Chapter 2: An Introduction for Policymakers

1. Introduction

15. Climate change is an existential threat. Countries are facing dramatic impacts because of global warming. Given the substantial costs associated with climate change, jurisdictions are increasingly adopting more ambitious and sophisticated policy instruments to support climate mitigation, especially market-based policy instruments such as carbon pricing.

16. Carbon pricing is more cost-efficient than other policy instruments and has co-benefits that can support additional development objectives, such as resource mobilization. Carbon taxation is a common carbon pricing instrument (CPI). In this chapter, we examine the rationale for carbon taxation and compare it with other carbon pricing policy alternatives, such as Emission Trading Systems (ETS). We also touch on the theory and motivation behind carbon taxation.

2. The environmental problem: climate change and carbon emissions[4]

17. The long-term stability of the climate depends on the Earth's radiation balance. Radiation comes from the Sun and is reflected by the Earth by emitting outgoing longwave radiation. Greenhouse gases act as insulators to longwave radiation coming from the surface. This is known as the natural greenhouse effect and is the reason the Earth's surface is warm enough to sustain life.

18. Carbon dioxide (CO_2) is a naturally occurring greenhouse gas (GHG). Through the carbon cycle, the Earth keeps a balance of CO_2 in the atmosphere. Natural emissions are kept balanced because processes that generate emissions of CO_2 (such

4 This section is intended as a general overview on the link between carbon emissions and climate change. For a more detailed discussion, there are a wide range of scientific publications that can be consulted, mostly for free. For example, the National Aeronautics and Space Administration (NASA) website offers a comprehensive (but easily consultable) description of the causes and effects of climate change, as well as a discussion of why there is scientific consensus on global warming being caused by human activities. You can navigate the website from this tab: https://climate.nasa.gov/evidence/. The Intergovernmental Panel on Climate Change (IPCC) reports (https://www.ipcc.ch/reports/) offer a deeper assessment of climate change causes and impacts, based on the most advanced scientific knowledge available and drafted drawing on the expertise of a wide range of scientists and organizations. Academic texts used in college-level degrees in environmental science (or similar) provide exhaustive, rigorous discussions of the mechanisms behind climate change; the best approach might be to contact your local university and inquire about what text they are using to teach introductory courses on climate change or climatology; or alternatively, to check out the websites of major universities, which often include the syllabus for courses they offer and the text of reference (although these textbooks might be harder to find locally). Finally, for a "journalistic" approach, two very good, simple and informative sources are the BBC's "very simple guide" to climate change: https://www.bbc.com/news/science-environment-24021772 and the National Geographic Global Warming Overview: https://www.nationalgeographic.com/environment/global-warming/global-warming-overview/

as the respiration of humans and animals, and decomposition) are compensated by emission-capturing processes, including photosynthesis and emissions absorbed by the ocean.

19. Besides natural processes, CO_2 can also be produced by human activities, most notably the burning of fossil fuels.[5] These emissions are called "anthropogenic". Since the industrial revolution, human activities have caused a dramatic increase in carbon emissions in the atmosphere,[6] which has disrupted the Earth's natural balances. Carbon emissions concentrate in the Earth's atmosphere, exacerbating the natural greenhouse effect by trapping heat. This phenomenon, known as global warming, is causing the Earth to warm faster than normal.

20. The Earth has already experienced an increase in temperature of around 1 degree Celsius (°C) since the industrial revolution. This is caused directly by carbon emissions' higher-than-natural concentrations, which the Earth would take a long time to rebalance. Therefore, even if we stopped all emissions today, it would still take up to 200 years for the last artificially emitted CO_2 particle to leave the atmosphere.

21. As the planet warms, a series of reactions ("positive feedbacks") kick in and amplify the warming effects that cause climate change. For example, increasing temperatures cause ice to melt at the Poles; this results in a loss of white surface, which is crucial in reflecting part of the Sun rays. With lower reflective surface, more rays are absorbed, causing the Earth to warm further.

22. In a recent report of the Intergovernmental Panel on Climate Change (IPCC), scientists estimated that an increase of 1.5°C with respect to pre-industrial levels (0.5 more than today) would cause the climate to change with severe consequences to natural and human systems. With an increase of 2°C, the Earth may reach a tipping point, where it is no longer possible to reverse global warming.[7]

23. The effects of climate change are already visible and felt by many communities around the world, especially the most vulnerable. These effects include sea-level rise causing flooding, loss of coastal lands and the destruction of islands; heat waves, affecting human health and causing droughts; increased precipitation causing flooding and the destruction of economic infrastructure, and more extreme weather events such as hurricanes that generate significant economic losses. These impacts also cause the loss of biodiversity and migration of species (e.g., decline of marine fisheries).

24. Global warming will also likely have severe impacts on agriculture, and it

5 For simplicity, we refer to fossil fuels as the main source of anthropogenic carbon emissions. However, it should be noted that CO_2 emissions are also generated by biofuels, by cement production, and by a range of other activities. Other GHG emissions can be generated both by fossil fuel production, and by other sources: for example, methane can leak from oil wells, but is also a by-product of farming and of garbage disposal in landfills.

6 Concentration of CO_2 in the atmosphere rose from 280 parts per million (ppm) before the Industrial revolution, to almost 415 ppm in February 2020. Source: Lindsey, 2020.

7 IPCC, 2018.

could cause famines at the global level. The situation would be made worse by the fact that around 60 percent of people will live in cities by 2030, without direct access to food sources.[8]

3. Carbon emissions: a global policy problem

25. As mentioned, anthropogenic carbon emissions are mainly a consequence of the combustion of fossil fuels. They are generated in connection to a range of human activities, including the production of consumer goods, transportation, and electricity generation. High emissions are also generated by intensive and unsustainable agriculture and farming.[9]

26. Whenever fossil fuels are burnt, carbon emissions cannot be completely eliminated. Unlike other pollutants, CO_2 cannot be effectively "filtered" before being emitted into the atmosphere – at least not with current technologies.[10] Currently, the only way to generate zero emissions is by using non-fossil fuel sources (for example, renewable energy sources such as wind, solar, geothermal, etc.) or reducing activities that are energy intensive such as cement, steel, and pulp production.

27. Emissions can be reduced by using more efficient technologies that require low fuel use to generate the same amount of energy. By technological abatement, we mean the introduction of a new technology or practice that can reduce emissions without changing the fuel source; for example, a car with a more efficient engine that will do more mileage per litre or gallon of gasoline. More efficient technologies also have important co-benefits in reducing local pollution.

28. It is important to underscore that carbon emissions are a global problem, meaning that emissions in any part of the world contribute equally to warming the planet, and not just the location where they were generated. This is another characteristic that sets CO_2 apart from other pollutants, and it poses challenges but also offers opportunities.

29. An obvious opportunity is that, if carbon emissions are reduced anywhere in the world, this will have impacts on a global scale. As mentioned above, artificial carbon-capture technology is not yet scalable to the needs of the whole planet; however, emissions can be "absorbed" by supporting natural processes, for example, by increasing forested lands. Because of the global nature of carbon, a power plant in the city generating emissions and a forest outside the city absorbing emissions could theoretically balance (or "offset") each other, resulting in net zero emissions.

8 UN Habitat, 2020.

9 For a breakdown of emissions by sector and geographical location, the World Resources Institute's Climate Watch tool offers a range of tools to see historic and current data. Available at https://cait.wri.org/

10 Some technologies, such as carbon capture and storage, can intercept carbon emissions before they are released in the atmosphere, and safely store them in geological formations. However, such technologies do not prevent fossil fuels from being utilized; moreover, they are not yet commercially scalable.

The forest could even be in another country or continent.

30. Some countries, and even corporations, already use the concept of carbon offsets to counter their carbon emissions. For example, an airline can pay for planting a certain number of trees or sponsor renewable energy technology in a different part of the world, to balance the emissions generated by the fuel burnt in their planes. However, this approach has generated some criticism.[11]

31. The global nature of carbon also poses significant challenges, most notably due to the problem of collective action, since to be effective, all countries must act together to reduce carbon emissions and fight against climate change. Therefore, a global approach and agreement are necessary.

32. In 2015, United Nations Member States committed to three ground-breaking international agreements: the 2030 Agenda for Sustainable Development (2030 Agenda), the Addis Ababa Action Agenda (which contains the foundation for financing the 2030 Agenda) and the Paris Agreement. These form the basis of the international architecture on climate change and carbon pricing initiatives globally. See Box 1 for more details.

Box 1. International Agreements on Climate Change

The 2030 Agenda contains 17 Sustainable Development Goals (SDGs) and 169 targets to advance the three dimensions of sustainable development: economic, social, and environmental.[12] Nine of the 17 goals contain pledges related to environmental protection, based on the consideration that environmental protection is inextricably linked to sustainable and equitable development, and that countries should aim to decouple economic growth from environmental degradation (SDG 8.4).

The 2030 Agenda does not contain specific commitments related to the reduction of carbon emissions but acknowledges that the United Nations Framework Convention on Climate Change (UNFCCC) is the primary platform to address global actions to fight climate change.

The UNFCCC, signed in 1992, was the first international agreement on climate change. It is an umbrella convention that provides a framework for both market and non-market approaches to address climate change.

As follow-up agreements to the UNFCCC, the Kyoto Protocol (signed in 1997, entered into force in 2005) and the Paris Agreement (signed in 2015) emphasized different climate protection instruments, each at its own time. The Kyoto Protocol introduced a market-based approach for the reduction and control of GHGs. The Paris Agreement greatly broadened the set of tools to address carbon emissions and climate change, to include green financing and trading in green bonds, as well as regulatory and fiscal instruments.

The Paris Agreement also broadened the scope of the fight against climate change, as it requires countries at all levels of development to use their best efforts through Nationally Determined Contributions (NDCs)[13] to curb GHG emissions and to commit to the GHG reduction goals assigned under Article 2 of the agreement.

Source: T. Falcão, A Proposition for a Multilateral Carbon Tax Treaty, IBFD, 2019

11 Some experts point out that carbon offsets are an insufficient incentive (and sometimes, a perverse one or even disincentive) for companies and individuals to lower their carbon footprint; some also question the effectiveness of some forms of offsetting (for example, planting trees) in removing carbon dioxide from the atmosphere in the long-term. Another criticism relates to the efficiency and effectiveness of the implementation of these types of programmes since they are hard to monitor and can be more expensive than alternative approaches. For some discussion, see UNEP, 2019.

12 United Nations, 2015.

13 NDCs are the successors of binding targets for greenhouse gas emissions.

4. Carbon pricing

4.1 Carbon emission reductions and Government policies

33. CPIs are policy instruments that use prices to provide incentives for economic agents to support climate mitigation. Today, they are considered fundamental to support environmental policy and climate mitigation, and their use has increased across the world. See Box 2.

34. CPIs are based on the theory of externalities by Pigou (1920) and further developed by Coase (1960) and Baumol (1971). Externalities are a side effect of an economic activity, which may have positive or negative effects on other economic agents (household or firms). The argument is simple: an economic agent is generating an externality through the process of producing (e.g., fossil-fuel based energy) or consuming a good (e.g., fossil fuels) or service. Since the production of the externality has no price, the environmental costs, associated with the consumption or production activity, are not fully internalized by the economic agent responsible for the activity. As a result, the polluter passes the environmental cost of doing business on to society.

35. Economic agents, such as firms and households, do not usually have an incentive to adopt technologies that lower carbon emissions derived from their polluting activities; it is often cheaper to just continue emitting, regardless of the effect this has on the environment. Therefore, policy intervention is needed to reduce emissions and, in the case of climate policy, mitigate climate change and achieve the NDC pledges under the Paris Agreement.

36. In general, governments can take two policy approaches to reduce carbon emissions. First, regulatory approaches, often known as "command-and-control" policy instruments, that rely on the introduction of specific regulations to change practices. These approaches include emission standards, reporting requirements and emission licensing, among others. Second, carbon pricing. Both types of instruments are effective at reducing pollution, but there is considerable evidence that carbon pricing does so at a lower cost. Therefore, it is considered a more cost-efficient policy instrument.[14]

37. Carbon pricing tries to affect market solutions by imposing an explicit or implicit price on the externality. If the price is set correctly, the social cost of the externality will be internalized in the cost of producing the good or service, generating a market incentive to achieve the optimal production and reduce the pollution to the socially acceptable level.[15]

14 Baumol and Oates, 1988.
15 Baumol and Oates, 1988; Bovenberg and Goulder, 2002; and Goulder and Schein, 2013.

38. There are many types of CPIs. However, in the context of climate mitigation, it is generally understood that this refers to two principal instruments, carbon taxes and Emission Trading Systems (ETS) also known as cap-and-trade.[16]

Box 2. Carbon pricing initiatives around the world

Carbon pricing can be used by countries to lower their carbon emissions and meet their NDC pledges under the Paris Agreement. In fact, two-thirds of all submitted NDCs (around 100 countries) consider the use of carbon pricing to achieving their emission reduction targets. It is estimated that it could alone reduce the cost of climate change mitigation by 32 percent by 2030 and achieve full potential when coupled with coherent energy and environmental policies.

As of May 2021, 64 CPIs had been implemented, and three more scheduled for implementation; of these, 33 are carbon taxes, primarily applied on a national level. Although these instruments represent around 21.5 percent of global GHG emissions, less than 3.8 percent of emissions are priced at levels consistent with the Paris Agreement goals.

Private investors are also starting to take carbon pricing into account when making financial decisions even in jurisdictions where instruments have not been introduced yet.

Source: World Bank, 2016 and 2021

4.2 Carbon pricing instruments

39. Carbon taxation is a policy instrument where a government sets the price of carbon and lets the market determine the total emissions. An ETS is a pricing instrument where the government sets a maximum limit on emissions and lets the market determine the price of carbon emissions and emission abatement efforts through a mechanism that allocates and trades emission permits (or allowances) across firms. In effect, taxation and ETS consist of different instruments that achieve the same objective of pricing carbon emissions.

40. There are also hybrid systems that have design elements of both 'pure' instruments, for example, tax regimes that accept emission reduction projects to reduce the tax burden, or ETS with floor and ceiling prices. All these instruments have specific design features but are based on the same principle: to internalize environmental damage through carbon pricing as an incentive to reduce emissions.[17]

41. It is also important to note that there are several other instruments that a country may introduce, or already have in place, which in practice sets a price on carbon, for example, taxes on energy, excise taxes on fossil fuels, resource taxes, among others. The interaction between carbon taxes and those instruments will be explored in Chapter 10.

42. An ETS is generally considered to be more complex than a carbon tax because it requires a specialized institutional system to establish the rules for the transaction of emission allowances. This is difficult and costly and has only been implemented effectively in developed countries. The most well-known experiences are the European Union (EU) emissions' trading system that covers European

countries, the Western Climate Initiative that involves trading between California and Quebec, and the Regional Greenhouse Gas Initiative (RGGI) that regulates States in the Northeast of the United States.

43. There are many obvious advantages in implementing a carbon tax instead of an ETS. It is simple, it does not require a complex monitoring, reporting and verification (MRV) system, and it can be implemented through the existing tax instruments such as excise taxes and duties. See Table 1 for details.

44. An ETS, on the other hand, is often perceived as a market instrument that reduces emissions more cost-efficiently than a tax, because it creates an emission trading market that can access lower abatement costs across firms and can be linked across jurisdictions. However, the literature is clear that under similar conditions, taxes and ETS are equivalent and provide the same incentives for emissions reductions.

45. However, ETS do provide an advantage in real world situations, since firms and other economic agents can access a broader range of opportunities to lower the costs they would have to incur to reduce their emissions. In an ETS, a firm can trade with another firm and buy permits instead of lowering their own emissions – in case the latter is cheaper. For example, a tax combined with an offset market can replicate any cost-efficiency advantage associated with an ETS, but with potentially lower administrative cost. This can be a feature that is particularly attractive for developing countries. See Appendix 1 for a discussion.

Table 1. Advantages and disadvantages of different carbon pricing instruments

	Advantages	Disadvantages
Carbon tax	Generation of revenues. Certainty in costs for economic actors. Depending on the format, can require more or less administration. Cost-effective.	A priori uncertainty in quantity of emissions reduction (however, the tax rate can be adjusted over time to meet emission reduction goals; see Chapter 5 for more information on how to dynamically set the tax rate).
Command-and-control instruments	Often requires less administration. Easier to enforce.	Regulation is usually insufficient to achieve carbon reduction goals. Does not generate revenues. Costly (as in, not cost-effective).
ETS	Generation of revenues. Provides certainty in emission reduction goals. Cost-effective.	Uncertainty in costs does not necessarily incentivize investment in low-carbon technology. Can be administratively more complicated than other measures, e.g., carbon tax, due to the need to set up a carbon market, auctions, etc.

Offsets	Can be more cost-effective. Provide incentives to reduce emissions beyond the tax base.	Market not well developed and subject to manipulation. Risk of low additionality (due to manipulation and/or other uncertainties).

5. A Carbon Tax

46. A carbon tax, for the purposes of this Handbook, will be defined as a compulsory, unrequited payment to general government, levied on carbon emissions or its proxy that can confer a reduction in corresponding carbon-based (equivalent) emissions in the atmosphere and is thus characterized as having both environmental purpose and effect.[18]

47. This follows the general Organisation for Economic Co-operation and Development (OECD) definition of environmentally related taxes as "compulsory, unrequited payment to general government levied on tax-bases deemed to be of particular environmental relevance".[19] In this sense, carbon taxes can be seen as a specific type of environmental tax, as per the OECD definition of "[taxes] whose tax base is a physical unit (or a proxy of it) that ha[ve] a proven specific negative impact on the environment", namely CO_2.

48. The definition presented above suggests that a carbon tax can be set on emissions, as is the case of carbon taxes that have implemented what we refer to as the 'Direct Emissions Approach' or, alternatively, its proxy. Given the close relationship between carbon content and emissions in the case of fuels, taxes on fuels set at a rate consistent with carbon content can be considered as a proxy for carbon emissions and, therefore, should also be considered a carbon tax. In this Handbook, we will refer to these type of taxes as adopting the Fuel Approach.

49. Although the Handbook focusses on taxes from fuel sources, using either the Fuel or Direct Emissions Approaches, these should be considered examples of broader approaches. In effect, while the Direct Emission Approach can consider any type of emission, the Fuel Approach focuses on emissions from fossil fuels based on their carbon content. However, the Fuel Approach can be broadened to also include the emissions from the whole value chain, as, for example, in the case of the tax adopted in Finland on biofuels (see Chapter 6, for a discussion).

50. In theory, a carbon tax, as any other environmental tax, should be set at the marginal social cost of the damage generated (this is known as the social cost of carbon). In the case of climate change, the marginal social cost is global, and the

18 There is still a lot of debate around the definition of carbon tax, environmental tax and environmentally related tax, and those terms may have different meanings in different contexts. The definitions proposed here should be intended as working definitions for the purposes of this Handbook.

19 OECD, 2017.

cost of emissions reduction is local; as a result, the optimum tax set at the global level may be considerably higher than what a specific jurisdiction can effectively sustain economically.

51. Therefore, governments will have other considerations to determine the tax rate, such as emission reduction objectives or commitments (e.g., the NDCs), competitiveness, the distributive impact, coherence with other policy instruments and, above all, political viability. Therefore, in practice, carbon taxes are not set in terms of the socially optimum level, but rather in terms of the specific objectives of the jurisdictions that implement them. As a result, tax rates vary considerably across jurisdictions (see Chapter 5 for a discussion and for examples).

Box 3. Carbon taxes across the world

Many countries (among developing countries, Chile, Colombia, Argentina, Mexico, and South Africa) have already introduced carbon taxes at a domestic level. However, other countries have introduced taxes which may be called "carbon tax" but should not be considered carbon taxes from a technical perspective.

For example, some countries have taxes in place that are commonly referred to as a carbon tax but are in fact ad-valorem taxes on fuels, or taxes on motor vehicles. The distinction is relevant because those instruments, in practice, do not act like a carbon tax. They may be appropriate for raising revenue but will likely fail to produce the environmental effect that are usually associated with a true carbon tax (although they might reduce local pollution or bring other environmental benefits).

For example, an ad-valorem tax on gasoline might reduce car use, but not have any effect on the use of fuels for home heating, which also generate carbon emissions. Another example is that a carbon tax allows a different pricing between a traditional diesel and "cleaner" diesel (i.e., lower fossil content, achieved by blending with biofuels), while this would be more difficult with an ad-valorem tax. Since currently there is no single definition of what a carbon tax is, policymakers should be aware of possible methodologies in designing carbon taxes.

6. Motives for the introduction of a carbon tax

52. The primary purpose of a carbon tax is the reduction of carbon emissions (i.e., an environmental purpose). However, governments may also have additional or complementary goals while implementing these policies; for example, they may wish to also generate public revenues. Different policies provide different advantages and disadvantages. Depending on their priorities, governments may, therefore, prefer to implement one type over the other, or to combine elements of two or more policy objectives.

53. Below we provide a discussion of goals that governments may seek to address in their policies for emissions reduction. For each goal, we will discuss whether carbon taxes are the best-suited instrument, considering the advantages and disadvantages.

54. Although the primary focus of this Handbook is on carbon taxes, comparison

with other policy options to reduce carbon emissions is provided. The purpose of this comparison is to support policymakers in understanding whether carbon taxation is the best policy instrument for their country, depending on their desired policy objectives and institutional constraints.

6.1 Fighting climate change by reducing carbon emissions (the "green" dividend)

55. Carbon taxes are considered a cost-effective way to incentivise the reduction of GHG emissions by encouraging low-carbon emission behaviour, including the abatement of emissions through investment in technology. The reduction of carbon emissions is the primary tool to fight against climate change and complies with Sustainable Development Goal (SDG) 13 (Climate Action).

56. By implementing a tax, emitters are confronted with the environmental cost of their actions and forced to manage their carbon emissions. Carbon prices create incentives that spread up and down supply chains, delivering emissions reductions where they make sense, while simultaneously providing disincentives for new investments in carbon intensive technologies, as well as incentives for innovation. In addition, the reduction of emissions has other co-benefits to consider such as reducing pollution and, therefore, lowering health-related costs.

57. However, contrary to an ETS, a carbon tax does not offer the same degree of certainty on what will be the total emissions reduction in the economy (and therefore the contribution to the concentration of emissions in the atmosphere). The uncertainty derives from the fact that a carbon tax sets a price on emissions, and it is up to economic agents to decide how much to emit (based on the total amount they are willing to spend). Therefore, there is no assurance that any given tax level will result in the desired reduction in greenhouse gas emissions.

58. However, such a disadvantage can be reduced by adjusting the tax if the initial emissions reductions are considered not to meet the objectives. This will be discussed further in Chapter 4.

6.2 Generation of budgetary sources

59. Even though it is not their primary objective, carbon taxes can generate considerable revenues. Therefore, they can mobilize resources to support other development objectives. In this respect, an efficient redistribution of tax revenues may foster sustainable growth, creating new business and employment opportunities (often known as "green growth").

60. Furthermore, the design of the tax could include provisions to ensure that revenues compensate distributional concerns of particularly regressive effects, as

discussed in Chapters 7 and 9.

61. Moreover, where the tax rate is maintained, a reduction in emissions will reduce the tax base and affect revenue stability over time. To provide a growing incentive for emissions reduction, and to keep revenues stable, the tax rate should be revised periodically and possibly increased over time.

6.3 Promotion of investment in new technology

62. A major challenge for developing countries is to industrialise while reducing emissions. To reduce carbon emissions, many countries are shifting towards renewable energy. In the EU, for example, renewables are expected to reach at least 27 percent by 2030. Similarly, some oil producer and import countries have developed plans in the medium and long-term to reduce their dependence on oil and diversify their respective economies (e.g., Vision 2030 plan or China's National Climate Change Programme). However, other countries are still reliant on fossil fuels to develop their economy.

63. How to balance economic growth and reduction of emissions poses a crucial policy issue for both developing countries and industrialised countries introducing public policies to support decarbonization of their economy.

64. Carbon taxes provide an incentive for technological innovation to decarbonise, and, unlike emission standards (or command-and-control instruments), this incentive is permanent and is known as dynamic efficiency. Therefore, taxes encourage investment and innovation in alternative energy sources by making them cost-competitive with respect to fossil fuels.

65. Ideally, over time, continued investment in technologies for emissions' reduction will result in technological progress and reduce the cost of clean energy, therefore providing an accelerating mechanism for the reduction of carbon emissions. Moreover, this incentive will create new jobs while offering a competitive edge to industries.

7. Policy considerations in the introduction of a carbon tax

66. When introducing a carbon tax, policymakers will consider their goals and the advantages of a carbon tax over other instruments. They should also apply the four principles behind environmental policy discussed in Box 4.

67. Moreover, to facilitate the introduction and implementation of the tax, and to ensure that other overarching policy goals are not negatively impacted by the introduction of the tax, other considerations should be made. The sections below discuss issues such as instrument design, considering certainty and predictability

of the carbon tax; administrative burden; the prevention of distributional impacts; and the safeguarding of competitiveness. All these issues will be explored in more detail in subsequent chapters of this Handbook.

Box 4. Principles of environmental policy

When introducing carbon taxation, policymakers are (implicitly or explicitly) applying four core principles, even though they might not be stated in national legislation. These principles are (i) the polluter-pays principle; (ii) the principle of prevention; (iii) the precautionary principle; and (iv) the principle of common but differentiated responsibilities. The section provides an overview of these principles, and their theoretical underpinning.

(i) The polluter-pays-principle promotes the internalisation of environmental costs using economic instruments, considering the approach that the polluter should, in principle, bear the cost of pollution, rather than shift the cost of pollution to the community.

→ A carbon tax can internalize the environmental cost of pollution by making the polluter pay (and potentially, pass on to the consumer) a tax that is directly proportionate to the polluting content of the product consumed, produced, or extracted.

(ii) The principle of prevention provides that States have the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States.

→ A carbon tax does not impede economic activity per se, although countries with high carbon tax rates (e.g., above US$40) may render carbon intensive investments less appealing. In essence, countries employing carbon taxes continue making use of their sovereign right to exploit their own resources pursuant to their own environmental and developmental policies. However, by attaching a price to pollution (i.e., by costing the environmental damage), countries employing carbon taxes at a high enough rate not only prevent the widespread use of carbon intensive fuels and technologies, but they also employ the required duty of care to make sure that the activities within the control of their jurisdiction do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

(iii) The precautionary principle is based on the concept that preventative measures should be put in place when there is a risk of future long-term harm to the environment that cannot be fully assessed at the time of the decision-making process.

→ By conceding to employ a tax instrument of environmental control, countries automatically acknowledge that there is a risk of future long-term harm to the environment if their emissions are not reduced or eliminated. Therefore, the introduction of a carbon tax is also the indirect embodiment and endorsement of the precautionary principle.

(iv) The principle of common but differentiated responsibilities assumes that all countries are to share the responsibility for avoiding environmental degradation, but with differentiated levels of engagement depending on their social and economic development.

→ The principle is implicitly included in every national carbon tax legislation in the form of the tax rate adopted by the country. Low- and middle-income countries employing carbon taxes are more prone to apply lower tax rates (particularly on first introduction) whereas high income countries are more likely to employ higher taxes, as further demonstrated in Chapter 5.

Source: Falcão, 2019

7.1 Certainty and predictability of the price of carbon

68. A carbon tax ensures cost certainty as the price is determined by the tax rate, and whatever the incidence of the tax (i.e., whether it can be passed on to consumers or not), the cost cannot rise above this price. An ETS, on the other hand, suffers from inherent cost uncertainty. While allowances may be initially distributed for free, businesses will eventually have to pay for them, and since the price is determined by the demand and supply of emission permits or allowances, businesses will face price uncertainty.

69. A carbon tax offers stable and predictable carbon prices. Economic agents are aware that they will have to pay a certain price when the triggering event occurs, i.e., when they emit above a certain level. This enables businesses to plan their investments on low-carbon technologies based on reliable decision-making elements. Therefore, a carbon tax provides certainty on the cost that the polluter will consider when making decisions. In addition, in situations of emissions' reductions (e.g., economic downturn), the tax will continue to provide a price signal.

70. To ensure the continued reduction of emissions, policymakers should review the tax rate periodically and check whether the rate is still suitable to achieve the desired emissions' target. However, revision of the tax rate might provide uncertainty. A way to lower uncertainty is to contemplate an explicit adjustment mechanism in the tax legislation and inform businesses that the tax rate might be increased over time.

7.2 Administration of the carbon tax

71. Compared to other pricing mechanisms, a carbon tax is often simple and quick to implement, as well as easy to administer and collect at low costs, particularly when adopting the Fuel Approach. Generally, monitoring, reporting and verifying emissions is not simple, something that is normally required for carbon trading systems. However, carbon tax systems tend to work with a proxy (i.e., an assumed amount of carbon released when burning certain types of fossil fuels). The proxy price generally avoids the complexities of carbon trading systems. While the Direct Emissions Approach may be more complex to implement, both approaches are based on the current tax administration system and, therefore, can take advantage of the current institutional system.

72. Nevertheless, in both cases, complexity will be increased with additional features such as exemptions, subsidies, or refund mechanisms applied to support or compensate certain industries affected by the tax (e.g., agriculture, fisheries, etc.). For this reason, it is important to consider the existing overall fiscal framework when introducing a carbon tax, and carefully consider administrative interactions.

73. Additional details on the administration of carbon taxes, and on which elements may simplify or complicate their implementation, can be found in Chapter 8 on the administration of a carbon tax.

7.3 Potential distributional implications and corrective measures

74. Introducing a carbon tax may have distributional effects that raise concerns, especially impacting low-income household and consumers (see Chapter 7 for more details). To mitigate these negative economic distributive effects, governments may need to consider other changes to the tax system to alleviate the tax burden of low-income citizens; a more detailed discussion on how to design a carbon tax with this purpose will be provided in Chapter 7.

7.4 Safeguarding the competitiveness of domestic industries

75. In the absence of a global agreement, some countries or regions have unilaterally adopted a carbon price. A carbon price, whether in the form of a carbon tax or another instrument, forces domestic producers to partially internalize the cost of environmental damage, and therefore can raise their cost of production.

76. When the carbon tax is not imposed on producers outside that country or region, this can reduce the competitiveness of domestic producers as compared to foreign companies. The result may be that a polluting activity is reduced in geographical areas where environmental standards are higher but increased or taken over by competitors in places with laxer regulatory regimes. This is known as "carbon leakage".[20]

77. Dealing with competitive disadvantage and potential carbon leakage is important for government to gain industry acceptance of climate policy, including carbon pricing (see Chapter 7 for more details). Moreover, some governments are exploring carbon border adjustments mechanisms (CBAM) as a tool to deal with carbon leakage and competitiveness.[21]

8. Conclusion

78. Carbon emissions generated by humans are the main drivers of climate change, which will have extremely negative consequences for humans and for the environment. Even a warming of 1.5°C will impact ecosystems and societies much more severely than previously thought. Considering that the Earth temperature has already increased by 1°C post-industrial revolution, it is imperative to act quickly.

20 Ex-post studies have found little evidence confirming the existence of carbon leakage. See, for example, World Bank, 2015.

21 For example, in 2021, the European Commission adopted a proposal for a new Carbon Border Adjustment Mechanism, with the aim to put a price on the carbon content of imported products. For more references, please see Chapter 4.

79. Carbon taxation is one of the instruments available to countries to reduce carbon emissions efficiently. It can be used in conjunction with other environmental taxes, as well as other forms of regulation, to promote environmental protection and mitigate climate change. However, practical design requires considering several issues from tax rates to distributional concerns and administrative simplicity. These are all explored in this Handbook.

80. This chapter provided an overview of CPIs. It outlined the advantages and disadvantages of such instruments as opposed to a carbon tax, to allow policymakers to identify which are their most pressing concerns and whether a carbon tax is the right instrument. Carbon taxation was defined and the motivations behind implementing it were also explored.

81. To be feasible, however, carbon tax needs public acceptability, and it must be well designed. The next chapters will explore how to improve public acceptance and design a carbon tax from a practical point of view to ensure this instrument is effective at achieving the goals set by policymakers.

9. References

Aldy, J. E., and Stavins, R. N. (2012). "The Promise and Problems of Pricing Carbon: Theory and Experience". The Journal of Environment & Development, 21(2), 152–180. https://doi.org/10.1177/1070496512442508

Baumol, W. (1971). "On Taxation and the Control of Externalities". The American Economic Review, 62(3), 307-322. http://www.jstor.org/stable/1803378

Baumol and Oates. (1988). "On The Theory of Externalities". Macmillan. http://econdse.org/wp-content/uploads/2014/07/Baumol_Oates_Theory_of_Environmental_Policy_1988-2.pdf

Bovenberg, L. A., and Goulder, L. H. (2002). "Environmental Taxation and Regulation" in Handbook of Public Economics. A. Auerbach and M. Feldstein eds. New York: North Holland.

Carbon Pricing Leadership Coalition (CPLC) (2017). "Report of the High-Level Commission on Carbon Prices." Washington, DC: World Bank. https://www.carbonpricingleadership.org/report-of-the-highlevel-commission-on-carbon-prices/

Coase, R. (1960). "The Problem of Social Cost". (PDF), Journal of Law and Economics, The University of Chicago Press, Vol. 3 (Oct. 1960): 1–44, DOI:10.1086/466560

Edenhofer, O., et al. (2015). "Closing the emission price gap", Global Environmental Change 31(0): 132-143. 10.1016/j.gloenvcha.2015.01.003.

Falcão, T. (2019). "A Proposition for a Multilateral carbon Tax Treaty". Books, IBFD. https://www.ibfd.org/IBFD-Products/Proposition-Multilateral-Carbon-Tax-Treaty

Goulder, L. H., and Schein, A. R. (2013). "Carbon Taxes versus Cap and Trade: A Critical Review". Climate Change Economics, Vol. 4 (3), pp. 1-28.

Goulder, L. H., Parry, I. W., and Burtraw, D. (1997). "Revenue-raising versus other approaches to environmental protection: the critical significance of pre-existing tax distortions" RAND Journal of Economics, Vol. 28, No. 4 (Winter), pp. 708–31

IPCC (2018). "Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty." [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. https://www.ipcc.ch/sr15/

Lindsey, R. (2020). "Climate Change: Atmospheric Carbon Dioxide". National Oceanic and Atmospheric Administration. https://www.climate.gov/news-features/understanding-climate/climate-change-atmospheric-carbon-dioxide

Metcalf, G. E., and Weisbach, D. (2009). "Design of a Carbon Tax". U of Chicago Law & Economics, Olin Working Paper No. 447, U of Chicago, Public Law Working Paper No. 254. http://dx.doi.org/10.2139/ssrn.1324854

OECD (2004). "Environmentally Related Taxes". https://stats.oecd.org/glossary/detail.asp?ID=6270

OECD (2005). "Environmental Taxes". https://stats.oecd.org/glossary/detail.asp?ID=6437

OECD (2008). "Carbon Tax". https://stats.oecd.org/glossary/detail.asp?ID=287

OECD (2017). “Environmental Fiscal Reform, Progress, Prospects and Pitfalls”. Report for the G7 Environment Ministers, pg. 6, available at: https://www.oecd.org/tax/tax-policy/environmental-fiscal-reform-G7-environment-ministerial-meeting-june-2017.pdf.

Partnership for Market Readiness (PMR) and International Carbon Action Partnership (ICAP) (2016). “Emissions Trading in Practice: A Handbook on Design and Implementation”. World Bank, Washington, DC. License: Creative Commons Attribution CC BY 3.0 IGO https://icapcarbonaction.com/en/icap-pmr-ets-handbook

Pigou, A. C. (1920). “The Economics of Welfare”. London: Macmillan.

Schmalensee, R. and Stavins R. N. (2017). "Lessons Learned from Three Decades of Experience with Cap and Trade". Review of Environmental Economics and Policy, vol 11(1), pages 59-79.

UN Habitat (2020). “World Cities Report 2020, The Value of Sustainable Urbanization”. https://unhabitat.org/sites/default/files/2020/10/wcr_2020_report.pdf

UNEP (2019). “Carbon offsets are not our get-out-of-jail free card”. https://www.unep.org/news-and-stories/story/carbon-offsets-are-not-our-get-out-jail-free-card.

United Nations (2015). “Transforming our world: the 2030 Agenda for Sustainable Development.” ECOSOC Resolution A/RES/70/1. Resolution adopted by the General Assembly on 25 September 2015. Retrieved from http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E

World Bank (2015). “Carbon Leakage: Theory, Evidence and Policy Design.” Partnership for Market Readiness Technical Papers. https://openknowledge.worldbank.org/handle/10986/22785

World Bank (2016). “State and Trends of Carbon Pricing 2016”. World Bank, Washington, DC. https://openknowledge.worldbank.org/handle/10986/25160

World Bank (2021). “State and Trends of Carbon Pricing 2021”. World Bank, Washington, DC. Doi: 10.1596/978-1-4648- 1728-1 https://openknowledge.worldbank.org/handle/10986/35620

Appendix 1: Emission Trading Systems (ETS) vs taxes and cost-efficiency

A1. *ETS and taxes*

82. An ETS is a carbon pricing system in which emitters are provided with emission allowances or permits and allowed to trade between themselves. In its most basic form, an ETS establishes a maximum cap for total emissions within a specific jurisdiction and assigns permits to emissions' sources.[22] Emitters can choose to use their permits, or to sell them to other emitters that have fallen short. Emitters are usually allowed to trade directly among themselves, sometimes across sectors and even jurisdictions. This way, polluters for whom it is easier or cheaper to lower their emissions can do so and sell their permits to companies that are having a harder time in reducing their emissions.

83. If the market works and there is no incentive to accumulate permits or speculate due to uncertainty, an ETS can take advantage of the different marginal costs of abatement or reduction across emitters, in different sectors, and even across multiple jurisdictions; i.e. a specific emitter will find it more convenient to just buy extra permits from another firm to avoid exceeding their allocation; while for the other firm, it is cheaper to install technology that lowers their emissions, or to source their energy from renewable sources. However, the key design consideration for an ETS is allowing trade across firms and sectors. If this is not permitted, an ETS in practice is the same as a tax in its basic formulation, namely the tax rate is determined by the minimum auction price set by the government.

84. Carbon taxes do not establish a market for exchanging "permits to pollute" The lack of a carbon market means that facilities liable for paying a tax will produce up to the point that the marginal benefit of producing an additional unit of carbon emission is equal to the cost determined by the carbon tax. In theory, the optimal pollution will be the same for a tax as an ETS. In practice, entities that pay a tax may not face continuous marginal abatement costs. This means that they may face the choice of paying the tax or closing, with no intermediate choice in the middle.

85. In effect, tax-liable entities cannot take advantage of the potential for lower abatement costs by exchanging tax commitments with entities that have lower costs or more investment flexibility.

86. This limitation of the carbon tax (i.e., the lack of a carbon market that allows purchasing of permits, which can be cheaper than reducing emissions) can be overcome by using mechanisms such as offsets, i.e., allowing economic actors to pay for an equivalent amount of emissions to be reduced or "absorbed" elsewhere,

instead of paying the tax. An example could be that a power plant in Canada pays a farmer in Zambia to plant a quantity of trees sufficient to offset the power plant emissions. This might be cheaper than paying the tax or the significant investment required to switch fuels, and it can have substantial co-benefits (for example, on the livelihoods of people in developing countries).

87. With offsets, a carbon tax can take advantage of lower abatement costs across or between economic sectors. In fact, a carbon tax combined with an offset market is essentially equivalent to an ETS that allows for trading of permits across different sectors (and/or jurisdictions). The decision on the specific design features of a tax will ultimately depend on institutional and political context of the jurisdictions implementing the instrument.

88. What is relevant for our purposes is that a tax can have additional complementary features that allow for more cost efficiency, making it comparable to the advantages of an ETS, but with potentially lower administrative costs. For this reason, carbon taxes with offset mechanisms can be easier to implement, especially in developing countries, while providing much of the same benefits as an ETS that allows for a secondary cross-sector market.

A2. Carbon pricing and markets

89. Climate change is a global problem with multiple impacts. The social cost of carbon can be defined as the monetary value of the damage generated by the emission of an additional (marginal) unit of carbon. Significantly, since the problem is global, the social cost of carbon should (in theory) be the same anywhere - and a carbon tax should therefore be set at the same level everywhere. However, as is discussed in Chapters 3 and 4, establishing a tax rate is often a political decision that considers many factors, including political acceptance.

90. Determining the social cost of carbon is complex, and there are many estimates. According to the 'Report of the High-Level Commission on Carbon Prices', a price consistent with the objectives laid out in the Paris Agreement varies between US$ 40-80 per ton of CO_2 for 2020 and between US$ 50-100 for 2030.[23]

91. While the social cost of carbon should be the same everywhere, the costs of carbon emissions mitigation may vary considerably across different jurisdictions. For example, the cost of labour or installation of a new technology might be different depending on the country. The economic implication is that reducing emissions is more cost-efficient in jurisdictions where the cost of reduction is lower.

92. For example, if the global social cost of carbon emissions is US$ 50, but it

23 CPLC, 2017.

costs US$ 10 to reduce emissions in Chile and US$ 40 to reduce in Europe, it is socially optimal to reduce carbon emissions in Chile rather than Europe. This is the logic behind integrating global markets: in short, to reduce the costs of climate change mitigation, some form of carbon market exchange is necessary. In the case of carbon taxes, this can be achieved by introducing measures such as offsets and compensations schemes across sectors and jurisdictions, and/or by introducing a sufficient level of coordination among States so that the real value of carbon pricing is similar in different jurisdictions.

93. According to recent estimates, global mitigation costs can be reduced by implementing integrated markets, and by reducing emissions wherever it is cheapest to do so, to almost 56 percent in the unconditional NDC scenario and by 44 percent in the conditional NDC scenario.[24] Similarly, Fujimori (2016) found that global markets could reduce welfare losses up to 75 percent.[25] Therefore, global integrated markets are a way to reduce global mitigation costs.

94. However, as emission reduction targets become more ambitious globally, all countries will have to contribute. In the example above, if all of Europe turned to Chile to offset emissions, at some point, the marginal cost of emission reduction in Chile would start to increase and level with that of Europe (for example, cheaper technologies reach capacity and economic agents must start employing more and more expensive technologies; or the capacity for reforestation starts declining; etc.).

A3. *References*

Carbon Pricing Leadership Coalition (CPLC). (2017). "Report of the High-Level Commission on Carbon Prices." Washington, DC: World Bank. https://www.carbonpricingleadership.org/report-of-the-highlevel-commission-on-carbon-prices/

Fujimori S. et al. (2016). "Will international emissions trading help achieve the objectives of the Paris Agreement?." Environmental Research Letters 11, 104001. https://doi.org/10.1088/1748-9326/11/10/104001

Hof, A. F. et al. (2017). "Global and regional abatement costs of Nationally Determined Contributions (NDCs) and of enhanced action to levels well below 2°C and 1.5°C". Environmental Science & Policy, 71, 30–40. https://doi.org/10.1016/j.envsci.2017.02.008

Partnership for Market Readiness (PMR), & International Carbon Action Partnership (ICAP). (2016). "Emissions Trading in Practice: A Handbook on Design and Implementation." Washington, DC: World Bank. https://icapcarbonaction.com/en/?option=com_attach&task=download&id=364

24 Hof, et al., 2017.

25 In the UNFCCC and Paris Agreement nomenclature, NDCs are the Parties' (country) explicit commitments for climate mitigations. Conditional NDCs refer to those commitments that depend on additional financial support.

Chapter 3: How to Generate Public Acceptability for Carbon Taxes

1. Introduction

95. A key element in implementing carbon taxes is their feasibility. Feasible policy measures are those that can be implemented and achieve their objectives efficiently. This chapter discusses how the policy feasibility of carbon taxes can be increased by improving its acceptability, as well as the elements that policymakers might want to consider to increase successful policy implementation.

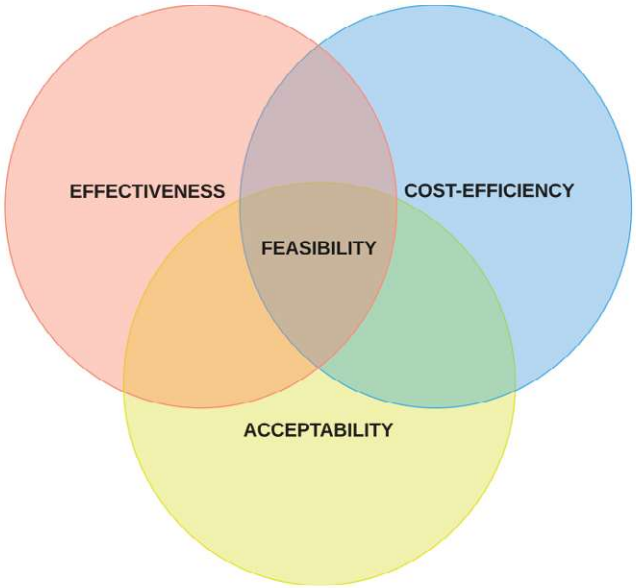
96. First, the chapter examines the concept of a feasible carbon tax and how this relates to acceptability. Then, it explores the main factors affecting people's attitudes towards carbon taxes. Finally, it discusses how these factors can be dealt with to increase acceptability.

2. Designing a feasible carbon tax

97. Assessing climate policy designs is complex and is based on several criteria. The most relevant are the direct and indirect impacts on climate mitigation (i.e., effectiveness), implementation costs, enforcement capacity, and the side-effects of implementation (i.e., cost-efficiency).

98. It is generally accepted that carbon taxation is a more efficient policy instrument than rights-based or regulatory measures.[27] However, the effectiveness and efficiency of a carbon tax is also connected to *acceptability*, that is, the extent to which the policy, once implemented, has the potential to be accepted by the public. Only when these three components (i.e. effectiveness, cost-efficiency, and acceptability) coincide can the policy measure be considered as feasible. Although the focus of this chapter is on public acceptability of carbon taxation, the last section discusses how policy-mixes can simultaneously address all three components presented in Figure 1, and may, therefore, increase the probability for feasible policy implementation.

Figure 1. Feasibility as a function of effectiveness, cost-efficiency, and acceptability



2.1 The importance of acceptability

99. Even though carbon taxation is both an effective and cost-efficient policy instrument for mitigating climate change, it has only been implemented in a small number of jurisdictions around the world.[28] This can be attributed to contextual factors such as the system of government and policymaking, path-dependence, economic conditions and development, quality of government, and political culture.[29] However, research also points towards the highly politicized nature of climate policies and carbon taxes, making them sensitive to public opinion for their successful implementation.[30] Specifically, the limited prevalence of carbon taxes around the world reflects a lack of public acceptability, therefore making them unfeasible.

100. Low acceptability has been an issue in failed attempts to implement carbon taxes, for example, in Washington State (United States of America), where a ballot initiative for a carbon tax was rejected in both 2016 and 2018. Similarly, in France, the *gilets jaunes* (yellow vests) protests in 2018 forced the government to suspend its proposal to escalate the existing carbon tax.[31] Other experiences illustrate how

28 See Chapter 2.
29 Harring et al., 2019.
30 Feldman and Hart, 2017.
31 Maestre-Andrés et al., 2019.

low public acceptability has restricted policymaking and limited implementation.[32]

101. The public's attitudes towards the tax are also important once the policy has been implemented. Sustaining public *acceptance* (i.e., attitudes formed once the policy is in place) over time may be crucial for effective implementation (see section 4.5 of this chapter, "Consider trial periods"). Research on the implementation of other similar policy instruments (e.g. congestion charges and taxes in major European cities, such as London and Stockholm) shows that the level of acceptability was relatively low before implementation, but gradually increased after the policy was put in place.[33] One reason is that people's acceptance is linked to their experience with the policy and its intended effect.[34]

102. In sum, it is crucial for governments to recognize the importance of policy acceptability, and to design carbon taxes to minimize public resistance and reduce subsequent political and economic costs. To do so, knowledge on the factors that explain acceptability is necessary. However, although some factors are known to generate positive attitudes towards environmental policy, how they influence carbon tax acceptability specifically is still an open question. Thus, it is also a question that has yet to be answered for countries aspiring to implement carbon taxes in the future.

3. Explaining attitudes towards carbon taxes

103. Research has consistently identified several factors that drive attitudes with respect to environmental policy. Although not all of these have been systematically studied in relation to carbon taxes, there are reasons to believe that they constitute important drivers for carbon tax acceptability.

104. Research on policy attitudes has had a limited geographical scope – in fact, there is little systematic research on carbon taxation acceptability conducted in developing countries. This limits the possibility to draw definitive conclusions for developing countries.

105. A major strand of research focuses on *individual-level factors*. A person's core values, beliefs (e.g., about the seriousness of climate change and general risk perceptions), and personal norms (i.e., a feeling of moral obligation to act in a specific way) are relevant for their attitudes towards carbon taxation. In addition, people who are more aware of or knowledgeable about climate change, tend to be more willing to accept climate policy measures. Finally, a person's ideology is also a factor in explaining different attitudes to taxation. A consistent finding is that

32 Drews and van den Bergh, 2016.
33 Schuitema et al., 2010.
34 Jagers, Matti and Nilsson, 2017.

conservatives are usually less accepting of government intervention than those inclined towards the left.[35] It should, however, be recognized that few studies have focussed on the relationship between ideology and climate policy attitudes *outside* developed countries.

106. *Inter-relational factors* also determine policy attitudes. Most notably, trust in people's voluntary compliance with policy initiatives (i.e., interpersonal trust) and in the political-administrative system responsible for implementing and enforcing policies (i.e., institutional trust) affect policy acceptability. While interpersonal trust influences both the perceived necessity and potential effectiveness of a carbon tax, institutional trust relates to ability of political institutions to monitor and enforce compliance, to create incentives for behavioural change, and to present viable alternatives to the public.

107. There are significant variations in acceptability across different types of policy measures and between different policy designs. This suggests that the perceived characteristics and consequences of the proposed policy, or *policy-specific beliefs*, should also be considered as factors determining policy attitudes.[36]

108. Four interrelated policy-specific beliefs have been suggested to affect policy attitudes:

(i) perceived distributional effects - the extent to which the consequences of a carbon tax are perceived as being fair;

(ii) perceived impact on freedom of choice - whether implementing a carbon tax requires a change in behaviour and whether behavioural substitutes are readily available;

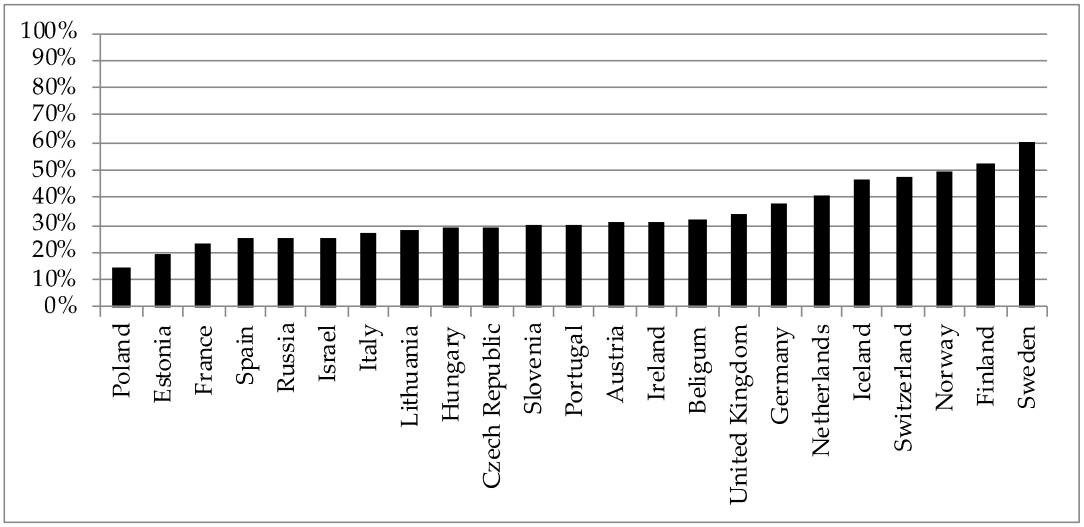
(iii) perceptions of policy *effectiveness* - the extent to which the proposed carbon tax is expected to achieve its aims, and;

(iv) personal outcome expectancy - the perceptions of how oneself will be positively or negatively affected by implementing a carbon tax.

109. It is worth noting that these policy-specific beliefs are the results of both individual-level factors and policy design.

35 See for example McCright et al. 2014; Harring & Sohlberg, 2017.
36 Samuelson & Messick, 1995.

Figure 2. Attitudes in favour of climate taxes across 23 countries



Note: The figure is previously published in Davidovic & Harring 2020 using the survey question 'To what extent are you in favour or against the following policies in [country] to reduce climate change?' and five response categories ranging from 'strongly in favour' (1) to 'strongly against' (5). The figure shows the proportion of respondents in percentages who are "somewhat in favour" or "strongly in favour" of climate taxes ("increasing taxes on fossil fuels, such as oil, gas and coal"), in 23 countries.
Source: European Social Survey 2016. Data available at https://www.europeansocialsurvey.org/data/download.html?r=8

110. Differences in policy acceptability are not only evident between individuals; there is also substantial cross-national variation (see Figure 2). Thus, it is important to consider how *contextual factors* might interact with the factors that determine policy attitudes. Cross-national variations have been attributed to various contextual features such as system of government and policymaking, path-dependency, economic dependencies, political culture, wealth and affluence, and social capital.

111. Recent studies also suggest that differences in political and institutional quality, or *Quality of Government* (QoG), can explain why policy attitudes differ significantly across countries. Higher levels of corruption correlate negatively with the acceptability of economic policy tools, such as taxes and subsidies, but positively with acceptability of command-and-control regulations.[37]

4. How to generate public acceptability

112. Attempting to implement an optimal, but unpopular, tax may not be feasible. However, a feasible carbon tax requiring public acceptability entails costs, such as designing a not fully efficient tax or setting the tax below the effective rate. On the other hand, even if combining all three objectives only results in the implementation of a second-best policy instrument in terms of effectiveness and cost-efficiency, one should keep in mind that this will nevertheless be significantly better than the

37 Davidovic and Harring, 2019.

risk of not implementing due to public protests.

113. In addition to the high indirect societal costs of attempting to forcefully implement an unpopular (yet optimal) tax, introducing policy measures that do not enjoy acceptability among the public should also be questioned from a perspective of democratic legitimacy. As such, striving for feasible approaches should be seen as a worthwhile route for most decision-makers. The specific factors that increase public acceptability are explored in Checklist 1 below. Additionally, examples of policy mixes are presented that can mitigate or overcome negative public attitudes towards carbon taxes.

Checklist 1. Achieving public acceptability

1. Ensure transparency in the decision process
2. Engage in dialogue with stakeholders
3. Consider revenue use for environmental objectives or affected groups
4. Ensure perceived fairness
5. Consider introducing carbon tax in broader tax reform
6. Establish trail periods
7. Consider policy mixes
8. Consider compensating disproportionately affected groups or stakeholders
9. Engage in public communication and information campaigns

4.1 The role of political and institutional trust

114. The characteristics and perceived quality of government are crucial for the acceptability of a proposed carbon tax. This is a challenge for most governments but will particularly be problematic in countries where overall trust in both the government and the administration are low.[38] Institutional trust is important since it is linked to people's general beliefs about the legitimacy of the political system, that is a belief that the existing political institutions and processes are the most appropriate. Without political legitimacy, most policies are difficult to implement and sustain.

115. Unfortunately, there are no known quick fixes or shortcuts to renewing institutional trust. Trust can, however, be generated for a specific issue, for example, a proposed carbon tax. Two key components are transparency in the decision-making process and stakeholder dialogue early in the process. A large body of social science research suggests that deliberative practices are crucial for generating

38 Davidovic and Harring, 2020

acceptability for policy decisions, particularly when they conflict with stakeholders' short-term self-interests.[39]

116. Furthermore, being transparent about the use of tax revenues can be a successful way to increase acceptability, especially among groups with low levels of political and institutional trust. Since earmarking is often not permitted in many countries, measures that clearly and transparently connect tax revenues with compensatory measures can be explored. Finally, it is important to note that many of the countries that have introduced carbon taxes suffer from relatively low corruption according to the Corruption Perceptions Index metrics.[40] In a situation where countries and governments experience low political trust, it is important to introduce the carbon tax in a way that would not further lower institutional trust.[41]

4.2 Focus on the revenues

117. A carbon tax is often a reliable source of revenue. This can contribute to increased levels of acceptability, especially if it can be convincingly demonstrated that welfare improvements will be achieved with the expected revenues.[42]

118. Since the costs for climate change adaptation are likely to increase in most countries, linking mitigation policies such as carbon taxation explicitly to the funding of adaptation efforts may increase acceptability. This emphasizes the local and national benefits from the tax, and instead of focussing exclusively on mitigation, it is also a way to build political alliances with domestic groups that benefit from adaptation. Policies where the benefits accrue to broader groups in society run a lower risk of being terminated when reviewed by Parliament.[43]

4.3 The importance of perceived fairness

119. Research has emphasized the importance of perceived fairness for policy acceptance.[44] Expectations that some groups will benefit more than others increase the perception of unfairness, resulting in negative opinions on a carbon tax across all stakeholders.[45]

120. However, people tend to have different perceptions on what fairness entails. On the one hand, multiple exceptions, such as tax reliefs for certain industries, increase perceptions of unfairness and, therefore, reduce acceptability across

39 See for example McLaverty and Halpin, 2008.
40 Transparency International, 2017.
41 Klenert et al., 2018.
42 Jagers and Hammar, 2009.
43 Klenert et al., 2018.
44 Maestre-Andrés et al., 2019; Drews and van den Bergh, 2019.
45 Evidence suggests negative opinions are not necessarily only among those who expect to be personally worse off than others, but also among morally righteous "winners" (Maestre-Andrés et al., 2019).

the public. On the other hand, allowing focussed exceptions for disadvantaged groups may increase the perception of fairness and, therefore, acceptability. These issues must be analysed considering the attitudes towards taxation in the specific jurisdiction.

4.4 Searching for windows of opportunity

121. Previous experiences in carbon tax implementation (e.g., in Sweden, Chile, Colombia, and Mexico) suggest that timing can be an important factor for increasing acceptability. Introducing carbon taxation as an isolated policy response will inevitably increase public attention, both positive and negative, compared to the case where the carbon tax is implemented as part of a broader tax-reform. This will also provide an opportunity for governments to signal more clearly the interlinkages between carbon taxation, other sources of governmental revenues, and potential plans for revenue-use.

4.5 Consider trial periods

122. Research on the acceptance of other economic policy measures, for example congestion taxes and charges, finds that there is stronger resistance before the policy is implemented. This suggests the importance of policy-specific beliefs, and that expected outcomes are a key driver for pre-implementation acceptability. Once implemented, people become familiar with the policy, and adjust their perceptions since their first-hand experience is less negative than what was initially expected.[46]

123. Therefore, trial-periods for implementation should be considered, so that groups who have negative perceptions can assess the policy impacts and change their opinion. However, although this has been shown to matter for policies where the local benefits are evident, for example, improved air quality and less congestion as discussed above, there is less evidence for policies where the positive outcomes are global. A related strategy, more relevant for carbon taxes, is to introduce a relatively low tax and then to gradually (and transparently) increase the tax rate along the way.

4.6 Examples of potential policy-mixes/packages

124. There are no simple solutions for some of the factors that drive the acceptance for carbon taxes. For example, the fact that people's core values affect their propensity to accept a carbon tax does not help policy design since (a) core values are difficult to change, and (b) it is difficult to design a tax that is sensitive to the great variation in people's core values.

46 See for example Schuitema et al., 2010.

125. On the other hand, *personal norms* are probably less challenging since such norms *can* be changed. Two important channels for such norm changes are education and the media. Thus, a long-term objective can be to educate students that those environmental policies are necessary for sustainable development. However, this is beyond the scope of this chapter, and we will instead concentrate on the factors more directly affecting policy-specific beliefs.

126. As mentioned in section 3, there are four policy-specific beliefs that have been identified as major drivers of (non)acceptance: (a) perceived distributional effects and consequences related to perceived fairness of the policy, (b) perceived impact on personal freedom, (c) perceived effectiveness, and (d) personal outcome expectancy.[47] Considering these beliefs, it is possible to increase acceptability by combining the tax with additional policy measures. Since there is little empirical evidence on this issue, the following exercise should be seen primarily as *food for thought* for policymakers when designing policy packages aimed at overcoming challenges constituted by the various policy-specific beliefs.

(Un)fairness in outcome

127. If studies in a jurisdiction show that unfairness in outcome is a reason why agents express disapproval of an intended carbon tax, reducing the potential resistance by combining the tax with compensatory measures should be considered.[48] This can be done in various ways. For example, a flat dividend (lump sum) will compensate for perceived "wallet"/income effects, especially among lower-income groups. If this compensation is connected to an annual income tax return, then a flat dividend can even have a redistribution effect, since many citizens with lower incomes may not have access to a car at all but will – in this example - still benefit from the dividend.

128. An alternative compensation scheme can be to connect the tax revenues to other policy goals, for example, compensation by improving healthcare, education or other policies aimed at increasing the general welfare.[49] Finally, avoiding exceptions is another approach that can lower resistance, since the tax will then "hit" individuals more equally.

47 It is true that all four aspects in a sense can be seen as different expressions of fairness, but here we disregard this and stick to the terminology in the literature. See Samuelson and Messick, 1995.

48 See further below under section 4.7, "Measuring acceptability in due time".

49 Such connections should not be conflated with earmarking, which is typically not compatible with many countries' constitutions.

Freedom

129. Introducing a carbon tax is often associated with reduced freedom (e.g., of movement). When the price increases, some people can only afford public transport or vehicles without combustion engines. For example, a common argument against the intended increase of the French carbon tax was that it would mainly affect people living in suburbs or in rural areas that had no alternative but to drive their car. To avoid such reactions, it is possible to combine the carbon tax with policies improving public transport or increasing access to the existing system, for example, through the provision of parking space nearby train or bus stations, or by subsidizing electric vehicles.

Effectiveness

130. A common argument against a carbon tax is whether it is necessary and will have the intended effect. These arguments cannot be overcome by complementing the tax with a compensation scheme. This challenge has to do with overcoming people's scepticism: i.e., lack of knowledge, conviction and eventually with experience.

131. To overcome scepticism, education and a communication strategy are important, as well as to explain to the public the benefits and the most likely outcomes of the implemented tax. The communication strategy can be built upon various lines of reasoning, for example, either by applying pure cost-efficiency arguments, or more ethical motivations, to argue that it is more *reasonable* that only polluters are paying, rather than all of society.

132. Policy measures are usually resisted *before* implementation. However, once the policy has been in place for a while, the level of acceptance tends to increase. Adopting a trial period (see above under section 4.5) can reduce resistance and reinforce public support gradually.

Personal outcome expectancy

133. Personal outcome expectancy resembles unfairness in outcomes but is specifically directed towards the consequences for the individual consumer or citizen. Nevertheless, the same logic can be applied to both, for example, the tax can either be complemented with direct compensation, such as a dividend or a deduction in the income tax return and/or in investments in more general welfare policies such as improved public transport, educational programmes, or improvements in the health sector.