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Finance fit for change



Pengwern Associates

STIFTUNG
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Exploring the challenges and
opportunities for climate finance
in states and regions



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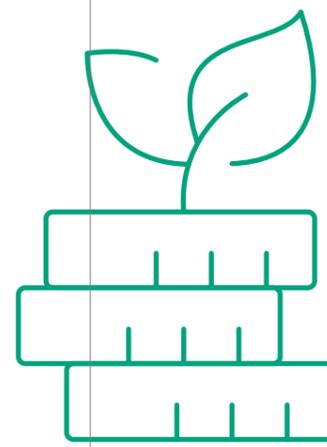
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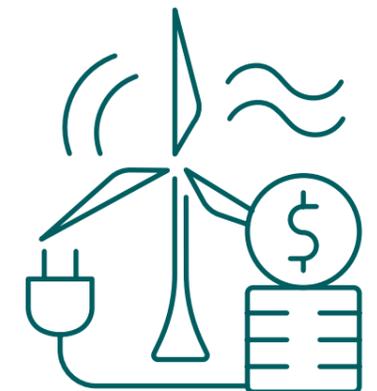
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Executive Summary

This report is based on two fundamental facts.

First, ambitious climate action requires finance. We will only be able to make the significant investments needed to reach net zero if key actors (public and private) have access to sufficient financial resources. But access to finance is not enough; we also need to ensure that these resources are spent wisely and effectively, supporting not only climate action but also economic prosperity, social justice and well-being.

Second, states and regions are critical to achieving net zero. They provide an essential layer of regulatory, legislative and budgetary autonomy, and control key policy levers that have a direct impact on emissions. Previous research shows that subnational governments (states and regions, as well as cities) account for over 50% of public investment in the OECD.

Despite these facts, there has been relatively little analysis of climate finance at the state and regional level. This is all the more surprising given that states and regions are often among the most pioneering and innovative actors in financing climate action. With the support of Stiftung Mercator, one of the aims of this report is to address this gap. It draws on existing literature and a series of structured interviews from representatives of states and regions in Europe and North America to identify the successes and challenges faced by states and regions in relation to climate finance. Based on these findings, it considers what support states and regions need to maximise existing successes and overcome current barriers in order to increase future climate finance flows.



We structure the discussion around three themes of importance to states and regions:

- How to raise climate finance, with a particular focus on options that are dedicated to climate change alone or that both raise revenue and help reduce emissions.
- How to spend climate finance, looking at how states and regions can adapt their budgetary processes, change their investment and financing strategies, and use the power of public procurement to deliver climate action.
- How to encourage others to raise and spend climate finance.

When it comes to raising climate finance, the different powers of different states and regions mean that they have different opportunities. Some states and regions, particularly in North America, have extensive powers to set their own taxes or incur debt, making issues such as issuing green bonds and designing carbon pricing very important. Others have much less taxing and borrowing power and are more interested in developing partnerships to bid for funding. Others fall between these two positions, for example having borrowing powers but not the ability to set carbon taxes. Revenue raising options also vary according to the size of the jurisdiction. Larger states and regions have a wide range of different options for raising revenue, while smaller states and regions have more limited options and tend to focus on raising funds from national and supranational authorities.

Where feasible, carbon pricing is a potentially attractive revenue-raising option for states and regions, but key design challenges need to be addressed. Carbon pricing can both incentivise emission reductions and raise revenue. The evidence suggests that carbon taxes, where they can be implemented, can be particularly effective in raising revenues. However, states and regions have understandable concerns. These relate to

the disproportionate impact carbon pricing may have on low-income households and concerns about leakage and competitiveness, which may be more acute at the state and regional level than at the national level. But there is also a growing body of evidence on how these challenges can be addressed.

Green bonds are another fund-raising option for some states and regions. They offer states and regions a way to demonstrate their commitment to climate action, change internal incentives to develop low-carbon projects, diversify their investor base and potentially access cheaper financing. But the practical challenges of issuing green bonds – such as identifying and preparing projects, or understanding regulatory requirements and investor expectations in different markets – can be difficult to navigate.

When it comes to spending climate finance, there is considerable interest in making better use of green budgeting, including across states and regions of very different jurisdictions and sizes. Green budgeting involves using the tools and systems of budgetary policymaking to inform, evaluate and deliver on environmental objectives. It can include, but is certainly not limited to, climate budget tagging, which involves identifying (or ‘tagging’) those expenditures (including tax expenditures) that support a jurisdiction’s climate and/or environmental objectives, and monitoring this spend over time. States and regions recognise the power of green budgeting, but are also concerned about the risk of greenwashing, the possibility of creating perverse incentives, and the human and organisational capacity it may require.

Within the overall budget, particular attention needs to be paid to the role of states and regions in designing and financing low-carbon infrastructure. This need is underlined both by the current importance of states and regions in driving infrastructure development and by the scale of the low-carbon investment



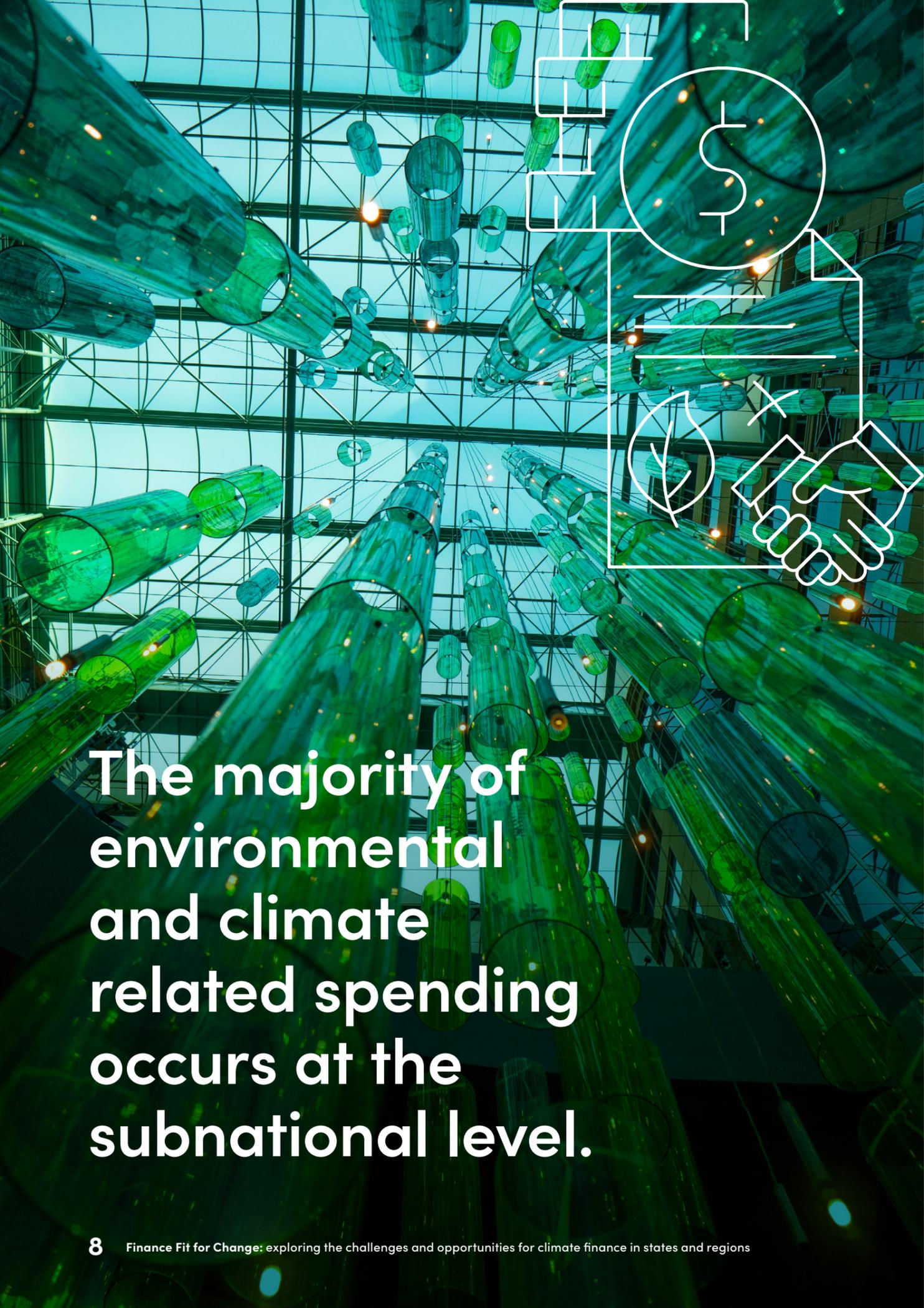
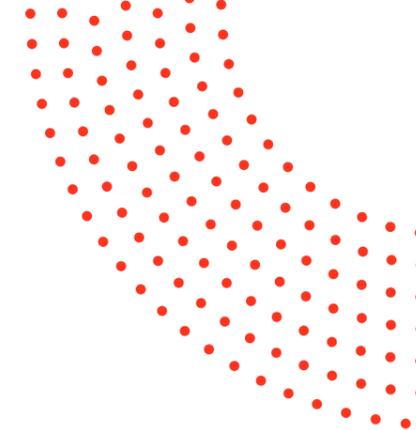
challenge. Different states and regions prioritise different approaches to this challenge, particularly in terms of the role played by blending public and private finance or by public-private partnerships. However, all states and regions have a common interest in improving public investment management processes to develop an adequate pipeline of well-prepared (intra-regional) projects.

Another important way in which states and regions can spend their resources wisely to promote net zero goals is through the effective use of their procurement budgets. European Union (EU) government spending on works, goods and services accounts for around 14% of EU GDP, with subnational governments accounting for a larger share of this budget than national governments. There are precedents showing how this spending power can help achieve low-carbon goals, for example through the purchase of low-carbon materials. But states and regions want to

better understand how to use this purchasing power and how to overcome (perceived) legal barriers.

Finally, states and regions can play an important role in enabling climate finance flows from others. They can do this in a variety of ways, including through the policies, regulations and incentives they provide; through their approach to planning; and through the provision of collaborative governance models. These roles can be very effective even in the absence of national climate leadership. There is considerable work underway to support states and regions in these roles, although states and regions continue to express interest in exploring how policy and incentives can be used to deliver emissions reductions and support investment in more challenging areas such as energy efficiency, electrification of domestic heat, transport and agriculture.

1.0



The majority of environmental and climate related spending occurs at the subnational level.

Introduction

Climate finance is an area of increasing importance and interest to governments around the world. We are in the Climate Decade and climate action, and how these actions can be financed, are moving to the forefront of policymaking decisions.

States and regions are uniquely positioned to drive climate action globally. They represent an essential layer of regulatory, legislative and budgetary autonomy and control significant policy levers with direct bearing on greenhouse gas emissions. The majority of environmental and climate related spending occurs at the subnational level. In a study sampling 27 OECD countries across 2000–2016, subnational governments were responsible for 64% of

this spending. Subnational governments play a significant role in public investment, contributing over 50% of public investment in the OECD (OECD et al., 2018).

As the Secretariat for the Under2 Coalition, Climate Group is keenly aware of key role that states and regions play in driving climate action fast. The Under2 Coalition is the largest global network of states, regions, provinces and other subnational governments committed to achieving net zero emissions by 2050 at the latest. The Coalition is made up of more than 270 governments, representing 50% of the world's economy and 1.75 billion people – including states such as California, one of the world's largest economies.



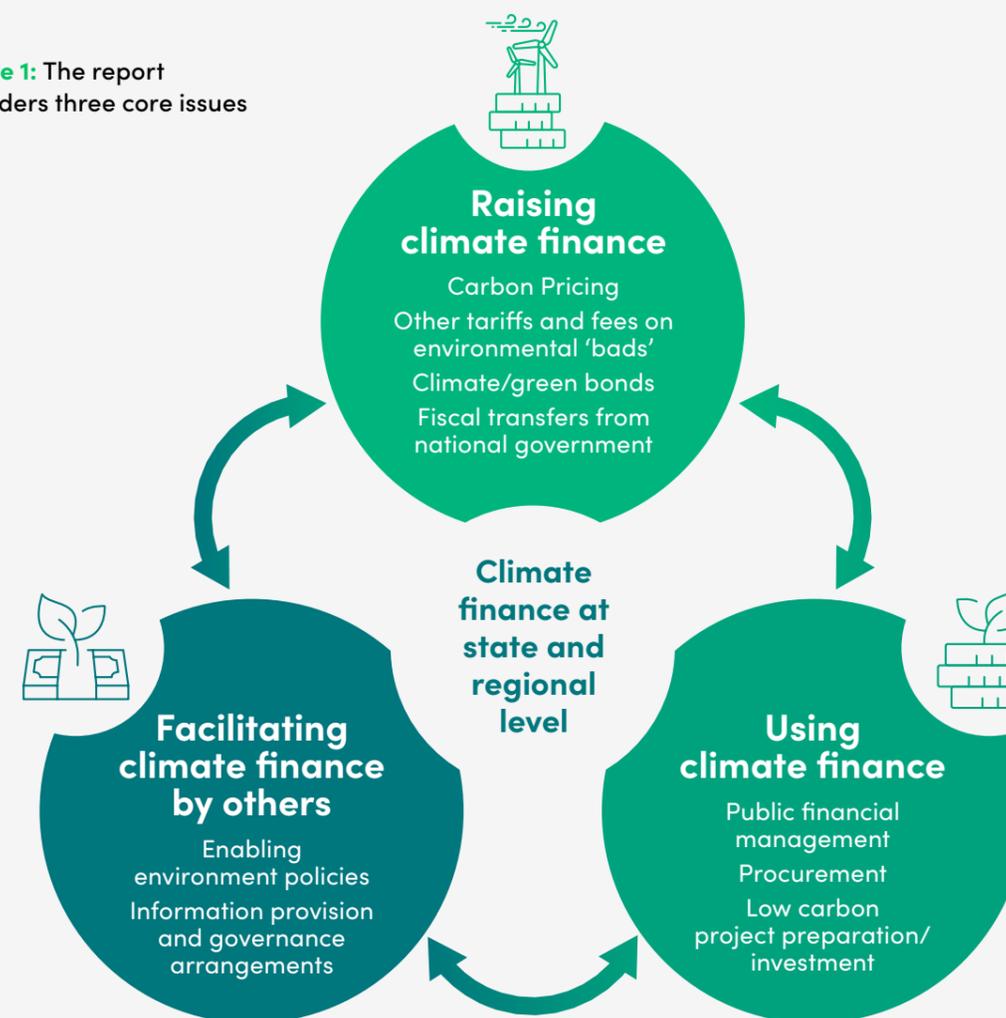
However, more work is needed to understand the financial and fiscal tools available to states and regions to drive climate action. With the support of Stiftung Mercator, Climate Group's Finance Fit for Change project is seeking to address this gap. This report makes an initial contribution to filling this gap through exploring the key successes and challenges faced by states and regions in raising and using climate finance.

For this initial scoping phase, our work focuses primarily on the experiences and opportunities associated with states and regions in Europe and North America. Certain issues – such as how to access financial resources from international climate finance institutions such as the Green Climate Fund – are, therefore, largely outside the scope of this report. However, the report does draw on examples or lessons from beyond Europe and North America, where these are relevant to its geographic focus.

The report draws on insights obtained from a combination of literature review and structured interviews (and related input) with a sample of ten Under2 Coalition members. The literature review examined key reports from a selection of international organisations including the OECD and World Bank. The findings from the literature review informed the content and structure of in-person and email interviews conducted with ten members of the Under2 Coalition: Andalucía, Baden-Württemberg, British Columbia, California, Hawaii'i, Lombardy, Madeira, Northern Ireland, North Rhine-Westphalia and Québec. Together, the states and regions consulted as part of the project account for over 8% of the population and more than 12.5% of the gross domestic product (GDP) of Europe and North America. The annex provides further details on the interviewees.



Figure 1: The report considers three core issues



We structure the analysis around 3 key themes. As Figure 1 illustrates, we first consider the opportunities and challenges that states and regions face when raising finance for climate action. We then explore the issues that can arise when states and regions seek to use financial resources to support climate action. Finally, and more briefly, we consider some of the issues that arise when states and regions look to facilitate climate finance flows made by other actors. We consider each theme in turn (sections 2-4), while section 5 provides a brief summary assessment of the potential implications for the future work of the Under2 Coalition.

In addition to exploring the challenges, gaps and opportunities for states and regions on climate finance, this report also looks at what support states and regions will need to maximise these successes and overcome these barriers in the future. With a wide global network built upon 15+ years of government engagement, Climate Group is uniquely positioned to provide this support and bring state and regional governments to drive the shift needed on subnational climate finance. This report provides some programmatic insights for future work, building off the success of previous projects such as the Energy Transition Platform and Industry Transition Platform, both carried out with the support of Stiftung Mercator (Climate Group, 2023a; Climate Group, 2023b).



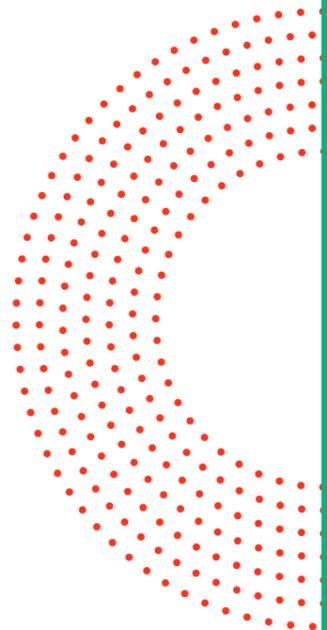
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Raising climate finance

This section looks into the successes and challenges faced by states and regions in raising climate finance. Raising climate finance is a prerequisite for states and regions to be able to finance the programmes and projects needed to achieve their climate goals. Therefore, the ability to mobilise finance from a range of sources is critical to maintaining and scaling up their climate action.

We focus on financing mechanisms that are explicitly climate relevant. Subnational governments can use all of their standard budgetary tools to raise climate finance but in this work, we have examined those mechanisms that both raise resources and

incentivise emission reductions in the state/ regional economy, or those raise funds that are to be used exclusively to finance climate action. These potential sources of finance can be broadly categorised as budgetary finance (taxes or transfers from national government) and external finance (borrowing).



The four broad groups of climate-related financing mechanisms we focus on:



Carbon pricing

This includes both carbon taxes and emissions trading systems (ETSs), both of which put a price on greenhouse gas (GHG) emissions to encourage companies and consumers to take account of the external costs of these emissions in the decisions they take.



Green bonds

These work in a similar way to traditional bonds – they are tradeable debt instruments issued by states and regions that have to be paid back in the future, typically with a requirement to for the issuer to pay interest for the period before they are paid back – with the difference being that the funds raised are earmarked for projects that deliver environmental benefits.



National financing mechanisms explicitly targeted at climate action at the state and regional level

These include direct transfers, national climate funds and Ecological Fiscal Transfers (EFTs). Each of these mechanisms are ways for states and regions to access additional funding from the central government for their climate programming.

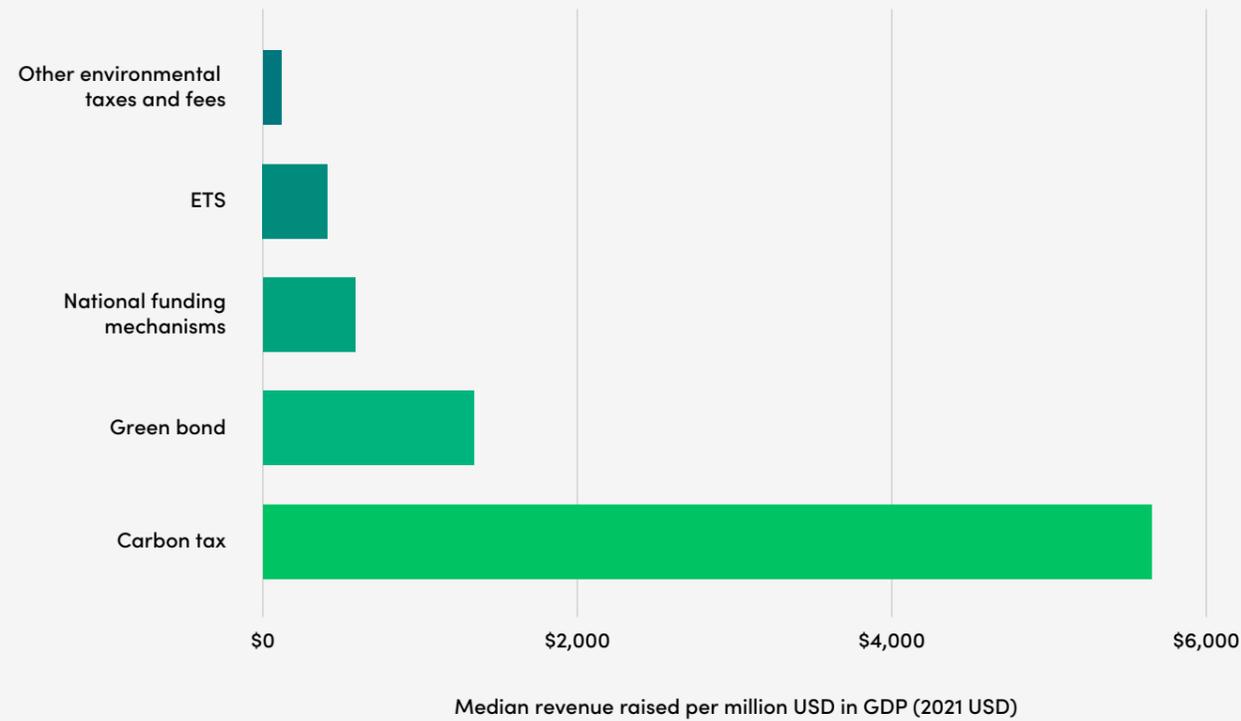
Carbon pricing, national funds and other environmental taxation are examples of budgetary finance, while green bonds are a source of external finance.



Other environmental taxes and fees

These are levied on environmentally damaging activities that occur in state or regional economies but focus on activities or indicators other than greenhouse gas emissions. They include, for example, energy excise taxes, waste taxes and water abstraction fees.

Figure 2: Carbon taxes tend to raise the largest amounts of revenue of the instruments explored



The four climate finance raising mechanisms vary significantly in their ability to raise capital. To explore this, we have compiled a database of 79 instances where states and regions in North America and Europe have raised revenues using these instruments.

Figure 2 shows the results of an analysis comparing the annual revenues they raised. In order to make the analysis comparable across states and regions of different sizes, we have standardised the revenues by state/regional GDP (USD million)¹. For example, and purely for

illustrative purposes, the median ETS in our database raised \$414 for every million dollars of GDP so, a state or region with \$90 billion in GDP (roughly the size of Hawaii's economy), could expect to raise around \$37.3 million (\$414*90,000) per year through an ETS. The results show that carbon taxes tend to raise the largest amounts of revenue followed by green bonds. National funding mechanisms and ETSs² raise roughly similar amounts of revenue (on average), with other environmental taxes having the lowest revenue raising potential on average.

Table 1: The amount of revenue generated is highly context dependant for all of the instruments

Mechanism	Min	Max	Sample size (N)
Other environmental taxes and fees	\$1	\$4,830	34
ETS	\$149	\$2,220	14
National climate grant	\$451	\$1,423	6
Green bond	\$115	\$6,952	20
Carbon tax	\$132	\$7,666	5

The amount of revenue which a mechanism can raise can vary considerably depending on the context and design of the instrument. The amount of finance raised by each instrument (even when controlling for GDP) can be many times greater in some contexts than in others (see Table 1). The difference is particularly large for carbon taxes and green bonds. For each, there is about a 60-fold difference between the highest and

lowest examples of revenues raised. Other environmental taxes are also highly variable, reflecting the range of different tax bases used by states and regions.

¹ All references to monetary values refer to 2021 USD unless otherwise specified.
² The discrepancy between carbon taxes and ETSs, despite both providing a price on carbon, is discussed further in Section 2.1.

2.1



Carbon pricing

2.1.1. Overview

Carbon pricing mechanisms have increasingly come to the fore at both the national and subnational levels. These mechanisms come in two forms: carbon taxes and ETSs. Both are designed to force emitters to take into account the external costs of their GHG emissions. Carbon pricing is an attractive revenue raising tool because it can raise large amounts of revenue while providing an incentive to reduce emissions.

An ETS (sometimes called a cap-and-trade system) sets a limit on the total level of greenhouse gas emissions. It then creates an equivalent number of allowances and requires companies responsible for emissions to surrender one allowance for every tonne of GHG emitted. Companies can buy their initial allowances at auction, with the proceeds going to the government³ and can then trade them on the secondary market. By creating supply

and demand for emissions allowances, an ETS establishes a market price for emissions which provides an incentive to reduce emissions. Over time, the total amount of emissions allowed falls, causing the price to increase.

A carbon tax puts a price on carbon by setting a tax rate on greenhouse gas emissions. It is often implemented by taxing the carbon content of fossil fuels. Carbon taxes provide a pre-determined price but an uncertain emissions outcome which is the opposite of an ETS.

The amount of revenue raised depends on key policy design choices. In the case of carbon taxes, the tax rate and the activities/sectors covered by the tax are the main determinants of revenue. For an ETS, decisions on the amount of emissions to be auctioned (or distributed) each year are the most important factors, along with coverage and ambition.

³ In some cases, allowances are freely distributed to market participants such that they can trade them on the secondary market. However, this is not revenue generating.

Many ETSs use their revenues to fund climate change projects, but this is less common for carbon taxes. In 2018, 62.7% of global ETS revenues were allocated to environmental projects. In contrast, in the same year, only 23.2% of global carbon tax revenue was directed towards environmental projects, with the majority (58.5%) allocated to the general budget (World Bank, 2019).

2.1.2. Application in states and regions

Both approaches to carbon pricing are becoming more common across state and regional governments, with ETSs proving particularly popular. There are at least 14 cases of states and regions with an ETS in place and a further 5 cases of carbon taxes (see Table 1). States and regions most commonly introduce carbon pricing on industrial and transport related emissions.

Carbon taxes tend to raise higher levels of public revenue for subnational governments than ETSs (see Figure 2). The main reason for this is that, in many ETSs, some or all allowances are given away for free rather than being auctioned. While this still results in a carbon price, as a result of the secondary trading of allowances, it reduces the revenues raised for the public purse. On the other hand, the ability to give away some allowances for free makes it politically easier for governments to introduce ETSs. This helps to explain the relative popularity of ETSs at the state and regional level.

2.1.3. Examples of good practices

The Under2 Coalition includes some of the world's leaders in state and regional carbon pricing. For example:

- California and Québec both use their ETS as a source of climate revenue with 100% of the revenue generated by their systems used to finance their state-level green funds.
- California's ETS is one of the most successful ETSs in terms of revenue generation (per unit of GDP) and a big part of this success is its broad coverage. It covers the transport, buildings, industry and power sectors. In 2020, these sectors emitted a total of 334.2 million tonnes of CO₂e; 90.5% of the state's total emissions (ICAP, 2021).
- British Columbia's carbon tax is the most effective regional tax in terms of revenue generation (per unit of GDP). It has a broad coverage, about 70% of provincial emissions, with a carbon price of CAD 50 per tCO₂e (\$37 USD) (British Columbia, 2022). It also has mechanisms to reduce the challenge that carbon pricing may have a disproportionate impact on low-income households, as explored further below.
- Catalonia is one of the few European regions to implement carbon pricing, designed so as to complement the EUETS⁴. The first phase of their programme was a tax on CO₂ emissions from vehicles, which came into effect in 2021, and takes the form of an annual fee based on a vehicle's emissions efficiency⁵.

⁴ A range of challenges arise when more than one carbon pricing instrument is deployed at the same time, requiring careful design to avoid instruments being redundant and/or some firms being subject to 'double taxation'. The simplest way to avoid these challenges is if the two carbon pricing instruments apply to different tax bases. These issues are discussed further in Fankhauser, S., Hepburn, C. and Park, J. (2012) Combining multiple climate policy instruments: How not to do it, *Climate Change Economics*, 1:3, 209–225.

⁵ The tax covers vehicles which emit over 120g CO₂ per km and the marginal rate ranges from €0.55 euros per g CO₂/km at the lower end to €1.10 euros per g CO₂/km for vehicles which emit over 200g CO₂ per km (Agencia Tributaria de Catalunya, 2022).



While this is not a strict carbon tax (see section 2.4 below), the second phase of this work will be a broader carbon tax covering a range of industrial activities, although it is unclear when this will be implemented. 100% of the proceeds from both phases of the tax will go towards funding a regional Climate Fund.

- New York State, Maine, Massachusetts and Rhode Island are all members of the Regional Greenhouse Gas Initiative (RGGI). The RGGI is a regional market-based cap-and-invest initiative that requires regulated power plants in each of the 11 states to purchase one RGGI CO₂ allowance for every short ton of CO₂ they emit (RGGI, 2022b)⁶. The RGGI states distribute allowances at quarterly auctions and each state has discretion over how best to use their proceeds. Most of the proceeds have been invested by states to fund clean energy and energy efficiency programs and bill assistance for local businesses and communities (ICAP, 2022).

2.1.4. Challenges faced by states and regions

States and regions have different jurisdictional powers when it comes to implementing carbon pricing. Some states and regions don't have the authority, either in theory or in practice, to implement such schemes. In countries with more centralised administrative systems, the power to introduce taxation on energy production or consumption, or the equivalent through an ETS, is often reserved to national authorities. Even in cases where powers are not reserved in this way, in practice, the existence of national or supra-national

schemes, most notably the EU ETS, limits the potential for states and regions to introduce carbon pricing schemes unless they are prepared either to risk creating distortionary interactions with these other schemes, or to focus the scheme on emissions that are not otherwise priced. The combination of these factors means that the use of carbon pricing as a revenue raising tool by states and regions is more common in North America than in Europe.

Carbon taxes and ETSs require a high level of technical capacity. This capacity is needed for tasks such as measuring and monitoring emissions levels. In the case of ETSs, states and regions need the technical capacity to set up the infrastructure (registries) to ensure that allowances are appropriately surrendered when installations are responsible for emissions. This challenge can be particularly acute for smaller states and regions which may not have the scale required to employ the specialists in these areas.

Addressing the potential risk of carbon leakage and/or perceived loss of competitiveness is critical to the success of carbon pricing policies. Carbon leakage is the shifting of output/emissions shift to other states or regions where carbon pricing is lower or absent. This problem may be more acute at the state and regional level than at the national level, as it is relatively easier to shift economic activity across state/regional boundaries than across national boundaries. This may help to explain why, of the 68 carbon pricing initiatives in place in April 2022, 36 (53%) were at the national or supranational level and that the 14 highest carbon prices were also all imposed at these levels of governmental (World Bank, 2022).

⁶ The other 7 participants are Connecticut, Delaware, Maryland, New Hampshire, New Jersey, Vermont and Virginia who are not Under2 members.

Box 2: British Columbia combats carbon leakage by providing funding for industrial decarbonisation and tax relief for high performers.

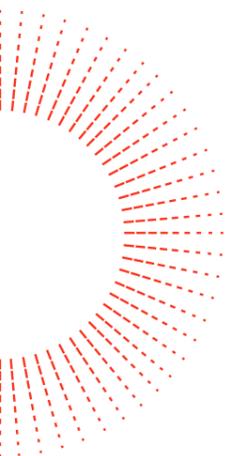
British Columbia has one of the most comprehensive carbon taxes in the world, covering 70% of provincial emissions (British Columbia, 2022). This coverage includes heavy industry, which is a big part of the province's economy. The importance of developing a carbon pricing strategy that effectively engages with, and supports the decarbonisation of, heavy industry has been crucial. This has led to two complementary initiatives.

An industrial decarbonisation fund supports businesses to reduce their emissions intensity. A portion of the revenue generated from the carbon tax is recycled into the fund which is then used to co-finance industrial decarbonisation projects with private sector partners (British Columbia, 2022). By providing this finance, the fund helps private sector partners reduce their emissions, and therefore their carbon tax bills. This means that the tax's net impact on competitiveness is reduced. The fund also has the added benefit of incentivising and accelerating innovation.

The Canadian province rewards businesses with 'world leading' emissions intensities with a lower rate (British Columbia, 2022). British Columbia increased its carbon tax rate in 2018. However, the extent to which this higher rate applied to heavy industry was mediated by the carbon intensity of installations: installations that demonstrated world-leading carbon intensities received a 100% rebate on the addition to the tax rate. 'World-leading' was defined through an extensive benchmarking exercise across sectors undertaken by the provincial government. This incentive encourages adoption of energy efficient practices and helps alleviate competitiveness concerns for these high performing firms.

Revenue neutrality plays a key role in combatting carbon leakage. The two initiatives are part of a wider strategy to offset the costs imposed by the carbon tax with tax cuts in other areas.





To respond to this challenge, some states and regions have sought to use some portion of the revenues from carbon pricing to help reduce the emissions of businesses in their state/region. Box 2 describes British Columbia's approach.

Another challenge is that carbon pricing can be disproportionately costly for low-income households. Carbon prices will lead to an increase in the price of fossil-fuel based energy. While this is part of the policy design, as higher prices encourages emission reductions, it can pose challenges as those in low-income brackets tend to spend a higher proportion of their income on fossil fuel energy. Again, states and regions have explored a number of ways to address this issue by using some of the revenue raised to support low-income programmes. British Columbia, for

example, has also been able to make its tax less regressive by allocating revenue to low-income programmes. According to the 2015-16 budget, the government allocates 1/3 of total carbon tax revenues to support individuals through tax cuts for low-income work tax cuts and property tax reductions (CPLC, 2016). Similarly, since its inception, the states which make up the RGGI have allocated a substantial portion of their revenues towards supporting low-income households through a mixture of energy bill assistance and subsidies for energy efficient retrofits (RGGI, 2022a).

In 2020, this support accounted for 13% of their total revenues. The Greenhouse Gas Reduction Fund (GGRF) capitalised by the auction revenues from California's cap and trade scheme also has a strong focus on financing projects that will particularly low-income households.



2.1.5. Areas for future support

Carbon pricing was the finance raising mechanism that received the most interest from respondents, particularly from North American members. Respondents with carbon pricing mechanisms in place were keen to compare their experiences with those of other states and regions and those that have yet to implement carbon pricing were keen to learn from leaders in the space. In addition, some respondents were interested in how the design of carbon pricing mechanisms can vary between states/regions to cover the sectors which are most relevant to that particular jurisdiction.

Managing carbon leakage was seen as a particular area of interest. How to reduce the risk of a loss of economic activity when implementing a carbon pricing mechanism is a key concern for states and regions. States and regions are keen to understand how significant this risk may be, and the effectiveness of different measures to respond to this challenge. As noted above, the nature of this challenge may be particularly acute for states and regions as economic activity may shift across state/regional boundaries more easily than it does across national borders.

Options to combat the potential impact of carbon pricing on low-income households was also brought up as an area of concern. Certain states and regions were

curious about how their peers have dealt with this issue. As mentioned above, there are a number of states and regions who have attempted to tackle this head on. Facilitating knowledge transfer both between those states with experience in the area and states who are still contemplating their carbon pricing plans could be beneficial for a number of Under2 Coalition members.

Providing a forum for states and regions to share experiences and for horizontal cooperation could help improve existing programmes and encourage wider uptake. When designing carbon pricing mechanisms there are a wide range of different options available. This is a great strength, but it also makes it difficult for states and regions to determine what version of carbon pricing is the best option for them. Sharing experiences with their peers could be of great benefit for overcoming design challenges, particularly around carbon leakage and regressivity.

European members tended to be more interested in how they could be supported in accessing revenues from national and supranational schemes. Under2 Coalition members could benefit from guidance on how they can access funds generated by schemes such as the EU ETS as well as joint working with their peers on this issues. However, as discussed in section 5 there may be scope to provide this support in some of the core work that the Coalition already does with its members.

2.2



Green bonds

2.2.1. Overview

Green bonds work in much the same way as traditional bonds except that the funds raised are earmarked for projects that deliver environmental benefits. 'Green' can include, among others, renewable energy, sustainable resource use, conservation, clean transport, and climate change adaptation, among others.

Raising finance through green bonds can benefit from a 'greenium'. A greenium is the reduction in yield that investors are willing to accept because of the green credentials of the bond, resulting from the high demand from investors to invest in these products.

Green bonds have a number of other potential benefits. One of the most tangible benefits of green bond issuance is that it creates internal incentives within

government to develop and/or structure projects in a way that makes them eligible for green bond financing. Green bond issuance also sends a signal to private sector actors about the issuer's priorities and goals which may make them more likely to invest. Finally, green bonds can broaden the issuer's investor base to include sustainability-minded investors.

2.2.2. Application in states and regions

Subnational governments in several OECD countries have the authority to issue bonds and other debt instruments, including for green investments. Bonds are common at the state level in several federal countries (Canada, the United States, Germany, Switzerland, Germany and Spain), and at the local level in some unitary countries

(New Zealand, Japan, Norway, Korea, Iceland and Sweden) (OECD, 2019). The database developed for this research discussed in Box 1 identified at least 20 instances of subnational governments issuing green bonds.

States and regions report a small 'greenium' from their green bond issuances.

Québec and Baden-Württemberg have reported receiving a greenium of around 2 basis points (0.02%) at the time of issuance.

However, respondents noted that the size of the greenium could vary over time, in either direction, depending on the dynamics of supply and demand within debt capital markets.

2.2.3. Examples of good practice

A number of Under2 Coalition members have issued green bonds consistently over a period of time. For example:

- The German state of North Rhine-Westphalia issued its ninth 'sustainability bond' in 2022, worth €3.5 billion, to finance social and environmental projects in the state (NRW, 2022). The state has issued at least one green bond every year since its first issue in 2015, with the annual amounts raised gradually increasing over time.
- In 2022, the Community of Madrid became the first public entity in Spain to list a green bond in line with the EU's principles for an environmentally sustainable economy. The €500m, 7-year bond was sold with a coupon rate of 2.822%, bringing the Community's total green bond issuance for the year to €1.5bn (Community of Madrid, 2022).
- Andalusia's Regional Climate Action Plan (PAAC 21-22) includes a measure on sustainable bonds, Measure 110_T, as part of the sustainable financing framework of the Regional Government of Andalusia (Junta de Andalucía).





2.2.4. Challenges faced by states and regions

States and regions may face restrictions on the extent to which they can make use of external financing. In some cases, the constitutional settlement requires states and regions to run a balanced budget from year to year. This is the case in Northern Ireland where the devolved administration is explicitly prohibited from any form of long-term borrowing and can only borrow to assist cashflow under very restricted circumstances (HM Treasury, 2022). In other cases, there may be restrictions that mean that states and regions can only engage in long-term borrowing, such as issuing bonds, to finance investment in infrastructure and major facilities, or they may be prohibited from borrowing to cover current expenditures. However, these partial restrictions will typically not prevent the issuance of green bonds given that the proceeds are often used to finance low-carbon infrastructure projects.

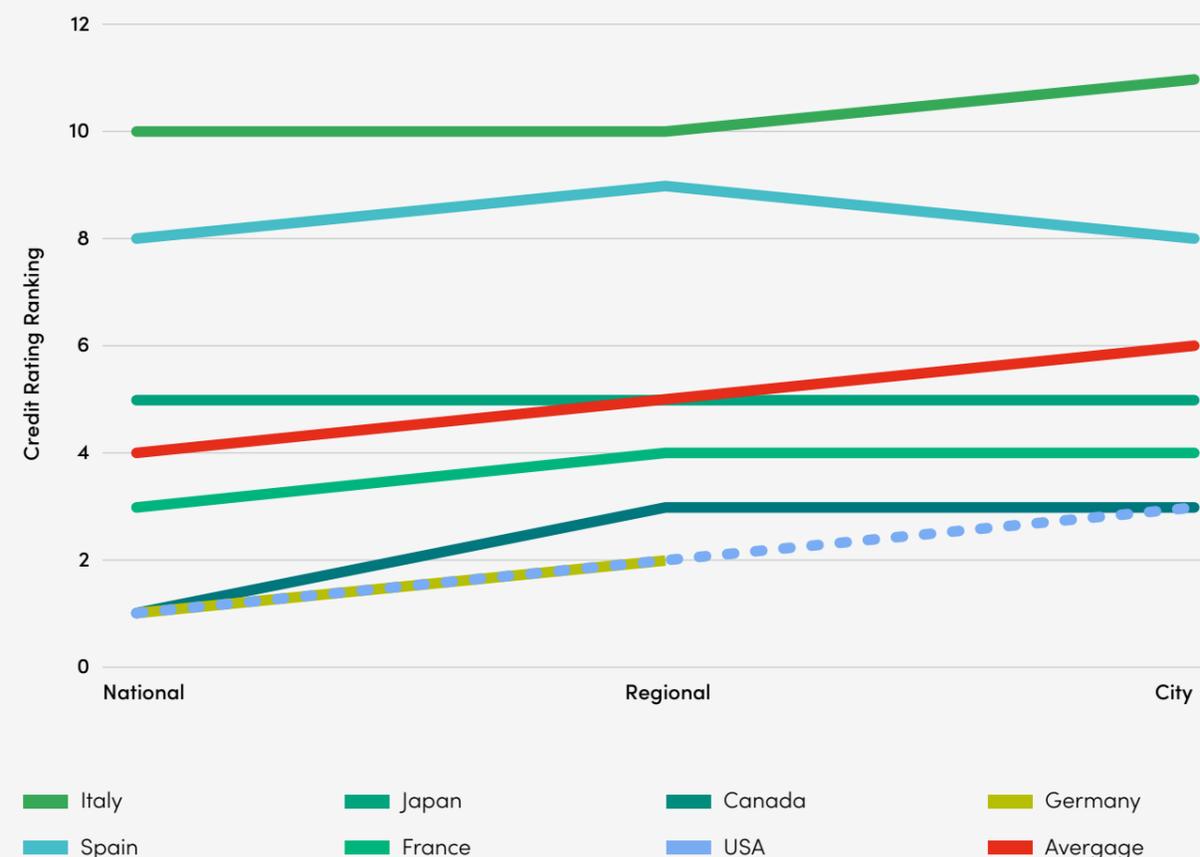
Subnational governments may face creditworthiness issues that make borrowing, including through green bonds, more expensive. Low credit ratings can make external borrowing prohibitively expensive, especially for smaller states and regions. To better understand the extent of the creditworthiness gap between national and subnational governments, we conducted research to compare national, regional and municipal credit ratings in seven major economies. Figure 3 shows that, on average, the creditworthiness of states and regions is slightly lower than that of the respective sovereign, which might typically be expected to translate into borrowing costs that are 0.2% higher (European Parliament, 2020). However, the results also show that states and regions have, on average, better credit ratings than cities/municipalities in the same country⁷.

⁷ These results should be interpreted with caution, as entities with the greatest difficulties in accessing borrowing may not have a reported credit rating.

The high fixed costs associated with bond issuance may be difficult for smaller states/regions to justify. The costs are driven by the need to certify, account for, audit and report on the use of proceeds in a far more elaborate manner than is needed for traditional bond issuances. The costs are driven by the need to certify, account for, audit and report on the use of proceeds in a far more elaborate manner than is needed for traditional bond issuances. It may only be worthwhile for well-capitalised, larger states and regions with greater investment needs and the capacity to issue larger bonds to bear these fixed costs. An additional problem for smaller states usually stems from identifying a sufficiently large amount of project expenditure, as capital markets prefer benchmark size bonds (500 million euro and higher).

Finally, states and regions may find it difficult to understand and comply with investor or regulatory guidance/requirements on the use of green bond proceeds. A number of states and regions reported that investors have different expectations about what activities (with what specific technical requirements) are eligible for green bond financing. This is partly due to differences in the content of national and regional taxonomies of green activities, such as the EU taxonomy on environmentally sustainable economic activities. In addition, some EU-based states and regions have expressed concern that the expectation (or potentially the requirement) that future issuances be aligned with the European Green Bond Standard, and thus the EU taxonomy on environmentally sustainable economic activities, could make it more difficult to issue green bonds. They are concerned that it could be burdensome to collect all the technical data required to demonstrate this alignment. There is also concern that “green activities” that make sense and contribute to environmental targets cannot be included anymore, because they are not deemed to be an “economic activity”. One example of this is awareness campaign expenditure.

Figure 3 The credit rating of states and regions is typically worse than that of sovereigns, but better than that of cities – although this can vary.



Notes: Letter credit ratings are converted into a numerical scale where 1 is the best (Aaa or AAA) and 21 is the worst (C). No city level credit ratings were reported for Germany.

Sources: California State Treasurer (2022), Fitch Ratings (2022) & Moody's (2022)

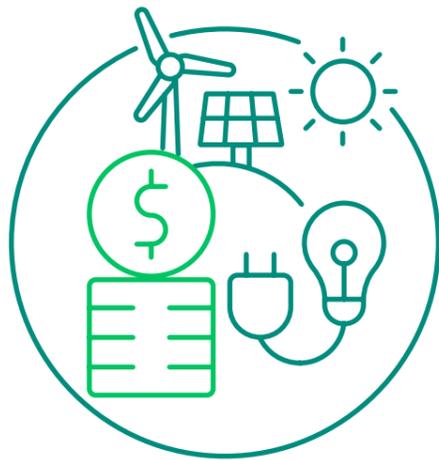
2.2.5. Areas for future support

Support in this area could take the shape of a forum where leading states and regions can share their experiences with aspiring bond issuers.

A number of states and regions expressed interest in sharing experiences and lessons learned on green bond issuance. There was particular interest in learning more about the practical challenges in issuance – such as how to identify and prepare projects or how to understand regulatory requirements and investor expectations in different markets.

Some EU-based states and regions indicated that they would appreciate support in navigating the European Green Bond Standard. Again, the focus was on understanding the practical implications of the standard, such as how states and regions can best go about collecting technical data on potential projects.

2.3



National funding mechanisms

2.3.1. Overview

All states and regions can use national funding for climate financing. In many cases, it is up to states and regions to decide how much of their total central government funding to allocate to climate mitigation⁸. However, as discussed in section 2.1, our focus is on those revenue raising measures that are either directly focused on climate activities or that help to incentivise emission reductions. This leads to a focus on national climate funds and ecological fiscal transfers.

National climate funds provide grants that either fully finance, or co-finance, climate-related projects and programmes. They are a way for national governments to earmark amounts of national finance for climate related projects at the regional level, allowing regional/state governments to develop proposals on how best to use the funds to achieve their climate goals.

⁸ The use of unearmarked funding for climate change is likely to be particularly important for those subnational governments that are limited in their ability to levy taxes. For example, in The Netherlands and Austria, where less than 25% of subnational government revenue comes from taxes, tariffs and fees, states and regions are heavily reliant on national transfers to fund all of their activities, including climate programming (OECD, 2019).

Ecological fiscal transfers (EFTs) transfer public revenue between national governments and subnational governments based on ecological indicators such as the percentage of protected areas or the percentage of forest cover. The transfers can both help ensure that transfers are commensurate with the costs that subnational governments incur in relation to the targeted activities and can encourage greater activity. Most EFTs to date have focused on ecosystem conservation but there is little in principle that would prevent the use of other indicators, including those related solely to GHG emissions.

2.3.2. Examples of good practices

All members of the Under2 Coalition will benefit from national transfers in some way or another, but examples of national climate funds are less common. Two of the most prominent examples are in Germany and Canada.

Germany's National Climate Initiative (NKI) has enabled German Länder to access large amounts of climate finance. The fund is the main source of funding for co-financing agreements between the federal government, the Länder and municipalities.





Between 2008 and 2017, the NKI invested EUR 790 million in 25,000 projects and catalysed total investment of around EUR 2.5 billion (OECD, 2019). The activities funded by NKI funds are aligned with existing programmes and cover a range of sectors, including transport, energy and sanitation services (BMUB, 2014).

Canada’s Low Carbon Economy Fund also provides significant climate finance to its provinces and territories. The Canadian Ministry of Environment and Climate Change launched the fund in June 2017 and it has become the federal government’s primary vehicle for implementing the Pan-

Canadian Framework on Clean Growth and Climate Change at the provincial and territorial levels (Government of Canada, 2022). The Fund provides a total of 2.2 billion CAD over the 7-year period between 2022/23 and 2030 to help provinces and territories that have adopted the Framework to implement their commitments.

In terms of EFTs, the Indian states of Punjab and Tripura are currently benefiting from an EFT from the national to the state level. In 2015, the country’s Finance Commission mandated that 7.5% (adjusted to 10% in 2020) of total fiscal

transfers between the Union and the states would be made on the basis of the percentage of their land area which is covered by areas of high- or moderate-density forest. The funds are not tied to state forestry budgets and can be used for any purpose, at the discretion of the state government. The success of the programme in increasing forest cover is not yet evident in correlational studies, but some of the lack of impact has been attributed to a lack of clarity on how progress is measured (Busch, 2019). Most other EFTs take place between the national and municipality levels. For example, in Portugal, municipalities receive transfers in part according to the percentage of their territory which is under nature protection. The programme has been considered a success as its introduction was found to have increased the number of regional and local-level protected areas (Busch et al., 2021). France introduced a similar scheme in 2007 and other European countries (such as Germany and Poland) have discussed the introduction of similar transfers.

2.3.3. Challenges faced by states and regions

Both climate funds and EFTs require the approval of the national government, so they’re not actions that states or regions can take unilaterally. In addition, they generally require the national climate agenda to be aligned with the state or regional government’s climate agenda in order for the latter’s desired projects or programmes to be approved.

Reliance on the national government can make it difficult to rely on funding over the long term. Long-term planning relies on consistent revenue streams, so if control of funds is ultimately at the national level, states and regions may find it difficult to commit to larger projects with longer time horizons.

Careful design is needed to ensure that EFTs do not create perverse incentives. In India, the transfer was based on the historical value of the percentage of land area covered by high or medium density forest. The scheme did not explicitly state that this value would be updated over time. This reduced the incentive for countries to increase their conservation efforts over time. Furthermore, in cases where forest cover is used as a basis for transfer, the type of forest cover that meets the criteria needs to be specified to avoid incentivising the replacement of mature and dense forest cover with newly planted forest cover with lower carbon sequestration and biodiversity benefits.

2.3.4. Areas for future support

Some states and regions expressed an interest in receiving support to develop skills and partnerships to help them prepare better funding bids. For example, US states are currently developing their strategy for the newly created US Greenhouse Gas Reduction Fund, which was part of the 2022 Inflation Reduction Act (IRA). The fund is expected to provide \$7 billion in loan financing explicitly earmarked for use by US states.

Some of this support is already being delivered through the core activities of the Under2 Coalition. For instance, the Green Recovery Alliance, a partnership between Climate Group, as Secretariat of the Under2 Coalition, and The Center for Climate Strategies is helping guide US subnational governments to target and acquire federal funding, including through the Infrastructure Investment and Jobs Act (IIJA) and the IRA. States and regions in the EU have expressed a similar interest in the Under2 Coalition Secretariat coordinating cooperation between states and regions to support bids for funds made available through the auctioning of EU ETS allowances.



2.4



Other environmental taxes and fees⁹

2.4.1. Overview

Other environmental taxes and fees are levied on environmentally damaging activities but based on factors other than the quantity of GHGs that they generate. They all aim to discourage activities that damage the environment and which are also associated with GHG emissions and/or which can make the economy less resilient to climate change. The most common of these taxes/fees can be grouped into four categories:

- Energy (energy excise taxes that are not proportional to carbon content)
- Transport (car sales/registration taxes and annual vehicle circulation taxes)
- Pollution (including waste taxes and taxes on the use of pesticides and/or fertilisers)
- Water (abstraction fees/charges)

2.4.2. Application to states and regions

In contrast to carbon pricing initiatives, taxation in some of these areas (notably waste and water) is dominated by subnational governments. The widespread use of these tools at the state and regional level is exemplified by the fact that there are 29 regional environmental taxes and fees in Spain alone whereas we could only identify 5 examples of state or regional carbon taxes in any European or North American countries (see Table 1).

The attraction of these instruments is that they combine the potential to raise revenue with the creation of incentives for sustainable practices. In some states and regions with limited revenue raising powers, they may be one of the few ways in

which the state or region can raise revenue in a way that supports climate action. There are also a range of different options giving states and regions the flexibility to design approaches suitable to their needs.

2.4.3. Examples of good practices

Many Under2 Coalition members have been able to raise revenue through environmental taxes and fees.

For example:

- Northern Ireland was able to generate £2.7 million pounds in 2021 through a 5p per bag carrier bag levy. This rate increased to 25p per bag in 2022. Revenue from the levy is used to directly fund the province's Environmental Fund.
- Catalonia illustrates how an ensemble of environmental taxes and fees can generate significant revenues. In 2021, its four environmental taxes (excluding its carbon tax) generated a combined total of just under €320 million in revenue, equivalent to 0.14% of regional GDP (Spanish Ministry of Finance, 2022). The taxes cover air pollution, waste disposal and the environmental damage associated with electricity transmission and large commercial facilities (like shopping centres and retail parks).
- Andalucía developed Measure 112_T "Actions to promote green public procurement" (PAAC 21-22) in order to draft technical instructions and requirements for the inclusion of Green Criteria in public procurement processes. Andalusia regional Law 18/2003 also defines four specific ecological taxes (Impuestos Ecológicos Andalucía) for gas emissions, coastal water discharges, radioactive waste and hazardous waste.

2.4.4. Challenges faced by states and regions

In some countries, these taxes are mainly implemented at the national or municipal level rather than at the state and regional level. Where they are implemented at the national level, it's only at the discretion of the national government that their revenues are passed down to the subnational level. There may be scope for state and regional governments to add taxes to those levied by the national or city/local government, but this is not always the case.

The tax base is usually quite modest. As Figure 2 shows, other environmental taxes and fees generate, on average, the lowest revenues of the instruments examined (standardised for GDP). The specificity of the taxes means that the maximum coverage of the tax is relatively small. Correspondingly, the environmental impact of each individual tax and fee is also generally quite small.

2.4.5. Areas for future support

Some respondents expressed an interest in understanding how environmental taxation can be used to help reduce GHG emissions in more challenging sectors such as agriculture. We discuss this further in section 4.

A narrow focus on environmental taxes and fees may have a relatively small impact. While there is certainly scope to support the small subsection of severely fiscally constrained states and regions to make the most of the limited tools at their disposal, for most states and regions, these taxes will represent a small part of their potential to raise revenue in a way that is linked to climate mitigation.

⁹ Fees differ from taxes because they are associated with a service being directly provided in exchange for the payment.



3.0

Using climate finance

In this section we explore the successes and challenges faced by states and regions when spending public funds in a way that supports net zero goals. The ability to raise or access additional resources in a way that is consistent with emission reduction objectives will become much more useful if these resources can be spent wisely. In this context, we examine three key issues:

- First, we consider the overarching way in which budgeting tools and public financial management practice can be used to meet low-carbon and other environmental objectives (typically referred to as green budgeting).
- Second, we look specifically at the issue of how public budgets can be used to support the design and financing

of low low-carbon infrastructure and investment projects. These are a critical element within the budget of most states and regions and meeting net zero goals will require a fundamental shift in the nature of the investment and infrastructure designed and financed by states and regions.

- Third, states and regions can also procure goods and services in a way that supports climate action. This can be applied to the material inputs used for infrastructure projects, such as concrete and steel, thereby complementing efforts to develop infrastructure that supports the low-carbon transition. Changes in procurement practice to support climate goals can also shape the current/resource budgets of state and regional governments.

3.1



Using public budgets to support low emissions growth

3.1.1. Introduction

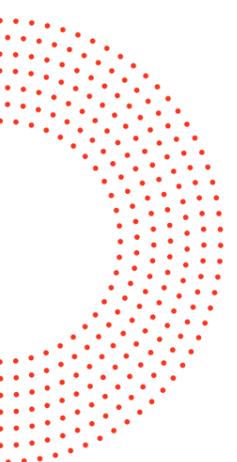
Green budgeting is an increasingly popular practice which involves using the tools and systems of budgetary policymaking – and public financial management – to inform, assess and deliver on green objectives. The OECD identifies that a robust green budgeting approach should consist of (OECD, 2021):

- A robust strategic framework for green budgeting, consisting of an overarching climate strategy, a clear legal/political commitment to green budgeting and clarity about the organisation(s) responsible for green budgeting
 - The selection and use of a range of specific tools to implement green budgeting
 - A commitment to publish the results of green budgeting
- Public organisations can use a number of tools within a green budgeting approach:
- Climate budget tagging – identifying those budget expenditures (and tax expenditures) that support climate goals;
 - Climate perspective in performance setting – requiring a certain proportion of performance measures within the budget to be linked to climate goals;
 - GHG assessments of the budget – providing an understanding of the overall impact of a budget on emissions;
 - Climate fiscal sustainability analysis – ensuring a comprehensive approach to risk management;
 - Natural capital accounting – demonstrating the value of a state or region’s natural assets to promote their better management.

Climate budget tagging is the tool most commonly associated with green budgeting. It involves identifying (or ‘tagging’) those expenditures and/or tax revenues that support a jurisdiction’s climate and/or environmental objectives, and then monitoring or tracking them in the future. It can cover both investment and operating/current spending. This makes it possible to assess whether these resource flows are in line with the agreed strategic objectives, and to track trends and progress towards objectives over time.

Green budgeting has a number of benefits. Most importantly, it helps to identify how public authorities can change their budgetary approaches to make it more likely that climate and environment goals can be achieved as efficiently and effectively as possible. In addition, green budgeting, and the subsequent publication of the results, can help increase public and political awareness of climate action, thereby catalysing action by a wider range of stakeholders. Thirdly, it can generate valuable information that can be used for complementary purposes. For example, at the national level, Ireland’s green budgeting framework has supported the process of managing the proceeds of its green bond issuance (Cremins and Kevany, 2018).





3.1.2. Application for states and regions

To date, green budgeting has been dominated at the national level. In 2020, over 40% of OECD nations were implementing some form of green budgeting, but only just over 20% of the implementing countries were also implementing the practice at the subnational level (OECD, 2021).

However, there is growing interest at how these approaches can be applied at the subnational level, including for states and regions. This is reflected, for instance, by the launch of the OECD's Subnational Government Climate Finance Hub which includes guidelines, case studies and a self-assessment tool on green budgeting (OECD, n.d.).

3.1.3. Examples of good practices

Some members of the Under2 Coalition are already adopting some green budgeting practices:

- Northern Ireland is developing a 'Green Growth Test' that requires all new funding proposals and policies to explain how they contribute to emissions reduction targets;
- In Andalucía, annual budgets are accompanied with annual reports on the prevalence of green finance in the budget and also, crucially, on how the budget is expected to impact on environmental indicators (Junta de Andalucía, 2021);
- In British Columbia, both the budget and the fiscal plan include technical details as well as a high-level summary of climate spending;
- In North Rhine-Westphalia and Baden-Württemberg there have been political commitments to implement a climate check which would assess funding programmes to ensure they are in line with climate goals and North Rhine-Westphalia will introduce climate budget tagging. At the time of writing, the details of these plans are still being worked out.

3.1.4. Challenges faced by states and regions

Despite the potential value of climate budget tagging and other green budgeting tools, there are a number of challenges generally associated with their implementation. Respondents recognised four particular challenges that can accompany green budgeting.

First, there is a risk of greenwashing.

Respondents recognised that without robust processes in place, there could be strong pressure to inflate the climate relevance of the budget which could undermine support for climate-related measures in the medium term. This may be particularly relevant for those budget expenditures that are not justified because they support climate action, but which nonetheless may have some climate benefits, as well as to the treatment of expenditures that reduce emissions but not at a pace and scale commensurate with the targets set by states and regions.

Secondly, focusing exclusively on the size of the climate budget could be misleading. By focusing solely on the size of the budget, this could easily lead to an expectation that larger allocations are always preferable which ignores the outputs and outcomes delivered by the spend and hence its cost effectiveness.

Thirdly, green budgeting could lead to an inappropriate re-allocation of funds away from other priorities. If certain elements of the budget are prioritised, this could lead to other elements, for example education spending, being deprioritised and potentially cut. It was recognised by some interviewees that finding the balance between incentivising green spending without inappropriately disrupting funding for other priorities could be both technically and politically challenging.

Finally, interviewees acknowledged that green budgeting requires significant resources and technical capacity which may not be available to all state and regional governments. This partly reflects general human resource challenges in some states and regions. But it also reflects the fact that green budgeting requires a combination of financial and climate/environmental policy expertise that may not be easy to co-ordinate.

3.1.5. Areas for future support

There is strong interest among many (but not all) of the states and regions interviewed in further work on green budgeting by the Under2 Coalition.

In fact, more members identified this topic as a area of future interest for work than any other. They want to understand how other states and regions, as well as other public bodies, have overcome the challenges faced when implementing green budgeting. This broad interest reflects both the growing international interest in green budgeting and the fact that all states and regions are responsible for developing budgets. This contrasts with a number of the other issues related to climate finance (for example, scope to use carbon pricing to raise climate finance) where the relevance depends on the jurisdiction of individual states and region.

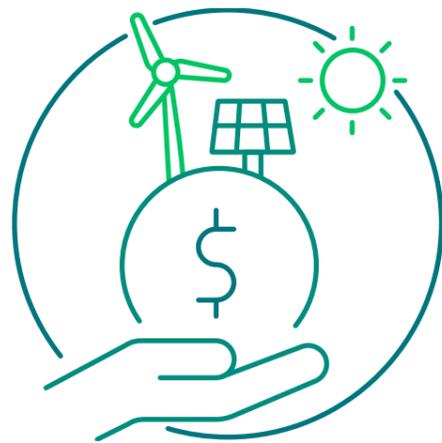
A number of other states and regions expressed interest in the specific aspects of green budgeting and climate budget tagging which could be areas for future support. Representatives from Hawai'i, for example, felt that a tagging process that allowed for assessing how budget negotiations led to changes in the proportion of the budget allocated to climate goals could be very valuable during the budget negotiation process. Similarly, stakeholders in Northern Ireland felt that the ability for politicians to communicate their climate commitments would be welcome.

Further support could help to explore possible solutions to key the concerns identified. For example, taxonomies and clear scoring methodologies, supported by robust implementation processes, should help to reduce the risk of greenwashing. In addition, a number of more sophisticated approaches to climate budget tagging can help to align it with other policy objectives.

It may be preferable to have a broad scope – looking at green budgeting as a whole – rather than a narrow focus on climate budget tagging. This could help to broaden the appeal of future work and ensure that the perspectives of those states and regions that have experience with green budgeting beyond climate budget tagging can be fully included. A broader perspective that considers a range of green budgeting tools could also help address concerns that climate budget tagging focuses too narrowly on financial inputs and does not sufficiently focus on the effectiveness of the spending.

A number of initiatives already provide guidance and support on green budgeting. The OECD, through its Subnational Government Climate Finance Hub, and CDP, through its States and Regions Climate Tracker are two such examples. Although, none of the interviewees identified these institutions and resources during the interviews, future support would need to take these into account to avoid unnecessary duplication.

3.2



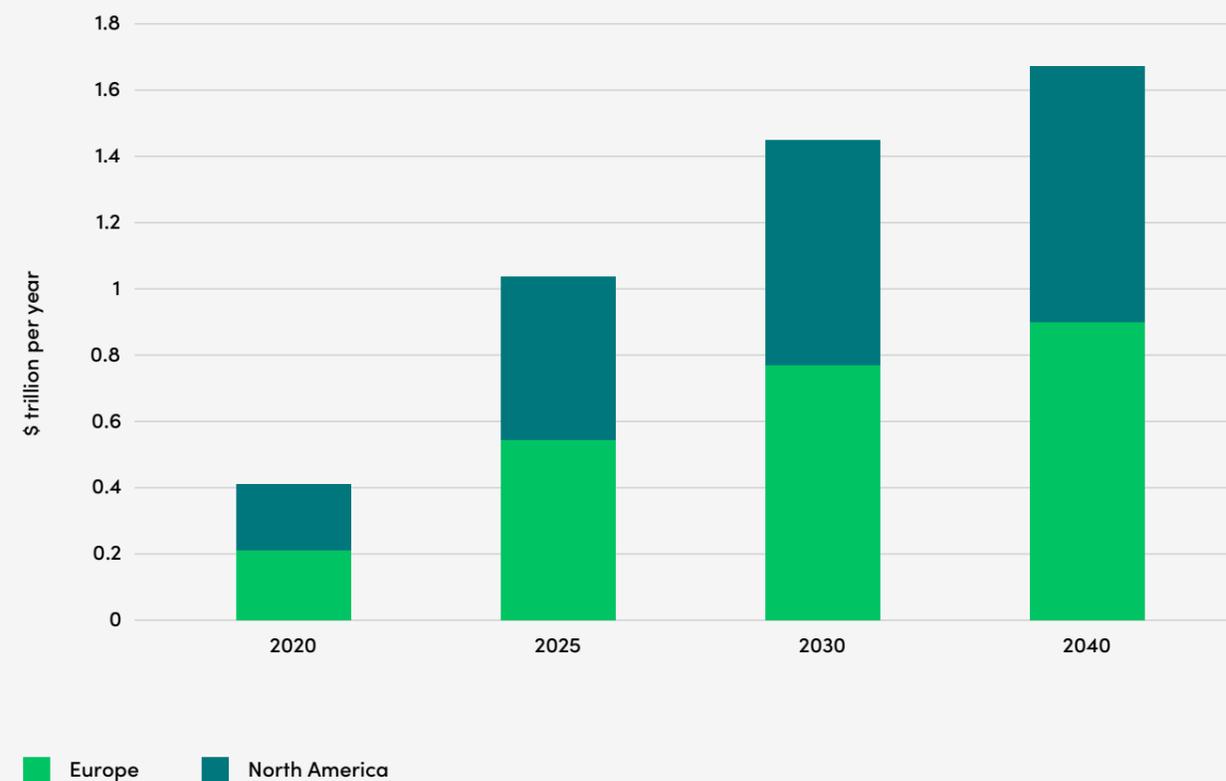
Designing and financing low-carbon investment projects

3.2.1. Introduction

Reducing emissions is capital intensive. Achieving net zero requires a complete transformation of our energy system and in the way that we use and manage land. It will often require replacing high-carbon assets with high running costs (coal- and gas-fired power stations) with assets that have much lower running costs but higher capital costs (renewable power and energy

efficiency). Figure 4 provides an estimate of the capital investment that may be needed in Europe and North America across 6 key sectors. It shows that total annual investment in Europe and North America may need to increase four-fold over the period between 2020 and 2040, from \$0.4 trillion in 2020 to \$1.6 trillion in 2040.

Figure 4 Low-carbon investment in Europe and North America must quadruple to meet net zero goals



Source: (Race to Zero, n.d.)

3.2.2. Application in states and regions

The direct role of states and regions in designing and financing these investments will vary according to geography and jurisdiction, but in all cases a significant scale-up will be required. To date, there has been no quantitative examination of

the likely contribution of state and regional budgets to this scaling up in investment. However, the scale of the challenge and the importance of the role currently played by states and regions¹⁰, means they will inevitably be crucial actors.

¹⁰ As noted in the introduction, In a study sampling 27 OECD countries across 2000–2016, subnational governments were responsible for 64% of this spending. Subnational governments play a significant role in public investment, contributing over 50% of public investment in the OECD (OECD et al., 2018).

Box 3: Hawaii'i uses the C-PACE Model to de-risk investment in energy efficiency or renewable energy improvements for commercial properties.

In 2022, Hawaii'i became the 40th US state to authorise the C-PACE model. The state's Green Infrastructure Authority (HGIA) intends to use to model to increase investment in energy efficiency improvements, small-scale renewable energy and water conservation (State of Hawaii'i, 2022).

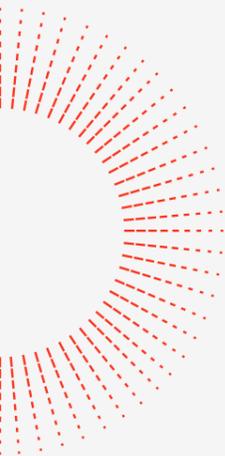
The C-PACE mechanism works as a loan. The Green Infrastructure Authority provides property owners with a portion of the upfront capital to fund their energy efficiency or renewable energy property improvements which can then be paid back through higher taxes or charges on the property in the future – usually for a 20-to-30-year period. However, the property owner should see year-on-year benefits with either the energy cost savings or the revenues from the sale of renewable energy exceeding any additional property charges in each year.

The mechanism de-risks the investment.

The model achieves this through two mechanisms. Firstly, as part of the conditions of the loan, the investor is given a senior lien on the property which means that they will be repaid before other debt holders. Secondly, the repayments are collected on the property owner's tax bill which further decreases the risk of non-payment. This security allows lenders to offer better interest rates and longer repayment terms than are otherwise available and thus makes finance cheaper for property owners. A further benefit is that any future transfer of ownership of the property does not have a material impact on the financing arrangements, which are linked to the property rather than any particular owner. However, while the C-PACE model has been popular in many US states, some report that using property taxes to repay loans can be associated with high transaction costs, especially when the scheme is extended to residential properties. As a consequence, some states, such as California, are exploring a model where repayments are made through energy bills.

The C-PACE programme is part of a wider energy efficiency and clean energy agenda funded by the HGIA.

The HGIA was capitalised using a \$150 million green bond in 2014 to make clean energy investments accessible and affordable to Hawaii's residents (CFGF, 2022). Since 2014, the HGIA has been providing loan finance of various forms to Hawaiian homeowners and small businesses to incentivise their investment in clean energy. Channelling climate funding through a dedicated green financial authority like the HGIA allows the funds to be ringfenced for specific uses, such as investment in energy efficiency or clean energy, and to be administered by an agency with specialist expertise in climate finance.



Depending on the geographical context, states and regions can play different roles:

- Designing and then financing specific investment projects using their own balance sheet;
- Taking responsibility for some or all of the design of investment projects but handing over some or all of the financing responsibility to the private sector, either through blended finance or public-private partnerships (PPPs)¹¹, potentially harnessing dedicated financing institutions such as green banks or green funds;
- Creating a favourable policy, regulatory and enabling environment to facilitate private sector investment. (This is discussed separately in section 4).

3.2.3. Examples of good practices

Under2 Coalition members are already adapting their investment project development processes in order to support the design and selection of net zero-aligned projects. For example:

- Baden-Württemberg recently announced its intention to use a shadow carbon price when assessing investment options. This involves calculating and valuing the emissions impacts associated with investment projects. Projects that increase emissions are perceived as more costly, while projects that reduce in emissions are perceived as more beneficial. This is an effective way to compare a project's GHG impacts with its economic and social impacts¹²

- When developing new public projects, sponsors in British Columbia are required to identify the additional environmental benefits that can be secured if the budget is increased. The Treasury Board can then make an informed decision on whether to pursue the option with the higher environmental benefits.

Under2 Coalition members are also using a number of innovative financing models to support climate investments:

- In Québec, the REM light rail system was developed by the Caisse de Dépôt et Placement du Québec, a public pension fund, with the province then taking an equity stake in the project;
- Hawaii's Green Infrastructure Authority is successfully using the C-PACE financing model, implemented through a dedicated green financing authority, to finance energy efficiency and renewable energy investments in the state (see Box 3 for more detail).

3.2.4. Challenges faced by states and regions

Some states and regions find it difficult to carry out the detailed technical feasibility studies needed to implement green investment projects. This problem is particularly acute for those low-carbon investment projects that rely on relatively new and fast developing technologies such as Internet of Things technologies to improve energy efficiency and/or facilitate the integration of intermittent renewables technologies on to the grid (Martinez-Vazquez, 2021).

¹¹ A range of definitions for PPPs are available. We define PPPs as a financing model where a contract is agreed between a government and private capital providers (typically selected through a competitive bidding process) that requires private investors to finance an investment with revenues then provided from taxpayers or users over the course of the asset's lifetime. This typically involves the government swapping a large upfront financing need with a series of ongoing payments to the contractor. This contrasts with a blended finance model where both government and private investors provide the upfront financing for the investment, typically with the government offering preferential or concessional terms in order to make the investment more financially attractive (higher returns and/or lower risk) to the private investors.

¹² Smith and Braathen (2015).



In states and regions with a strong focus on the use of public funds, a key challenge is how to reconcile the multi-year timelines of many low-carbon investment projects with the annual budgeting process. These states and regions saw little need to supplement public financing with private capital and are concerned that this could increase overall financing costs. However, there are challenges around accounting rules. In British Columbia, for example, there is a requirement to balance the books at the end of each fiscal year with no under- or over-spend. This can be difficult to achieve when financing multi-year infrastructure projects where some flexibility between spending in different years of the construction phase is very valuable. A related issue, specific to the German Länder, is whether and how low-carbon investments should be considered in the context of the national ‘debt brake’ rules.

In other states and regions, there is a greater emphasis on spending public money to help secure private capital to finance projects for which the public sector retains responsibility. State and regional governments are often important key players in national efforts to attract private finance to infrastructure. For example, in Germany, subnational PPPs constitute approximately 80% of PPP investment in the country. Prior research has shown that the complexity of PPPs and the skills required to implement them can raise issues regarding administrative capacity and accountability within subnational governments (OECD, 2019). Respondents for this work also noted that it can sometimes be difficult to ensure that the pipeline of PPP projects is sufficiently focused on low-carbon investment opportunities.



Recent studies argue that a number of other technological developments will help accelerate the low-carbon transition in the near future including green hydrogen and solutions that harness the power of Artificial Intelligence (Stern and Romani, 2023). While this will support the overall low-carbon transition, it may expose further technical challenges in some states and regions.

The technical development of cross-border projects is a particular challenge. States and regions in Europe reported that differences in rules and regulations between countries, such as detailed technical codes for infrastructure, can make it difficult to implement these projects. Northern Ireland noted it is particularly

interested in opportunities for inter-regional project collaboration. Similarly in Canada, some states and regions considered that a lack of inter-provincial collaboration can hinder the development of infrastructure projects.

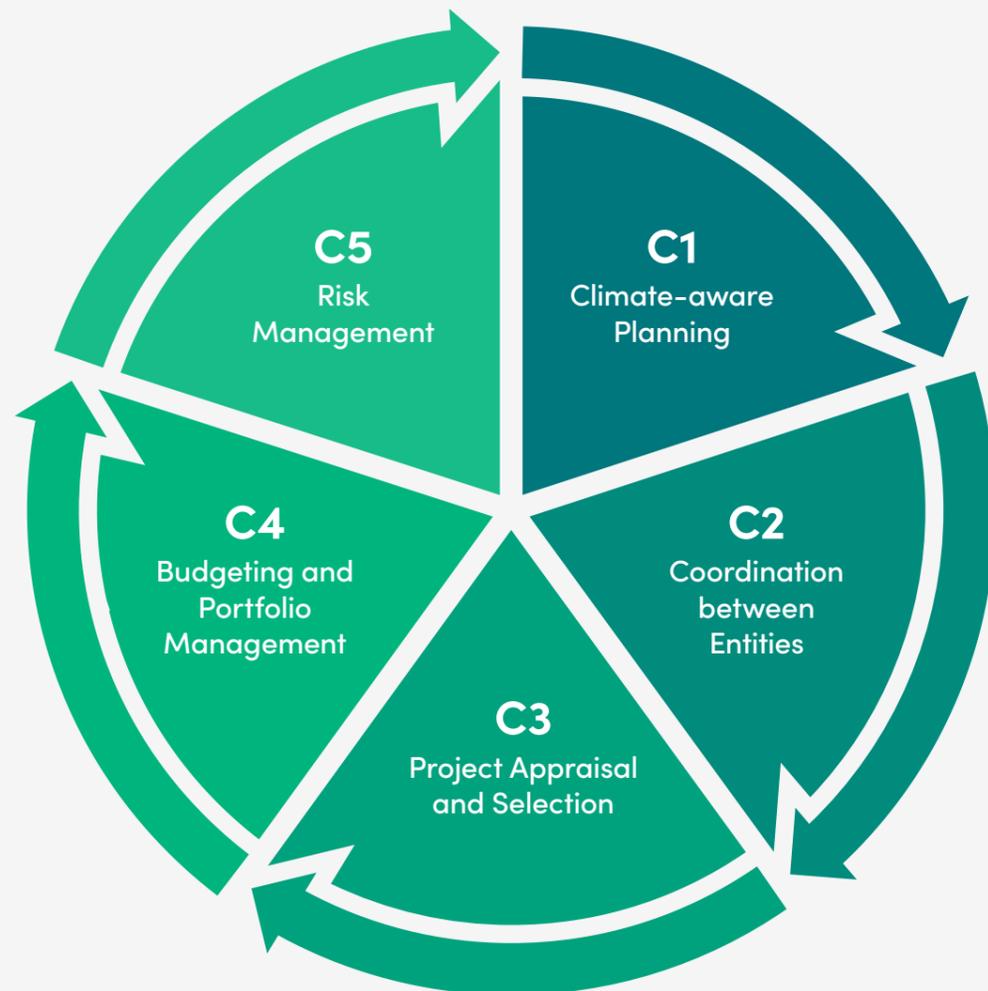
A complementary challenge relates to the development of financing models for specific low-carbon investment projects, but the nature of this challenge varies across states and regions.

Different states and regions placed different emphasis on the extent to which they seek to engage private capital in projects that are traditionally the responsibility of the public sector.¹³

¹³ The public sector’s responsibility for low-carbon investment varies significantly between jurisdictions. In many countries, public transport infrastructure is considered a responsibility of the public sector. Practice in relation to the power sector is more varied: in some countries, like the UK, the sector is privatized with little role for the public sector (either at the national or state and regional level). In other countries, such as the Netherlands, public sector responsibility dominates, especially in relation to transmission and/or distribution. The focus in this section is on sectors where the public sector at the state and regional level retains responsibility for the services i.e. the sector is not fully privatized, but where there may still be an attempt to use the private sector for financing.



Figure 5: The IMF's C-PIMA tool explores the ability to manage climate related infrastructure across five dimensions.



Source: (International Monetary Fund, n.d.)

The possibility of using public funding to attract institutional investors – especially state and regional pensions funds and similar organisations – is seen by some stakeholders as worthy of further exploration. As the Québec case discussed above shows, there are some isolated examples of state and regional governments co-investing with regional pension funds. However, in many contexts, the potential for this complementary source of financing has not yet been fully explored.

Subnational public and union pension funds manage over \$9.5 trillion in assets globally and so attracting even a small portion of this investment would represent a significant opportunity (Solomon & Pinko, 2022). One interviewee suggested that a key problem is that both investors, and wider political stakeholders, are not convinced that investing in regional climate projects offer sufficient/superior risk-adjusted returns.

3.2.5. Areas for future support

All states and regions should have a common interest in improving public investment management processes to develop an adequate pipeline of well-prepared (intra-regional) projects. In this regard, there may be opportunities to explore how emerging frameworks for improving infrastructure planning and management at the national level may also be relevant at the state and regional level. For example, the International Monetary Fund (IMF) has recently developed its Climate Public Investment Management Assessment (C-PIMA) tool. As shown in Figure 5, this has been designed to help national governments identify potential improvements in public investment institutions and processes across five

dimensions to build low-carbon and climate-resilient infrastructure. This may be a useful starting point for exploring similar issues among state and regional governments, although respondents did not raise this as a particularly salient issue.

Some states and regions are keen to strengthen relationships with their neighbours to support cross-border project development, but this requires innovative programme design to make it relevant to a wide range of Coalition members. For example, some European members would value opportunities to work with other European members to support cross-border project development. Some Canadian members would also value the opportunity to work with their Canadian peers. However, it is a challenge to make this type of work relevant to all members.



3.3



Procurement

3.3.1. Introduction

Public procurement represents a powerful tool to shape climate outcomes. It is estimated that government expenditure on works, goods and services represents around 14% of the GDP within the EU, with a significant proportion of this expenditure directed towards products from sectors from hard to abate industrial sectors such as cement and steel (Hasanbeigi et al., 2021).

There are two ways governments can use their purchasing power to contribute to mitigation. This can be done in two complementary ways:

- Procurement rules can be changed to give greater weight to the climate/environmental performance of the goods and services being purchased, and of their suppliers. This often involves

adopting costing methodologies so that they better take into account cost implications over the whole lifecycle. For example, many low-carbon options, such as the purchase of electric vehicles or the retrofitting of public buildings, require additional upfront costs, but generate cost savings in the medium term. Public authorities will only recognise these benefits if life-cycle costing methodologies are in place. This approach can be complemented by changing tendering conditions and criteria to place greater emphasis on the environmental sustainability/ climate performance of suppliers.

- Second, public authorities, states and regions can use procurement as a strategic tool, to help bring new low-carbon technologies to market by providing a guaranteed demand.



There is growing global interest in exploring how procurement policy can support climate and other goals, in other words, green procurement. For example, the Clean Energy Ministerial's Industrial Deep Decarbonization Initiative has developed Green Public Procurement guidelines to help governments set ambitious targets for buying near carbon zero products for building roads, bridges, schools and hospitals among others (Clean Energy Ministerial, 2022). There are also an increasing number of material-specific initiatives. For instance, Climate Group's SteelZero commitment framework provides a clear foundation for all consumers, including public entities, to procure and specify responsibly produced steel within near-term 2030 and end-state 2050 targets.

3.3.2. Application in states and regions

The extent of green public procurement is undertaken at the state and regional level varies by country, but in some countries it is much more important than at the national level. A study for the European Commission looking at procurement practices in 10 EU member states found that 43% of the identified green public procurement procedures were undertaken by regional or local authorities (41% by value). This is notably higher than the equivalent values for national authorities (8% by number and 26% by value)¹⁴. In some countries, such as Spain, the role of subnational governments is particularly pronounced where 54% of green public procurement procedures are led by regional and local contracting authorities (Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, 2017).

¹⁴ The balance comprises 'body governed by public law', 'utility sector' and 'other'.



3.3.3. Examples of good practice

There are already examples of Under2 Coalition members using procurement to support their low-carbon goals:

- Northern Ireland, through its draft Green Growth Strategy has set out its commitments to ensure that Green Growth is central to budgetary decisions through the introduction of a Green Growth Test and through ensuring a Green Growth aligned procurement strategy for all Government spend.
- Lombardy developed an action plan for green procurement in 2020. This has now been updated to further integrate environmental criteria at each phase of the public procurement process. Key components of the new action plan are improved governance of the topic at regional level and increased networking and learning opportunities among local authorities to ensure that the criteria can be effectively implemented across all departments and localities.
- Hawai'i has supported the development of a market for low-carbon concrete by mandating its use in the construction of new public buildings. It has also supported the uptake of electric vehicles (EVs) through innovative contracting arrangements. Its EV as a service contract allows state and county agencies to procure EVs and charging infrastructure on a per mile cost basis. Basing the decision on per mile costs allows public agencies to justify what can be higher upfront costs for EVs when compared to internal combustion engine alternatives (State of Hawai'i, 2021).
- California's Buy Clean California Act targets reductions in the GHGs released during the manufacture and transport of products used in public infrastructure projects. It requires suppliers of certain products to demonstrate that the global-warming potential of their material or product is less than or equal to pre-determined threshold values. Coverage includes carbon steel rebar, structural steel, flat glass, and mineral wool board insulation (University of California, n.d.).

- Baden-Württemberg has recently updated its budget law (§ 7 Landeshaushaltsordnung) which now makes an explicit reference to sustainability aspects as a part of any cost-benefit-analysis. This should give further assurance for sustainable procurement.

3.3.4. Challenges faced by states and region

A number of barriers prevent states and regions from using procurement as a lever to drive emissions reductions.

Limited technical capacity and low availability of resources. Developing and implementing life-cycle costing models and then ensuring their rigorous application in procurement decisions requires a sufficient number of highly skilled staff. Similarly, assessing a supplier's 'greenness/climate credentials' requires specific technical skills. A particular challenge is to ensure that changes in procurement approach are sustainable. Applying a revised procurement approach can be time-consuming and resource intensive. Some respondents expressed concern that even when new procurement rules are introduced, a lack of training and human resources will lead procurement teams to revert to using simpler approaches to decision-making.

Perceived legal constraints. Some respondents noted perceived legal barriers that might limit the potential of this lever.

Perceived cost. Even when life-cycle costing can demonstrate that low-carbon options offer better value for money in the long-term, procuring low-carbon options can be politically challenging. For example, one state reported that its procurement of electric vehicles within its fleet led to some political backlash as they were perceived to be too costly.

Limited political appetite for procurement reform. Some respondents express concern that political leaders may not be interested in their civil servants exploring procurement reform. This is partly because it may be perceived as too technocratic and also because politicians may feel that they are already using the lever as much as possible. However, this perception in the part of political leaders may ignore the practical barriers associated with the sustained use of procurement as a climate policy tool.

3.3.5. Areas for future support

There was strong appetite from states and regions for further support around the use of procurement as mitigation policy tool.

Most interviewees agreed that further work in this area would be valuable. In the EU, a key area of interest is navigating existing EU regulatory requirements. Some smaller states and regions in the EU are particularly interested in learning from their larger, better-resourced counterparts on what options are available to work within these rules and their resource implications. By contrast, in North America, and particularly the US, there is more interest in understanding the power of procurement and where it might be best applied. In both cases, it would be necessary to engage public procurement counterparts who have traditionally been less heavily involved in Under2 Coalition work. It may also be necessary to ensure that there is sufficient political support for this work, at least in some states and regions.

Future work might also build on the Climate Group's SteelZero and ConcreteZero commitment frameworks (Steelzero, 2022). Under these frameworks, organisations have publicly committed to procuring 100% net zero steel and concrete respectively by 2050. It may be possible to use a similar commitment device to unite regions and states in their efforts to green their procurement practices.



4.0

**Facilitating
climate
finance flows
by others**

4.1

Introduction

States and regional governments have an indispensable role to play in creating an enabling environment for private sector low-carbon investment within their jurisdictions. Even in cases where national leadership on climate change is lacking, states and regions can still do much to enable emission reductions. This section explores this wider enabling environment role in more detail. Previous research, reflected in Figure 6, suggests four key roles for states and regions (Smoke and Cook, 2022).

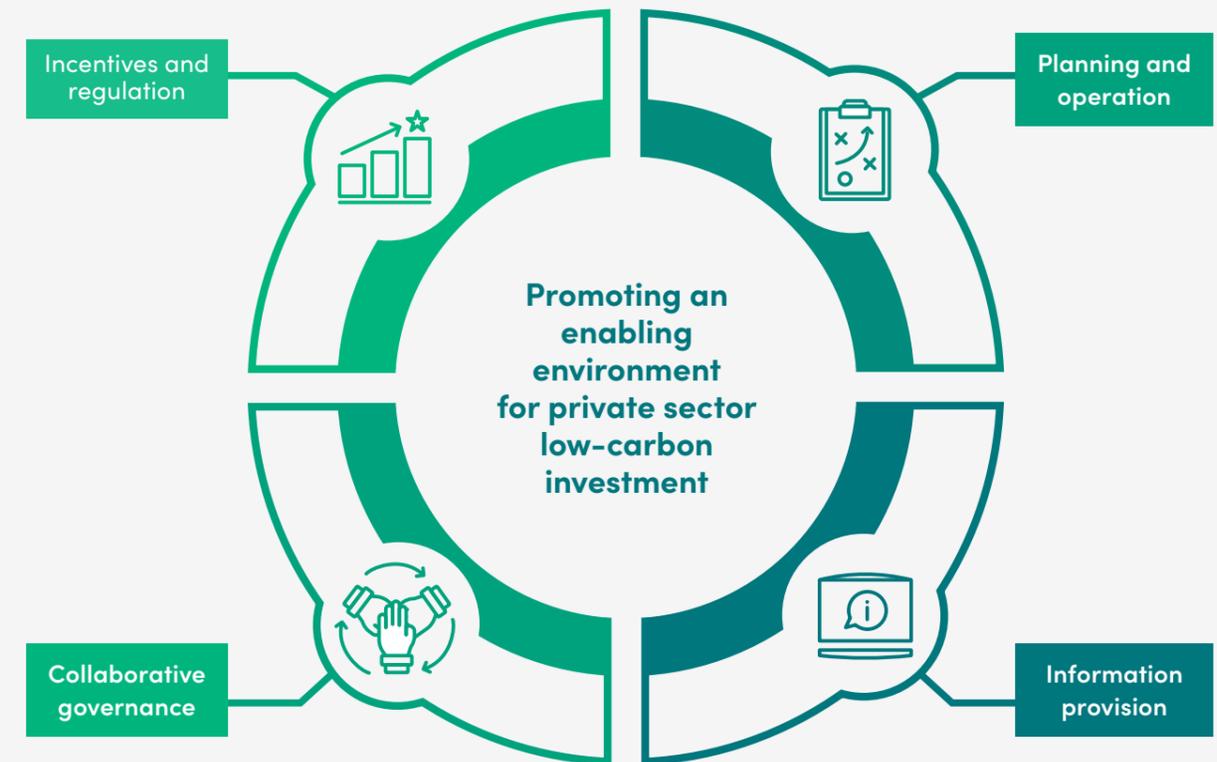
First, state and regional governments play a crucial role in incentivising and regulating the private sector. Sometimes this involves the explicit provision of financial incentives such as tax credits or subsidies. They may also mandate the use of certain low-carbon technologies or the achievement of certain performance standards. At other times, their role is to clarify requirements and expectations (for example, regarding approaches that should be taken to maintain health and safety). In recent years, there has been an increasing focus on how regulation might

be used to encourage information disclosure, particularly by large financial institutions and companies, although this has largely been led by national governments.

A second important role relates to planning and operational activities.

Strategic plans can provide a clear overall sense of policy priorities and direction which can play an important role in giving private investors sufficient confidence to invest in long-lived assets. The approach taken to the planning, development and financing of key physical infrastructure – as discussed in section 3.2 above – can have a major impact on whether firms providing low-carbon goods and services are able to do so competitively (as well as directly influencing the emissions profile of the state or region). Of equal or greater importance to the competitiveness of those providing low-carbon goods and services is the institutional framework of the state and region, and whether this is operationalised in a way that gives businesses and consumers confidence that they will be treated fairly and with due process.

Figure 6: Four main roles for states and regional governments in creating an enabling environment for low-carbon investment.



Thirdly, states and regions can provide information and analytics that makes low-carbon investment easier. The provision of accurate and up-to-date emissions inventories is important. These can help investors assess the mitigation impact of their potential investments or ensure they are targeting areas which are strategically important. They also help all stakeholders understand the extent to which the state or region's climate ambitions are on track. Beyond climate mitigation, information on physical climate risks – along with the exposure and vulnerability of assets and people to these risks – can help private investors plan adaptation investments.

Finally, the use of collaborative governance mechanisms can help build stakeholder support for climate action and provide confidence that plans and actions are informed by a rigorous evidence base. They also help build accountability and enable better decision-making. States and regions can use of a range of mechanisms to realise these benefits including open consultations on the development of key strategies and policies, the provision of financial information in citizens' climate budgets, partnership agreements with academic and civil society organisations and collaborative decision-making fora such as climate assemblies.

4.2



Examples of good practice

Again, Under2 Coalition members provide excellent examples in all four areas:

- Hawai'i was the first US state to adopt a 100% renewable portfolio target. Enshrined in law, Hawai'i has committed to 40% renewable power in 2030 and 100% renewable power by 2045. State officials report that this legislation has ensured a common direction of travel towards renewable energy and meant that there has been very little discussion about the role of natural gas power generation. The targets have been supported by a tax credits, set at a more generous rate than available federally, available for the installation of solar photovoltaics (PV) (with and without batteries) and wind power. Officials credit these with the uptake solar PV in the state.
- Québec has published its 2030 plan for a green economy, supported by a number of specific fiscal policies and measures. Similarly, North Rhine-Westphalia has developed roadmaps on key issues such as hydrogen and how key industrial production processes can reach net zero by 2045.
- Madeira and Andalucía are among a number of states and regions which have developed and begun to publish GHG inventories in recent years. They began in 2020 and 2021 respectively, although in Andalucía inventories have been compiled since 2016 and made public since 2018 to comply with regional Climate Change Law 8/2018 ley Andaluza del Cambio Climático y Transición Energética.
- North Rhine-Westphalia is advancing its work on industrial decarbonisation through a series of working groups that allow the state's approach to be developed in collaboration with heavy industry and scientific institutions. Similarly, the development of Madeira's adaptation strategy was supported by a extensive stakeholder engagement exercise. These collected stakeholders continue to meet annually to discuss with the government the progress made against the strategy's performance indicators.



4.2



Areas for future support

Within this theme, the interest of the Under2 members we engaged with was strongly focused on considering the policy and regulatory measures that can incentivise private sector investment.

Members were particularly interested in exploring together what incentives can encourage private investment in some of the sectors and/or activities that have, to date, received relatively little attention from policymakers. These include:

- Electrification of domestic heat
- Energy efficiency, especially for small and medium-sized Enterprises (SMEs);
- Agriculture;
- Green hydrogen (promoting both production and consumer switching, again with a particular focus on SMEs); and
- Carbon capture and storage (CCS).

In considering the appropriate incentive policy for these investments, members recognised that there are barriers to the design of an effective incentive policy.

Three of the biggest challenges are:

- **Large-scale investment.** In some sectors and activities, such as green hydrogen production and CCS, there is a need for large scale capital investment into long-lived assets. This requires incentive frameworks that are credible over the long term, which can be difficult to ensure given political cycles.
- **High switching costs.** In other cases, such as encouraging a switch to green hydrogen consumption or electrification of domestic heat, there is a need to find a way to incentivise practices that, at present, have higher operating costs than conventional technology. This can both be expensive and,



within the EU, has historically been difficult because of EU State Aid rules (Allenbach-Amman, 2023). However, press reports suggests that these rules may be reformed in the future,

- **Small and diffuse emission sources.** Finally, in the case of agriculture and energy efficiency investments by SMEs emissions come from a large number of relatively small sources, which may be difficult to monitor cost-effectively. This is also a challenge when it comes to electrifying domestic heat.

Aside from this, there was more interest from Under2 coalition members on issues relating to raising and spending climate finance (the material discussed in sections 2 and 3 above). This likely reflect that there is already lots of support, including from the Under2 Coalition, on many of the issues related to the creation of an enabling environment and facilitating financial flows by others. By contrast, there is relatively less activity on the themes of accessing and using finance.



5.0

Implications and next steps

As this research has shown, there is a clear opportunity to increase finance flows towards climate protection through deliberate action at the state and regional level. Globally, many of the economic, environmental, financial and fiscal policy powers needed to drive ambitious climate action are the competence of state and regional governments.

What's more, our findings clearly show that members of the Under2 Coalition are introducing innovative, world-leading policies to access and use climate finance, and facilitate flows by others. Many of the solutions to achieve a world with no more than 1.5°C of global warming already exist and are being developed and deployed by Under2 Coalition members.

However, our Finance Fit for Change project has also shown significant variance across members. Some Under2 members recognise that they are close to the start of their journey on raising and using climate finance, and are keen to learn from the experiences of their peers.

There are important differences in the nature of the interest in raising versus spending climate finance.

On the issue of raising finance, the differences in the powers granted to different Coalition members under their national constitutional arrangements lead to divergent interests across the membership. Some states and regions, particularly in North America, have





extensive powers to set their own taxes or incur debt, making issues such as green bond issuance and carbon pricing design very salient. Others have much less taxing and borrowing power and are most interested in developing partnerships to bid for funding. Others fall between these categories and have, for example, borrowing powers but not the ability to set carbon taxes. The size of the state or region also helps to determine their interest. Larger states and regions have a wide range of different options for raising revenue, while smaller states and regions have more limited options and tend to focus on raising funds from national and supranational authorities.

By contrast, there is more consistency across states and regions with different jurisdictions and sizes, on issues related to spending climate finance. All states and regions produce budgets, so in principle they could all try to integrate climate considerations into their budgeting process. The same is broadly true for integrating climate considerations into procurement processes. In this theme, the biggest difference across states and regions is the political attention given to using public funds to leverage private capital for investments within their control. For some states and regions this is critical, while others are more focused on financing investments entirely from public funding.

This work has also helped us to identify some of the specific key areas where additional support for Under2 states and regions on the topic of climate finance could be particularly valuable. Table 2 summarises these, with the most commonly cited issues/questions highlighted in bold.

The Under2 Coalition, with Climate Group as its Secretariat is well-placed to provide some of this support. The Coalition provides a valuable forum for members to work together to accomplish a common objective, expand knowledge, learn from the success of peers, forge new partnerships, and communicate their

leadership. With the support of Stiftung Mercator, the Coalition has already led the way in driving subnational government action to cut emissions from energy and heavy industry while supporting growth, job creation and prosperity. We will now turn our attention to how we can activate our ambitious network and drive government action on climate finance at the subnational level.

There may be some challenges along the way. Driving action on climate finance at the state and regional level will mean engaging with a wider range of stakeholders than previous programmes. It must include, at a minimum, both climate change/environmental and finance/treasury functions. Depending on the specific areas and issues being explored in depth, it may be necessary to involve those responsible for procurement, economic planning (in relation to private sector investment) and/or specific departments where climate investment is sought. In some contexts, it may also mean working closely with state and regional legislatures, responsible for scrutinising the use of expenditure and passing new legislation at the state/regional level. Future support must maximise the expertise and knowledge across the Under2 coalition while embracing a broader range of functions and institutions at the state and regional level.

The biggest strength of the Coalition has always been our ability to work together and find solutions as a group, even though we may be thousands of miles apart.

Effective finance holds the key to the transition to net zero by 2050 and a world of greater prosperity for all. With the support of Stiftung Mercator, our research has shown that states and regions have a crucial role to play. Working with ambitious subnational governments, we need to move further, faster to ensure that finance is truly fit for this change.

Table 2 Across each theme, stakeholders from states and regions highlighted a number of specific areas of interest.

Theme	Areas that could be explored	Specific questions of greatest relevance to Coalition members
Raising climate finance	<ul style="list-style-type: none"> Developing carbon pricing to reduce GHGs and raise revenues Issuing green bonds Accessing resources from national and supra-national schemes through competitive bidding, ecological fiscal transfers Using other environmental taxes and fees to reduce GHGs and raise revenues 	<ul style="list-style-type: none"> How to build political support, and overcome concerns, on carbon pricing (including among legislators)? How can taxes and fees be used to reduce GHGs (and raise revenues) in more challenging sectors e.g., transport, agriculture to encourage and support more sustainable practices Support to better understand investor expectations/regulatory requirements on green bonds, how they vary by regional capital market and how states and regions can respond How to better access existing funding sources, including through inter-regional coordination
Spending climate finance	<ul style="list-style-type: none"> Project pipeline development (technical and financial) Aligning budgetary systems with climate goals Using public procurement to support climate ambitions 	<ul style="list-style-type: none"> How to use public money to mobilize private capital towards regional low-carbon projects (including pension funds and equivalent)? How to make public investment management processes more climate responsive? What changes can be made to budgetary processes to align them to climate goals in a smart way? What changes can be made to procurement processes to align them to climate goals? How to build the technical expertise for this?
Facilitating finance flows by others	<ul style="list-style-type: none"> Providing regulatory and financial incentives Improving operational processes Generating information and analytics Facilitating collaborative governance 	<ul style="list-style-type: none"> What incentives and regulations will best encourage private sector investment (especially in electrification of domestic heat, energy efficiency, transport and agriculture)? How to generate political incentives for reform and establish appropriate accountability mechanisms?

Population and GDP of participants

The 10 surveyed states and regions have a combined GDP of over \$6.3 trillion USD and a total population of more than 100m people. They account for over 8% of Europe and North America's combined population and more than 12.5% of its GDP. These values are based on 2021 data, the latest year for which data was available.

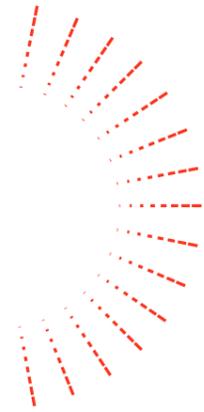


Figure 7 The total GDP of the surveyed states and regions exceeded \$6.3 trillion in 2021

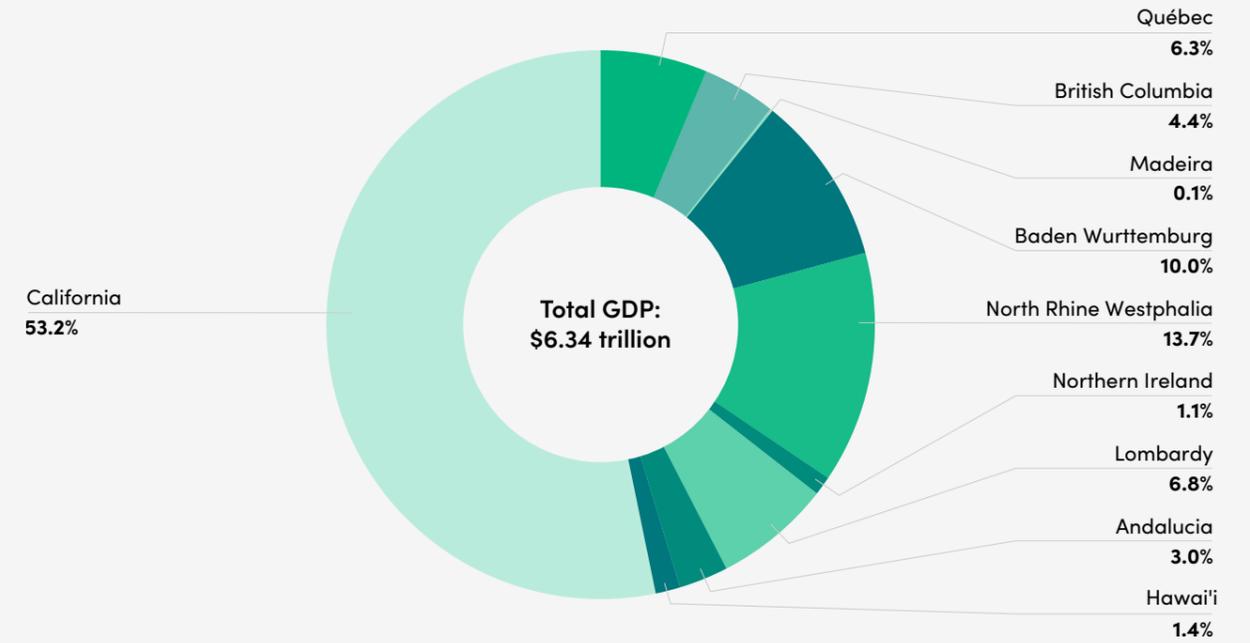
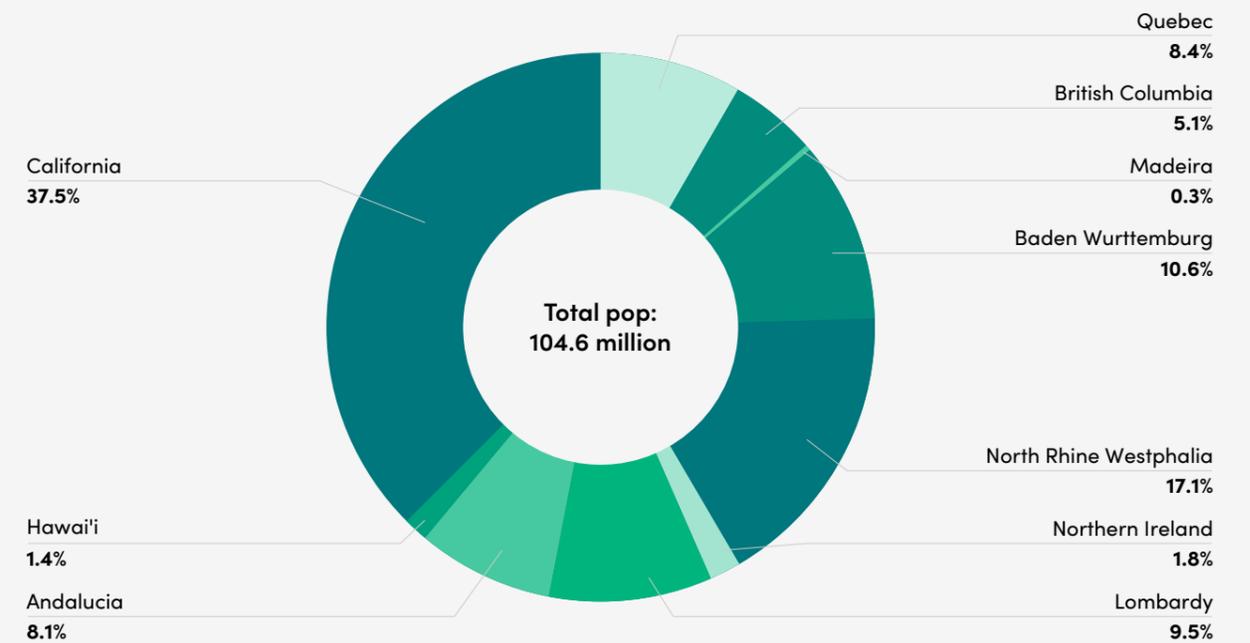


Figure 8 More than 100m people live in the states and regions surveyed



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List of Acronyms

BMUV German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection	EUR Euros	NKI German National Climate Initiative
CAD Canadian Dollar	EV electric vehicle	NRW North Rhine-Westphalia
CCS carbon capture and storage	GDP gross domestic product	OECD Organisation for Economic Co-operation and Development
C-PACE Commercial Property Assessed Clean Energy	GFANZ Glasgow Financial Alliance for Net Zero	PPP Private Public Partnership
C-PIMA Climate Public Investment Management Assessment	GHG greenhouse gas	REM Metropolitan Express Network
CPLC Carbon Pricing Leadership Coalition	HGIA Hawai'i Green Infrastructure Authority	RGGI Regional Greenhouse Gas Initiative
ETS emissions trading system	ICAP International Carbon Action Partnership	Solar PV Solar Photovoltaic
EU European Union	IMF International Monetary Fund	USD United States Dollar
	IRA Inflation Reduction Act	



CLIMATE GROUP

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Our mission is to drive climate action, fast.

Our goal is a world of net zero carbon emissions by 2050, with greater prosperity for all. We do this by forming powerful networks of business and government, unlocking the power of collective action to move whole systems such as energy, transport, the built environment, industry, and food to a cleaner future. Together, we're helping to shift global markets and policies towards faster reductions in carbon emissions.

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Pengwern Associates

Pengwern Associates is a UK-based consultancy specialising in the economics of climate change, the environment, international development and the linkages between them. Across these areas, it provides advice to support strategy development, decision-making and implementation, drawing on both quantitative and qualitative analysis.

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