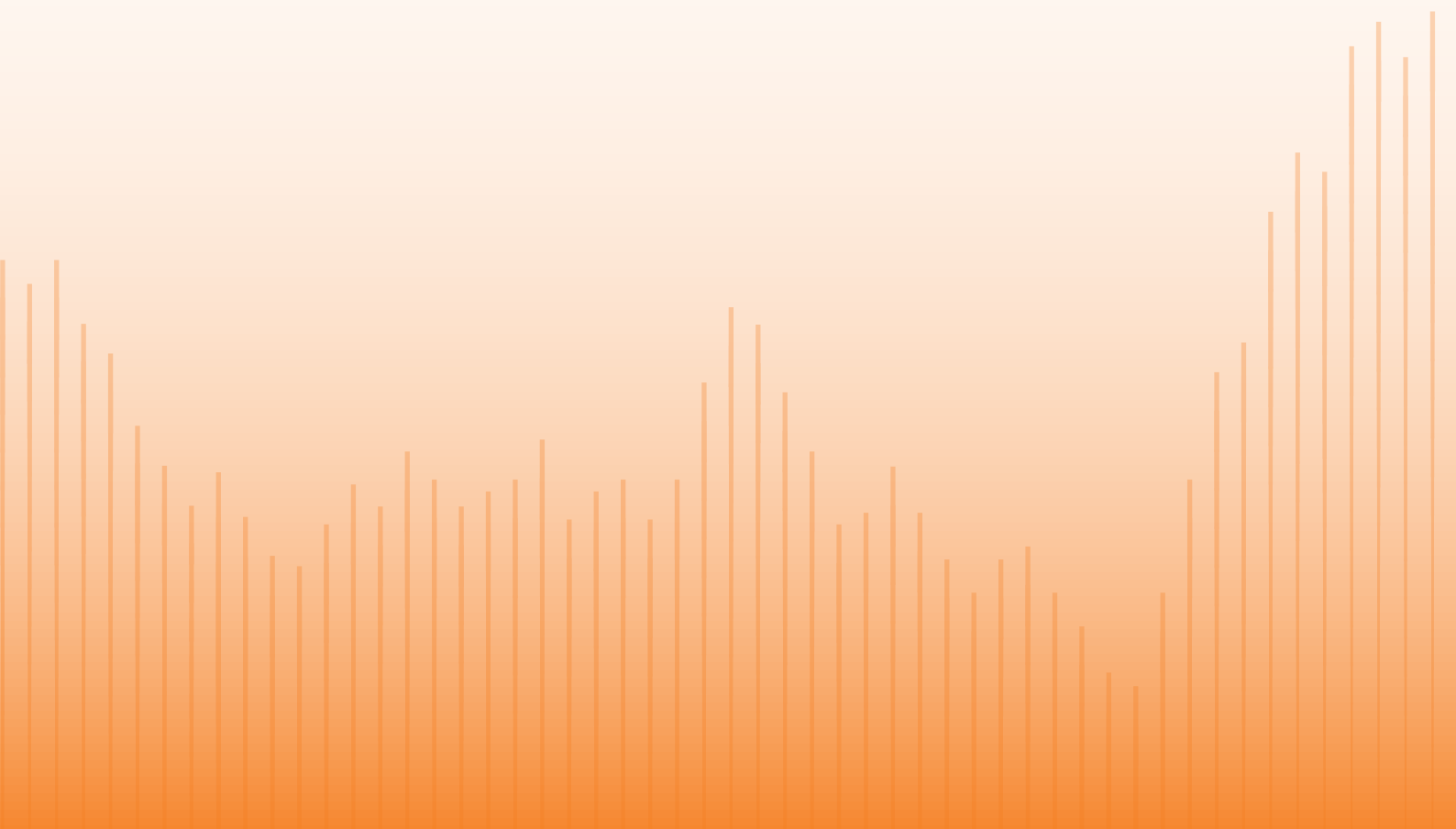


**PROMETEIA
DISCUSSION
NOTE N. 12**









DECEMBER 2019

THE EUROPEAN ROADMAP TO CARBON NEUTRALITY



Main points

-  To tackle climate change and contain temperatures rise will require significant reductions in global Greenhouse Gas (GHG) emissions and substantial climate-friendly investments worldwide.
-  The EU is the world leader in global environmental policy and the new European Commission (EC) intends to enhance this leading role by launching a European Green Deal.
-  The EU currently operates an Emissions Trading System, covering 45% of total European GHG emissions, complemented (in some countries) by national carbon taxes and by environmental taxes.
-  However, GHG emissions are not priced in line with the Paris Agreement...
-  ...and without a significant increase in carbon prices, it will be impossible to reduce GHG emissions to the required levels.
-  In addition, it will be crucial for there to be more green financing to scale up investments and allow advances towards an energy-efficient and low-carbon economy.

I. Introduction

The 2015 Paris Agreement was a global milestone in relation to tackling climate issues; for the first time, all countries agreed about the need to act together to fight climate change and make adaptations in relation to the changes that have already occurred.¹ The Agreement stipulates that all signatory countries and the European Union (EU) should make concerted efforts, or Intended Nationally Determined Contributions (INDCs), to reduce global GHG emissions. The overall goal is to maintain global temperature rise to well below 2°C above pre-industrial levels over the long term and to aim to limit this increase eventually to 1.5°C. The Paris Agreement also requires countries to report their efforts and, every five years, to assess progress and, if possible, set even more ambitious targets. The first five-year review is due to take place in Glasgow in 2020.

Meeting the goal of limiting global warming to 2°C will require a one-third reduction in GHG emissions compared to current levels (Figure 1). Under the current Business-As-Usual (BAU) scenario, global warming is expected to result in temperatures 4°C above pre-industrial

¹ The Paris Agreement became binding on 4 November 2016, 30 days after its ratification by the 55 countries that account for at least 55% of global emissions (the so-called "double threshold"). A total of 195 countries adopted the first-ever universal, legally binding global climate deal based on the 1992 United Nations Framework Convention on Climate Change (UNFCCC) or the Convention.

levels by the end of this century. If the mitigation efforts established in the Paris agreement are fully implemented, it is expected that this rise could be contained at 3°C, less than previously estimated. The Intergovernmental Panel on Climate Change (IPCC) states that, to avoid major and irreversible damage, the temperature rise must be at most 1.5°C.

Following the Paris Agreement, the EU committed to three key targets by 2030: 1) a reduction of at least 40% in GHG emissions compared to 1990 levels; 2) the achievement of at least 32% share for renewable energy in total energy consumption; and 3) at least 32.5% improvement in energy efficiency compared to the 2030 BAU scenario.² Based on the existing clauses, and the EC's new agenda, the second and third goals could be made even stricter by 2023, while the first could be raised to 50-55% by 2021.

In November 2018, the EC has proposed a strategy (not a legislative proposal) for a CO₂-neutral Europe by 2050 ("A clean planet for all"), confirming the EU's leading role in achieving a net-zero GHG emissions economy. This strategy does not include new targets; it merely constitutes a long-term vision and proposes a range of solutions that could be applied by Member States, businesses and citizens to address the environmental challenges in future decades, while maintaining EU competitiveness, jobs conversions and social fairness.³

This note provides an overview of the targets and actions being taken to address climate change in Europe. Section II reviews the key points in the new EC agenda for the coming years. Section III provides an overview of the carbon pricing tools implemented at the EU level and Section IV focuses on the environmental, fiscal and economic implications of carbon taxation for several countries. Section V describes the role of both public and private green investments in relation to supporting the transition to a low-carbon economy. Section VI concludes.

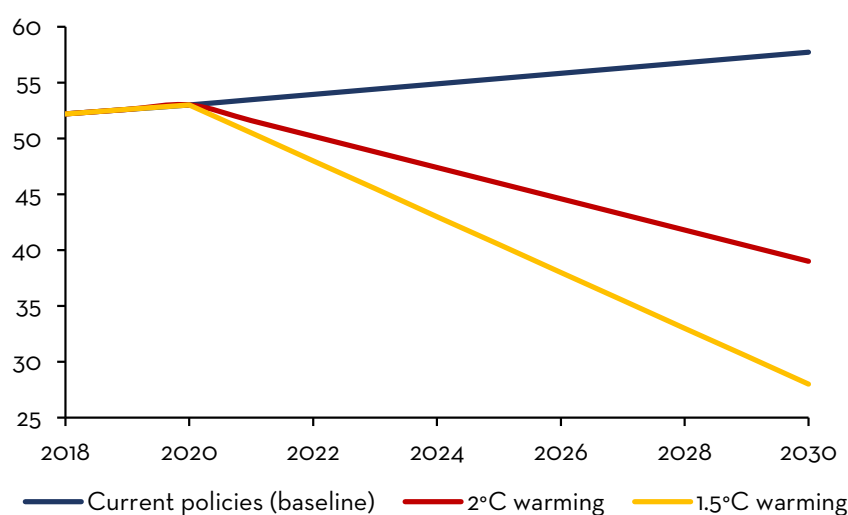


Figure 1
Emissions pathways and warming goals
Global GHG emissions, billion tons

Source: IPCC 2018, IMF, Fiscal Monitor October 2019.

² The EU-INDC (2015) states that "the EU and its Member States are committed to a binding target of an at least 40% domestic reduction in greenhouse gas (GHG) emissions by 2030 compared to 1990". This target is consistent with a reduction in GHG emissions of 80%-95% by 2050. The other two targets are included in the "Clean Energy for All Europeans" revision to the Renewable Energy Directive (Directive (EU) 2018/2001) and Energy Efficiency Directive (Directive (EU) 2018/2002) and replace the previous targets of 27% by 2030.

³ This strategy identifies seven strategic areas where planning, investment and joint action are required: energy efficiency; deployment of renewables; clean, safe and connected mobility; competitive industry and the circular economy; infrastructure and interconnections; bio-economy and natural carbon sinks; carbon capture and storage to address remaining emissions.

II. The European Green Deal in the von der Leyen's agenda

The transition to a clean and healthy planet is one of the most important elements of von der Leyen's political guidelines for the EC 2019-2024.⁴ The agenda defines being the world's first climate-neutral continent as “the greatest challenge and opportunity of our times” for Europe. To achieve this goal, the new Commission will launch a proposal for a European Green Deal within 100 working days from its inauguration. A European Climate Law will be approved, to formalize the EU's goal of climate neutrality by 2050 within the EU legislative framework. In what follows, we identify the four main pillars of the European Green Deal.

First, the European Green Deal will allow a reduction in GHG emissions in the EU by more than the current 2030 Paris-consistent target, through an extension to the existing European Emissions Trading System (ETS) and the introduction of a Carbon Border Tax (CBT). The ETS will be extended to certain energy-intensive sectors not included in the scheme, so far, for competition related reasons. These sectors include the maritime, transportation and construction industries. The CBT will be a complementary tool, which will avoid transfer of production to countries with less stringent restrictions on GHG emissions (carbon leakage) and will provide revenue that can be invested in green projects. This pricing approach to emissions is aimed at an emissions reduction of at least 50% and towards 55% by 2030, compared to 1990.

Second, a Sustainable Europe Investment Plan will be implemented to support a €1 trillion investment in green projects over the next decade. The EU will become the leader in relation to green financing strategies, involving multiple actors and based on synergies. On the public investment side, the EU could contribute directly by allocating a higher share of the EU budget to climate-related projects and indirectly by reforming the European fiscal framework such that green investments are exempt from fiscal rules (e.g. through the introduction of a “Green Golden Rule”). In relation to private investments, which, based on the plan should constitute the bulk of green financing, these will be boosted by von der Leyen's agenda which gives a crucial role to the European Investment Bank (EIB). The EIB will become Europe's climate bank and will provide double the current share of loans earmarked for climate-friendly investment.⁵

Third, the plan will target how we produce, consume and trade, by strengthening strategies such as the Circular Economy Action Plan, the Biodiversity Strategy for 2030, the fight against plastic waste and the Farm to Fork Plan.

Finally, the EC will introduce a new Just Transition Fund to ensure political viability of the European Green Deal and to make the transition fair. The transition towards a zero-carbon emissions economy will produce winners and losers; politics will have the task of making the transition just and inclusive, based on introduction of compensatory measures. The European Green Deal foresees the establishment of a new Just Transition Fund, which will use a part of the revenue from climate policies to compensate low-income households most affected by the higher prices for carbon-intensive products and coal, and the current energy-intensive sector regions.

⁴ Available at https://ec.europa.eu/commission/sites/beta-political/files/political-guidelines-next-commission_en.pdf

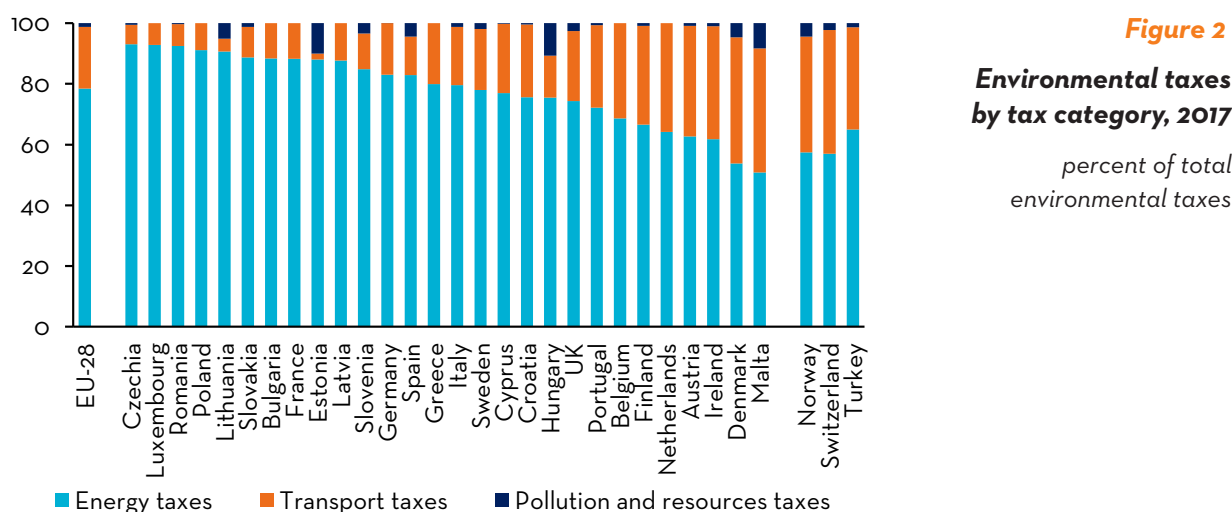
⁵ The EIB has committed to increasing its share of green financing to 50% by 2025. Total annual EIB financing was about €47 billion in 2018, and €60 billion on average in the period 2010-2018.

III. Actions taken: environmental taxes and carbon pricing

In Europe, climate actions are already underway. Environmental policies are addressing a range of environmental and resource challenges, based on various tools including environmental taxes, carbon pricing and green investment.

At the European level, there are four types of environmental taxes that apply to energy, transport, pollution and resources.⁶ Environmental taxes are being used increasingly to influence the behaviour of producers and consumers in order to protect the environment and natural resources. In 2017, total environmental tax revenues in the EU28 amounted to €369 billion, compared to €264 billion in 2002, an average annual increase of 2.2%, in line with nominal GDP growth. They represented 2.4% of the GDP and 6.1% of total government revenue from taxes and social contributions in the EU.

Energy Taxes on energy products and electricity accounted for more than three quarters of total environmental tax revenues in 2017 (76.9%), while transport taxes accounted for 19.8% and pollution and resources taxes for 3.3% (Figure 2). Companies and households contributed almost equally to the energy taxes collected by governments in 2016 (51% and 47%, respectively). However, households contributed most to transport tax revenues (in the EU, 65% on average compared to 33% for companies), mainly because they pay the largest share of motor vehicle tax revenues.



Source: Eurostat.

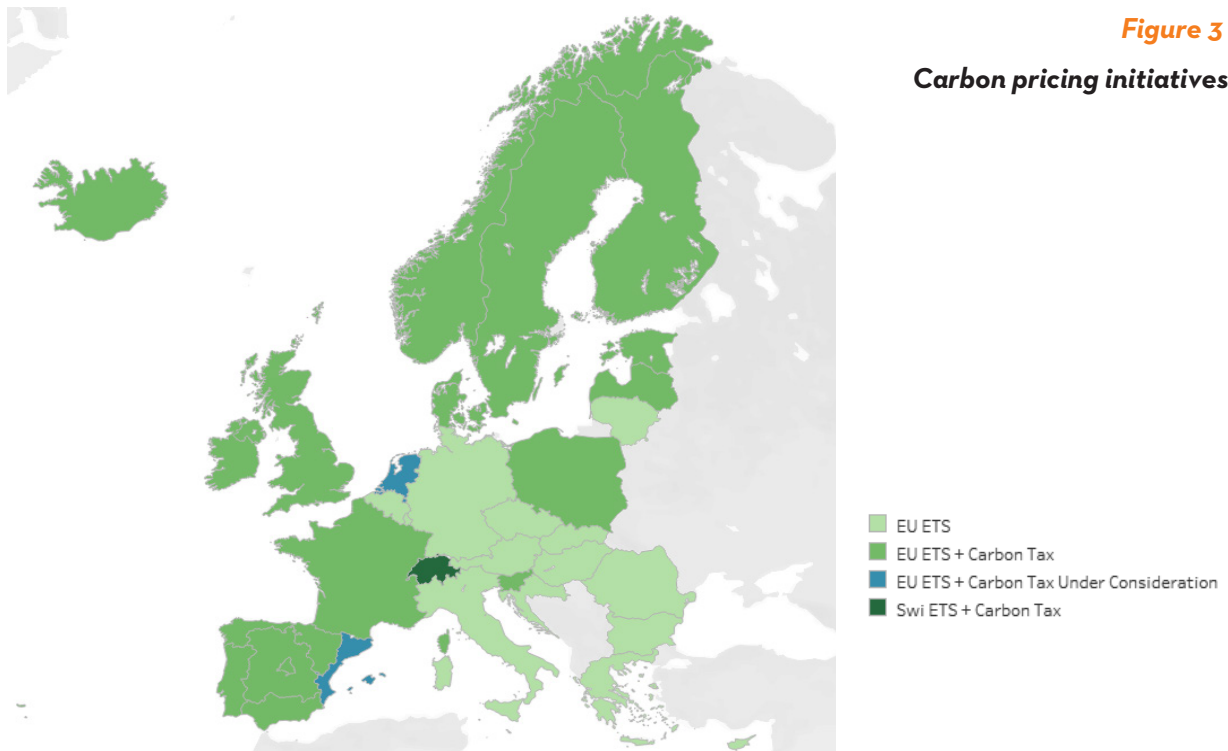
Another way to reduce emissions is carbon pricing. This strategy includes all initiatives providing for an explicit price on GHG emissions, expressed in monetary units per ton of CO₂. The objective is to charge producers directly for their emissions, and to encourage a shift in the energy mix away from carbon-intensive energy sources (differently, energy taxes are levied on consumers and are aimed at reducing energy consumption). There are two tools that can be used to set carbon prices: a carbon tax on fossil fuels and the ETS. Both are applied in Europe and imply different

⁶ Energy refers to energy products used for transport (e.g., leaded and unleaded petrol, diesel, etc.), energy products for stationary purpose (light and heavy fuel oil, natural gas, coal electricity and district heat consumption and production), and GHGs (i.e., carbon content of fuels and emissions of GHGs). Transport excludes fuel for transport and includes import and sale of motor vehicles, registration or use of motor vehicles (annual taxes), road use (e.g., motorway taxes), congestion charges and city tolls, flights and flight tickets, vehicle insurance (excludes general insurance taxes). Pollution includes measured or estimated emissions to the air, ozone depleting substances, measured or estimated effluents to water, waste management, noise (e.g., aircraft take-offs and landings). Resources include water abstraction, harvesting of biological resources, extraction of raw materials, landscape changes and felling of trees.

rates for producers and users in different countries. Figure 3 depicts implementation of these two carbon pricing instruments across Europe.

The Northern countries were the first to apply a carbon tax, implemented in the 1990s, and currently have higher tax rates (Figure 4). Finland's rate is around \$70 per ton of CO₂, Norway's is over \$58, in Denmark and Ireland it is around \$25 and in Iceland about \$30. The carbon tax rate in Sweden has been increasing since 1991, and is the highest in the world today at over \$120. Among the main European countries, France and Spain introduced a carbon tax in 2014 at the respective rates of about \$51 and \$16, while Germany and Italy have yet to do this.⁷ In 2008, Switzerland introduced a carbon tax whose current rate is \$96 and in 2015 Portugal imposed a carbon tax at the rate of about \$14.⁸ The Eastern Europe countries have been experimenting with various carbon pricing methods including comprehensive air emissions taxation systems which include carbon emissions.

The EU introduced the ETS in 2005; it is the world's first and the largest international emissions trading system and includes more than three-quarters of global trading of emissions allowances.⁹ It operates in 31 countries (the 28 EU countries plus Iceland, Liechtenstein and Norway) and covers around 45% of the EU's GHG emissions. It imposes limits on emissions mainly from heavy energy installations (power plants and industrial plants) and airlines.¹⁰ It is currently



* The different colours indicate different combinations of initiatives in the countries. Swi ETS indicates the Switzerland emissions trading system.

Source: Prometeia's calculations on World Bank Group data.

⁷ In the 2020 Budget Law, Germany provides for 2021 a national ETS that will cover some sectors excluded by the EU ETS, such as transports and heating sector.

⁸ See IMF Fiscal Monitor, October 2019 and World Bank "State and Trends of Carbon Pricing 2019", June 2019.

⁹ The EC is a founding member, also, of the International Carbon Action Partnership (ICAP), which brings together countries and regions with mandatory cap-and-trade systems, which are increasing worldwide with national or sub-national systems already operating or under development in Canada, China, Japan, New Zealand, South Korea, Switzerland and the US.

¹⁰ It covers CO₂ emissions from power and heat generation; energy-intensive industries, including oil refineries and producers of iron, steel, aluminium and other metals, cement, lime, glass, ceramics, pulp, paper, cardboard, acids and bulk organic chemicals; and commercial aviation; nitrous oxide (N₂O) from the production of nitric, adipic, glyoxal and glyoxalic acids; and perfluorocarbons (PFCs) from aluminium production.

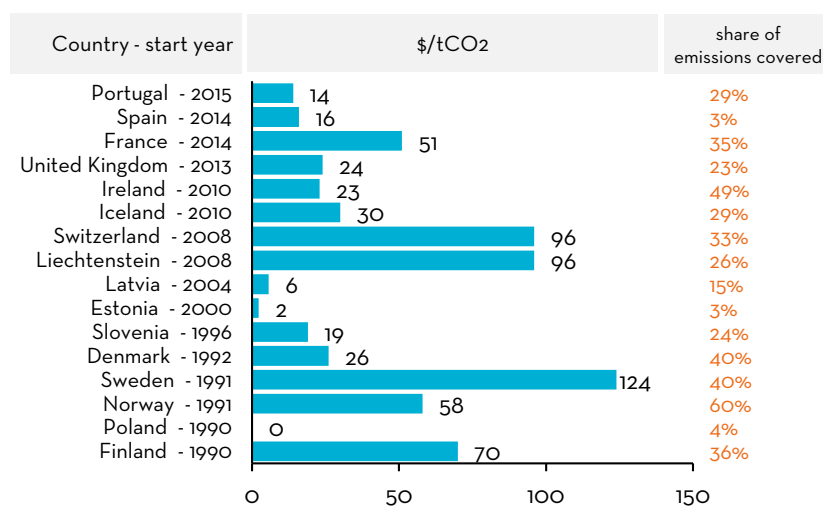


Figure 4
Features of carbon taxes
in 2019

Source: I4CE.

in Phase 3, covering the period 2013-2020, which aims at reducing the covered emissions by 21% by 2020, compared to 2005. In 2030, after ETS Phase 4 (2021-2030), emissions are expected to be 43% lower than in 2005. The 2020 target has already been met: the European Environment Agency (EEA) figures show that, at end of 2017, emissions from installations covered by the EU ETS had fallen by 26.4% compared to 2005 (EEA, 2018).

Based on the cap-and-trade principle, the EU ETS system sets a cap on total annual GHG emissions by all participants. The cap decreases over time to ensure a gradual reduction in total emissions. Total emissions have been declining by 45Mt (million tons) per year, on average, during Phase 3, which is considerably faster than the cap, which has been declining by 36Mt per year.¹¹

The tradeable emissions allowances are allocated to market participants through a combination of auction and free allocation. In 2018, auctioning revenues were about €14 billion. In the current phase (2013-2020), it is expected that 57% of total trading will be auctioned, with the remaining allowances available for free allocation. Free allocation is intended, in particular, for companies at high risk of carbon leakage and to facilitate their transition to a low-carbon economy. The manufacturing industry received 80% of its emissions allowances for free in 2013, based on benchmarks that reward the most efficient installations in each sector. The proportion of free allocated allowances is decreasing gradually year-on-year and will be only 30% in 2020, but will continue after 2020 to help prevent risk of carbon leakage.

Within the cap, companies must hold a European Emission Allowance (EUA) for every ton of CO₂ emitted within a calendar year. Companies can trade allowances with each other as needed. One allowance gives the holder the right to emit 1 ton of CO₂ (or equivalent). From 2012 to 2017, the price of a EUA traded on the European carbon market was generally below €7. The low price of allowances - due to a large surplus of allowances resulting from the economic crisis - indicates a serious lack of rigour which could threaten decarbonisation of the European energy system. However, since the beginning of 2018, prices started to rise. The start of the Market Stability Reserve in January 2019 (900 million allowances were set aside instead of being auctioned), curbing supply, has led to an increase in the price of allowances from less than €10 at the beginning of 2018 to around €25 per ton of CO₂ currently.

¹¹ For details, see the "2019 State of the EU ETS Report" provided by ERCST, Wegener Center, ICIS, I4CE and Ecoact (<https://www.i4ce.org/wp-core/wp-content/uploads/2019/05/2019-State-of-the-EU-ETS-Report.pdf>).

IV. The role of carbon taxes in slowing global warming

There is widespread consensus that a well-designed carbon price is the most powerful and effective mitigation tool.¹² Fiscal policies are being encouraged to play a decisive role in mitigation, by reshaping national tax systems to discourage use of coal and other fossil fuels, and incentivise more efficient consumption and use of alternative energy sources. CO₂ generated by fossil fuels combustion accounts for over 60% of GHGs. Among the possible mitigation instruments, the most efficient in terms of cost-effectiveness is to increase the cost of CO₂ emissions and let consumers and businesses choose how to save energy and/or switch to greener sources. In other words, pricing is the most effective way to force the factor of climate effects into individual decisions. In the short run, energy saving will be achieved by a reduction in consumption due to higher costs, while in the medium term it should lead to the development of more efficient energy production. In addition, the rising carbon price has positive externality effects such as reduced traffic congestion and air pollution.

There is a consensus, also, that the global average carbon price is too low. The IPCC, IMF and OECD are all underlining the need for stronger and accelerating carbon pricing. Evidence provided by the latest World Bank Report shows that only 20% of GHG emissions are covered by a carbon price and less than 5% of this 20% are currently priced at levels consistent achieving the Paris Agreement temperature goals.¹³

Increasing the carbon price through imposition of a carbon tax meet several important criteria... Implementation of a carbon tax is straightforward; it does not require a specific regulatory framework because it is part of the national tax system. However, it can be comprehensive and well designed, so that price increases can be predicted and targeted to meet mitigation objectives.

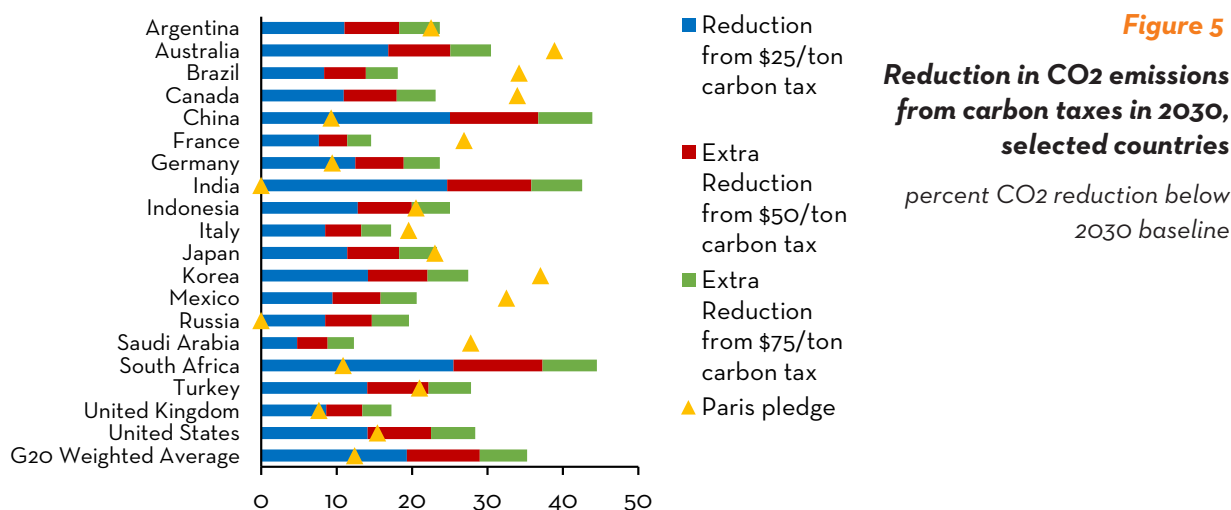
...but at what level should it be set? To quantify the new efforts needed to deliver mitigation commitments, the IMF conducted analyses to compare emissions projections in 2030 for 135 countries, in different scenarios: the baseline (BAU) scenarios defined with no new (or tighter existing) mitigation measures, the Paris pledge scenarios, and three scenarios with carbon tax rates of \$25, \$50 and \$75 per ton of CO₂.¹⁴ Figure 5 shows the estimated emissions reductions (with respect to the baseline) from uniform carbon prices for selected countries, and highlights that many Paris mitigation pledges would imply very high carbon prices, even more than \$75 in some cases (although the stringency of the pledges differs considerably across countries).

The IMF estimates that to contain global warming below 2°C requires a \$75 tax, which would have a considerable impact on energy prices. In the IMF estimate, to ensure an average emissions reduction of around 35% below the baseline, the global average carbon price will have to rise to \$75 by 2030, from an actual average price of \$2 per ton. This huge increase implies much higher energy prices, with differences across countries depending on current price levels and emissions intensities. For example, the price of coal would rise by more than 200% on average, electricity bills would increase by 43% on average, with peaks of more than 80% in those countries most dependent on coal for electricity generation such as India and South Africa. The price of gasoline would rise by 14% on average and the price of natural gas would rise by 70%. In Italy, prices would increase by 134% for coal, 50% for natural gas, 18% for electricity and 9% for gasoline.

¹² George Akerlof and others, 2019, "Economists' Statement on Carbon Dividends", <http://www.econstatement.org>. IMF blog "Getting Real on Meeting Paris Climate Change Commitments". S. Bassi, M. Carvalho, B. Doda and S. Fankhauser, "Credible, effective and publicly acceptable policies to decarbonise the European Union Final report", Grantham Research Institute on Climate Change and the Environment, LSE, 2017.

¹³ World Bank, "State and Trends of Carbon Pricing 2019".

¹⁴ IMF policy paper, *Fiscal policies for Paris climate strategies—from principle to practice*, May 2019; IMF Fiscal Monitor October 2019.



Source: IMF, Fiscal Monitor October 2019.

Higher energy prices will generate economic costs, due to a decline in overall economic activity and a shift to cleaner but costlier technologies and equipments. In addition to the direct costs to households which will pay more for their energy consumption, there will be significant impacts on carbon-intensive sectors and fossil energy producers. Comprehensive quantification of these costs is not straightforward. There are both aggregate and distributive effects to account for, since the effects of the price increases are not uniform across individuals, businesses or countries. The IMF analysis focuses on a \$50 ton carbon tax and measures only the costs of switching to costlier technology and equipment, resulting in a loss in 2030 of less than 0.5% of GDP for the 17 countries considered.

Carbon pricing also provides much needed revenues... An important element in the design of carbon pricing reforms is how governments use this revenue, which could have a significant effect on the political and economic viability of this reform. The amount of these receipts in the IMF scenarios is considerable (Figure 6): in the G20 weighted average, in 2030, a \$25 tax represents 0.7% of GDP and a \$75 tax represents 1.6% of GDP. The additional revenue ranges from 0.5% to 4.5% of GDP across countries (0.9% of GDP in Italy), depending on their reliance on coal, energy use efficiency and importance of energy among economic sectors.

...to fund other measures to complete the reform strategy. From a policy perspective, we can identify four main goals that can be achieved using the revenue from carbon taxes: (i) offsetting the burden that a carbon tax will impose on consumers and producers and the economy more broadly; (ii) funding green investments and/or other actions designed to reduce GHG emissions; (iii) funding other public priorities not related to climate, that is, reducing the levels of other taxes; and (iv) reducing the fiscal deficit. The first goal includes assistance targeted to low-income households (which tend to be the most affected by an increase in energy prices), energy-intensive firms, displaced workers and coal-mining regions. The second includes public expenditure aimed at easing the transition to clean energy (direct investments and subsidies) to complement carbon pricing, including, for example, strategic choices related to investment in public transportation, public R&D spending and fiscal incentives to promote low-carbon investments. Reductions to other taxes should be aimed at efficiency gains for the economy or a more progressive tax system to balance the distributional burdens imposed by higher prices and promote sustainable and inclusive growth.

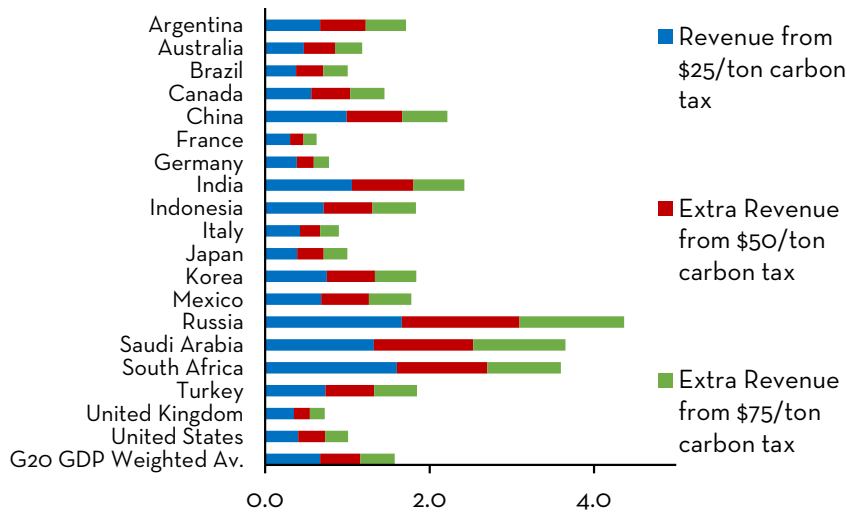


Figure 6
Revenue from comprehensive carbon taxation in 2030, selected countries
 percent of GDP

Source: IMF, Fiscal Monitor October 2019.

V. Investment in transition

According to EC estimates, to meet the Paris Agreement objectives, Europe will need to close the still large gap in green investments, which is beyond the capacity of the public sector alone.

Reducing this investment gap, which corresponds to a 40% reduction in GHG emissions in the EU, is estimated to cost €260 billion per year up to 2030.¹⁵ Supra-national and national institutions are pledging resources to support sustainable projects (see below), but most of this investment will have to come from the private sector.

From a supra-national perspective, the EU and the EIB are increasing their efforts (and their resources) to fighting climate change. In 2018, the EU earmarked around 20% of its budget (some €30 billion), much more than 13.6% of the 2014 budget. This share is likely to increase to 25%-30% in the 2021-2027 EU budget.¹⁶ Another important instrument is the InvestEU programme, an updated version of the Juncker Plan, which will continue to support private investment. Also, the EIB has mobilized several billion euros to support low-carbon and climate-resilient growth. In 2018 alone, the EIB allocated €16.2 billion or around 30% of its total lending to these objectives, making it one of the world's most relevant multilateral providers of climate finance for projects with a positive impact on climate change.

In November, the EIB adopted its new Energy Lending Policy (ELP), which emphasizes its role as the EU Climate Bank and incubator for climate finance. The European Green Deal, announced by the new EC, includes a call for the EIB to support achievement of EU targets by fostering private investment in new sustainable technologies and phasing out lending to fossil-fuel energy projects. The new ELP is the EIB's response to this call. This new ambitious strategy implies strong commitment by the EIB to three main objectives: i) to devote at least 50% of financing to environmental goals by 2025; ii) to help unlock more than €1 trillion of investments by 2030; iii) to align the financing activities to the principles and goals of the Paris Agreement by the end of 2020. Moreover, the EIB will work closely with the EC to ensure a just transition.

From a national perspective, some EU countries have issued sovereign green bonds to accelerate the transition towards less carbon dependent development models. Green bonds

¹⁵ EC (2019) 'United in delivering the Energy Union and Climate Action Setting the foundations for a successful clean energy transition', COM(2019) 285 final.

¹⁶ The Multiannual Financial Framework (MFF) 2021-2027 is currently under discussion: the EC has proposed a 25% quota while the European Parliament is aiming at a 30% target.

are bonds whose revenue is earmarked for sustainable projects.¹⁷ All issuers of green bonds are required to publish a framework defining the sector destination of their revenue, how projects are selected and how processes are controlled and disclosed. For example, at the sovereign level, France is investing mainly in energy efficiency buildings, clean transport and organic farming while the Netherlands is focusing on flood risk management and freshwater supply, renewables energy, an efficient railway system and energy saving in residential homes.

Sovereign green bonds have raised capital for projects with environmental benefits... Poland was the first to issue green bonds (€0.75bn) in December 2016, followed by further issues of two bonds with different maturity, to a total of €3.75bn. France issued the largest green bond in January 2017 (€7bn), with additional tranches which have raised the amount outstanding to over €20bn. In recent years, Belgium (almost €7bn), Lithuania (€0.02bn), Ireland (€5bn) and the Netherland (first sovereign AAA rated green bond, €7bn) have also issued sovereign bonds. Although the size of the green government bond market is still small compared to total government bonds, there is reason to believe that this market has good potential.

...and have paved the way to the development of private green bond markets. In recent years, finance to support private green investments has grown in terms of products and volume, driven by, among other things, increased interest from institutional investors, such as mutual funds, and retail investors. However, the public sector could boost private green investments by making them more attractive to households, businesses and financial institutions, through regulation and good practice.

The EU Action Plan on sustainable finance, launched by the EC in March 2018, represents a first step towards orienting private capital to sustainable investment. It mandates European institutions to create a unified classification system (“taxonomy”) for sustainable activities and financial institutions to be more transparent about the sustainability of the projects they finance. We need a precise definition of green in order to avoid risk of greenwashing and/or reputational risks for issuers which the market might penalize on the grounds of not being sufficiently green.

The EU is the leader for issuance of green bonds, but the market is growing worldwide. The green bond issuances have increased significantly over recent years from \$36.6bn in 2014 to \$167.6bn in 2018 (\$66.6 by European issuers), according to the Climate Bond Initiative data. Since 2014, green bond issuances show an exponential rise. In December 2018, total cumulative issuances since 2007 amounted to \$521bn, including \$190bn in Europe, \$137bn in North America and \$120bn in Asia-Pacific - this last representing the highest year-on-year growth equal to 35%. Financial corporations and the public sector (sovereign, local government and development banks) are the most active sectors, but a not negligible contribution comes from the non-financial corporate sector.

The growth in the green bonds market is likely to continue and could contribute to reducing the investment gap. The global value of green bond issuances in December 2018 was \$521bn; the cumulated goal is \$1tn by the end of 2020. Available data for 2019 (\$223bn up to November) make achievement of this target very likely. Looking farther ahead, the 2020 decade could become the golden decade for green bond market, due (hopefully) to a favourable regulatory framework and a better awareness of this asset class (financial side) and maturity of low-carbon technologies (real side).

¹⁷ The success of this new asset class is demonstrated by the fact that it is likely to attract socially responsible investors and asset managers with green investment mandates (new and diverse investors), will benefit from high demand and a diversified investor base, which should reduce the bond yield compared to standard bonds (pricing advantages), and can be used as a promotional tool to strengthen relationships with investors, businesses and stakeholders (visibility and networking). For a recent description of the market see Prometeia, “European countries’ green revolution challenge: How is Italy reacting?”, Atlante, October 29, 2019, <https://www.prometeia.it/en/atlante/european-countries-green-revolution-challenge-how-is-italy-reacting?uniq=1b495e84cc1ea4def97444f4e40c7a69c>

VI. Summing up

Climate warming is proceeding faster than expected and global leaders need to act to reduce GHG emissions and make economic models sustainable. The latest estimates show that, if no action is taken, temperatures will rise 4°C above pre-industrial levels by the end of this century; also, even implementation of the Paris pledges will be insufficient to contain temperature increases at below 2°C.

The EU's efforts to combat climate change are substantial, but the new EC is aiming for even better results. Currently, the EU is committed to cutting GHG emissions by 40% by 2030, increasing investment in renewable energy and improving energy efficiency. These targets will become more ambitious over the next years, supported by the new European Green Deal.

The EC's European Green Deal is aimed at extending the existing ETS by increasing sector coverage and supplementing the ETS with a carbon border tax. The ETS and the carbon tax are the two main tools available to raise carbon prices and discourage use of fossil fuels. The former has already been implemented and applies to all the EU28 countries and 45% of GHG emissions; the latter has been implemented by only a few countries so far.

The introduction of a carbon tax, in particular, would appear to be the quickest and most efficient way for countries to achieve their mitigation targets. From a regulatory perspective, a carbon tax could be introduced into national tax systems and allow adjustments to price increases in line with national mitigation targets. Moreover, a carbon border tax, as proposed by the new EC, would prevent carbon leakage.

The IMF estimates that the global average carbon price should have to rise to \$75. The IMF study shows that for the G20 countries the \$25 carbon tax scenario is sufficient to meet the Paris commitments, while, in some cases, such as Italy and Australia, even a \$75 carbon tax would not meet the Paris goals. To ensure an average reduction in emissions worldwide of about 35% below the baseline, the global average carbon price would have to rise to \$75 in 2030 compared to the actual price of \$2 per ton.

Policy makers will play a crucial role in making the transition to a low-carbon economy politically and economically viable. Revenue from carbon taxes should be allocated to provide assistance to low-income households and displaced workers, and to enable direct investment and subsidies to ease the transition to clean energy in coal-mining regions, in particular.

Finally, the green transition will require large amounts of private capital, which, in turn, will require greening of financial markets. The public sector must create the market conditions needed to mobilize private investment, by direct financing, changes to financial regulation and establishment of good practice. This has already happened in the case of green bonds, a new asset class that sovereigns, financial institutions and corporates are using increasingly to finance sustainable projects.

Prometeia Associazione per le Previsioni Econometriche

Piazza Trento e Trieste 3, 40137 Bologna, Italia – tel. +39 051 648 0911 – fax +39 051 220 753
 info_associazione@prometeia.com – www.prometeia.com
 based on data available up to November 29th 2019

contributors: Lucia Cossaro, Simone Passeri, Emilia Pezzolla

contact person: Lorenzo.Forni@prometeia.com