CPB Netherlands Bureau for Economic Policy Analysis
PBL Netherlands Environmental Assessment Agency

Abolishing fossil fuel subsidies: a brain teaser rather than a no-brainer

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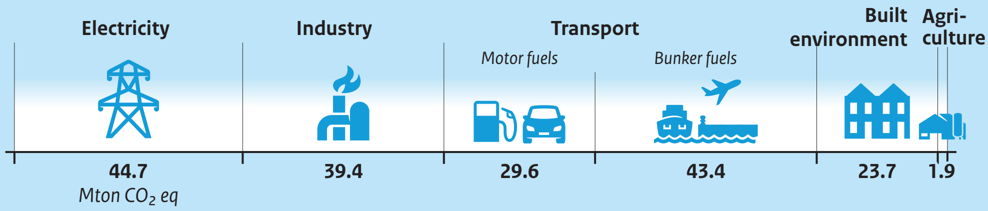
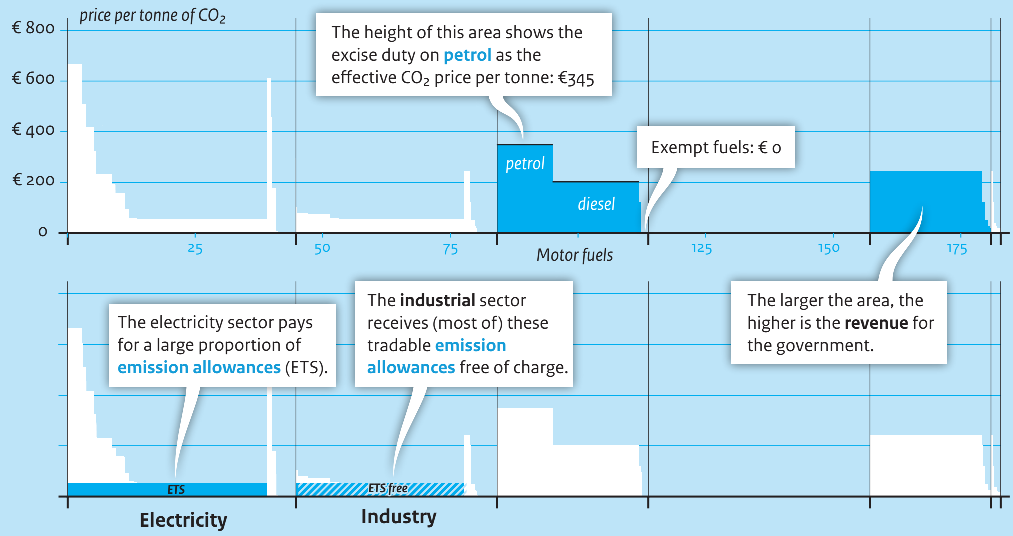
Guideline for abolishing fossil fuel subsidies

The abolition of fossil fuel subsidies is beneficial particularly where polluters are still not paying sufficiently for climate damage. The external cost approach elaborates on this principle.

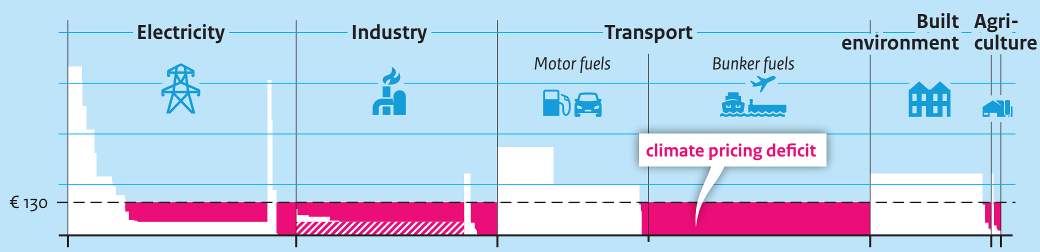
1 **First, we look at the CO_2 emissions per sector resulting from fossil energy consumption.**



2 **The effective CO_2 price of existing energy taxes and emission allowances was then calculated within the sectors for each fuel.**



3 **By comparing this to the climate damage of €130 per tonne of CO_2, it is possible to see where climate pricing deficits arise.**



4 **The key question in abolishing fossil fuel subsidy schemes must be: will it help the energy transition? The schemes in question are both direct and indirect, such as:**

- *Exemptions for electricity generation* — € 2.5 billion
- *No or low energy tax in industry* — € 2.4 billion
- *Free CO_2 emission allowances* — € 2.1 billion
- *Tax exemptions for shipping and aviation* — € 5.8 billion
- *VAT exemption in aviation**
- *Tax advantages purchase and ownership of cars**

** Unquantified*

Summary and conclusions

The current debate on fossil fuel subsidies focuses too little on the underlying core question: does the abolishment of such subsidies support the energy transition and hence climate policy? Government policies that directly or indirectly support the use of fossil fuels are known as fossil fuel subsidies. Abolishing such subsidies looks like a no-brainer because it would reduce greenhouse gas (GHG) emissions while also generating income for the treasury. But it is not so easy to determine which policies precisely support the energy transition and which policies impede it.

The debate on fossil fuel subsidies in the Netherlands is currently focused primarily on the level of tax revenue that is potentially foregone due to exemptions or reduced rates in the Energy Tax. All kinds of specific regulations or 'policies' directly or indirectly encourage fossil fuel use. Several studies in the Netherlands list these policies on the basis of an 'inventory approach', with more and more policies being included. The emphasis here is mainly on policies related to taxes on natural gas, electricity and transport fuels. The identified amounts differ, not only because the studies do not include the same policies, but also because they differ in the reference rates used. Moreover, the size of the calculated subsidies gives no direct indication of how beneficial it would be to abolish them.

In order to reduce CO_2 emissions, it is important to focus on policies that reflect a so-called carbon pricing deficit. If polluters do not pay sufficiently for the climate damage they cause, additional pricing is justified from a social welfare perspective. This so called 'external cost approach' illustrates these pricing deficits. Large deficits arise in the Netherlands because of tax exemptions for shipping and aviation (€5.8 billion), free CO_2 emission allowances (€2.1 billion), zero or low taxes on fossil fuel use in the industrial sector (€2.4 billion) and exemptions for gas and coal use in power generation (€2.5 billion). Amending these policies therefore makes sense from the perspective of the energy transition.

The external cost approach is more helpful than the inventory approach in identifying fossil fuel subsidies that impede the energy transition. Focusing purely on abolishing fossil fuel subsidies under the inventory approach may lead to undesirable policy reform. A notable way of reducing fossil fuel subsidies under the inventory approach would be to substantially cut the top rate of Energy Tax on natural gas, but that would not benefit the energy transition.

The inventory approach and the external cost approach both have their merits. The inventory approach is particularly helpful in identifying policies that may directly or indirectly support the use of fossil fuels. The external cost approach complements this inventory by it is difficult to find out which policies are most important from the perspective of climate damage, in particular those policies that are most relevant for carbon pricing.

The inventory approach sometimes leads to counterintuitive conclusions. Under the inventory approach, the lower rates for large electricity consumers are deemed to be a fossil fuel subsidy. But a substantial increase in these rates would slow electrification and hence run counter to the energy transition. In this case, the external cost approach shows that fossil fuel subsidies are to be found not among electricity consumers, but in electricity generation using fossil energy sources.

It is also useful to look at policies that may slow the energy transition by indirectly encouraging the use of fossil fuels. Examples include VAT exemptions in aviation and various tax benefits for the purchase and ownership of cars. Other relevant policies that can indirectly encourage fossil fuel use are guarantees, credit insurance and the recent VAT cuts on energy. These policies are also discussed in this report, but without estimates of the budgetary amounts involved or their relationship with external cost.

Finally, it is important to take account of the domestic and European policy mix when considering abolishing fossil fuel subsidies. For example, the tightening and expansion of the European Union's emissions trading system will ultimately cause a further sharp reduction in CO_2 emissions and hence in the pricing deficit. Moreover, abolishing specific policies may also be useful if it would lead to more appropriate pricing of climate damage in the short term.

1 Introduction[1]

Fossil fuel subsidies are in the spotlight in the Netherlands and several other countries around the world. This is evidenced by the public debate on the subject in various (social) media and the actions of Extinction Rebellion, an action group that advocates accelerating and tightening climate policy. Extinction Rebellion's actions on the highway A12 in The Hague were mainly aimed at phasing out fossil energy carriers (oil, natural gas and coal) as soon as possible and abolishing fossil fuel subsidies. These subsidies refer to various government policies that support fossil energy use. Calculations by Metten (2021, 2023) on the Me Judice platform on the size of fossil fuel subsidies further increased the pressure. Politics is not sitting still either. Although such policies had long been under discussion (see, for instance, OECD 1998; Van Beers and Van den Bergh 2001), only the Rutte IV cabinet recognised the importance of phasing out these subsidies. But what exactly are fossil fuel subsidies? Are they always 'subsidies', i.e. the transfer of money from the government budget to companies or households? And, more importantly, is abolishing all kinds of policies labelled as fossil fuel subsidies a good idea in the context of the intended energy transition?

Abolishing fossil fuel subsidies seems to be a no-brainer. A well-known problem with fossil energy use is that burning oil, natural gas and coal releases greenhouse gases (GHGs)–- such as CO_2–- that contribute to climate change. In most sectors in the Netherlands, the damage of climate change is insufficiently reflected in the market prices on which producers and consumers base their decisions (Brink and Vollebergh 2023). Adequate pricing of GHG emissions, on the other hand, creates an incentive to better consider the external effects (and thus costs) of climate change, stimulating more sustainable consumption and production decisions. However, there are a variety of public policies that support fossil energy use. These include not only direct transfers of funds from the state budget, but mainly policies that lead to differences in tax treatment of market participants or that support fossil energy use more indirectly. These policies that directly or indirectly support fossil energy use are commonly referred to as fossil (fuel) subsidies. Simply abolishing these subsidies would strengthen the transition to climate neutrality and generate money for the treasury as well.

But abolishing fossil fuel subsidies really is a brain teaser. The emphasis in the social and political debate in the Netherlands is very much on calculations and total amounts of tax revenues foregone (e.g. Milieudefensie 2020; Metten 2021, 2023; SOMO et al. 2023; Ministry of Finance 2023a). These studies take the existing tax regime as a reference to determine the tax revenue foregone and also differ in the reference values used, which explains why different studies arrive at very different amounts. However, the focus on this kind of calculation ignores the key question in which cases abolishing the considered fossil fuel subsidies makes sense or not in the context of the intended energy transition because of climate change. By taking that energy transition as a starting point, the question can be answered which schemes are potentially relevant or problematic for the energy transition in the Netherlands. Because that question proves much more difficult to answer, in this study we place specific government policies in the perspective of the climate damage caused by the use of fossil energy carriers and the energy transition.

In this study, we offer an overview and interpretation of the debate on fossil fuel subsidies in the Netherlands. First, we discuss the current policy debate on these subsidies in more detail. We then outline a social welfare- perspective on fossil subsidies. Next, we discuss the two different approaches that inform the

[1] We thank Caroline van Kimmenaede for her contribution to a previous study that formed a basis for this report. Thanks are also due to colleagues from CPB Netherlands Bureau for Economic Policy Analysis and PBL Netherlands Environmental Assessment Agency for their comments on previous versions, particularly Rob Aalbers, Diederik Dicou, Olav-Jan van Gerwen, Marko Hekkert, André van Lammeren, Arjan Lejour, Gerald Schut, Jaco Stremler, Rutger Teulings, Bert Tieben, Marcel Timmer and Francis Weyzig. We are grateful to Arthur Beusen, Stefan Troost and Rob Zwitserlood for their assistance with the calculations.

debate on those subsidies including estimates provided for the Netherlands. Besides well-known policies, such as tax advantages for certain fossil energy users, we also discuss policies that do get less attention in the Netherlands because they support fossil energy use in more indirect ways. Moreover, we quantify the size of fossil subsidies based on different perspectives and assumptions and interpret the results using this social welfare perspective. Finally, we discuss proposed policy changes that affect the level of fossil subsidies in the Netherlands. In doing so, we do not discuss the effects of abolishing certain individual policies.

2 A closer look at fossil fuel subsidies

In this chapter, we discuss the background to the social and policy debate on fossil fuel subsidies. We then give a social welfare perspective on these subsidies and discuss the different ways in which fossil fuel subsidies are measured. Finally, we give an overview of recent calculations of these subsidies for the Netherlands.

2.1 Fossil fuel subsidies are receiving a lot of attention

International policy attention to fossil fuel subsidies has long existed. Back in 2009, for instance, at the Pittsburgh Summit, the G20 called for "phasing out inefficient fossil fuel subsidies" (G20 2009). This was further endorsed by the United Nations in 2015 by explicitly including this goal as a *Sustainable Development Goal* (SDG) for 2030 (UN 2015, SDG 12.c.1).[2] The 2021 COP26 in Glasgow again called for phasing out inefficient fossil fuel subsidies (UNFCCC 2021). The European Commission also previously ruled that reform of these subsidies is necessary to meet the European Union's climate ambitions (EC 2019). These climate ambitions–- in the form of a European Climate Act and *Green Deal*[3] - include a reduction of GHG emissions by at least 55 per cent by 2030 compared to 1990 and climate neutrality by 2050.

In the Netherlands, such policy attention has only recently increased significantly.[4] Until the end of 2018, the Dutch government reported that there were no fossil fuel subsidies in the Netherlands, although it was recognised that exemptions and lower rates in the energy tax could lead to higher consumption of fossil energy (EC 2018, p. 111). The Netherlands also lacked plans for reforms and was criticised for this (ODI 2019). The Netherlands used a narrow definition that only included direct subsidies or transfers to fossil energy consumption. Around 2019, this changed and the Netherlands voluntarily submitted to a review by the Organisation for Economic Cooperation and Development and the European Energy Agency (OECD and IEA 2020). The Ministry of Economic Affairs and Climate Change (EZK) also asked the Clingendael International Energy Programme to conduct a study on definitions and methods to determine fossil fuel subsidies (CIEP 2020). In 2020 and 2022, the Ministry of the Interior and the Ministry of Finance respectively published inventories of fossil fuel subsidies.[5] The subsidies reported therein were in the order of €4.5 billion per year, in addition to several non-quantified items. After Metten (2021) released a study quantifying the size of fossil subsidies at a whopping 17.3 billion euros in 2019 and later even 31 billion euros (Metten 2023), and after the demonstrations of Extinction Rebellion, the discussion only got off to a good start. The Rutte IV cabinet responded by taking some relevant steps (see also chapter 4).

2.2 A social welfare perspective on fossil fuel subsidies

Using fossil energy carriers causes far-reaching climate change, which energy transition policies try to counteract. Especially the combustion of fossil energy releases GHGs, such as CO_2. Climate change is widely seen as a threat and has led to energy transition policies in many countries. Characteristic of these policies is the ambition to move society towards little or no (net) GHG emissions within a certain timeframe, such as the

[2] According to SDG 12.c.1, governments should 'rationalise inefficient fossil fuel subsidies that encourage wasteful consumption by removing market distortions' (UN 2015). The 2015 Paris Agreement also included commitments to 'make financial flows consistent with a pathway to low greenhouse gas emissions and climate-resilient development' (UNFCCC 2015, Article 2.1.c).
[3] EU Climate Law: link. EU Green Deal: link.
[4] For an overview, see 'Member Van Raan's own-initiative note on fossil subsidies and how to abolish them' (link).
[5] Additional information can be found in the yearly National Budget and the yearly Budget Memorandum.

European Union and the Netherlands' goal of climate neutrality by 2050. Phasing out fossil energy carriers that are particularly responsible for CO_2 emissions as much as possible is thus at the heart of this policy.

Adequate pricing of external costs is essential for the transition to a climate-neutral society. When GHG emissions are priced too low or not at all, the market does not work properly and the energy transition is hampered. Not pricing emissions or pricing them too low is referred to in the economic literature as a negative externality, because market players do not sufficiently take into account the social costs of emissions. Adequate pricing of externalities such as GHG emissions creates an incentive to factor in the externalities of climate change and thereby make more sustainable consumption and production decisions (Baumol and Oates 1971; Pigou 1912). When these (external) costs are not captured by existing climate, environmental or other pricing policies, investments and the use of fossil fuel energy have preferential treatment over activities that do not release GHG emissions occurs.

When the government does not price GHG emissions adequately, fossil fuel subsidies exist. In principle, government policy should ensure adequate pricing of the external effects of using fossil energy carriers. If this is not the case, we can speak of subsidies. This applies, for instance, to policies that increase fossil fuel energy and thus lead to additional emissions. Examples are transfers to fossil energy companies in the extraction of natural gas, and policies that directly reduce the market price of fossil energy carriers, such as price subsidies for the use of coal or natural gas. In doing so, the government also has to levy higher taxes elsewhere to finance this additional expenditure. Moreover, more emissions take place as a result than without these subsidies.

However, even if GHG emissions are priced by government instruments, this pricing might still be inadequate and therefore result in fossil fuel subsidies. In practice, GHG emissions are often already priced by different policy instruments. For instance, there are instruments that explicitly charge for GHG emissions, as in the case of tradable emission rights or a CO_2 levy. Also excise duties on fossil energy carriers or even a tax on electricity are relevant here. In addition, fossil energy use or CO_2 emissions are also influenced by other instruments, such as regulation, standards and subsidies (see also Vollebergh et al. 2021; Vollebergh and Van der Werf 2014). If GHG emissions are ultimately not or insufficiently priced by the overall range of policy instruments, this so called 'carbon pricing deficit' could also be labelled as a fossil fuel subsidy (see further Vollebergh et al. 2021). Incidentally, the focus of these subsidies is on GHGs released from the combustion of fossil energy, which are thus mainly CO_2 emissions.[6]

Even if the government encourages the use of fossil energy in a more indirect way, there may be fossil fuel subsidies. There are also policies in the broader tax system that favour the use of fossil fuels, and these can also be fossil fuel subsidies. Think of tax exemptions or concessions that apply specifically to activities using fossil energy carriers, such as certain allowances in VAT, transport taxes, or specific corporate tax policies that benefit fossil fuel firms in particular. Guarantees or credit insurance for activities linked to the use of fossil energy carriers also lead to this kind of market distortion. And even trade policy is relevant here. For instance, recent academic research shows that generally higher import tariffs and other import barriers (price regulation, product standards, quotas and the like) apply to clean goods compared to more polluting goods (Shapiro 2021). Such regulations are also referred to as fossil fuel subsidies because of their undesirable negative impact on the environment and/or climate (OECD 1998).

[6] Not pricing emissions of other GHGs may also contribute to inadequate climate pricing, but these emissions generally do not arise from fossil energy combustion. These are mainly GHG emissions from agriculture (see also Vollebergh et al. 2021).

Government regulations that encourage the use of and investments in fossil fuels increase the risk of additional 'stranded assets' as a result of the energy transition. Here, by stranded *assets* we mean investments in assets that prematurely or unexpectedly lose their value due to (new) climate or environmental regulations or due to unforeseen disruptive rapid developments of alternative cleaner technologies (Campiglio et al. 2022). Fossil-fuel subsidies can lead to *lock-in* to fossil investments and thus to inappropriate, inefficient spending of resources over time. The government may face the cost of such stranded assets through stakes in or financing of companies with such assets. But even when the government does not directly invest in such companies, there can be substantial consequences when stranded assets lead to instability of financial institutions. The same applies if the government should bear the 'transition costs' of companies when fossil investments are no longer sustainable and investments in alternative production technologies are not yet sufficiently attractive to companies.[7] The government can reduce the risk of stranded assets by pursuing consistent and predictable climate policies in line with climate targets (Trinks et al. 2022b).

Adjusting certain fossil fuel subsidies can lead to welfare gains. So there are all sorts of of direct and indirect government policies that may impede the energy transition. In such cases, abolishing such policies helps the energy transition. In principle, a reduction in price subsidies or a reduction in carbon pricing deficits lead to fewer GHGs and therefore in principle promote social welfare.

Social welfare might increase for some policies even independently of the energy transition. Sometimes there are also additional welfare gains, as many of today's fossil fuel subsidies are directly linked to tax allowances. Taxation is necessary to finance public spending, but it also leads to welfare losses because it is distortionary: products or services are made more expensive and citizens could spend less. In general, the welfare loss for a taxpayer exceeds the tax revenue.[8] Abolishing some fossil fuel subsidies will then lead to fewer distortions, and the extra tax revenue can even be used to reduce other taxes. On balance, this may result in an even larger welfare gain.

Abolishing fossil fuel subsidies is complex and not always obvious. Yet abolishing a government policy once identified as a relevant fossil energy subsidy still does not always lead to welfare gains. One complication, for instance, is the open nature of the relatively small but energy-intensive Dutch economy. Tax bases, such as fossil fuel carriers, are quite often under pressure because of international competition and the possibility of carbon leakage (Vollebergh 2014). Concerns about a level playing field mean that lower rates or exemptions in the tax regime are sometimes chosen. Economic activities that are internationally mobile are more sensitive to higher rates than activities that are less mobile or elastic and less affected by international trade or competition (Aus dem Moore et al. 2019; Koch and Basse Mama 2019). If other countries or regions do not pursue policies, lower rates for internationally mobile activities relative to less mobile activities are sometimes justifiable from a social welfare perspective (Bovenberg and De Mooij 1994). This is even more so when relocation of activities results in little or no reduction or even increase in global emissions if policies elsewhere are less stringent (Hoel 1991).

Instrument overlap can also affect effectiveness. Ideally, an external effect–- such as an emission–- should be adequately regulated only once, for instance through a tradable right or a tax on emissions. When the same emission is priced by more instruments at the same time, there is a risk that the sum is less than the whole of the parts. For example, when a tax is combined with a tradable permit system, there is a risk that the tax lowers the price of the allowance. Companies that have to pay the tax will normally reduce their emissions in

[7] See, for example, Breitenstein et al (2022) in the context of the early phase-out of coal-fired power plants in Germany.
[8] This is because on top of the tax paid, there is also a welfare loss due to the so-called 'deadweight'. This approach is at the heart of the so-called optimal tax theory. See Van Weeghel et al. (2010) and Mirrlees et al. (2011) for further explanations and applications to existing systems.

response. This reduces the demand for allowances, which reduces their price. And so the combined tax and price of the tradable right may turn out to be lower than initially thought.

Closely related is that overlap of instruments at the local and European level can lead to carbon leakage. Carbon leakage can occur when certain fossil fuel subsidies are abolished only in the Netherlands. Then the released emission allowances may leak to other EU countries and activities may relocate within the European Union or even to countries outside (Perino 2018; Perino et al. 2019). As a result, in addition to CO_2 reductions in the Netherlands, on balance there may be no lower CO_2 emissions on a European or global scale.

The extent to which leakage of CO_2 may occur depends on a large number of factors. One important factor is the extent to which other countries make similar arrangements. When countries act in a coalition aimed at jointly tackling the same emissions, leakage within the coalition is not a problem because the international playing field does not change. Then, in principle, there is more room to eliminate fossil fuel subsidies. Other factors influencing the degree of relocation and carbon leakage are other policies affecting the business environment, and the ability of companies to adapt, pass on CO_2 costs and anticipate. We discuss this further in section 5.2.

2.3 Calculating fossil fuel subsidies

There is much ambiguity about which policies in the Netherlands qualify as fossil fuel subsidies and what amounts are involved. As indicated earlier, fossil fuel 'subsidies' are understood much more broadly than just the explicit transfer of funds by the government to market participants. In principle, fossil fuel subsidies involve not only (a direct) transfer of resources to certain households or companies, but also (more indirect) fiscal incentives, such as tax credits or exemptions or reduced rates in the tax system. Furthermore, policies that predominantly support a fossil fuel activity can also fall under a broad interpretation of fossil fuel subsidies. This would include government contributions through, for example, guarantees, equity support, and loans and policies through which government revenues are potentially foregone or not collected. Moreover, this broader understanding of the subsidy concept follows from the welfare assessment of government intervention discussed above. However, differences of opinion may nevertheless arise in determining the relevance of specific policies. In addition, further concreteness is needed to calculate the size of fossil fuel subsidies.

Determining the relevance and size of specific policies requires choices about what qualifies as a fossil energy subsidy and an associated benchmark or reference value to determine the size of that subsidy. In this report, we distinguish two perspectives. The first approach is called the *inventory approach*. This approach arrives at an amount in two steps. First, schemes that qualify as fossil fuel subsidies are inventoried, and then a reference value is established for each scheme on the basis of which the revenue foregone is calculated. We call the second perspective the *external cost approach*. This approach does not assume policies, but instead focuses on market prices and externalities of fossil energy carriers and examines whether fossil fuel energy may be insufficiently priced in relation to external costs. Below, we discuss both approaches in more detail.

Inventory approach

The inventory approach considers a number of categories of fossil energy support. The basis for this approach concerns a broad interpretation of the concept of subsidy ' used by the World Trade Organization (WTO): a 'financial contribution by a government or public body that confers an advantage on the beneficiaries compared to other market participants' (WTO 1994). UNEP et al. (2019) recommend a broad interpretation for determining progress on SDG 12.c.1. ('*amount of fossil fuel subsidies per unit of GDP (production and consumption)*'). According to this interpretation, four categories are distinguished:

1. Price support policies: direct income or price support reducing the price for producers and domestic consumers. This includes subsidies in kind (i.e. a good or service provided by government at a price below market value).
2. Direct transfers of resources: direct expenditure and budgetary or non-budgetary transfers of public resources to fossil fuel users.
3. Tax expenditures and other revenues foregone by the government due to exemptions, rebates, lower rates, deductions etc.
4. Risk transfer to the government: shifting risks to the government through loans, insurance or capital injections, among others, as well as direct transfers of funds or liabilities (e.g. loan guarantees).

This stock-taking of possible policies that qualify as fossil fuel subsidy is the first step in this approach.

To determine the size of fossil fuel subsidies according to the inventory approach, a reference value is needed. The second step aims to determine the size of the subsidies. For direct transfers (category 2), this is relatively straightforward and the cash transfer can be easily quantified in monetary units. But for the other policies, it is important to determine specific reference values for each scheme. For price support policies (category 1), for example, this is the market price without taxes or other subsidies. In the case of tax expenditures and revenues foregone (category 3), the reference would be the budgetary impact or the rates that would otherwise apply. For example if a product like natural gas is taxed at different rates one could use the highest rate as the reference value. Such a reference value should be determined separately for each scheme. It should be noted that not all categories, e.g. risk transfers (category 4), are easy to quantify (UNEP et al. 2019).

External cost approach

The external cost approach looks primarily at existing pricing of climate or other environmental damages based on carbon pricing policies deployed by governments. This perspective takes as its starting point the costs of externalities that are not adequately reflected in market prices. The approach has previously been used by the International Monetary Fund (IMF) (Coady et al. 2017; IMF 2021; Parry et al. 2021) and also PBL (Vollebergh et al. 2021; Brink and Vollebergh 2023). As in the inventory approach, this includes price support (category 1) that lead to market prices artificially below the market value of a fuel or fossil-fuel-generated electricity (Parry 2016). But in addition the external cost approach does also consider whether the government's pricing of fossil energy is 'adequate' compared to the value of the externalities in monetary terms. Also the OECD employs this approach when calculating and evaluating their effective carbon tax rates (OECD 2023)

The external cost approach is limited to the costs directly incurred when fossil energy carriers are burned. Externalities can be interpreted broadly as in the IMF studies (Parry et al. 2021). These estimates not only account for climate damage but also for the closely related cost of air pollution in all cases of burning fossil fuels, but also for congestion, safety and even highway wear and tear in the case of transport. However, 'partial' approaches are also possible. The OECD for instance limits their assessment of effective carbon tax rates to climate damage alone (OECD, 2022), while PBL applies an intermediate case based on the combined climate and air pollution damage (e.g. Vollebergh et al., 2014).[9] If the sum of the market price of fossil energy (including price-cutting subsidies) and relevant policies such as energy taxes, levies and potentially other pricing instruments, is lower than the producer price ('supply costs') plus the costs of the externalities considered, there is a fossil energy subsidy. In other words, the reference value here then refers to market prices plus the damage from externalities taken into consideration. If only external climate damage is considered, the reference value is climate damage or the social cost of carbon. This will be referred to as the carbon pricing deficit related to the use of fossil fuels (Vollebergh et al. 2021).

[9] Vollebergh et al (2021) discusses these different possibilities and the corresponding calculations in detail.

In the external cost approach, the reference value is the monetary damage of the external costs. To determine the magnitude of external costs, it is necessary to use shadow prices to compute monetary damage for the external costs such as the social cost of carbon. These shadow prices usually reflect the average damage from specific emissions. Once expressed in monetary terms, these external costs can be compared to the main set of pricing instruments included. In the context of climate change, the focus on identifying pricing instruments is then on direct pricing of GHG emissions and pricing based on tradeable CO2 allowances or energy taxes, for example.

Recent calculations of fossil fuel subsidies in the Netherlands

Table 2.1 shows that there are large differences in the calculated magnitude of fossil fuel subsidies for the Netherlands. These differences are a direct consequence of differences between the chosen approach. In particular, the inventory approach leaves a lot of room for interpretation. Differences are mostly due to differences in policies that are or are not included and quantified, but also to differences in reference values used for the same specific policies. This shows that the choice of policies and their references are always open to debate and that results on the size of fossil fuel subsidies can vary widely here. The external cost approach also arrives at a significant size of these subsidies, but this size has a very different interpretation. Here, unpriced external cost is the factor determining the size. Exactly how we map fossil fuel subsidies in this study is discussed in the next chapter. There we will also return to some important differences between our calculations and those in Table 2.1.

Table 2.1 Recent calculations of the size of fossil fuel subsidies in the Netherlands

Source	Approach	Year	Size (€ billions per annum)
IEA (2022)	Inventory (cat. 1 only)	2021	0
OECD and IEA (2020)	Inventory	2020	4.5 plus unquantified items (a)
Milieudefensie (2020)	Inventory	2016–2020	4.9 (b)
Ministry of Economic Affairs and Climate Policy (2020)	Inventory	2020	4.5 plus unquantified items
Ministry of Finance (2022)	Inventory	2021	3.4 plus unquantified items (c)
Metten (2021)	Inventory	2019	17.3
Metten (2023)	Inventory	2019 (d)	30.8
SOMO et al. 2023	Inventory	2020–2022	37.5
Ministry of Finance (2023a)	Inventory	2023	39.7–46.4
IMF (2021)	External costs (wide)	2021	11.2

(a) These are items which the researchers were not yet able to quantify.
(b) in addition, Milieudefensie reports a further €3.4 billion of annual government support in the form of loans, credit insurance and state-owned enterprises. This is a total amount and not the costs (due to potential revenue foregone) of alternative spending because the government offers more favourable conditions than the market.
(c) This concerns €0.6 billion of 'expenditure' and €2.8 billion of 'revenue foregone'.
(d) Metten (2023) provides calculations for the years 2019 to 2022 inclusive.

2.4 The inventory and external cost approach in the social welfare perspective

The amount of fossil fuel subsidies depends on the policies considered and reference used. It is already clear from the previous description of both approaches that the calculation of the subsidies depends on several choices. The amounts computed are not easily comparable. The application of the inventory approach in the Netherlands now mainly focuses on potentially revenues foregone from all kinds of tax policies, especially those in the existing taxes on use. Instead, the external cost approach calculates an amount of non-priced external costs and designates this as fossil fuel subsidies.

More important than the exact size of an amount is whether government policies hinder the energy transition. Both approaches provide useful insight. Both the inventory approach and the external cost approach provide insight into government policies but also have their limitations when assessing policies that hinder the energy transition.

The inventory approach reveals a wide range of policies that could be counterproductive to the energy transition. Which policies qualify as fossil fuel subsidies is not set in stone. Debate is regularly possible as to whether a particular scheme qualifies as a fossil subsidy, not or partially. The inventory approach is particularly helpful for identifying or stock taking policies that may complicate the energy transition, some more indirectly than others. This approach brings to the fore not only policies directly related to pricing instruments, but also all kinds of policies hidden in other (tax) policies such as car taxes, income or corporate taxes, and government co-financing of fossil energy projects, among others.

A limitation of the inventory approach is that the choice of reference is to some extent arbitrary and unrelated to the energy transition. References for determining the size of fossil fuel subsidies in the Netherlands are often based on existing government spending or existing taxes. These reflect political choices for government revenue and expenditure policies. Indeed, specific subsidies, tax bases or tariffs are set annually by politicians. This involves all kinds of considerations. Green taxes are also partly shaped by a revenue and distribution objective, where the relationship with external costs and the energy transition is not always clear (Vollebergh et al. 2016). Sometimes in the Netherlands, policies are classified as fossil fuel subsidies whose abolition may even lead to perverse effects from an energy transition perspective. This is the case, for example, with the electricity tax. Electrification is essential for energy transition. Yet tax rate differentials that apply to small and large consumption levels are classified as fossil subsidies because (part of) electricity is generated with fossil energy carriers. If these policies were then abolished, the electricity price goes up and the transition is hampered.

The external cost approach does have an energy transition-related reference. External costs basically reflect damages that are not directly reflected in existing fossil fuel market prices, but which are directly related to the combustion of fossil energy sources, depending on the specific application. This perspective links directly to the idea of market failure and, in particular, underpricing of fossil fuel use in its many applications ((Vollebergh, 2012; Brink and Vollebergh 2023). This brings into focus the extent to which existing tax bases and rates account for appropriate pricing and how different pricing instruments may overlap.

But the calculation of external costs is difficult. Indeed, it remains difficult to determine the external costs themselves and thus the size of the fossil fuel subsidy. Although much progress has been made over the years (see CE Delft 2023), monetisation of external costs always involves uncertainties. For instance, the valuation of external costs can increase or decrease depending on advancing scientific insights (see, for instance, Rennert et al. 2022). This also makes the calculation of the size of fossil fuel subsidies from this perspective uncertain and dependent on various choices.

Also, the external cost approach is limited in identifying relevant policies. This approach mainly focuses on pricing policies and inadequate pricing of externalities directly linked to energy use. This is certainly of great importance in the context of the energy transition as direct pricing here incentivises actors to better look out for cleaner alternatives. But, as described above and in section 2.2, there is a much broader palette of relevant fossil fuel policies that can work against the energy transition.

Ultimately, the energy transition is best served by a combination of both approaches. A good analysis of policies and the context in which they have been applied is essential to assess whether abolition of particular fossil fuel subsidies will ultimately lead to welfare gains. The inventory approach provides a more useful starting point for the stock taking exercise. Besides the direct pricing instruments that the external cost approach also and primarily focuses on, this approach also considers indirect support for fossil fuel use through subsidies on investments in that use (category 2), policies related to the income and corporate tax (category 3) and policies in which risk transfer plays a role (category 4). When assessing tax policies directly related to emissions, the external cost approach provides a logical first step. Indeed, through this angle, it becomes clear what external costs are associated with the use of certain fossil energy carriers and whether abolishing a subsidy makes sense for the energy transition.

3 The size of Dutch fossil fuel subsidies in 2021

In this chapter, we present our own calculations of fossil fuel subsidies in the Netherlands based on the approaches discussed in Chapter 2. We elaborate the inventory approach and the external cost approach in detail for the most discussed policies in the Netherlands. In doing so, we focus on those policies that *directly* address fossil fuel use and its associated emissions. Hereafter, we refer to these as *direct* fossil fuel subsidies. We describe the results of the calculations for both approaches in sections 3.1 and 3.2. Section 3.3 discusses the differences between the approaches. In section 3.4 we discuss *indirect* fossil fuel subsidies which are identified by the inventory approach.

To calculate and analyse the direct fossil fuel subsidies, we use the methodology for determining current pricing of GHG emissions previously developed and applied by Vollebergh et al. (2021). This methodology enables a comprehensive assessment of different pricing instruments and their links with the use of specific fossil energy carriers by different sectors. Additional data were used for a number of policies. The focus is on the situation in the year 2021, the most recent year for which updated data are available. In some cases, we use data from other years to still give a picture of the scale.

3.1 Inventory approach: direct fossil fuel subsidies

The inventory approach requires a list of policies and a quantification of the benefit received by beneficiaries. These are benefits in the production or consumption of fossil fuels. In the inventory of relevant policies, we follow the previously mentioned classification into four categories: price support policies (1), direct transfer of funds (2), tax expenditures and revenue foregone (3), and risk transfers to government (4).

Table 3.1 shows the policies that directly affect the use of fossil energy carriers and their associated emissions, and that we were able to quantify properly. The list was compiled on the basis of previous inventories of fossil fuel subsidies and discussions with experts from the Ministries of Economic Affairs and Climate Policy and Finance, CPB Netherlands Bureau for Economic Policy Analysis and PBL Netherlands Environmental Assessment Agency. In the end, many of the policies listed in Table 3.1 show similarities with policies identified in previous reports (see Table 2.1). But there are also differences.

Quantified fossil fuel subsidies in 2021 in the Netherlands, according to the inventory approach, mainly concern the category of tax expenditures and other potentially revenue foregone from taxes on energy. There were no price support policies in 2021. And direct resource transfers were also limited. The main policies in this category are *indirect* cost compensation for higher electricity prices due to the European Emissions Trading Scheme (ETS) for large consumers in particular, as well as potential revenues foregone from ETS allowances.[10] The vast majority of subsidies concern tax expenditures and potentially tax revenues foregone due to degressive tax rates, exemptions and other specific policies.

[10] Incidentally, it is not the case that these free rights could otherwise be auctioned by the Dutch government. Separate distribution keys apply for the distribution of auction volumes among member states.

Of note here is that the calculation of 'potential revenue foregone' says nothing about the amounts the government would collect in practice if the scheme were really abolished. This is because abolition is expected to induce behavioural effects among households and businesses: after all, abolition makes the use of fossil energy carriers more expensive, prompting a reduction in use and thus the tax base. For this reason, we refer to 'potential' revenue foregone.

Existing tax rates are mainly used as a reference value to calculate the potentially revenue foregone. The last column of Table 3.1 shows, for each identified scheme, the reference used to determine its potential revenue foregone. We have based the choice of reference values on the marginal rate that applies to most users in the case of rate differentials and, in the case of exemptions, on the marginal rate that would apply in the absence of the exemption. We provide some salient examples of our choices. For instance, for our calculation of subsidies related to degressive rates in the Energy Tax, we take the standard rates in the first bracket as a reference. We also take into account that electricity is not only generated with fossil energy carriers. After all, we are calculating subsidies on *fossil fuel* here. Therefore, we correct the potential revenues foregone in electricity taxation for the share of electricity generated from non-fossil fuel. Similarly, we treat the fixed (*lump sum*) transfer to each electricity connection to the grid and which significantly lowers the energy bill. To determine the value of 'free allowances in the European emissions trading system', the obvious choice is to take the market price of allowances over the whole year. In Annex A we briefly discuss all choices involved in our quantification exercise.

The revenue foregone calculations do not include VAT (Value Added Tax). Because VAT is levied on excise duties, VAT revenues are also foregone for the related fossil fuel subsidies. However, VAT cannot be seen as climate pricing, as it is purely intended as a revenue instrument (Vollebergh et al. 2016). Therefore, the calculated fossil subsidies also do not include VAT revenues foregone. Exemptions of differences in VAT rates (e.g. VAT exemptions) do create distortions and justify a separate discussion (Bettendorf and Cnossen 2014). In section 3.4, we discuss the indirect fossil subsidies associated with VAT.

Total fossil fuel subsidies in the Netherlands in 2021, according to the inventory approach used here, amount to 17.1 billion euros. As Table 3.1 shows, a few large policies account for the bulk of this amount. Most prominent is the fixed tax rebate in the Energy Tax and the degressive rates therein: in total this amounts to €7.7 billion. The free provision of ETS allowances to companies is also relatively high at €2.1 billion. The other large items (more than €1 billion) concern the difference in excise duty between petrol on the one hand and diesel, LPG and natural gas on the other, and excise duty exemptions for aviation and shipping. In total, these items account for over 90 per cent of the total amount mentioned. In Annex A, we explain the policies and the calculations behind the table above. Note that in 2021, there were no direct price support policies. However, this has changed recently due to concessions because of the war in Ukraine. These include a price cap on energy, whereby consumers now pay a maximum price up to a certain amount of natural gas and electricity consumption (see also Chapter 5).

The total amount of €17.1 billion is substantially higher than according to previous reports using the inventory approach. Previous reports (OECD and IEA 2020; Milieudefensie 2020; Ministry of Economic Affairs and Climate Policy 2020; Ministry of Finance 2022) arrived at an amount of around €4 billion per year. However, our table has quantified items previously listed as p.m. items. These are large items, such as the degressivity in the Energy Tax (both on electricity and natural gas) including the lump sum rebates, excise duty differences between petrol and diesel, LPG and natural gas and the exemption of refineries' own consumption of oil products.

Table 3.1 Direct and quantified fossil fuel subsidies in relation to pricing instruments in the Netherlands in 2021 according to the inventory approach

Scheme	Size (€ millions)	Reference value
Category 1: Price support policies		
- None		
Category 2: Direct transfer of resources		
Free EU ETS emission allowances	2,080	Average ETS price
Category 3: Tax expenditure and potential revenue foregone		
Energy tax and Additional Sustainable Energy and Climate Transition tax (ODE in Dutch)		
- Tax reduction (on electricity bill, fossil fuel share)	2,350	Total rebate, fossil fuel share (62%)
- Degressive rate structure for electricity (fossil fuel share)	3,420	Rate in 1st bracket, fossil fuel share (62%)
- Degressive rate structure for natural gas	1,940	Rate in 1st bracket
- Reduced rate for natural gas in greenhouse horticulture	120	Regular bracket rates for natural gas
- Exemptions for energy-intensive processes (natural gas + electricity)	40	Rate in 4th bracket
- Exemption for non-energy use of natural gas in chemical sector with direct CO_2 emissions	70	Rate in 4th bracket
- Tax rebate scheme for institutions (natural gas + electricity)	40	Regular bracket rates
- Exemption for natural gas consumption in extractive industries	20	Regular bracket rates for natural gas
Excise duty on mineral oils		
- Lower rate for diesel/LPG/CNG than for petrol	2,670	Excise duty rate on petrol
- Exemption for use of diesel (particularly inland shipping)	1,540	Regular diesel rate
- Exemption for use of kerosene in international air transport	1,500	Regular diesel rate
- Exemption for the use of fuel oil (particularly maritime shipping)	350	Regular rate for heavy fuel oil
Other policies		
- Input exemptions for electricity generation	640	Various regular rates
- Exemption for use of waste gases and mineral oils arising in house (refineries and chemical plants)	250	Various regular rates
- Untaxed use of coal products in blast furnaces and coking plants	30	Rate in 4th bracket for natural gas
- Exemption in coal tax for dual consumption	30	Regular rate
Category 4: Risk transfer to the government		
No quantified policies		
Total quantified	**17,110**	

At the same time, the amount is substantially lower than that in the recent studies by Metten (2023). Metten (2023) estimates fossil fuel subsidies for 2021 at €30 billion. This is mainly due to other chosen reference rates related to the degressive energy tax structure and its exemptions. For example, Metten uses the assumption that *all natural gas consumption* should be taxed at the rate of the first bracket, i.e. including all exemptions. Here, we take as a reference the marginal rate that would apply in the absence of an exemption under current legislation (in most cases, this is the rate of the fourth bracket).[11] Furthermore, Metten does include the full amount of VAT revenues foregone in relation to excises such as those of kerosine and diesel as well as the degressive rates in the energy tax. As indicated above, we have waived this.

The same applies to the study by SOMO et al (2023) and the 2024 National Budget (Ministry of Finance 2023a). SOMO et al. (2023) arrive at a figure of €37.5 billion per year between 2020 and 2022 (€36.8 billion in 2021), even though they exclude the VAT revenue foregone. Differences with Table 3.1 are partly because we characterise several policies as indirect fossil fuel subsidies and discuss them separately in section 3.4. Also, SOMO et al. (2023) uses higher reference rates, including for the excise duty exemption for the use of fuel oil in maritime shipping and for various exemptions for the use of natural gas and residual gases in industry and electricity generation.[12] SOMO et al (2023) also use the rates of the first bracket in the Energy Tax rates as the reference rate, measured in terms of energy density, totalling almost €7 billion. We take the comparable Energy Tax rate on natural gas and electricity as a starting point. The difference with the €39.7–46.4 billion from the recent 2024 National Budget (Ministry of Finance 2023a) is primarily because it also quantifies indirect fossil fuel subsidies. For example, the indirect fossil subsidy of leaving non-energy use of mineral oils untaxed alone creates a difference of €14 billion. The calculations in the 2024 National Budget also refer to the year 2023 instead of 2021. In that year, the energy price cap provided direct price subsidies of €3.2–3.8 billion (see also Chapter 4).

Direct fossil fuel subsidies are visualised by linking them to the pricing instruments of the use of specific fossil fuels deployed in the Netherlands. PBL has previously linked the existing direct pricing instruments to the use of fossil fuel energy carriers using the detailed Energy Balances for the Netherlands (see Vollebergh et al. 2021; Brink and Vollebergh 2023). As the main focus in the Dutch discussion is on fossil subsidies directly linked to the existing pricing instruments, the same methodology has been used here to calculate the size of fossil fuel subsidies in Table 3.1. This also allows most of the amounts to be visualised visually using the regulatory energy bases as well as their effective carbon price. Figure 3.1 shows on the horizontal axis the CO_2 emissions associated with the use of specific fossil fuels in the Netherlands, divided into six emission sectors.[13] Within each sector, different fossil fuel energy carriers contribute to CO_2 emissions (individual energy carriers are not shown in the figure). The vertical axis shows the level of (converted) direct pricing per tonne CO_2 or the effective carbon or CO price. ₂

Each plane in Figure 3.1 relates to emissions to which the same effective CO_2 price applies. The horizontal axis, and thus the width of the planes, indicates to which part of the emissions this effective price (vertical axis) relates. The leftmost plane in the road transport sector, for instance, shows the CO_2 pricing of petrol consumption in this sector, and where the excise duty on petrol of 81 euro cents per litre is converted into an effective CO_2 price of almost €350 per tonne CO_2, using the appropriate emission factor. The width of the plane for petrol is equal to the total CO_2 emissions in 2021 from petrol consumption in the road transport sector: 11 megatons. The plane to the right shows the CO_2 pricing of diesel consumption in this sector, with the excise duty rate of 52 euro cents per litre leading to an effective CO_2 price of just over 200 euros per tonne of CO_2. The

[11] Another difference compared to Metten (2023) is that we do not include the non-energy use of natural gas insofar as it does not directly release CO_2. In addition, Metten uses several different assumptions for the missed taxes due to degressive tariffs on (fossil-generated) electricity: for instance, he assumes a fossil share of 70 per cent and we of 62 per cent. All in all, he also comes out higher than us on this component.

[12] For instance, SOMO et al. (2023) calculate an additional amount of over €4.5 billion for marine fuel oil due to a difference in the excise tax rate between fuel oil and diesel, where we take the regular fuel oil rate as a reference. By including the difference between the rate of the first and fourth tranche in exemptions from the energy tax on natural gas, the fossil subsidies calculated by SOMO et al. (2023) also end up substantially higher than in our calculations. In our calculations, the total size of fossil energy subsidies would increase by around €10 billion if, for exemptions, the rate of the fourth tranche instead of the rate of the first tranche were used as a reference.

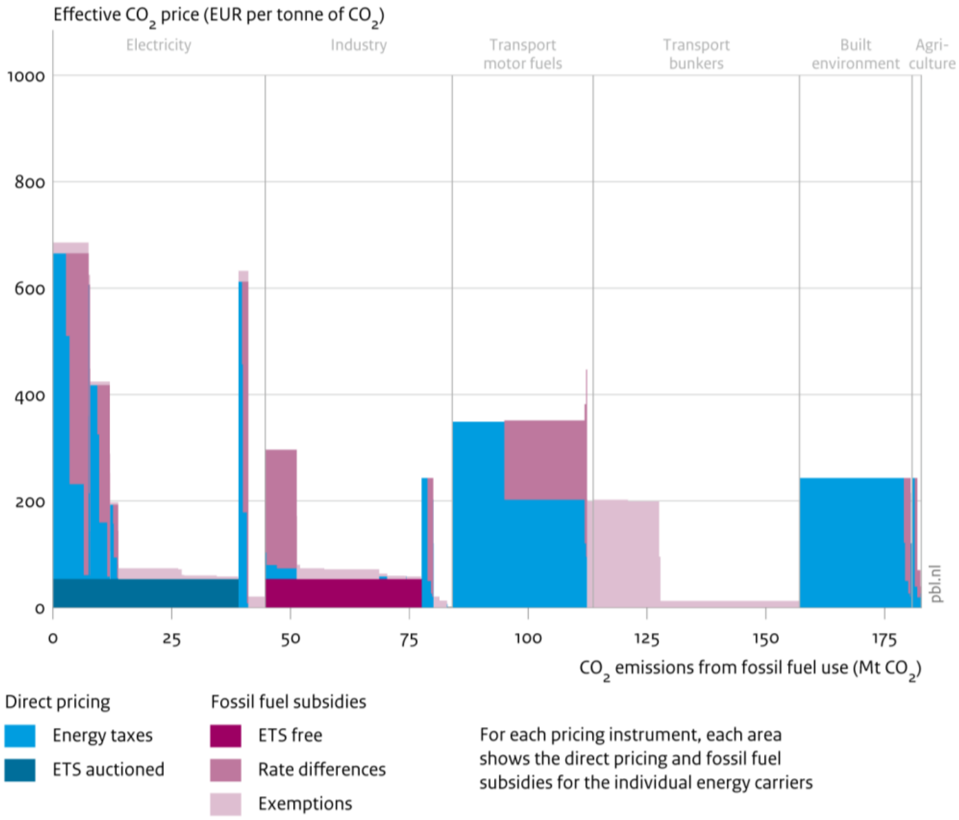
[13] Note that in this figure on the X-axis only (potential) CO_2 emissions are shown and not all GHG emissions, due to the focus on combustion of fossil energy carriers (see Figure 1 in Brink and Vollebergh (2023)).

width of the blue area for diesel in the road transport sector is equal to the CO_2 emissions in 2021 from diesel consumption subject to excise duty: almost 17 megatonnes.

The different colours of blue indicate which instruments contribute to what part of the effective CO_2 price. Thereby, the light blue areas in the Figure refer to the pricing by various taxes on energy (in addition to excise duty on mineral oils, also the Energy Tax (on natural gas and electricity) and the Sustainable Energy and Climate Transition Tax and the coal tax)while the dark-blue areas relate to pricing by the European emissions trading system. For some emissions, the effective price is zero, for example because the underlying energy use is not taxed or because this use is exempt from taxation or emission trading. The area of the blue planes reflect the total (opportunity) value of the allowances required or the total tax revenue of the instrument in question. To the extent that allowances are provided for free, they do not constitute revenue for the government. That part is shown separately (in dark violet) as a fossil fuel subsidy.

The design of the existing pricing instruments determines the size of most fossil fuel subsidies quantified under the inventory approach. The subsidies are shown in Figure 3.1 as planes in different shades of violet. Th planes reflect subsidies due to free allowances, subsidies related to tariff differentials and subsidies due to exemptions. The areas of the violet planes give the sizes of the potential revenue foregone. For instance, in the example of petrol and diesel described above, the difference in excise duty rate is seen as a fossil fuel subsidy. In doing so, we take the excise duty rate for petrol per unit of energy as the reference rate. Because CO_2 emissions per unit of energy for diesel are slightly lower than for petrol at the same rate per unit of energy, the effective CO_2 price for diesel is slightly higher than for petrol. The subsidy related to the rate difference between petrol and diesel concerns the violet area in the figure above the blue area for diesel consumption in the transport sector. We determine the magnitude of this subsidy by applying the reference rate to diesel consumption in the road transport sector (the blue area). Another example is the potential revenue foregone from electricity in the higher brackets and plotted against the rate in the first bracket on the far left of the figure. Because the same energy tax per kilowatt-hour of electricity leads to a different effective CO_2 price for different energy carriers used in electricity generation, the level of subsidies also differs within the electricity sector. The leftmost area relates to electricity generation via natural gas, followed by coal.

Figure 3.1 CO_2 pricing and fossil fuel subsidies according to the inventory approach, 2021



Source: PBL

Note: The figure includes the direct fossil fuel subsidies from Table 3.1, with the exception of the lump-sum 'Energy tax reduction' (which cannot be directly linked to CO_2 emissions in the electricity sector). 'Direct pricing' is pricing that directly addresses the use of fossil energy and related CO_2 emissions. Direct pricing exists in two forms, i.e. explicit pricing of CO_2 emissions (shown in dark blue) and implicit pricing by means of, for example, taxes on fossil energy (shown in light blue).

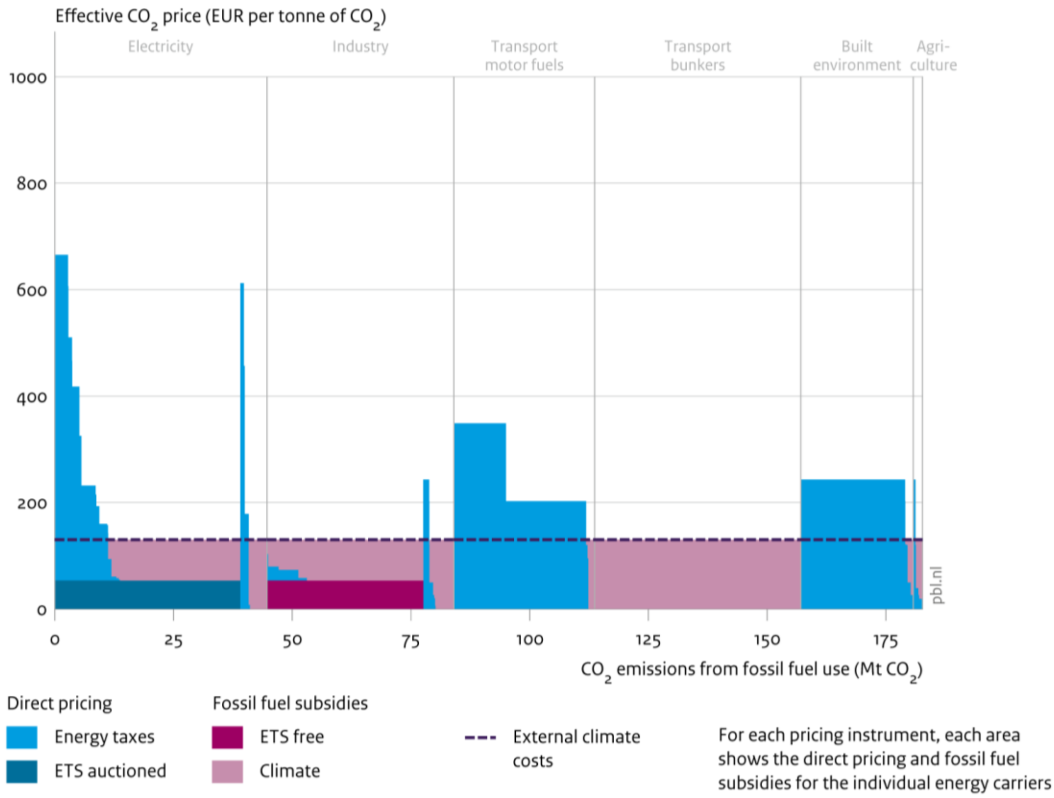
3.2 External cost approach

The size of fossil fuel subsidies can also be determined using the external cost approach. The starting point here is to compare pricing of the use of fossil energy by different instrument with the externalities expressed in monetary terms. Again we use the PBL methodology to visualise the fossil fuel subsidies for the Netherlands (Vollebergh et al. 2021; Brink and Vollebergh 2023).

As reference values for external costs, we use environmental shadow prices reported in the *Handboek Milieuprijzen* (CE Delft 2023; English translation: 'Handbook Environmental Pricing'). For climate damage we use a social cost of carbon value of €130 per tonne of CO_2 (CE Delft, 2023; Brink and Vollebergh 2023). As noted before we refer to a carbon pricing deficit if a difference exist compared to existing carbon pricing instruments (see also Vollebergh et al. 2021, pp. 72-83). This deficit reflects fossil fuel subsidies according to the external cost methodology but restricted to the external costs of climate change. The IMF (2021) includes not only climate damage but also other external costs such as air pollution, accidents and congestion. In Box 3.1, we show what including these other external costs in our calculations would mean for the picture of fossil fuel subsidies under the external cost approach (see also Vollebergh et al. 2021; Brink and Vollebergh 2023).

The external cost approach finds considerable underpricing and thus fossil subsidies. The reference in this approach is the social cost of carbon which is compared to the calculated effective CO_2 prices of the existing pricing instruments. Pricing deficits or fossil fuel subsidy are illustrated by the light violet areas in Figure 3.2. The effective carbon prices in the Netherlands by no means always reflects the associated external costs of, among other things, climate change (see also Vollebergh et al. 2021). In some cases, carbon pricing (blue areas) actually exceeds the external costs of climate change. This is the case, for instance, with the excise duty on motor fuels in the transport sector. However, there still is a pricing gap when other external costs other than just climate damage are taken into account (see Box 3.1).

Figure 3.2 CO_2 pricing and fossil fuel subsidies according to the external cost approach, 2021



Source: PBL
Note: 'Direct pricing' is pricing that directly addresses the use of fossil fuel and related CO_2 emissions. Direct pricing exists in two forms, i.e. explicit pricing of CO_2 emissions (shown in dark blue) and implicit pricing by means of, for example, taxes on fossil fuels (shown in light blue).

We quantify fossil fuel subsidies in the Netherlands in 2021 under the external cost approach at €13.7 billion. This (absolute) size of the subsidies, or the carbon pricing gap,[14] is illustrated in the violet areas of Figure 3.2. The same use of fossil energy carriers as in the inventory approach forms the basis of the calculated subsidies. Fossil fuel subsidies exist in all sectors, i.e. an (absolute) pricing gap for part of the fossil fuel use at a damage cost of €130 per tonne. The deficit amounts to €2.6 billion for the electricity sector and €3.0 billion for industry. The deficits in other sectors amount to €0.2 billion for carbon emissions related to motor fuel use in (domestic) transport, €5.6 billion for the use of bunker fuels by international aviation and shipping, €0.1 billion for the built environment and €0.1 billion for agriculture. The large deficit in transport is mainly due to bunker fuels remaining unpriced. By contrast, because of the energy tax on natural gas, there is only a very

[14] By absolute deficit, we mean that we do not offset any 'overpricing' of external costs against the underpricing.

small deficit in the built environment. The relatively low amount for agriculture is due to the fact that here we only look at emissions from fossil fuel use and not at emissions of other GHGs.

Box 3.1: External costs other than climate damage in the external cost approach

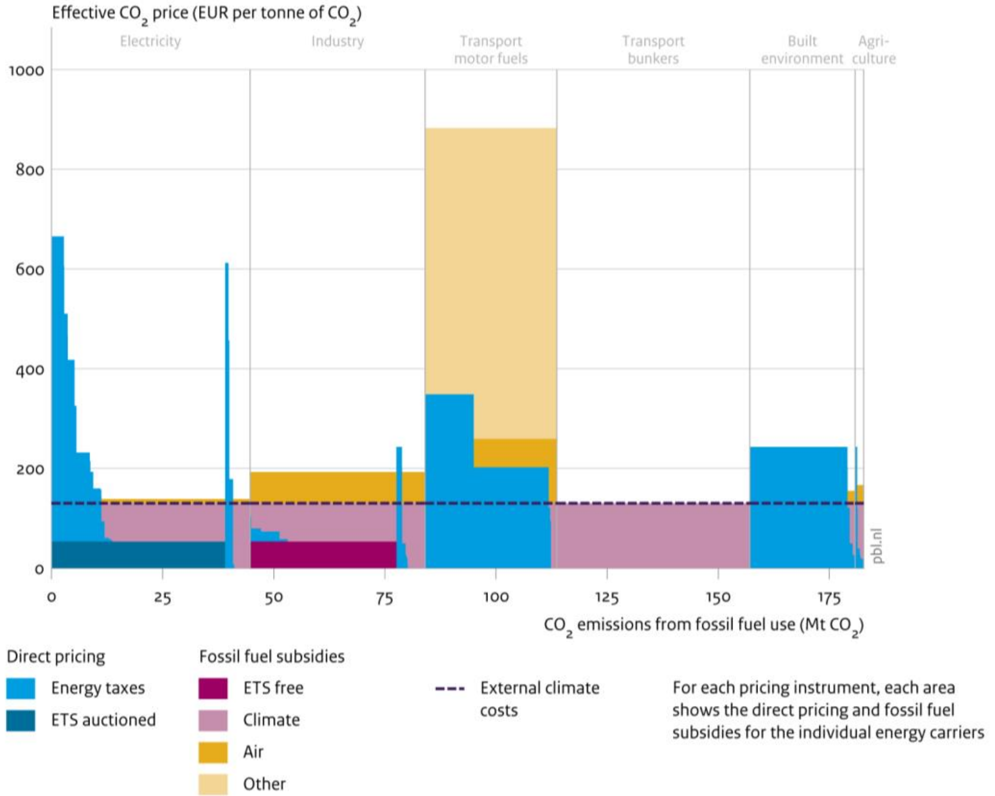
In addition to climate damage, the use of fossil fuel energy also contributes to other forms of environmental damage and hence social costs. For example, emissions of various air pollutants, such as nitrogen oxides (NO_x) and particulate matter (small particles such as PM10 and PM2.5) are directly or indirectly linked to the combustion of coal, oil (products) and gas (see Drissen and Vollebergh 2018b). Loading the environment with these substances has adverse effects on human health and ecosystems. In addition, costs of congestion, accidents and noise pollution are also related to (mainly fossil) energy use, especially in road transport.

Given the strong link between the use of (fossil) energy use and various externalities, some of the pricing instruments also address other externalities. PBL has therefore included them in previous studies on climate pricing (Vollebergh et al. 2021; Brink and Vollebergh 2023). Other externalities, however, are not always exclusively linked to the burning of fossil energy use, nor is there always a direct relationship between that use and the externalities. To visualise the effect of the external cost of air pollution, accidents and congestion, the external costs for each sector calculated by Brink and Vollebergh (2023) have been converted into external costs per tonne of CO_2. For bunker fuels sold in the Netherlands for international aviation and shipping, we do not include these other external costs, as their magnitude depends on where these fuels are ultimately consumed. We speak of a total pricing deficit if we also included the other external costs. The IMF (2021) also follows the calculation of this total pricing gap for determining fossil fuel subsidies (see also Vollebergh et al. 2021, pp. 84-109).[a]

The calculated fossil-energy subsidies become considerably higher if we include the external costs of air pollution, traffic safety and congestion in addition to the CO_2 costs of €130 per tonne. Figure 3.3 shows the additional subsidies for the other external costs in yellow. Taken together, the areas in violet and the different shades of yellow reflect the total pricing gap of externalities allocated to the underlying fossil energy carriers.[b] The total (absolute) amount of fossil fuel subsidies of the external cost approach then becomes €35.2 billion (excluding overpricing). More than half of this total pricing deficit is accounted for by transport because that is where there are high other external costs, mainly due to traffic (un)safety and congestion.
There cost are not exclusively linked to fossil fuel use, however, because electric vehicles are also responsible for these external costs. Moreover, other taxes are also relevant here, such as motor vehicle tax (mrb) and passenger car and motorbike tax (bpm). The external costs of air pollution from industry are also still considerable and increase the deficit by €2.4 billion. The figure shows that overpricing still occurs even then, especially because of the tax on electricity in the first and second tranches, but also in the tax on natural gas in the first tranche (borne mainly by households and SMEs).

↓

Figure 3.3 CO_2 pricing and fossil fuel subsidies according to the external cost approach (climate and other external costs), 2021



Source: PBL

Note: 'Direct pricing' is pricing that directly addresses the use of fossil energy and related CO_2 emissions. Direct pricing exists in two forms, i.e. explicit pricing of CO_2 emissions (shown in dark blue) and implicit pricing by means of, for example, taxes on fossil energy (shown in light blue). For the 'traffic bunkers' sector, air and other external costs are not calculated and are therefore not shown.

↓

Our estimates of the total pricing gap of €35.2 billion differ considerably from those of the IMF, which arrives at €11.2 billion only (see Table 2.1). The difference is explained in particular by the CO_2 price used: the IMF uses USD 60 per tonne (in 2020), while we use a CO_2 price of €130 per tonne (in 2021).[c] We also include the carbon pricing gap of fuel bunkering by international aviation and shipping which the IMF does not. Incidentally, the IMF does also include VAT rates on household products in the sums.

(a) Note that we also explicitly include the European Emissions Trading Scheme (ETS) as a pricing tool, while the IMF only focuses on taxes on energy.
(b) In fact, this is the same approach as the PBL 2021 study that also takes these external costs into account (see Vollebergh et al. 2021). However, that study did not calculate these areas and thus fossil fuel subsidies.
(c) The IMF's external cost approach does not assume specific pricing instruments, but an average tax burden per energy carrier. Moreover, as mentioned above, we also explicitly include the European Emission Trading System as a pricing instrument in our calculations, in addition to taxes on energy (see Figure 3.2).

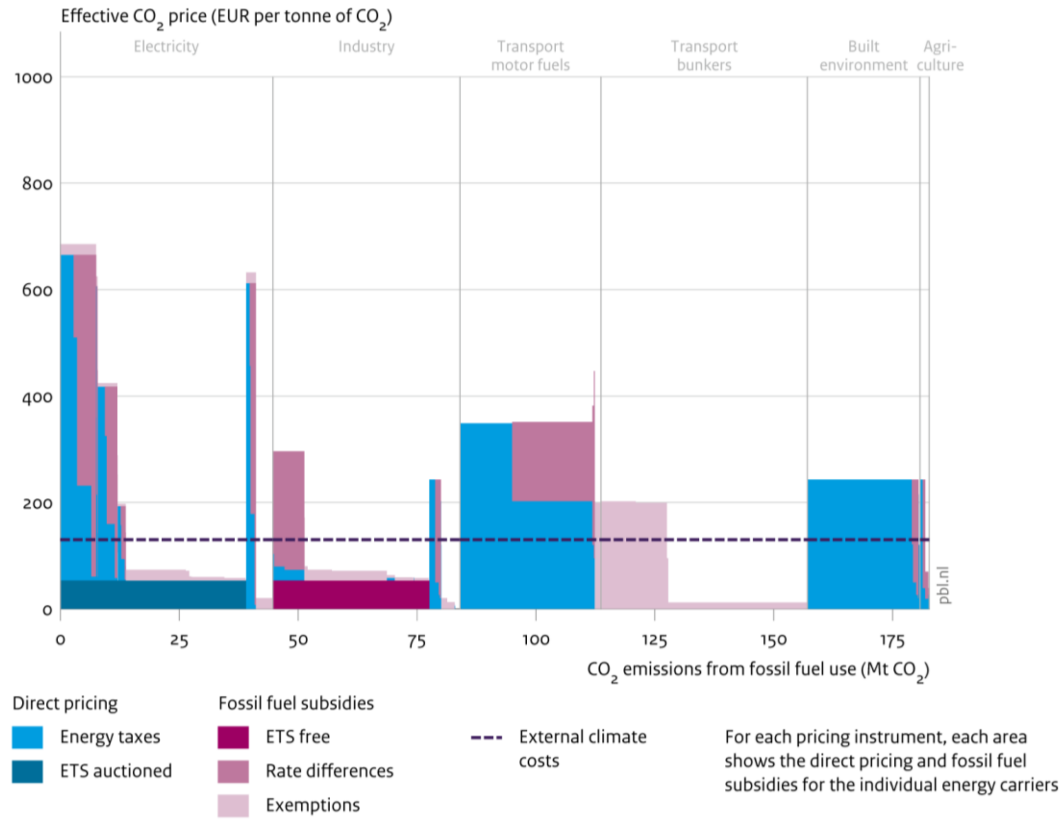
3.3 Interpretation of the results of both approaches

Our analysis shows that significant fossil fuel subsidies exist in the Netherlands in 2021. The size of these subsidies directly which are directly related to the carbon pricing instruments is large in both approaches. Precise amounts depend heavily on the approach chosen. Therefore, as indicated earlier in section 2.4, the fossil fuel subsidies calculated per approach cannot simply be added up or compared. This is because the starting points of the two approaches for determining the size of these subsidies are quite different.

The similarities and differences between the two approaches are graphically illustrated in Figure 3.4. As all calculated subsidies in relation to the pricing instruments refer to the same underlying fossil energy carriers, both approaches can be directly compared using the PBL methodology. Figure 3.4 shows the fossil fuel subsidies based on the inventory approach (identical to Figure 3.1) and the reference used by the external cost approach showing the external costs of climate damage as a horizontal 'dashed line'. Policies explicitly identified using the inventory approach are explicitly linked to the external costs associated with the fossil fuel energy use covered by the individual policies. In Annex B, we compare both approaches in tabular form: for each scheme from Table 3.1, the CO_2 emissions are shown and the magnitude of fossil fuel subsidies according to both the inventory and external cost approaches are given.

The level of calculated fossil fuel subsidies in both approaches sometimes differs significantly for the same fossil fuels used and associated CO_2 emissions. For some CO_2 emissions, fossil subsidies exist in both approaches, but may differ significantly in size. Subsidies are sometimes high under the inventory approach, whereas some are not actually fossil fuel subsidies according to the external cost approach, such as the taxed share of CO2 emissions from electricity, such as for the taxed share of CO_2 emissions in electricity. But the reverse is also the case, as in the case of several exemptions in electricity and in industry, where fossil fuel subsidies under the inventory approach are much smaller than those under the external cost approach due to low reference rates.

Figure 3.4 CO_2 pricing, external costs and fossil fuel subsidies according to the inventory approach, 2021



Source: PBL

Note: The figure includes the direct fossil fuel subsidies from Table 3.1, with the exception of the lump-sum 'Energy tax reduction' (which cannot be directly linked to CO_2 emissions in the electricity sector). 'Direct pricing' refers to pricing that directly addresses the use of fossil fuel use and related CO_2 emissions. Direct pricing comes in two forms, namely explicit pricing of CO_2 emissions (shown in dark blue) and implicit pricing by means of, for example, taxes on fossil energy (shown in light blue).

Without further analysis, the inventory approach sometimes leads to policy recommendations that are at odds with the energy transition. The relatively high tax on electricity is a good example. Fossil fuel subsidies calculated according to the inventory approach on the basis of the first bracket are substantial (€3.4 billion). Policy conclusions that fossil fuel subsidies in the energy tax on electricity should be abolished by raising the rates for large consumers fail to recognise that such higher rates actually complicate the energy transition, because electrification has a major role to play in that transition. Comparison with the external cost approach shows that, in this case, it reports precisely no fossil fuel subsidies. This is because, from the perspective of pricing external costs, the rates in the first bracket are already above the (marginal) climate damage cost (Vollebergh et al. 2021). Conversely, fossil subsidies arising from the degressivity in the energy tax on natural gas (€1.9 billion) could be reduced by lowering the rate in the first bracket. If this rate is reduced by, say, 25 euro cents, that subsidy will decrease by €1.4 billion. But this actually works against the energy transition, as the pricing deficit would increase. And, indeed, fossil fuel subsidies under the external cost approach will actually increase by €0.6 billion due to such a reduction.

Further analysis of fossil fuel subsidies according to both approaches shows that removing several exemptions can contribute to the energy transition. The carbon pricing gap in the electricity sector primarily relates to emissions that are only indirectly addressed by the Energy Tax on electricity and exempted from other taxes (€2.5 billion). In industry, both approaches point roughly in the same direction. Due to the lower reference rates used under the inventory approach the various fossil fuel use exemptions (the light violet areas in Figure 3.3) are much smaller (€0.4bn) than those under the external cost approach (€2.4bn). Also the fossil \fuel subsidies for bunker fuels (international aviation and shipping) point in the same direction for both approaches. Here, however, the size of these subsidies under the external cost approach (€5.8 billion) is clearly larger than that under the inventory approach (€3.4 billion).

The calculated size of fossil fuel subsidies under the inventory approach does not directly say anything about the need for reform. Under the inventory approach, it is immediately clear which policies have been inventoried and assessed. However, how these policies relate to externalities and thus to the intended energy transition is not immediately clear. The external cost approach does offer that perspective. Using this perspective for these policies allows to assess the total mix of pricing instruments by comparing it with the incentives needed for energy transition. Together these perspectives provide concrete guidance for policy. If a large pricing gap is observed, the policies that play a role here should be inventoried and assessed as to whether abolishing these policies would reducing this pricing gap.

3.4 Inventory approach: indirect fossil fuel subsidies

There are also government policies that support fossil fuel use in a more *indirect way* and thus complicate the energy transition. The inventory approach is not limited to policies directly related to pricing instruments, but looks more broadly at government policies. This is because there are also government policies that indirectly encourage the use of fossil energy carriers, although they do not directly affect fossil fuel use or CO_2 emissions. This broader view of the inventory approach is an added value compared to the external cost approach. Reviewing indirect policies is time-consuming and complex, but does provide a valuable additional perspective to prevent climate damage and inefficient use of public funds in the context of the energy transition.

Think of policies that support activities that lead to more or longer use of fossil fuels. There are all kinds of policies hidden in the tax system that mainly indirectly lead to more GHG emissions, such as car taxes and the corporate income tax. These may encourage the purchase of or investment in specific technology or products that mainly lead to increased use of fossil energy carriers. Sometimes this also involves more general policies, part of which is related to fossil fuel use. It is often much more difficult to determine the exact size of fossil fuel subsidies for such indirect policies. In this section, we discuss some potentially relevant examples of such policies. We divide these policies into the same four categories as in the previous section and explain some policies in more detail in Appendix A.

Strongly energy transition-related policies that involve a direct transfer of funds to companies producing or using fossil fuels can be seen as indirect fossil fuel subsidies. These may include, for example, reimbursements provided as compensation for additional costs incurred in accelerating the energy transition or reducing CO_2 emissions. For example, Exxon and Shell (NAM shareholders) receive compensation for the changed use of the Norg gas storage facility due to termination of natural gas extraction in Groningen. Also, policies to accelerate the energy transition via an accelerated closure of coal-fired power plants (by 2030) or a production limitation of coal-fired power plants in the years 2022–2024 (since withdrawn) could potentially lead to a direct transfer of funds. Incidentally, it is not obvious to classify these policies as fossil subsidies. On the one hand, the possible compensation will make the coal plants more valuable to the owner. On the other hand, the compensation will actually stop the deployment of coal after payment of this compensation.

Innovation subsidies can also sometimes be seen as indirect fossil fuel subsidies. There are subsidies intended to accelerate the energy transition, but sometimes also contribute to longer use of fossil fuels. In the Netherlands, for instance, subsidies are provided for the capture and storage of CO_2 (CCS), more efficient use of fossil fuel, investments in hybrid heat pumps, or possibly in the long term for producing (grey) hydrogen from fossil energy carriers when insufficient hydrogen production from renewable sources proves possible. Hence, part of these innovation subsidies can also be seen as support for fossil fuel use: after all, CO_2 is still being emitted and it keeps the fossil fuel infrastructure in place for longer (see also Van der Burg 2023). On the other hand, the energy transition is not primarily aimed at eliminating fossil fuels per se, but the ultimate goal is to bring GHG emissions to zero. Reducing fossil fuel use is not a goal, but a means.

Under the category of tax expenditure and revenue foregone, certain corporate tax policies can also be seen as indirect fossil fuel subsidies. These are policies that do not directly favour the use of fossil fuel over other energy. Nevertheless, they may encourage the use of fossil fuel, for instance because fossil fuel companies in particular have suitable characteristics to make use of them, or because they involve investments in technologies that can continue to support the use of fossil fuels.

A very specific regulation here relates to oil and natural gas extraction (see Annex A). The mining levy was introduced to tax excess profits such as those that occur in the extraction of oil and natural gas. The investment deduction allows companies to deduct part of new investments for small fields in the North Sea from the profits on which the mining levy is levied. This therefore reduces mining levy revenue and increases the supply of North Sea oil and natural gas. The investment deduction scheme within the mining levy can therefore be seen as an indirect fossil subsidy.

Corporate income tax credits may also partly qualify as indirect fossil fuel subsidies. There are general policies in the corporate income tax to offset losses, such as a general loss offset against profits in other years, and an offset for liquidation losses of participations. As these policies are open to all companies, there is no direct fossil fuel subsidy. Thus, these policies also apply to companies investing in renewable energy. At the same time, it can be argued that due to the nature of searching and drilling for oil and natural gas - with associated profits and losses - fossil fuel companies are precisely in the circumstances to benefit. Shell in the Netherlands, for instance, paid no profit tax on most of its operations in 2019 by, among other things, offsetting losses.[15] In recent years, restrictions around loss offsetting have already been put in place. [16]

[15] Link.
[16] For general loss relief, see: link; For liquidation loss relief, see brief explanation by PwC (link) and the Corporation Tax Act, Section 13d (link).

As long as the car fleet still mainly consists of combustion engine vehicles, various tax policies in relation to purchase, ownership and use of means of transport can also be regarded as indirect fossil fuel subsidies. In the road or circulation tax (mrb) and the car purchase tax (bpm), there are all kinds of policies that indirectly promote the use of fossil fuels and thus the emission of CO_2. Think of allowances for vans for entrepreneurs. Koeman et al (2022) arrive at some 40 relevant policies. The 2023 National Budget mentions a total amount of €2.2 billion in 2021 for these policies (see Annex A). The vast majority of this amount concerns exemption or a reduced rate for vans for entrepreneurs. The policies concerning electric and hybrid vehicles are not included in these amounts. It is also conceivable that the design of the policies for taxing the private use of company cars contains elements that stimulate the purchase and the use of petrol or diesel cars. Finally, according to current plans[17] electric cars will pay full-rate mrb from 2026 while these cars are at a relative disadvantage because their greater weight leads to a higher motor vehicle road tax rate.

The zero VAT rate for international passenger transport by ship or aircraft can also be seen as an indirect fossil fuel subsidy. Admittedly, this is not a direct fossil fuel incentive: the exemption also covers any sustainable forms of international passenger transport. Nevertheless, the exemption can be seen as an indirect subsidy. After all, for the time being, this concerns almost exclusively transport based on fossil energy carriers. The lost VAT revenue due to the zero rate on international air transport amounts to around €1.8 billion per year (see Annex A).

VAT revenue foregone on energy taxes and excise duties is another example of indirect fossil fuel subsidy. VAT is levied on energy taxes and excise duties as explained before. When fossil fuel subsidies occur due to potentially revenue foregone from these pricing instruments, there is also potentially VAT revenue foregone. A complication is that companies can reclaim VAT paid on exports, so this does not lead to additional government revenue. Since many fossil fuel subsidies relate to energy use by companies that also export, it is difficult to make a good estimate of the actual revenue foregone.

Leaving non-energy use of fossil energy carriers untaxed is another candidate for an indirect fossil fuel subsidy. Non-energy use of fossil fuel is exempt from energy taxation and excise duty. Indeed, much of this use does not directly lead to CO_2 emissions and is therefore considered an indirect fossil subsidy in our analysis. The carbon here is sequestered in products and does get released later as CO_2 , for example when the products are incinerated as waste at the end of their life. The magnitude of the emissions and the timing of their generation therefore do depend heavily on how the products are used and how the waste is treated (Drissen and Vollebergh 2018a; Brink and Prins 2022).

Finally, there are several policies that lead to a transfer of risk to the government. For instance, the government is involved in financing fossil fuel projects, including through loans in developing countries (FMO), export credit insurance (Atradius DSB), and through share ownership of companies investing in fossil fuel (such as Gasunie, EBN and ABN AMRO).

[17] Link.

4 Policy developments

In this chapter, we discuss policy developments on carbon pricing in the European Union and the Netherlands and how they affect the calculated fossil fuel subsidies over time. Here, we list the main policy developments relevant to the energy transition of the European Union in particular, but also in the Netherlands itself.

Currently, there are already many policy initiatives both at the European level and in the Netherlands to better price GHG emissions. Not only the European Green Deal and the Dutch Climate Agreement, but also the policy responses as a result of the war in Ukraine have implications for the fossil fuel subsidies calculated for this purpose. Table 4.1 summarizes important policy changes in relation to the policies listed in Table 3.1 based on the inventory approach. In Table 4.1, we use the same classification as in Table 3.1. At the end of the table, we list some additional policy changes. In the discussion, we also include fossil fuel subsidies according to the external cost approach. In particular, the revision of European climate and energy policy as reflected in the *Fit for 55 package* has a significant impact on the pricing of GHG emissions and hence of fossil fuels (Brink and Vollebergh 2021; Trinks et al. 2022a). Some of these policies have not yet been detailed or implemented.

Price support policies for fossil fuels (category 1) **have become more prominent since the 2022 energy crisis.** Due to the war in Ukraine, price support policies were introduced in the Netherlands (and elsewhere) (Gerlagh and Vollebergh 2023). In late 2022 the government decided to intervene directly in energy price formation. A price cap was agreed for households and other small users for electricity, natural gas and district heating in 2023. These policies would qualify as new fossil fuel subsidies according to both approaches.

Several changes in European policy that have now been agreed will eventually reduce existing fossil fuel subsidies in category 2 (**direct transfer of funds**). For instance, the accelerated reduction in the supply of emission allowances agreed in 2022 will mean that the amount of allowances allocated for free will also decrease more quickly. Moreover, with the introduction of an import tax on CO_2 content at the European Union's external border (the *Carbon Border Adjustment Mechanism*, CBAM) for a number of CO_2 -intensive products[18] the allocation of free allowances for these sectors will also gradually be phased out.

In the category of tax expenditures and revenue foregone (**category 3**), **because of the war in Ukraine, compensatory measures have been taken with varying effects on the size of fossil fuel subsidies.** Besides the introduction of the price cap, the government has also implemented several changes in energy taxes that have changed the size of fossil fuel subsidies, temporarily or otherwise. The lower rates of the energy tax on electricity in the first bracket have reduced the size of these subsidies under the inventory approach because the baseline has been lowered. Similarly, the reductions in excise duty rates on petrol and diesel have reduced subsidies according to this approach, but according to the external cost approach, these have actually increased subsidies. Finally, it is important to note that the tax rebate on energy taxes was increased and low-income households received a one-off energy allowance in 2022[19] which, according to the inventory approach, actually increased fossil subsidies again. At the bottom of Table 4.1, we also mention the reduced VAT rate on natural gas and electricity in 2022 which is an indirect fossil fuel subsidy.

[18] The products are: cement, aluminium, fertiliser, electric power production, hydrogen, iron, steel and some other products. For the full list, see: link.

[19] This energy allowance is not linked to energy bills or energy use, but to the level of household income. As this allowance is explicitly meant to compensate for a higher energy bill (natural gas and electricity), it can be seen as an *indirect* fossil subsidy. The amount of this energy allowance is in principle €1,800 in 2022 and €800 in 2023 (link).

Table 4.1 also shows that the Rutte IV government had plans or intentions for adjustment for a large part of the tax policies in category 3. The Dutch government has indicated its intention to abolish or reduce several fossil fuel subsidies in relation to the energy tax and excise duties on mineral oils over time. This applies, for example, to several exemptions, such as those for energy-intensive processes from 2025, and to the reduced rate for greenhouse horticulture. Once abolished, these activities will largely fall under the rate of the fourth bracket. In addition, a ban on the use of coal in electricity generation goes into effect in 2030. Several of these policies are also under pressure in the European context because of adjustments to the Energy Tax Directive proposed by the European Commission. [20] One of the proposals is to equalise excise duties for the energy content of diesel, petrol and LPG. Finally, there are also a number of adopted, planned and agenda-setting policy adjustments related to aviation and shipping.

[20] Because adaptation in the Energy Tax Directive requires unanimity among EU member states, they are more uncertain than other *Fit for 55 proposals* (Trinks et al. 2022a).

Table 4.1 Overview of (adopted, proposed and tabled) policy changes after 2021 relevant to fossil fuel subsidies

Scheme	Policy change
Category 1: Price support policies	
- None	*Government:* temporary price cap in 2023 for electricity, natural gas and district heating systems (A)
Category 2: Direct transfer of resources	
Free EU ETS emission allowances	*Fit for* 55: phase-out of free allowances combined with CBAM: pricing CO_2 emissions from imports of certain products (including cement, aluminium, fertiliser, iron and steel) (G)
Category 3: Tax expenditure and potential revenue foregone	
Energy tax and Additional Sustainable Energy and Climate Transition tax (ODE)	
- Tax rebate (on electricity bill, fossil fuel share)	*Government:* Temporary increase from €463 to €682 per electricity connection in 2022 (A); Additional one-off energy allowance: in principle €1,800 for low-income earners in 2022 and €800 in 2023 (A)
- Degressive rate structure for electricity (fossil fuel share)	*Government:* Temporary reduction in rate in first bracket for electricity from €0.0942 to €0.0368 between 1 January and 31 December 2022 (A); Spring Memorandum 2023: reduction of electricity rates in the higher consumption brackets (PR)
- Degressive rate structure for natural gas	*Government:* Spring Memorandum 2023: introduction of reduced rate up to a certain level of gas consumption with simultaneous rise in rates above the new bracket (PR)
- Reduced rate for natural gas in greenhouse horticulture	*Government:* abolition of reduced rate for greenhouse horticulture between 2025 and 2030 (PL); flat-rate individual CO_2 levy in Greenhouse Horticulture Energy Transition covenant 2022–2030 (PR)
- Exemptions for energy-intensive processes - (natural gas + electricity)	*Government:* extension of CO_2 industry levy and increase in rate (PR); abolition of exemption for metallurgical and mineralogical processes from 2025 (PL); research into phase-out path (PR)
- Exemption for non-energy use of natural gas - in chemical plants with direct CO_2 emissions	*Government:* extension of CO_2 industry levy and rate increase (PR); research into phase-out path (PR)
- Tax rebate scheme for institutions (natural gas + electricity)	*Fit for 55:* gas consumption in built environment under ETS-2 (PR)
- Exemption for natural gas consumption in extractive industries	*Government:* extension of CO_2 industry levy and rate increase (PR)
Excise duty on mineral oils	
- Lower rate for diesel/LPG/CNG than for petrol	*Fit for 55:* consumption of motor fuels in road transport under ETS-2 (PR); tightening of CO_2 standards for new passenger cars and vans (PR); proposal to amend Energy Taxation Directive, equal rates for equal use (PR); Government: temporary 21% reduction in rates for unleaded petrol, diesel and LPG (from 1 April 2022 to 30 June 2023) (A)
- Exemption for the use of diesel (particularly inland shipping)	*FuelEU Maritime Initiative*: GHG emission intensity of energy in ships: 6% lower in 2030, 75% lower in 2050 compared to 2020 (PR) Government: wide application of ETS-2 (opt-in), bringing fisheries in the Netherlands within the scope of ETS-2 (PL)
- Exemption for use of kerosene in international aviation	*Fit for 55:* tightening up of ETS-1 for intra-EU flights (A); ReFuelEU Aviation: blending mandate for intra-EU and departing intercontinental flights (PR); *Energy Taxation Directive:* minimum rate for tax on kerosene for air road transport (PR); International (ICAO): flights not covered by ETS-1 fall under CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation) (PR)

- Exemption for the use of fuel oil (particularly maritime shipping)	*Fit for 55:* maritime shipping (ships above 5,000 gross tonnage) from 2027 under ETS-1 (intra-EU 100% and for travel to and from the EU 50%) (PL); *FuelEU Maritime Initiative:* GHG emission intensity of energy in ships: 6% lower in 2030, 75% lower in 2050 compared to 2020 (PR)
Other policies	
-Input exemptions for electricity generation	*Government:* from 2025 restriction on exemption from energy tax for input of natural gas to combined heat and power plants (PR)
- Exemption for use of waste gases and mineral oils arising in house (refineries and chemical plants)	*Government:* extension of CO_2 industry levy and rate increase (PR); research into phase-out path (PR)
- Untaxed use of coal products in blast furnaces and coking plants	Government: extension of CO_2 industry levy and rate increase (PR); abolition of coal tax exemption for dual use from 2028 (PL)
- Coal tax exemption for dual consumption	*Government:* extension of CO_2 industry levy and rate increase (PR); abolition of coal tax exemption for dual use from 2028 (PL)
Category 4: Risk transfer to the government	
No quantified policies	*Government:* COP26 statement on ending public international financing of fossil energy projects in 2022 (PR)
Some additional policy changes	
Subsidy scheme for indirect cost compensation under ETS	*Government:* no further budget provision for this scheme after 2022 (A)
VAT on energy products	*Government:* VAT rate from 21% to 9% between 1 July and 31 December 2022 for natural gas, electricity and district heating systems (A)
Policies in motor vehicle and road taxes (including van policies for business owners)	*Government:* abolition of motor vehicle tax exemption for vans from 2025 (PL)
VAT exemption for international air transport	No direct change proposals. *Government:* from 2023 air travel tax raised from €7.95 to €26.43 per passenger departing from the Netherlands (A)

Explanation: In the *Climate and Energy Outlook* (see e.g. PBL et al. 2022), policies that were in effect on a given reference date are considered adopted policies (VA); policies that were in the public domain on that date, that had been officially announced in Letters to Parliamentary and that were sufficiently concrete on that date are considered intended policies (PL); policies and intentions that were in the public domain on that date but not yet sufficiently concrete are referred to as proposed policies (PR). As this classification was not made explicit in the *Climate and Energy Outlook 2023*, we have given our own interpretation of the status for the policy changes in this table in line with this classification, taking 19 September 2023 as the reference date.

Sources: For an overview of the European *Fit for 55* measures, see Hekkenberg et al. (2021) and Trinks et al. (2022a). For details of package components: ETS (link), CBAM (link), CO_2 standards for cars (link), ETS aviation (link), CORSIA (link), ETD (link), aviation blending mandate (link). For the various measures planned by the government, see Coalition Agreement 2021–2025 (link), Climate Memorandum 2022 (link), Climate Package in spring decision-making 2023 (link), price cap (link and Gerlagh and Vollebergh 2023), indirect cost compensation under ETS (link and link), exemption for vans (link), air travel tax (link), and COP26 declaration (link).

Of great importance are also the agreed adjustments to the EU-wide emissions trading systems. The *Fit for 55 package* made substantial adjustments to climate pricing through the existing European ETS-1 and a new ETS-2 system to be implemented.[21] From 2027, a significant part of emissions not covered by ETS-1 will be brought under a new system (ETS-2). Both systems will play an important role in pricing and reducing CO_2 emissions in the coming decades and thus also in reducing fossil fuel subsidies previously calculated using the external cost approach. Important legislation surrounding these emissions trading policies was recently adopted by the European Council and Parliament. It has been decided that ETS-2 will only gradually become binding after a number of years.[22]

[21] ETS-1, also known as ETS-SAM (*ETS Stationary installations, Aviation and Maritime transport*), concerns an emission cap for industry, power generation, intra-EU aviation and shipping; ETS-2 (also known as ETS-BRT: *ETS Buildings and Road Transport*), concerns an emission cap for built environment, road transport and additional sectors (mainly small industry).
[22] Link.

Depending on the exact design, ETS-2 together with ETS-1 leads to pricing of most of the CO_2 emissions associated with fossil fuel consumption in the Netherlands and in the long term (2044) for phase-out to zero. For the existing ETS-1, it was agreed to phase out free allowances in combination with the introduction of the CBAM. In addition, an accelerated reduction of the emissions cap and extension to maritime shipping (under ETS-1) has been agreed. Without further changes to the annual reduction in the emissions cap, this means that new emission allowances for ETS-1 will be zero in 2040. The widest possible introduction of ETS-2 envisaged by the Rutte IV cabinet and the allowance reductions therein would lead to zero allowances in 2044 (IBO 2023).[23] With the tightening, the price of allowances in ETS-1 has risen from an average of €53 per tonne in 2021 to €80–90 in September 2023, and is expected to increase further in the coming years.[24]

For risk transfer (category 4), the Netherlands has signed a declaration to end international public financing for fossil projects by 2022, but this promise has not yet been fulfilled.[25] This is primarily important for the more indirect policies as discussed in section 3.4. The Netherlands signed a declaration at COP26 to stop international financing of fossil projects, including export credit insurance. This is subject to some exceptions, such as for activities consistent with 1.5°C warming and the Paris Agreement targets. For the 1.5°C target, however, there is little or no room for new and planned fossil fuel projects (IEA 2021; McGlade and Ekins 2015; Welsby et al. 2021). Several intentions and projects can also be identified for the other risk transfers from section 3.4 (FMO and state participations). See Annex A for a description of these.

Finally, the table shows some additional policy changes to two indirect fossil fuel subsidies from section 3.4. For instance, the Rutte IV government decided not to extend the ETS indirect cost compensation subsidy scheme after 2022, although the European Commission did approve a scheme for the period 2021–2025.[26] Also, the bpm exemption for vans will be abolished from 2025 and the air passenger tax was increased for passengers departing from the Netherlands from 2023.

[23] Link.
[24] Link; a graphical representation of ETS prices: link.
[25] Glasgow Statement: link.
[26] EU approval: link; Ending indirect cost compensation scheme: link.

5 Reform of fossil fuel subsidies

5.1 Abolition of fossil fuel subsidies in perspective

Abolishing fossil fuel subsidies is seen in the scientific literature as a cost-effective measure to meet climate targets. Fossil fuel subsidies often work against adequate pricing of fossil fuel use. Moreover, both the empirical and theoretical literature suggest that abolishing these subsidies could bring about significant reductions in GHG emissions (Arzaghi and Squalli 2023; Mundaca 2017; Erickson et al. 2020; Matsuo and Schmidt 2017; Chepeliev and Van der Mensbrugghe 2020). According to some estimates, global elimination of consumer subsidies (which are part of fossil subsidies) would lead to about 6 to 18 per cent less GHG emissions globally (Burniaux and Chateau 2014). And with adequate pricing of social, climate and environmental externalities, global GHG emissions would be 36 per cent lower by 2025, compared to a scenario based on current policies (Parry et al. 2021).

However, abolishing fossil fuel subsidies is a brain teaser rather than a no-brainer. While in theory it is obvious to abolish fossil subsidies, it is more difficult in practice. Specifically defining what fossil fuel subsidies are is not always obvious. Moreover, in tax policies, the calculated size of these subsidies depends mainly on the chosen baselines and often says little about the amounts the government could raise in additional tax revenue.

It makes more sense to put the discussion on fossil fuel subsidies in the perspective of the energy transition. This perspective, elaborated in section 2.2, focuses on adequate pricing of fossil fuels and associated CO_2 emissions. All kinds of government policies then appear to potentially support or benefit companies or consumers using fossil energy carriers. For specific policies, it should then be evaluated whether or not their abolition, whether or not in combination with other pricing instruments, will advance the energy transition.

The external cost approach in particular focuses on regulations that hinder the energy transition. This reveals the extent to which existing taxes, for example, lead to adequate pricing of climate damage. Here, possible overlap of different pricing instruments can be explicitly taken into account. Where climate damage is insufficiently priced, the external cost approach identifies fossil subsidies that should be addressed. Then, for example, large-scale subsidies come into the picture, such as the exemption from the use of fossil energy carriers in electricity generation and various exemptions from fossil fuel use in industry. Remarkably, compared to the inventory approach, the external cost approach sometimes also identifies other policies as relevant. This plays out, for example, with certain policies in electricity taxation. Electrification is essential for the energy transition. Therefore, it does not make sense to look for fossil fuel subsidies in electricity taxation, as in the inventory approach. Of more importance is to look for them in the lack of pricing in generation with fossil energy carriers.

When evaluating fossil fuel subsidies, it is also important to consider the existing and proposed mix of policy instruments. For the possible removal of some subsidies, it is also relevant that climate pricing in practice often follows from combinations of tax policies and other instruments (Vollebergh et al. 2021). Several policies that lead to fossil fuel subsidies according to the inventory approach are precisely designed to avoid emissions being priced by multiple instruments. This applies, for example, to CO_2 emissions due to gas consumption by large companies in the Netherlands. These emissions are already priced by the Emissions

Trading Scheme (ETS-1), which would in principle justify lower energy tax rates and exemptions for these companies in the energy tax on natural gas.

Double pricing is sometimes necessary and helpful for the energy transition. Some policies classified as fossil subsidies under the inventory approach are designed to avoid double pricing. However, the external cost approach sometimes shows that a combination of instruments is needed for adequate pricing. In such a situation, there may well also be reason to examine whether a scheme that leads to a fossil fuel subsidy according to the inventory approach has a role to play in promoting the energy transition. For example, Figure 3.3 showed that despite the double pricing in industry by the ETS-1 and the energy tax on natural gas, total carbon pricing in 2021 was lower than the climate damage. Although ETS-1 will eventually lead to a substantial reduction with zero new allowances from 2040, until then the pricing of climate damages can be improved by increasing the energy tax rates on natural gas.

Apart from these types of direct pricing instruments, the energy transition is hampered also by more indirect policies. Before we have also explicitly identified policies in the broader tax system that favour the use of fossil energy carriers more indirectly. Think of tax exemptions or concessions that apply specifically to activities related to fossil fuel use, such as certain concessions in VAT, transport taxes, or corporate taxes. Guarantees or credit insurance for activities linked to the use of fossil energy carriers also lead to this kind of market distortions. Some of these policies, such as the ETS indirect cost compensation subsidy scheme and VAT exemptions, are good examples.

Finally, several policy developments are underway that will reduce fossil fuel subsidies over time. In particular, the revision of European climate and energy policy in the context of the *Fit for 55 package* has a significant impact on the pricing of GHG emissions and thus of fossil fuel energy use (Brink and Vollebergh 2021; Trinks et al. 2022a). Reference has already been made above to the significant changes in ETS-1 and the newly introduced ETS-2. However, it should be noted that most policy developments will only have an effect in the longer run and some of these are still intended policies that need to be detailed or have not yet been implemented. Another point to note is that price support policies for fossil fuels have taken on a greater role since the 2022 energy crisis.

5.2 Abolition policy considerations

Abolishing fossil subsidies also has effects that require political weighting. Even if policies that hinder the energy transition are well identified, it is important to consider whether abolishment is actually effective in reducing global GHG emissions, for example due to carbon leakage. Attention is also needed to feasibility (unilaterally as the Netherlands) and burden sharing. Additional instruments are often available to counter such effects.

The effectiveness of abolishing fossil fuel subsidies for emission reduction in the European Union is not guaranteed because of the interaction between tax measures and the European ETS. Precisely because the companies that currently benefit from a fossil subsidy are often already covered by European ETS, the climate gains of abolishing subsidies in the Netherlands could be (partly) reversed elsewhere in the European Union. If Dutch industry needs fewer allowances, companies in other EU member states can use them. The reduction in the Netherlands can then be accompanied by an increase in emissions elsewhere. This is also known as the waterbed effect.

Carbon leakage through the waterbed effect is mitigated in EU ETS through the operation of the so-called *Market Stability Reserve* (MSR). After the MSR enters into force in 2019, carbon leakage depends on the timing of a reduction, the demand for CO_2 allowances and the amount of unused allowances. Indeed, as long as the amount of allowances is reduced through the MSR, this waterbed effect can be dampened (Perino et al. 2019; Perino 2018).

Effectiveness may also be less with relocation of activities due to the abolition of fossil fuel subsidies. If abolishing these subsidies leads to relatively high pricing in the Netherlands compared to other countries, it is also possible that activities (partly) relocate. This could be either inside or outside the European Union. When this is outside, global CO_2 emissions may even increase on balance as a result of abolishing a fossil subsidy in the Netherlands, combined with the aforementioned waterbed effect.

Relocation can be mitigated by well-designed compensatory measures. Previous research by the CPB and PBL has shown that relocation effects and associated carbon leakage are manageable and depend on the design of compensatory policies (Vollebergh et al. 2019; Bollen et al. 2020; see also Branger and Quirion 2014; Carbone and Rivers 2017). Any risks of displacement and associated carbon leakage can be mitigated by using other instruments, such as subsidies on clean technology. On balance, such policies may even yield welfare gains (Vollebergh et al. 2019; Bollen et al. 2020).[27]

Concerns about employment effects also play a role, but these effects are small. Abruptly abolishing fossil fuel subsidies may lead to frictional unemployment in some sectors and increased demand for labour in other sectors in the short run. However, at the national level and in the long run, these effects are negligible (Jansema-Hoekstra et al. 2018).

Abolishing fossil fuel subsidies is more in line with the 'polluter pays' principle and could therefore actually lead to improved burden sharing in the context of the energy transition. There is growing concern about the impact of climate policy on poor households (WRR 2023). Abolishing fossil fuel subsidies is also important in this respect, as it leads to a different burden sharing between households and companies. The current energy tax structure in the Netherlands places the highest burden on households and not on companies (see also Figure 3.1 and Vollebergh 2022). Abolishing most fossil fuel subsidies therefore results in heavier tax burdens for companies that use a lot of fossil fuel, although their costs will be partly passed on in product prices. However, the revenues from this policy change can be used for lower taxes for households. The net effect of abolishing fossil fuel subsidies on the purchasing power of certain households will vary from case to case. Much ultimately depends on the precise design of policies aimed at reducing those subsidies and how the additional public funds are deployed (Vona 2023).

Unilateral abolition of fossil fuel subsidies by the Netherlands is now not always possible. Some policies cannot simply be adjusted or abolished unilaterally by the Netherlands because they follow European or international directives and treaties. These include the exemption from excise duty on fuel oil use in shipping, on diesel in inland navigation and on fuels in international air transport. Similarly, the exemption of (own) consumption of residual gases and mineral oils as fuel within a company that produces them itself follows from an EU directive. Adaptation of such regulations is then only possible if these directives and treaties are amended and thus requires (in most cases) an EU-wide approach. For this, the Netherlands can of course actively engage.

[27] Moreover, empirical research shows that, so far, pricing has hardly been detrimental to economic activity, although this could be different for small groups of firms and in the case of future tightening of unilateral pricing (Dechezleprêtre et al. 2023; Marin and Vona 2021; Trinks and Hille 2023). Relocation and leakage effects will ultimately depend on the design of climate policies elsewhere, other policies affecting the business location climate and the ability of firms to adapt, pass on CO_2 costs and anticipate (see Trinks and Hille 2023; Trinks et al. 2022b).

The pace at which fossil fuel subsidies are phased out is open to debate. Relevant here are the national and sectoral emission reduction targets, the Urgenda ruling by the Dutch High Court and repeated Dutch commitments to abolish 'inefficient fossil fuel subsidies', with the most recent promise to do so by 2030 at the latest.[28] The focus is often on reducing emissions on Dutch territory, while the emission reduction rate in the European Union as a whole is mainly regulated through the EU-wide emissions trading policies. Abolishing fossil fuel subsidies requires a political weighting of the reduction rate of the Netherlands compared to the European Union as a whole.

Reforming fossil fuel subsidies is a complex task for politicians. All in all, our study shows that abolishing fossil fuel subsidies is a no-brainer only for a limited number of subsidies. Abolishing inventoried fossil subsidies does not appear to help the energy transition in all cases. It is important to assess policies from the perspective of adequate pricing of climate damage and other externalities. This should also take into account overlapping and interacting policies. Abolishing existing policies makes sense especially if this allows for better pricing of external costs. Exemptions and concessions in electricity production and shipping and aviation should be considered for sure. However, it is also important to take a sufficiently broad view of fossil fuel subsidies, as advocated by the OECD's inventory approach and endorsed by the Rutte IV cabinet. As a result, all kinds of policies that also support fossil fuel use in an indirect way will also be covered. Finally, the possible negative impact on GHG emissions at European or global level deserves attention, as well as possible distributional effects. Attention should be paid to expected developments due to foreseen or intended policy changes in the European Union and the Netherlands itself. A phasing-out of fossil subsidies in the Netherlands in the longer term seems to be initiated by, for instance, the EU-wide emission trading policies. In the shorter term, there is still plenty of political weighing up to be done on where and to what extent acceleration is desirable.

[28] See 'Member Van Raan's own-initiative note on fossil subsidies and how to abolish them' (link) for an overview of previous unfulfilled commitments. This also involves the commitments of the Paris Agreement (UNFCCC 2015, Article 2.1.c) and the SDGs (UN 2015, SDG 12.c.1), among others.

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6 Annex A

6.1 Direct and quantified fossil fuel subsidies in 2021

In this annex we discuss the policies in Table 3.1. For each scheme, we briefly explain the choice we made when calculating the amounts for fossil fuel subsidies and reported in that table. We use the same order as in Table 3.1. The rates are based on information from the Ministry of Finance[29] (Policy Information Card 2022 and Tariff List Excise and Consumption Taxes). Data on energy consumption are based on data from CBS, in particular the Dutch *Energy Balance* (see also Vollebergh et al. 2021). If other sources have been used, we explicitly indicate this.

Category 1: Price support policies

None.

Category 2: Direct transfer of resources

6.1.1 Free emission allowances under European emissions trading system

EU member states receive free allowances that they can allocate to companies according to established rules.[30] The amount of free allowances a company receives depends on the size of production, the emissions benchmark for the processes within this company, whether or not the company falls under a sector on the list of sectors with the highest risk of carbon leakage, and the year in which production takes place. Because the amount of allowances a company is allocated for free depends on its production volume ('output-based allocation'), there is no incentive for companies to reduce their production (with associated CO_2 emissions) (Sato et al. 2022). This aspect strengthens the argument for viewing free allowances as a subsidy. The total number of free allowances to Dutch companies in 2021 was 39.1 million tonnes of CO_2 allowances. At an average ETS price of €53.31, the amount in 2021 totalled €2.1 billion.

Category 3: Tax expenditure and lost income

6.1.2 Energy tax rebate (on electricity bill, fossil fuel share)

There is a fixed 'Energy Tax Rebate' per electricity connection. This is a fixed amount and does not depend on how much gas or electricity was consumed or how much energy tax was paid. The fixed amount was €461.62 in 2021 and the total refund in 2021 was €3.8 billion.[31] Based on the fossil share (62 per cent), the amount comes to €2.3 billion for fossil fuel use. This rebate lowers the energy bill for households and is provided because the Tax Administration considers part of energy use as basic needs. By this reasoning, we see this as a fossil subsidy.

There is possible debate on how the tax rebate is included in the calculation of fossil fuel subsidies. The tax rebate concerns a lump sum tax reduction to almost every household and company in the Netherlands as they almost all have an electricity connection. The fixed amount per electricity connection aims to pursue an income redistribution goal. It also does not affect the marginal rate that energy users experience as an incentive to save energy, nor does it depend on how much fossil fuel is used. This may argue for not viewing

[29] Policy Information Map 2021 (link), Environmental Tax Rates Tables (link) and Rates List Excise and Consumption Taxes (link).
[30] For an explanation of how the free rights are distributed, see: link. The total number of free rights for the Netherlands in 2021: link.
[31] Link; link.

this lump sum refund as a fossil fuel subsidy. The tax rebate ensures that the final *average* tax rate is lower and also depends on how much electricity and gas was consumed. Another point of debate is whether the tax rebate should be allocated in its entirety to electricity or whether a part should also be allocated to gas.

6.1.3 Energy tax: degressive rate structure for fossil electricity and natural gas (including Sustainable Energy and Climate Transition tax)

The energy tax (plus the Renewable Energy and Climate Transition Tax (ODE) for both electricity and gas has four rate brackets that apply to increasing use of energy. The first bracket has the highest rate: €0.12 per kWh of electricity and €0.43 per m^3 of gas for the energy tax and ODE combined. When calculating the total subsidy, the rate for the first bracket is considered the reference value. Energy use in the higher brackets multiplied by the rate difference compared to the first bracket gives a total amount of €5.4 billion in 2021: €3.4 billion for electricity and €1.9 billion for natural gas. For electricity, only the part of electricity production generated using fossil fuels is included, thus excluding all electricity generated from biomass, other renewable sources, nuclear energy and waste. This amounted to 62 per cent of electricity generation in 2021.

There is possible debate as to how degressive taxes are included in the calculation of fossil fuel subsidies. Metten (2023) uses the average rate in the first bracket, taking into account the lump sum tax rebate, as a reference value in his calculations of the tax revenue foregone due to the degressive rates on fossil-generated electricity in the other brackets. Using such an average tax rate as a reference value then leads to a different size of the fossil subsidy.

6.1.4 Energy tax: reduced rate for natural gas in greenhouse horticulture (including ODE)

The use of natural gas for heating in greenhouse horticulture is subject to a reduced rate in the first two brackets of the energy tax as well as on the ODE.[32] Assuming the use of natural gas for this purpose in both tax brackets and the differences with the regular rates in those brackets, the amount comes to a total of €120 million in 2021.

6.1.5 Energy tax: exemptions for energy-intensive processes (natural gas + electricity, including ODE)

There are several exemptions from energy tax and ODE for energy-intensive processes. For natural gas, there is an exemption for metallurgical and mineralogical processes.[33] In addition, for electricity, metallurgical processes, electrolytic processes and consumption for chemical reduction are exempt. Using the regular rate for the fourth bracket of the energy tax and the consumption of energy by the relevant sectors amounts to €40 million in 2021.

6.1.6 Energy tax: exemption for non-energy use of natural gas in chemical plants with direct CO_2 emissions

The use of natural gas for non-energy use is currently not taxed in the Netherlands (Ministry of Finance 2022). However, this use in chemistry for e.g. fertiliser production converts part of the energy content (58 petajoules in 2021) into CO_2 emissions. This part also falls under pricing by the European ETS. We therefore see the exemption for this part as a fossil subsidy. Assuming the regular rate for natural gas (in the fourth bracket), this leads to a total amount of €70 million in 2021.

6.1.7 Energy tax: tax rebate scheme for institutions (natural gas + electricity, including ODE)

Certain institutions are eligible for 50 per cent refund of energy tax and ODE on natural gas and electricity. These include several non-profit institutions (social, charitable, cultural and scientific institutions, public

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[32] Link. For reduced rates, see here: link.
[33] Link. See also the annex to the Budget Memorandum (link).

benefit institutions and multifunctional centres) and institutions of a philosophical or religious nature.[34] Based on the difference with regular tariffs, the total amount comes to €40 million in 2021.

6.1.8 Energy tax: exemption for natural gas consumption in extractive industries

Own consumption of natural gas by gas extraction companies will not be taxed. Assuming regular natural gas rates, this concerns an amount of €20 million in 2021.

6.1.9 Lower excise duty for diesel/LPG/CNG than for petrol

Excise duty on diesel and LPG in the Netherlands is lower than excise duty on petrol if it is measured by energy content (e.g. excise duty in euros per gigajoule).[35] The same applies to the energy tax rate on CNG (natural gas) for mobility. In calculating the total size of fossil fuel subsidies, we take the rate for petrol (measured by energy content) as the reference value. In addition, petrol, diesel and LPG are subject to a so-called inventory levy that is levied as if it were an excise duty. This inventory levy is to finance international obligations to maintain minimum stocks.[36] We also include the rate differences of the inventory levy measured by energy content compared to petrol in the calculations. For diesel, this leads to an amount relative to petrol of €2.5 billion in 2021. For LPG this amounts to 0.1 billion euros in 2021 and for CNG 50 million euros.

The motor vehicle tax (mrb) for diesel, lpg and cng is incidentally higher than for petrol. This difference is not directly related to fossil fuel use. Therefore, we do not include it in Table 3.1. Since this is a compensation for the lower excise duty, it is obviously relevant to name and quantify it here. Based on data as provided by the Ministry of Finance, this amounts to €0.8 billion for diesel based on the June 2022 position. We do not have specific figures for 2021. For LPG and CNG, we have no estimate of the additional revenue due to the higher mrb.

6.1.10 Exemption from excise duty for the use of diesel (mainly inland shipping) and fuel oil (mainly maritime shipping).

International shipping, inland navigation and fishing are exempt from excise duty. Supplying fuels to international shipping is also referred to as bunkering. Pleasure craft is not covered by the exemption.[37] Assuming the regular rates for fuel oil and diesel, the fossil subsidy for this exemption totals €1.9 billion in 2021.

6.1.11 Exemption from excise duty for the use of kerosene in international aviation

Fuels, such as kerosene, used for international commercial air travel are exempt from taxes.[38] Through bilateral agreements, EU member states can introduce a tax on kerosene. To our knowledge, no country has yet done so (Transport & Environment 2020). Assuming the rate of diesel in euros per energy content (€14.45 per gigajoule) and the amount of kerosene consumed or stored (bunkered) for international air tranasport (104 petajoules in 2021), the amount comes to a total of €1.5 billion in 2021.

6.1.12 Input exemptions for electricity generation

The use of natural gas, blast furnace gas, coking gas, refinery gas, coal and diesel for electricity generation are exempt from taxes and duties.[39] This is due to the mandatory exemption in the European *Energy Taxation*

[34] Link and link.
[35] Link.
[36] Link.
[37] Link. This is also a consequence of EU ETD (EU Energy Tax Directive) Article 14 (OECD and IEA 2020). The exemption for inland navigation is based on the Mannheim Convention (CE Delft 2019).
[38] Link. This is also a consequence of EU ETD (EU Energy Tax Directive) Article 14 (OECD and IEA 2020). This exemption to the IA is based on provisions in a 1944 international treaty: the 1944 ICAO Chicago Convention (link).
[39] For gas and coal: link. For diesel: link.

Directive (ETD) for the use of inputs such as natural gas and coal to generate electricity (OECD and IEA 2020). This is to avoid double taxation and treating energy sources differently. Assuming the regular rates for gas (in the fourth bracket), coal tax and diesel excise duty, combined with the total use of fossil fuel sources, the total amount then comes to €640 million in 2021.

6.1.13 Exemption for use of waste gases and mineral oils arising in house (refineries and chemical plants)

The use of crude oil and petroleum products to manufacture mineral oil products is not taxed as a result of the Excise Tax Act.[40] In practice, this is referred to as the refinery exemption, although it is not a true exemption under the current law. The tax exemption for refinery processes also falls within the scope of the European ETD, Article 21 (OECD and IEA 2020). In refineries, crude oil and oil products are converted into products that are partly taxed themselves, such as petrol and diesel. However, some of the oil products created during production are themselves used during the refining processes. This so-called own consumption involves a mix of residual gases, petroleum coke, LPG and oil. Assuming standard tariffs for the most similar fossil fuel, the amount comes to a total of €250 million in 2021.

6.1.14 Untaxed use of coal products in blast furnaces and coking plants

The use of coal in various processes of steel production creates coke oven gas and blast furnace gas as by-products. These gases are also used again in the coking plants and blast furnaces, but are not taxed. Assuming regular rates for natural gas (fourth tranche), this involves a total of €30 million in 2021.

6.1.15 Exemption from coal tax for dual use

The use of coal for dual use[41] is exempt from tax.[42] Dual use of coal mainly occurs in the production of steel. Based on regular rates, this concerns a total of €30 million in 2021.

Category 4: Risk transfer to the government

Policies in this category fall outside the adopted focus on policies that have a direct relationship with fossil fuel use and directly related emissions. Therefore, these policies are described in section 6.2 below.

6.2 Indirect fossil fuel subsidies in 2021

In this annex we further explain some of the policies from section 3.4.

6.2.1 Subsidy scheme for indirect cost compensation under ETS

For companies that are sensitive to carbon leakage and use a lot of electricity, there is the ETS Indirect Cost Compensation Subsidy Scheme.[43] The European ETS requires electricity producers to buy emission rights. This increases the cost of electricity, potentially putting companies at a competitive disadvantage compared to companies outside the Union. Compensation is possible for companies that fall under sectors on the list of sectors with the highest risk of carbon leakage. Companies must comply with obligations to carry out an energy audit. After 2022, there is no budget foreseen for this scheme (Ministry of Finance 2022) even thought the European Commission has already approved a subsidy scheme for the period 2021-2025.[44] The amount for 2021 is €173 million based on a report by the RVO.[45]

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[40] See, for example: link.
[41] Using coal both as a heating fuel and for purposes other than as a motor or heating fuel.
[42] Link.
[43] Link.
[44] Link.
[45] Link.

6.2.2 Mining levy: investment deduction for exploration/production in North Sea gas fields

Holders of a mining licence to extract oil or gas from Dutch soil (both onshore and offshore) pay a mining levy. This levy is designed to tax excess profits that may occur in this sector. The levy consists of a surface right, an excise duty (annual payment) based on turnover (0 per cent for offshore projects) and a profit share. The profit share is levied on the (shielded) profit and amounts to 50 per cent. This profit share is deductible as an expense for corporate income tax purposes. In addition, the state-owned company Energie Beheer Nederland (EBN) is involved as a non-operating partner in almost all oil and gas extraction projects in the Netherlands with a stake of generally 40 per cent.[46]

Companies can deduct 40 per cent of new investments that result in more hydrocarbons becoming available from small fields in the North Sea from profits on which the 50 per cent profit share is levied. In 2021, this percentage was increased from 25 to 40 per cent.[47] This increase was partly motivated by the desire to accelerate the reduction of gas production from the Groningen field.[48] The increase encourages investments in new oil and gas fields in the North Sea on the one hand, but also reduces the government's revenues due to the mining levy. This investment deduction can therefore be seen as a fossil fuel subsidy. However, the mining levy itself is specifically designed to tax profits from oil and gas extraction on Dutch soil. From this perspective there is no advantage over other (non-fossil) market participants. Due to a lack of data, this scheme cannot be quantified.

6.2.3 Policies in motor vehicle and road taxes (including van policies for business owners)

The Tax Act on Passenger Cars and Motorcycles ('the bpm Act') stipulates that tax is levied on the registration of a passenger car, a motorbike or a van in the vehicle registration register. This includes exemptions for some motor vehicles. These include exemptions and refund policies for different categories. These exceptions are called the 'special policies' (Koeman et al. 2022). In total, this concerns an amount of €827 million in 2021 compared to the regular bpm rates.[49] The policies concerning electric and hybrid vehicles are not included in this amount. The exemption for entrepreneurs' vans concerns the by far largest item of this by volume: 98 per cent.

The Motor Vehicle Road Tax Act ('the mrb Act') provides that tax is levied for keeping a passenger car, van, motorbike, truck or bus. This includes some exceptions via exemptions and reduced rates (Koeman et al. 2022). In total, according to Annex 9 of the Budget Memorandum, the exemptions concern an amount of €1,390 million in 2021 compared to the regular rates.[50] This does not include the policies concerning electric and hybrid vehicles. The reduced rate for company vans concerns a large part of this: namely 72 per cent.

In total, the bpm and mrb policies thus involve an amount of €2,217 million in 2021, not including the policies concerning electric and hybrid vehicles. The vast majority of this amount concerns entrepreneurs' vans.

6.2.4 VAT exemption for international passenger transport

International passenger transport by ships or aircraft has a VAT rate of 0 per cent.[51] Although this 0 rate does not directly apply to the use of fossil fuel, this policy can still be seen as an indirect fossil fuel subsidy. After all, it almost exclusively involves transport based on fossil fuels. We were unable to quantify the extent of VAT

[46] Sources: OECD and IEA (2020), link and link.
[47] Link.
[48] Link.
[49] Budget 2023, Annex 9, link.
[50] Koeman et al (2022) arrive at a figure of €1.57 billion in 2020. The 2023 Budget Memorandum arrives at €1.29 billion for this year. We could not identify the reason for the differences. We use the figures from the most recent source in our report.
[51] Link. See also the 0 per cent VAT rate for ship and aircraft supplies: link. See also ICAO (International Civil Aviation Organisation) policy on taxes for international air transport (ICAO 2000).

revenue for international passenger transport by ship due to a lack of data. To quantify the part related to aviation, we use a 2019 report that relied on data for the period August 2016-July 2017 (European Commission 2019). We could not retrieve more recent data. This report cites a total number of air tickets of 23.1 million, at an average price of €371.[52] Assuming a VAT rate of 21 per cent, this gives a total amount of €1.8 billion.

6.2.5 Atradius DSB: insured fossil energy projects

Atradius Dutch State Business N.V. (Atradius DSB) is the export credit and investment insurance arm of the Dutch government.[53] On behalf of and for account of the Dutch State, Atradius DSB covers financial risks associated with exports and investments abroad. The Dutch state only insures 'non-marketable' risks, which are risks deemed impossible to insure by the private insurance market. The state wants to operate additionally in the market, supporting exports that would otherwise not be considered possible. This is done on a break-even basis: the premiums received are sufficient in the longer term to cover net claims. [54]

Atradius DSB covers risks from multiple fossil fuel projects. By the end of 2021, 21 per cent of the portfolio was directly linked to the fossil value chain. Government support incentivises other investors to support these projects as well, thus getting fossil fuel projects off the ground that might not have happened otherwise. In that sense, this can be seen as a fossil fuel subsidy. Thereby, while the premiums do cover costs in the long run, it can be questioned whether this sufficiently priced the government's hedging of 'non-marketable' risks. On the other hand, Atradius DSB supports many projects that are not solely focused on fossil fuel.

There are several initiatives to reduce the share of fossil fuel projects at Atradius DSB. Since 2001, insurance applications have been assessed for unacceptable social and environmental impacts. The share of 'green' transactions also increased in 2021 compared to 2022. However, the 'green' portfolio is still considerably smaller than the 'fossil' portfolio (€0.8 billion versus €4.4 billion at the end of 2021). In addition, the Netherlands signed a declaration during COP26 committing to end international financing of fossil energy projects by 2022.

6.2.6 FMO: government ownership, share in fossil energy projects

The Nederlandse Financierings-Maatschappij voor Ontwikkelingslanden N.V. (FMO) is the Dutch development bank for entrepreneurs. FMO supports private sector growth in developing countries. It does so by providing equity or loans for projects to private parties mainly in the financial, agricultural and energy sectors. These are projects that market parties would not finance under identical conditions and that meet FMO standards on social conditions, environment and good governance. The Dutch government has a 51 per cent stake in FMO. The state guarantee provided to FMO allows the bank to raise capital relatively cheaply.[55]

Because FMO finances fossil energy projects where it benefits, among other things, from the state guarantee, this can be seen as a fossil fuel subsidy. FMO also finances 'green' projects. In June 2021, FMO published a position paper presenting its commitment to phasing out direct investments in fossil energy. This policy was further defined in January 2023.[56]

6.2.7 ABN AMRO: government ownership, share in fossil energy projects

In 2021, the Dutch government has a stake of around 56 per cent in ABN AMRO and 100 per cent in Volksbank. Through the ownership in ABN AMRO (since 2008), financing is provided to fossil fuel energy projects. ABN

[52] VAT is levied on domestic air travel (EC 2019). The number of domestic flights and their average ticket price are not mentioned in the report. Due to the very limited number of domestic flights in the Netherlands, this has a presumably limited effect on the total amount.
[53] See Atradius DSB's website: link. Other sources are annual reports (link) and a general brochure (link).
[54] Link.
[55] Sources: FMO website (link), annual report (link) and Ministry of Finance (2021).
[56] Link.

AMRO still has a 47 per cent fossil energy share (about €1 billion) in 2021; this share has long been at 0 per cent for Volksbank (fully government-owned since 2013).[57] It should be noted, however, that ABN AMRO is taking steps to reduce its fossil energy share. Since 2016, this share has already been roughly halved. In addition, ABN AMRO has drawn up plans to reduce funded CO_2 emissions, for example by signing the Climate Commitment,[58] a climate strategy[59] and participation in the Net-Zero Banking Alliance,[60] which should lead to the bank being climate neutral by 2050. No concrete plans are known for a complete winding down of government ownership in the bank.

6.2.8 Government enterprises (including Gasunie, Havenbedrijf Rotterdam, Schiphol, Air France-KLM, EBN, GasTerra)

The state is a shareholder of several companies with many fossil energy activities. Companies in which the state is a shareholder are also referred to as participations. To safeguard public interests, the state exerts influence on these companies through its share ownership. In addition, government involvement can lead to higher credit ratings and signals to the market that the government supports the activities of these organisations. State participations also seize social financial assets. Several state-owned companies play an important role in extracting fossil energy and making fossil energy available to others, or are highly dependent on the use of fossil energy for their activities. Relevant state participations in this context are: Gasunie, Havenbedrijf Rotterdam, Air France-KLM, Schiphol, Energie Beheer Nederland (EBN) and GasTerra.[61]

Because of the state's advantages as a shareholder, this may support certain fossil energy activities of state participations. On the other hand, many state participations are also important for the energy transition, or state participations can play a role in the transition to sustainable energy in relevant sectors. Examples are the intended deployment of the current gas network for the transport of green hydrogen, the initiation of CO_2 reduction projects and the realisation of infrastructure for CO_2 capture and storage (CCS).

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57 Link.
58 Link.
59 Link.
60 Link.
61 Sources: Ministry of Finance (2022a); Annual Reports Management of State Participations 2020 (link) and 2021 (link).

7 Annex B

Table B.1 shows the share of CO_2 emissions that can be related to the various policies for which fossil fuel subsidies have been quantified in this study using the inventory approach (Table 3.1). Furthermore, this table also shows the share of the climate pricing gap related to these emissions under the external cost approach.

Table B.1 Comparison of fossil fuel subsidies according to the inventory approach and the carbon pricing deficit according to the external cost approach, 2021

Policies	CO_2 emissions ($Mt\ CO_2$)	Inventory approach (€ millions)	External cost approach: Climate (€ millions)
Category 1: Price support policies			
- None			
Category 2: Direct transfer of resources			
Free EU ETS emission allowances	32.9	2,080	2,080 (a)
Category 3: Tax expenditure and potential revenue foregone			
Energy tax and Additional Sustainable Energy and Climate Transition tax (ODE)			
- Tax reduction (on electricity bill, fossil fuel share)	15.8	2,350	0 (b)
- Degressive rate structure for electricity (fossil fuel share)	13.7	3,420	190 (b)
- Degressive rate structure for natural gas	9.8	1,940	660
- Reduced rate for natural gas in greenhouse horticulture	1.2	120	120
- Exemptions for energy-intensive processes (natural gas + electricity)	2.8	40	220
- Exemption for non-energy use of natural gas in chemical sector with direct CO_2 emissions	3.3	70	250
- Tax rebate scheme for institutions (natural gas + electricity)	0.3	40	0
- Exemption for natural gas consumption in extractive industries	1.2	20	160
Excise duty on mineral oils			
- Lower rate for diesel/LPG/CNG than for petrol	17.4	2,670	10
- Exemption for use of diesel (particularly inland shipping)	7.8	1,540	1,010
- Exemption for use of kerosene in international air transport	7.4	1,500	960
- Exemption for the use of fuel oil (particularly maritime shipping)	29.3	350	3,810
Other policies			
- Input exemptions for electricity generation	43.6	640	2,510
- Exemption for use of waste gases and mineral oils arising in house (refineries and chemical plants)	13.2	250	1,100
- Untaxed use of coal products in blast furnaces and coking plants	3.6	30	270
- Exemption in coal tax for dual consumption	5.7	30	430
Category 4: Risk transfer to the government			
No quantified policies		unquantified	
Total quantified	**195.4**	**17,110**	**13,660**

(a) The gross amount is €4.4 billion. To avoid double counting with other exemptions in energy-intensive industries, we only show the value of the free emission allowances here.
(b) The gross amount here is €190 million. As a result of double counting with the degressive rate structure for electricity, we show an amount of zero here.