise duty

Under an overarching cap, the burden on end users can be eased by phasing out the energy tax and excise duty. This leads to a higher ESR price, but the total gas price and petrol price fall. The diesel price remains unchanged.

Competitiveness and carbon leakage

We conclude that risks are particularly prevalent in greenhouse horticulture in the case of one cap and in livestock farming in the case of separate caps. Risks of refuelling across the border also play a role in mobility. Although not all sectors of small industry have been studied, the impact on those that have been studied is limited.

7 Conclusions

In this chapter, we answer the main question:

“How can a national emission cap for ESR sectors be introduced as an effective safeguard mechanism for national emission reduction targets, taking into account factors including the existing policy system and feasibility?”

7.1 Pros and cons of an emission cap as a safeguard for national climate targets

There are a number of advantages to an emission cap with trading of allowances. It sets emission targets by law, which provides certainty about achieving targets. Instead of imposing a solution, the system gives the market flexibility to achieve emission reductions or purchase emission allowances. Emissions trading also promotes cost-effective emission reductions.

The main risk of an ESR cap is undesirable high prices. Although a price effect is at the heart of how the system works to incentivise emission reductions, in practice some reduction measures may not or cannot be taken. This could be due, for example, to lack of personnel, financing, reluctance to rebuild, grid congestion or long realisation times. As a result, more expensive measures are needed to meet the target and the ESR price rises. Parties without a perspective for action are also affected by the increased prices. This could impact international competitiveness, leakage effects, energy poverty, etc. Additional policies are needed to counteract undesirably high prices. This can encourage the desired measures but also cushion the burden effects. Auction proceeds can be used to pay for such policies.

The ESR price can thereby act as a signal to strengthen other policies and to steer towards, for example, a 'fairer' distribution between target groups, strengthening the perspective for action among the parties involved, stimulating innovative reduction options or giving certainty to the market so that it will invest in emission-reducing technologies in good time (as in the case of the CO₂ standards for cars). Without an ESR cap, this signalling function takes place with the annual Climate and Energy Outlook. An ESR cap signals this to the market and makes it 'real-time'. Of course, this adjustment will take some time.

7.2 Weighing up the variants

The advantages and disadvantages of a national ESR cap depend heavily on the design of the instrument:

- **An overarching cap** with trading within and between ESR sectors is the most economically efficient to achieve emission reductions and has the lowest implementation burden. However, this does not allow the government to determine in which sectors reductions take place and sectors that already meet their target with other policies may still have an extra ESR price imposed on them.

- **Partial caps per sector** can safeguard the current indicative Dutch residual emission targets. In such a system, there is also more scope for adjustment by sector. On the other hand, it is less efficient and could therefore lead to higher ESR prices in some sectors. Our analyses show that ESR prices in such a system can be 11-100% higher than in an overarching cap system. In addition, the burden of implementation is higher because differentiating sectors at the energy supplier is complex.
- **An emission tax with dispensation allowances** provides certainty about the (maximum) price but has less safeguarding effect. Implementation is more complex because the number of dispensation allowances, their allocation and the tax level have to be determined by the government.

The key trade-offs are summarised in Table 23.

Table 23 - Key trade-offs between the three main variants

Trade-off	Overarching cap	Separate caps	Taxes with dispensation allowances
Safeguarding effect	Strong due to legal cap.	Strong due to legal cap.	Lower safeguards (depending on tax level).
Steering by sector targets	No.	Yes, but aligning precisely with climate sectors is difficult to implement.	Yes, but aligning precisely with climate sectors is difficult to implement.
Cost-effectiveness	Highest because cheapest measures are taken in all sectors.	Lower because some sectors require measures that are less cost-effective.	Lower because some sectors require measures that are less cost-effective.
Risk of undesirably high prices	Yes, such as due to volatile gas prices, market failure and limited perspective for action.	Yes, such as due to volatile gas prices, market failure and limited perspective for action.	No, there is a maximum price (emission tax).
Clarity about price path in advance	No, price is set by the market.	No, price is set by the market on a sector-by-sector basis.	Partly: maximum price set periodically, but price for dispensation allowances is set by the market.
Burden of implementation	Relatively limited, if aligned with scope of ETS-2 (with maximum opt-in).	Relatively complex to distinguish separate caps.	Relatively complex to distinguish sub-sectors, determine tax level and allocate dispensation allowances.
Burden on end users	ESR price is the same in all sectors even if no additional reduction takes place in particular sector.	In certain sectors, prices may be higher than an overarching cap. As a result, the total burden is higher.	In certain sectors, prices may be higher than an overarching cap. As a result, the total burden is higher.
Distribution of burden across sectors	Sectors that achieve the sector target also pay.	Only sectors that have not yet attained the target with existing policies will be subject to the ESR price.	Only sectors that have not yet attained the target with existing policies will be subject to the ESR price.
Government revenue	Depending on whether emission allowances are auctioned or given away: If all emission allowances are auctioned, all revenues go to the government.	Depending on whether emission allowances are auctioned or given away: If all emission allowances are auctioned, all revenues go to the government.	Depending on quantity and allocation of dispensation allowances. More free dispensation allowances means less revenue for the government.



Key choices

Although there are thus many trade-offs between the different variants, three fundamental choices stand out:

1. **Balancing the maximum price against safeguarding climate targets.** To counteract undesirably high prices, a maximum price can be introduced; this corresponds to the variant with emission tax. However, this means that the cap is no longer safeguarded by law. The higher the maximum price, the stronger the safeguarding effect. But any real certainty of meeting the target is abandoned with the introduction of a maximum price or tax system.
- **Trade-off between efficient emission reduction and limiting the burden of implementation (overarching cap) or steering by sectors.** Partial caps make emission reductions less effective and implementation more complex for the parties in question, and it is impossible to precisely delineate sectors according to climate targets. However, livestock farming does differ in many ways from the other sectors, which could make it more feasible and logical to have a separate cap for that sector. If livestock farming is set apart, the choice for the remaining sectors would be to align qua scope with the ETS-2 or define sectoral separate caps (with implementation challenges).
- **Allocation of allowances by auction or free allocation.** At an auction, the auction proceeds accrue to the government. Free allocation of allowances leads to lower charges for system participants, but probably not for end users. This depends on how energy and fuel suppliers will pass on the ESR price. Since participants can choose between selling allowances (at market price) and passing on costs, it is expected that they will pass on marginal costs. In this case, this creates excess profits among energy or fuel suppliers. If the burden in a particular sector is not passed on, or is only passed on partially, there will be insufficient incentive to take the necessary reduction measures. This will further increase the ESR price, leading to a less efficient system and higher burdens in other sectors. How the charges are actually passed on depends on the market power of the system participants. If there is little price competition, we expect marginal costs to be passed on.

In this study, we identified the reasoning and impact of the different choices. Balancing the various interests is ultimately up to policymakers and requires political choices.

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