Belgian National Debate on Carbon Pricing

FINAL REPORT

EXECUTIVE SUMMARY

June 2018

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TOWARDS A LOW CARBON SOCIETY

EXECUTIVE SUMMARY

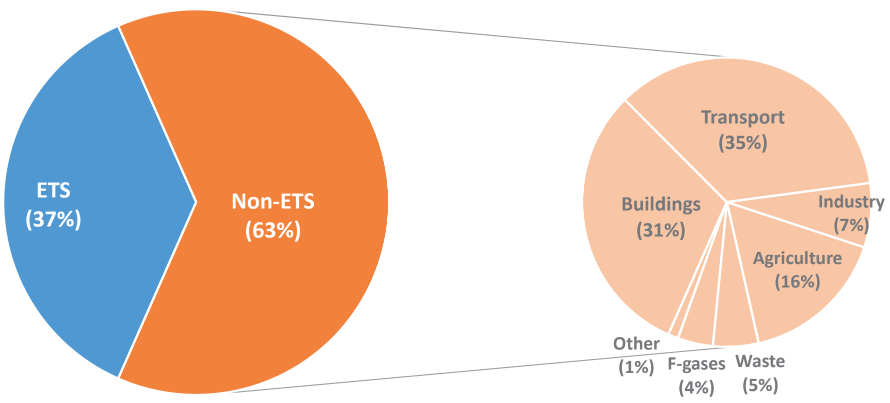
1 Context

In 2015, by adopting the Paris Agreement, its signatories committed to holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels. In order to meet this ambition, urgent action is needed to significantly reduce, and ultimately phase out, greenhouse gas emissions. In line with this commitment, the European Union (EU) and Belgium, as a member state of the EU, have committed to reducing their emissions of greenhouse gases (GHG) by at least 80 to 95% by 2050 with respect to 1990. In this context, the EU has already developed a framework to reach 2030 medium-term objectives through the EU Emission Trading System (EU ETS) and the EU Effort Sharing Regulation, that are part of the broader Energy Union strategy. Under this EU framework, Belgium is to develop and implement an integrated national energy and climate plan, as well as a Long-term Low Emission Strategy (LTLES) to guide its transition towards a low carbon society.

Such a transition requires the implementation of a series of coordinated policies and measures at different levels. Previous analyses[1] have shown that, if the appropriate policies are implemented, the low carbon transition can stimulate economic activity, create jobs and contribute to grasping other benefits such as energy security and reduced air pollution.

The pricing of carbon is a measure that is currently being developed and adopted by an increasing number of countries around the world. EU Member States have been at the forefront in this respect, with, next to the EU ETS in 2005, pioneering countries such as Denmark and Sweden having implemented carbon taxes in the early nineties, while other countries introduced such a tax more recently, such as Ireland in 2010 and France in 2014. Outside of the EU, the adoption of carbon pricing initiatives has been accelerating as well, with interesting cases in amongst others China, Canada (British Columbia), New Zealand, Chile and South Africa.

Figure ES.1: 2016 emissions in Belgium – Share of ETS vs non-ETS sectors in total emissions and share of the different non-ETS sectors in total non-ETS emissions



Sources: NIR 2018 and MMR2018

[1] See for instance Berger, L., F. Bossier, Th. Bréchet, Th. Lemercier and J. Pestiaux (2016), *Macroeconomic impacts of the low carbon transition in Belgium*, Final Report, Study performed for the Federal Public Service Health, Food Chain Safety and Environment. Available at www.climatechange.be/2050.

In Belgium, only 37% of GHG emissions are priced via the EU ETS. The remaining 63% of emissions, representing about 74 $MtCO_2e$, are not subject to any explicit carbon price. Figure 1 illustrates the main sources of these non-ETS GHG emissions. The transport and the buildings sectors represent respectively 35% and 31% of total non-ETS emissions and together accounted for 49,4 $MtCO_2e$ in 2016. The remaining 34% of GHG emissions stems from the non-ETS industrial sector (7%), the agricultural sector (16%), the waste sector (5%) and from products used as substitutes for ozone depleting substances, leading to the emission of fluorinated gases (4%).

In order to analyse the potential modalities for implementing a carbon price in the Belgian non-ETS sectors, the Belgian federal Minister of Energy, Sustainable Development and Environment launched a national debate on this topic in January 2017. This report presents the results of this dialogue. The process was based on a thorough exchange among Belgian and foreign experts covering the public, private, academic, associative and trade unions' sectors. The approach was fact-based, fed by numerous analyses including benchmarking analyses, and was organized around a series of high-level events, technical workshops and bilateral meetings. The performed analyses and the identified options for the implementation of a carbon price outlined in the present report are based on the views and the expertise gathered on these occasions.[2]

2 Transversal issues

On the basis of the literature and of experiences from abroad, **three overall principles** have been identified that serve as a common framework for guiding carbon pricing implementation modalities.

- The **first principle** is **budget neutrality** which is perceived by all consulted actors as a key success factor for the concrete implementation of carbon pricing. Although budget neutrality can be understood in different ways, there is a common understanding that any revenues should not simply feed the public budget, but should rather lead to a corresponding amount of reduced taxation and/or transfers[3] to actors. These aspects are further developed below when the different possible uses of carbon pricing revenues are outlined.
- The **second principle** is the **long-term orientation of carbon pricing**, which should be taken into account from the outset. Indeed, the purpose of implementing a carbon price is not to penalize and impose a burden on actors in the short-term, but to set a credible price signal over time to progressively orient the decisions of citizens, companies and institutions towards low carbon behaviours and investments.
- **Finally,** although carbon pricing is a powerful instrument, it should be clear that it will, as such, not suffice on itself. Several barriers, including information failures and principal agent problems, influence the behavioral and technological choices of economic agents, as does the inherited physical and institutional infrastructure in which societal actors interact. Any successful pricing of carbon emissions therefore requires the **concomitant implementation of a broad package of specific measures**, at different levels.

Four key implementation issues that define the main modalities of implementation of any carbon price have then been identified: (i) the scope of carbon pricing, (ii) its price level and trajectory, (iii) the use of the collected public revenues and (iv) the alignment of this policy measure with other existing, forthcoming or yet to be defined policies.

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[2] The authors wish to thank all participants to the national debate for their contributions and the rich discussions that took place. The content of the report is, however, of the sole responsibility of the authors.

[3] The notion of budget neutrality could be extended beyond the definition retained here, namely the explicit allocation of revenues from carbon pricing to specific purposes. It could encompass, for instance, all related changes in energy taxation in general (which would include a loss in revenues from excise duties for instance) or be even broader and include all indirect and potentially positive, macroeconomic effects on economic activity and thereby on public revenues.

In terms of **scope**, an analysis of experiences abroad shows that almost all countries having implemented a carbon tax have chosen to apply it to the buildings and the transport sectors. Non-ETS industrial sectors are also covered most of the time, although sometimes with reduced rates or exemptions. In the agriculture sector, CO_2 emissions are often subject to the tax while non-CO_2 emissions are never covered. Finally, a number of countries implement a tax on fluorinated gases.

Regarding the **price trajectory**, most countries with a carbon tax have opted for gradually increasing prices. Moreover, countries having recently adopted such a tax, such as Switzerland or France for instance, have set a price trajectory in advance. Such an approach has the advantage of smoothly implementing the scheme while providing actors with clear expectations on the strength of the price signal in the mid-term, thereby already re-orienting their investment decisions.

Table 1 below illustrates three options for the level of a carbon price to be implemented in the non-ETS sectors in Belgium. A price of 10 €/tCO_2e would be set in 2020 and this price would (in real terms) rise in 2030 to between 40 €/tCO_2e (option A), namely the currently expected carbon price in the EU ETS sector, and 100 €/tCO_2e (option C), a level close to the price observed in the most ambitious countries such as France or Sweden, which also corresponds to the high end of the carbon price range recommended by the High-Level Commission on Carbon Prices (Stiglitz and Stern, 2017)[4]. An intermediate level, 70 €/tCO_2e (option B), has been selected and is used to perform most impact analyses. It is supposed that the carbon prices follow a linear trajectory, towards 100, 190 and 280 €/tCO_2e by 2050 for Options A, B and C, respectively. As shown in Table 1, the impact of such carbon prices on final fossil fuel prices are in the order of 2 to 4% in 2020 and between 11 and 26% in 2030 under option B.

Table ES.1: Options for carbon price trajectories (2020 and 2030) and illustration of their impact on fossil fuel final prices

Carbon price		Impact of carbon price							
		Diesel 2,71 kgCO_2e/l 1,4 €/l		Petrol 2,24 kgCO_2e/l 1,4 €/l		Heating oil 2,63 kgCO_2e/l 0,7 €/l		Heating gas 0,202 kgCO_2e/kWh 0,06 €/kWh	
	€/tCO_2e	€/l	%	€/l	%	€/l	%	€/kWh	%
2020	10	0,03	2%	0,02	2%	0,03	4%	0,00	3%
2030 - Option A	40	0,11	8%	0,09	6%	0,11	15%	0,01	13%
2030 - Option B	70	0,19	14%	0,16	11%	0,18	26%	0,01	24%
2030 - Option C	100	0,27	19%	0,22	16%	0,26	38%	0,02	34%

Sources: Emissions factors: IPCC; Weekly oil bulletin; Own calculations

The total level of **revenues from pricing carbon** in the non-ETS sectors will depend on the exact scope of the instrument and on its price trajectory. The maximum[5] total revenues under price trajectory B amount to 607 M€ in 2020 and 2599 M€ in 2030.

Potential uses of these revenues aligned with the principle of budget neutrality include:

1. **overall tax shifts;**
2. **direct redistribution or compensation;**
3. **support of the transition in specific domains.**

The last two potential uses are rather sector-specific and are further detailed below. Regarding a potential **tax shift**, experiences abroad and discussions with experts have led to the definition of two main options.

4 Stiglitz, J. and N. Stern (2017), Report of the High-Level Commission on Carbon Prices, Carbon Pricing Leadership Coalition, The World Bank, 29 May. Available at www.carbonpricingleadership.org.

5 Assuming that agricultural non-CO_2 emissions and emissions of fluorinated gases are not priced and assuming that all emissions from the non-ETS industry are priced and generate revenues. When only the buildings and the transport sectors are accounted for, total revenues amount to 519 M€ in 2020 and 2085 M€ in 2030.

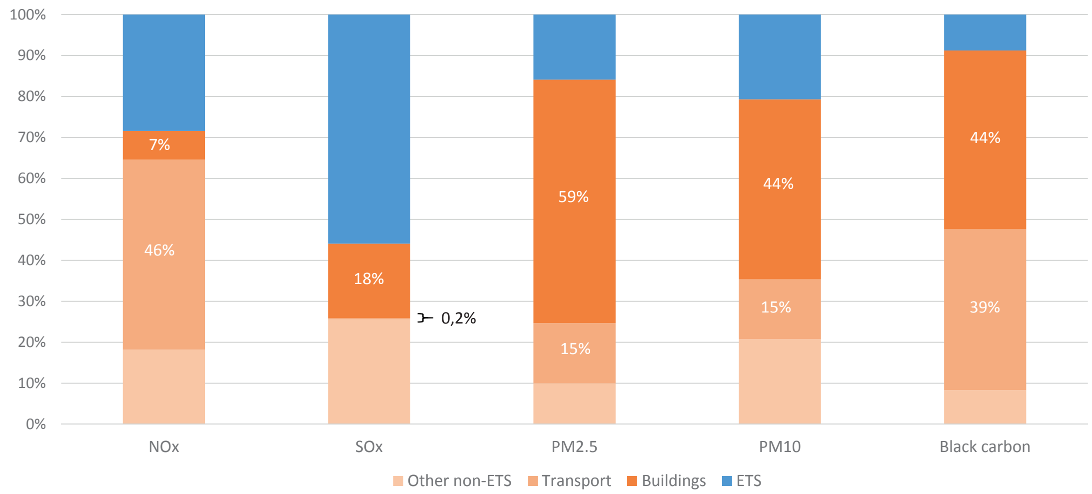
The first option is to use (part of) carbon pricing revenues to reduce **taxes on labour** such as social security contributions. Modelling exercises have quantified the positive impact of such a shift on employment and growth (see Berger et al., 2016). Still, uncertainties remain on the exact extent of the effect of this shift.

The second option is the **reduction of charges and levies on electricity**. While fossil fuel prices are generally lower, electricity prices in Belgium are higher than those observed in neighbouring countries, meaning that the fossil fuel-electricity prices spread is higher and that the incentives to electrify might be lower. Given the amount of expected revenues generated by the carbon price, any impact on final electricity prices is nevertheless expected to be relatively moderate.

It should not be forgotten that the low carbon transition necessarily involves a loss of public revenues from excise duties on fossil fuels[6]. Even though this is not directly linked to carbon pricing itself, the progressive reduction of such revenues will have to be accounted for in the mid/long-term together with the required evolution of the overall fiscal system and with the potentially positive impact on public finances of the macroeconomic stimulus generated by the transition.

Finally, any carbon pricing policy must be carefully aligned with a multitude of other policies and objectives at different levels, in particular environmentally harmful subsidies. By reducing the use of fossil fuels, the implementation of a carbon price could also generate other co-benefits related to the low-carbon transition, such as an improvement of our energy security and air quality. Figure 2, for example, shows that non-ETS sectors, in particular the buildings and the transport sectors, are by far responsible for the largest share of most air pollutants.

Figure ES.2: Source of emissions of air pollutants in Belgium, 2015



Source: NEC 2017

3 Buildings

Analyses show that current taxes on heating fossil fuels are relatively low and that the major concern of setting a carbon price in this sector is the potentially negative impact on vulnerable households. Discussions held during the debate allowed to identify clear options that could overcome this concern and that could be implemented in the short-term.

6 In 2017, total revenues from excise duties on energy amounted to about 6 billion €, i.e. about 2,5% of general government revenues in Belgium.

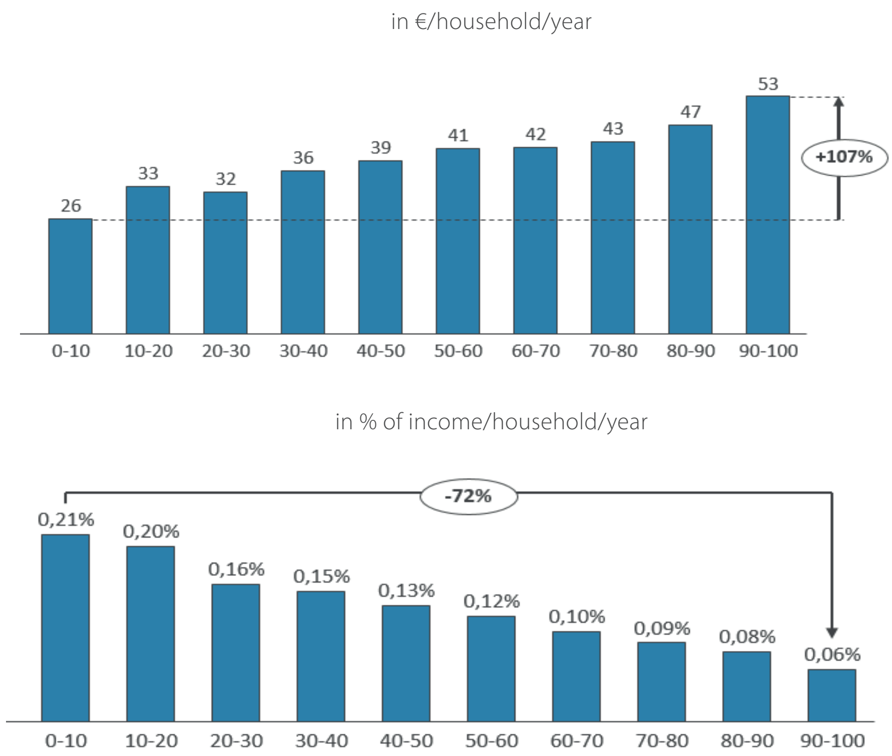
Context

GHG emissions in the buildings sector represented 31% of total Belgian non-ETS emissions in 2016. The buildings stock in Belgium is old as a large part of it has been built before the implementation of energy norms. Moreover, one third of the residential buildings is not occupied by their owner(s), which may hinder or slow down low carbon investments in those buildings. In terms of energy prices, Belgium has lower prices for both heating oil and natural gas than its neighbouring countries, by an amount corresponding to 59 €/tCO_2 (heating oil) and 44 €/tCO_2 (gas) w.r.t. the four neighbours (France, The Netherlands, Luxemburg and Germany), and to 117 €/tCO_2 (heating oil) and 90 €/tCO_2 (gas) w.r.t. the two main neighbours (France and The Netherlands).

Impacts and implementation modalities

In terms of scope, the option consists in introducing a carbon price in the form of an additional component of excise duties on all fossil fuels. Biomass would be excluded for practical reasons and would have to be dealt with through specific policies, including those aiming at controlling air pollution. Policy alignment on this matter is essential as biomass is the largest contributor to air pollution in this sector.

Figure ES.3: Average carbon contribution for heating by decile of income with a 10€/tCO_2 carbon price



Sources: Households budget survey, 2016; own calculations

The expected impact of the carbon price trajectory under option B corresponds to an **average annual carbon contribution of 32€ per household in 2020**, i.e. about 2% of the total energy bill. By 2030, the carbon contribution would increase up to 127€ per household. However, at the same time, the reduction of the energy demand following the introduction of the carbon price and the accompanying set of policies and measures would lead to a significant fall of the average energy bill (carbon contribution included), by about 10% w.r.t. its level in 2020. By 2050, the carbon contribution would amount to 51€ per household and the energy bill would be reduced by 47% w.r.t. its level in 2020.

Importantly, these average impacts potentially mask very different realities. First, an analysis of the impact of a carbon price of 10€/tCO_2e per income decile shows that, although absolute carbon contributions are significantly larger for higher incomes than for lower ones, these are much larger for lower income households when expressed as a percentage of their income (see Figure 3)[7]. In other words, without compensation measures the scheme is potentially regressive. Second, further analyses show that energy poverty is multi-faceted and that heterogeneity within income classes is significant. Carbon pricing revenues might then play a role in dealing with such concerns.

In terms of **revenues**, 159 M€ and 668 M€ would be collected on residential buildings in the years 2020 and 2030, and 60 M€ and 270 M€ would be collected on non-residential buildings in the years 2020 and 2030, under the assumption that the carbon price is fully implemented following price trajectory B.

The first option for the use of (part of the) revenues from pricing carbon emissions in the buildings sector aims precisely at dealing with such distributive issues. It consists in organizing a **lump-sum transfer to people at risk of energy poverty together with the financing of policies targeting those households**. The lump-sum transfer could take the form of energy vouchers that could be used for the payment of the energy bill as well as of low carbon investments (cf. France). They could potentially be linked to, reinforce and progressively replace current social tariffs and related measures. Next to these transfers, targeted policies would have to be developed at regional or local levels. The development and the actual implementation of these transfers and policies appear to be critical elements for pricing buildings' carbon emissions.

The second option consists in **fostering the transition** in three possible, different forms:

1. lump-sum transfers to every citizen (cf. Switzerland);
2. renovation programmes for households (cf. Ireland);
3. specific policies to support SMEs.

The low carbon transition is expected to lead to a drastic reduction of the energy bill even when carbon emissions are priced. However, to capture these gains, investments need to be made in building retrofitting and environmentally friendly heating technologies, mainly heat pumps. Our analyses show that, although the profitability of such investments is specific to each building and situation (e.g. whether a renovation is made only for energy savings motives or for other reasons), **the introduction of a carbon price significantly weighs on the profitability of the low carbon alternatives** and thereby fosters their implementation. Carbon pricing could therefore be an essential instrument **to support the different renovation strategies** and related policies currently under development at regional level.

4 Transport

Analyses show that, except for non-professional diesel, taxes on fuels are slightly lower than in the neighbouring countries, except Luxembourg. The main issue related to pricing carbon emissions in the transport sector is the potential impact on the competitiveness of the freight road transport sector. As was the case in the buildings sector, discussions held during the debate allowed to identify clear options to deal with such a concern that could be implemented in the short-term.

Context

GHG emissions in the transport sector represented 35% of total Belgian non-ETS emissions in 2016, with 20% for cars, and 14% for light and heavy-duty vehicles and buses. There are limited reduced excise rates or exemptions on motor fuels used for road passenger transport in Belgium and its neighbouring countries. Regarding road freight transport, a reimbursement scheme for 'professional' diesel is in place in Belgium. When these reimbursement schemes are taken into account, final prices in Belgium (incl. VAT) are lower than in its neighbouring countries (with the exception of Luxembourg). The difference with the average in

[7] The average carbon contribution is slightly larger here than the 32 € evaluated by 2020 (cf. above) due to a.o. changes in energy consumption levels between 2014 and 2020.

the four and in two (the Netherlands and France) neighbouring countries corresponds to a price of around 19 €/tCO_2e and 36 €/tCO_2e, respectively.

Regarding non-professional diesel, given the alignment of excise duties on diesel and petrol in Belgium, final prices tend to be higher than in its neighbouring countries. Implementing a carbon price in Belgium of 10 €/tCO_2e above the current excise duty rates would rise the differential by about 2 percentage points. Regarding petrol, final prices in Belgium (incl. VAT) are lower than in its neighbouring countries (with the exception of Luxembourg). The difference with the average in the four and in two (the Netherlands and France) neighbouring countries corresponds to a price of around 10 €/tCO_2e and 54 €/tCO_2e, respectively.

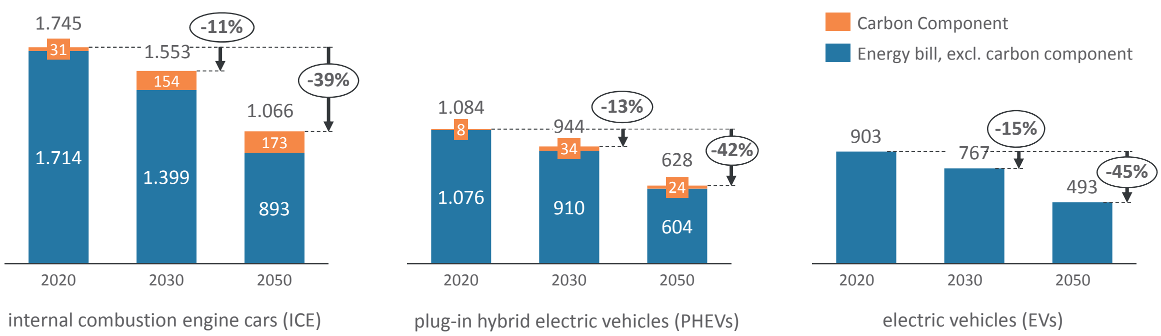
Impacts and implementation modalities

In this sector, **the suggested carbon price would cover the GHG emissions of all fossil fuels** (petrol, diesel and gas). The biomass component of fuels would be subject to the carbon price with, for instance, an emission factor equivalent to the corresponding fossil fuel (cf. France).

Two implementation options have emerged from the discussions and analyses:

- **Option 1: Implementation of the carbon price as an additional component to excise duties**. While the carbon price would apply to all vehicles indistinctively, freight transport would benefit from a specific treatment in order to address potential competitiveness concerns. For these actors, the actual carbon contribution would be limited to such a level that the final price of diesel (with reimbursement) roughly equals the price in the neighbouring countries. This can be done by increasing the current reimbursement of excise duties from which they benefit by the corresponding share of the carbon price. In order to maintain the price signal, that share could then potentially be introduced through the existing road pricing for heavy-duty vehicles by means of an approximation of the fuel consumption per type of truck. Under the same option, a variant could consist in applying the initial carbon price level (10 €/tCO_2e in 2020) within current taxation levels (cf. France).
- **Option 2: Implementation of the carbon price through a road pricing system instead of a component of excise duties.** For this option to be effective, the road pricing system would need to be smart and applicable to all vehicles and roads in Belgium. As the implementation of such a system in the three regions may require some time, it could be envisaged to start with the first option and possibly move thereafter to the second one.

Figure ES.4: Evolution of the average annual energy bill for passenger transport, by type of vehicle in the low-carbon scenario with Option B (in €/vehicle/year)



Source: Own calculations

In terms of impacts for road passenger transport, the **carbon contribution will differ according to the type of car**. As illustrated in Figure 4, the average annual carbon payment per car powered by an internal combustion engine (ICE) would amount to about 31€ by 2020, 154€ by 2030 and 173€ by 2050. However, due to improvements in technology, the energy bill related to these same vehicles would at the same time be reduced by more than 10% in 2030 and about 40% in 2050 w.r.t. 2020. For freight transport, carbon pricing would increase fuel cost payments, the second most important category of expenditures after labour costs. It would also increase load factors.

Analyses show that pricing carbon also positively and significantly impacts the profitability of electric cars with respect to ICE cars, in particular small and mid-size electric cars. Sensitivity analyses show that this result is robust to changes in energy prices.

In terms of **revenues**, 173 M€ and 591 M€ would be collected on passenger transport in the years 2020 and 2030, and 116 M€ and 556 M€ would be collected on freight transport in the years 2020 and 2030 under the assumption that the carbon price is fully implemented following trajectory B.

Besides general tax shifts away from labour and electricity, the proceeds collected from passenger transport could be redistributed through lump-sum transfers to households, used for infrastructure investments or used to promote low carbon modes that include electric mobility (e.g. charging network), public transport and active modes of transport. As for the share of revenues collected from pricing freight transport emissions, it could be used to cover investments in infrastructure, including active modes of transportation and multi-modality, or to finance a fund dedicated to technological innovation and deployment of all modes of freight transport.

Finally, **any pricing of transport emissions must be aligned** with a series of other policies and measures. A first incoherent policy is the favorable fiscal treatment of company cars and of other fossil fuel subsidies. A second point of attention is the implementation of air pollution policies for which synergies are obvious, not only regarding combustion emissions, but also particulates from tires and breaks in the transport sector. Finally, other fiscal policies might need to be reformed, in particular with regard to the support of low carbon alternatives.

5 Other sectors

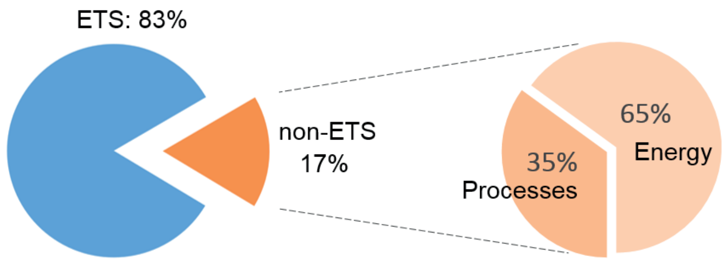
In each of the other sectors, namely non-ETS industries, agriculture, waste and fluorinated gases, carbon pricing implementation modalities need to account for the large heterogeneity within the sources of GHG emissions. In many of these sectors, a major point of attention is the potentially negative impact of a carbon price on competitiveness. Here again, implementation modalities, including an exemption from the carbon payment, reduced rates or specific compensation measures, allow to account for such concerns.

Industry

Context

The main sectors generating GHG emissions in the non-ETS industry are chemicals, food and drinks, textile, off-road emissions from industry and construction, manufacture of wood (products), glass, ceramics, cement, lime, plaster, etc. Non-ETS industry emissions amounted to 17% of total industry emissions, representing around 5,4 $MtCO_2e$ in 2016, as illustrated in Figure 5. 65% of those emissions stem from fuel combustion, 35% from processes. It is also observed that non-ETS industry relies more heavily on electricity than the ETS industry, in a context where electricity prices are mostly higher in Belgium than in the neighbouring countries, while gas prices are lower.

Figure ES.5: GHG emissions in industrials sectors in Belgium



Source: NIR 2018

Industry has already taken and continues to take action to reduce its fossil fuel consumption. For instance, in the sectors participating in voluntary agreements, the GHG emission intensity was reduced by 14,8% in the Walloon Region (excl. emissions from electricity production) and 10,4% in the Flemish Region (including emissions from electricity) during the period 2005-2015 and 2002-2014, respectively. Still, further emission reduction possibilities have been identified, in particular regarding the electrification of heating processes.

Impacts and implementation modalities

For implementing a carbon price in the non-ETS industries, two main options have been identified that take into account potential competitiveness concerns.

The first main option involves the gradual pricing of all fossil fuel emissions from combustion according to the retained carbon price trajectory (A, B or C), **except for the sectors at risk of carbon leakage**, for which the price would be capped at a level corresponding to the current fossil fuel (mainly gas) price gap (all taxes and levies included) with the neighbouring countries[8]. Regarding process emissions, special treatment (e.g. based on ETS practices and involving benchmarks) is likely to be required given the specific levers needed to reduce them. In order to be able to implement this option, further work needs to be undertaken for identifying the non-ETS sectors at risk of carbon leakage, for setting and periodically revising the price cap, and for dealing with specific features of process emissions. Two possible variants for the price level could be envisaged here:

1. using the ETS price (i.e. an average of past prices, to be regularly reviewed) instead of using one of the three proposed carbon price trajectories A, B or C to ensure consistency between the prices applied to ETS and non-ETS industries, or
2. implementing the first component of the carbon price trajectory (i.e. 10 €/tCO_2e in 2020) within the current taxation level for all sectors (at risk or not at risk of carbon leakage), after which the trajectory would apply.

The second main option would consist of reforming the existing regional systems of voluntary agreements to include an explicit carbon price in the evaluation of the projects or investments to be made. If this option is chosen, companies not bound by these voluntary agreements would be subject to a carbon price implemented through an additional carbon component on energy taxes, while companies that do sign the new agreement would be exempted from such a contribution. However, under these new agreements, companies would be obliged to implement a 'shadow carbon price' in the evaluation of all their projects or investments.

This would implicitly favour low-carbon investments without involving the collection of any levy. Such a reform would obviously require a revision of a series of parameters for the determination of the degree of profitability of the investments at stake. Here as well, a possible variant for the price level could be to use the ETS price (forecasted prices in this case, that would also have to be regularly reviewed) when setting the price trajectory, instead of using one of the three proposed carbon price trajectories A, B or C.

Regarding the **potential public revenues** generated by a carbon price implemented in the non-ETS industries, estimates greatly vary in function of the scope considered. Therefore, using a simplified assumption for the emissions trajectory up to 2050, maximum theoretical carbon revenues amounting to 55 M€ in 2020 and 286 M€ in 2030 have been estimated under the price trajectory B.

As to the **use of these revenues**, two possibilities have been identified:

- The first proposal entails to allocate part or all of these revenues to reduce either labour taxes or taxes and levies on electricity. However, for the impact on the final electricity price or on the labour costs to be perceptible for the non-ETS industries, revenues from other important emitting sectors would need to be allocated to such a tax shift.
- A second, potentially complementary possibility identified is to accompany industries, in particular the small and medium-size enterprises (SMEs), in the transition through the financing of accompanying measures, like for instance setting up a fund for innovation.

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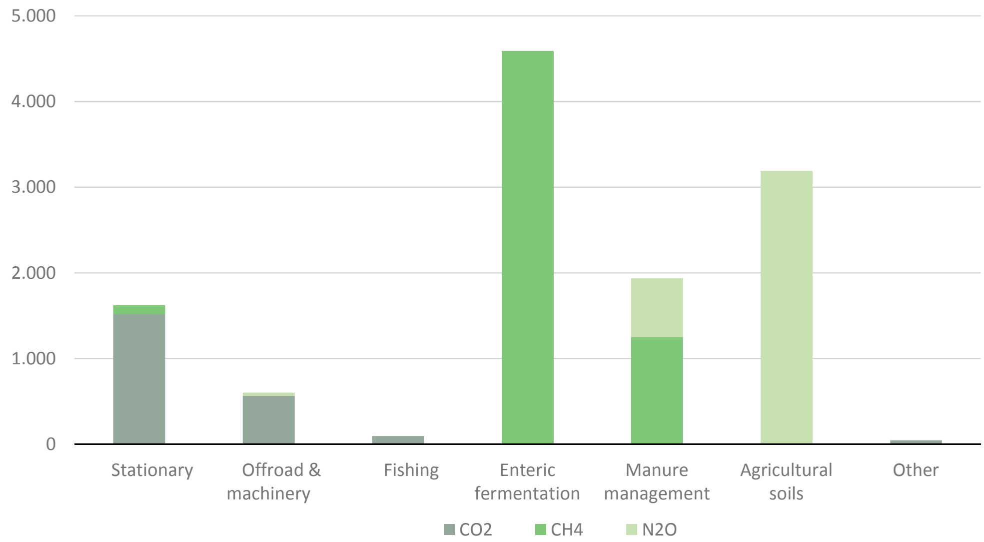
8 And potentially other countries if relevant.

Agriculture

Context

In the agriculture sector, emissions from fuel combustion represented around 19% of this sector's GHG emissions in 2016, while the remaining emissions were generated by enteric fermentation, agricultural soils and manure management activities (see Figure 6). Even though the emission reduction potential in the agricultural sector is limited when compared to other sectors, several levers for reducing fuel combustion and non-CO_2 emissions have been identified. When considering and implementing climate policies, the Belgian agriculture's key characteristics should be taken into account, among others that it is an export-oriented sector, that the greenhouse crops sector has already made an important switch to natural gas with cogeneration and that the agriculture sector could have an important role to play in the context of reaching net-zero/negative emissions in the long term, through maintaining and even increasing carbon in soils.

Figure ES.6: 2016 GHG emissions in agriculture per type of gas (in ktCO_2e)



Source: NIR 2018

Impacts and implementation modalities

The main option identified for implementing a carbon price in this sector, is to **apply a carbon price** (with a price trajectory A, B or C) **to all energy-related fossil fuel emissions from non-stationary sources (offroad vehicles and machinery) through (increased) energy taxes**, given that these sources are currently mostly exempted from taxes on energy in Belgium, which is not the case in our neighbouring countries, with the exception of Luxembourg. As for energy-related fossil fuel emissions from **stationary sources, which mainly originate from greenhouses, an approach similar to the one proposed for the non-ETS industrial sectors** is suggested. Either a carbon price is implemented but capped at a level corresponding to the fossil fuel (gas) price gap with respect to neighbouring countries in case of a risk of carbon leakage, or voluntary agreements are signed that foresee the introduction of a carbon price in investment assessments.

Analyses also show that **putting a price on non-CO_2 emissions** (enteric fermentation, manure management and soils) **would currently not be appropriate**, mainly due to the difficulty to accurately measure those emissions at the source level. These emissions should therefore be addressed through specific policies, aimed at redirecting consumption patterns towards agricultural products with a low-carbon impact. However, despite these implementation barriers, the impacts and feasibility of putting a price on the non-CO_2 GHG content of agricultural products (at product market level) could meanwhile be analysed.

Estimated maximum carbon public revenues from the agriculture sector under the price trajectory B would amount to 23 M€ in 2020 and 122 M€ in 2030. Other than using these revenues for reducing labour or electricity taxes, the two options discussed in the context of this debate are the financing of specific programs supporting the transition of the agricultural sector, or a lump-sum transfer to farmers, for which a basis would need to be determined.

Waste

Context

Non-ETS GHG emissions stemming from the waste sector amounted to 3,8 $MtCO_2e$ in 2016 (representing 5% of total Belgian non-ETS emissions that year), of which around two thirds originate from waste incineration with recuperation of electricity and heat. The other main sources of emissions from the sector are solid waste disposal and waste water treatment and discharge.

The key lever for reducing emissions in the waste sector is reducing the amount of waste. Even though municipal waste per capita has decreased substantially in Belgium between 2007 and 2016, waste incineration per capita has remained stable during the same period. While emissions from waste disposal are projected to decrease considerably, emissions from waste incineration with production of electricity and heat are projected to remain significant, totalling around 2$MtCO_2e$/year in a mid-term horizon. Therefore, even if substitution possibilities at the level of waste treatment are limited, introducing a carbon price could contribute to reducing the amount of waste and increase recycling rates by internalizing the externality.

Impacts and implementation modalities

Non-energy related CO_2 emissions originating from the incineration of waste could thus be subject to a **carbon price integrated into the current environmental incineration taxes**. These taxes could be converted into carbon equivalent taxes, and if the carbon price trajectory is higher, the level of these taxes could be raised by the corresponding gap. The main advantage of such an option is that its administration is based on an existing system that fully integrates any cross-border shopping effects as the tax is applicable to all waste from Belgian origin. Regarding the other sources of GHG emissions from the waste sector, that are projected to decline significantly in a business-as-usual scenario, it could still be envisaged to price them in order to contribute to foster alternatives, including waste reduction. The carbon price could also here be potentially included into existing environmental taxes, provided that these taxes have been introduced with the purpose to reduce the amount of waste. Estimated maximum **public carbon revenues** from the waste sector amount to 30 M€ in 2020 and 159 M€ in 2030 under price trajectory B. Regarding the use of these revenues, other than using them for reducing labour or electricity taxes, envisaged options include devoting them to specific programs for the transition of the sector and/or to support measures promoting a circular economy.

Fluorinated gases

Context

Emissions of fluorinated gases currently represent around 2-3% of the global GHG emissions. Nevertheless, these emissions are rising rapidly worldwide and projections indicate they could reach up to 20% of global GHG emissions in 2050, if no measures are taken on fluorinated gases and the other GHG emissions are reduced or contained. In Belgium, total emissions of fluorinated gases from product uses as substitutes for Ozone Depleting Substances (ODS) almost reached 3 $MtCO_2e$ in 2016. The largest (weighted) share of fluorinated gases is used for air conditioning, refrigeration and heat pumps, followed by foam blowing agents, aerosols and fire extinguishers.

Legislation at international and EU levels has been adopted with the objective to progressively phase out fluorinated gases. The recent Kigali Amendment (KA) to the Montreal Protocol as well as specific EU legislation are the main drivers of the projected phase out in Belgium and should put the country on a path towards reaching its 2050 objectives. Consequently, prices of 'old' fluorinated gases tend to rise significantly. **The extent to which the implementation of a GHG price on fluorinated gases in Belgium**

is relevant must therefore be evaluated against these developments and account for the fact that Belgium imports fluorinated gases.

Implementation modalities

Any implementation of a carbon price in Belgium could benefit from the experience of several European countries that have implemented or are in the process of implementing a tax on fluorinated gases with diverse modalities. The price could be set at a level corresponding to the carbon price trajectory in the other sectors (with possibly reduced rates in function of e.g. the source of the substance). In terms of scope, **several options can be envisaged that would all require further investigation** before they can be implemented concretely. Based on experiences from abroad, a GHG price could be applied on imported gases in function of the source of the substance (virgin, recycled, reclaimed) and its application could be subject to the location of its use (Belgium, other EU Member State, non-EU Member State). Moreover, a support for the destruction of a given amount of F gases could be considered in several scenarios. The special gas SF_6, used in Medium and High Voltage Switchgear and controlled within a specific legal framework, may follow a differentiated pathway depending on the availability of alternatives. Finally, any concrete proposal for the implementation of a carbon price on fluorinated gases should ensure that traffic as well as loopholes or the development of a black market are avoided.

6 Conclusions

The pricing of carbon or GHG emissions is a measure that is regarded by most academics and policy experts as an essential policy to gradually drive our economy towards low-carbon alternatives, that should be central to any effective climate policy package. The discussions held in the context of this national debate clearly demonstrate that, although several concerns potentially arise from the implementation of a carbon price, it is possible to define the necessary modalities that overcome these concerns in the different sectors. In this respect, choosing the appropriate uses of the public revenues generated by the carbon price appears to be crucial and will be a key success factor for the concrete implementation of the mechanism and for its support by most if not all actors.

For the buildings and the transport sectors, that together account for about two thirds of total Belgian non-ETS emissions, a limited number of clear-cut options for implementing a carbon price has been identified. Analyses show that the impact of a carbon price is manageable for these identified options, especially when carbon pricing revenues are used to compensate for its potential adverse impacts and to finance complementary measures, including measures that foster the transition by supporting low carbon alternatives. Only few practical, well-defined implementation issues remain open that could be dealt with fairly smoothly based on inspiring lessons from the carbon pricing schemes implemented abroad.

Experiences from abroad show as well that pricing GHG emissions in most of the other sectors is also feasible, provided that their specificities are adequately accounted for. The debate has shown that potential competitiveness and other specific concerns need to be properly taken into account. Options in these sectors have been identified that deal with these concerns, but that also require further analyses before being ready to be implemented.

Both the implementation of a carbon price and the use of its revenues will require a high degree of coordination between the different authorities in order to ensure policy alignment. Guaranteeing policy coherence at all levels is essential for the measure to deliver its full potential in mitigating climate change and to grasp the many opportunities linked to the low carbon transition. In any case, the current climate and energy policy context, and in particular the necessity to develop measures towards mid-term and long-term goals in the context of the integrated national energy and climate plan and of the future Belgian Long-term Low Emission Strategy, is a unique opportunity to implement an overarching and transversal measure such as carbon pricing.

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