



Financing Climate Futures

RETHINKING INFRASTRUCTURE

Financing climate objectives in cities and regions to deliver sustainable and inclusive growth

CASE STUDY

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Financing Climate Futures

RETHINKING INFRASTRUCTURE

Governments recognise that scaling up and shifting financial flows to low-emission and resilient infrastructure investments is critical to deliver on climate and sustainable development goals. Efforts to align financial flows with climate objectives remain incremental and fail to deliver the radical transformation needed. The OECD, UN Environment and the World Bank Group, with the support of the German Ministry of Environment, Nature Conservation and Nuclear Safety, have joined forces

under a new initiative – *Financing Climate Futures: Rethinking Infrastructure* – that provides a roadmap to help countries make the transformations in their infrastructure, investment and finance systems that are needed to make financial flows consistent with a pathway towards a low-emission, resilient future.

For more information on *Financing Climate Futures: Rethinking Infrastructure* visit: oe.cd/climate-futures

Financing climate objectives in cities and regions to deliver sustainable and inclusive growth

The investment choices we make in the coming years will either lock-in a climate-compatible, inclusive growth pathway, or a high-carbon, inefficient and unsustainable pathway for decades to come. Cities and regions, responsible for 60% of public investment in OECD countries, are significant contributors to spending and investment related to climate. With high levels of inequalities in many cities, the success of the transition will depend on the ability of local governments to engage in a “just” transition. This paper focuses on how national and sub-national governments can align subnational financial flows to transition towards low-carbon, resilient and inclusive cities. The paper is a contribution from the OECD Champion Mayors for Inclusive Growth initiative and to the OECD Programme on Subnational Finance and Investment.

DISCLAIMER

This paper is a contribution to *Financing Climate Futures: Rethinking Infrastructure*, a joint initiative of the OECD, UN Environment and the World Bank Group, to help countries deliver on the objective of making financial flows consistent with a pathway towards low emissions and climate-resilient development.

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Executive Summary

With the momentum generated by the Paris Agreement to limit overall global warming to below 2 degrees Celsius, cities and regions will be critical actors in the global response to climate change:

- Cities are part of the climate change problem, responsible for 70% of greenhouse gases globally and two thirds of energy global consumption. They are also particularly susceptible to climate change impacts, with a large share of the world urban population residing in low-lying coastal areas and susceptible to flooding. With more and more people projected to live in cities in the coming decades, this puts additional pressure to invest in low-carbon climate-resilient solutions.
- Cities and regions also bear the brunt of the significant economic and human costs of climate change, both in terms of rebuilding and recovery efforts that follow climate-related disasters, as well as the pre-emptive investments that can support climate mitigation and adaptation efforts. Climate-related events, such as storms, droughts and heat waves, put residents, the local economy and social cohesion at risk; they also have the potential of entrenching existing inequalities, as disadvantaged populations suffer disproportionately from climate change damages.
- Subnational governments are major spenders and investors in a low-carbon, climate-resilient future, and particularly in the infrastructure that will be required to meet the ambitions of the Paris Agreement.
- Data are very limited to track climate finance in general, and even more so at the subnational level. This is a big problem, as it means there are no real data to track progress towards the Paris Agreement commitments.

While national and subnational governments have announced commitments to meeting the goals of the Paris Agreement, data on actual spending and investment have been harder to track. This paper provides a preliminary methodology to better assess spending and investment by subnational governments in selected sectors that have a direct implication on climate change. It reviews the different sources of revenues available to finance climate-related spending and investment and examines how these budgetary resources could be better exploited to increase the subnational revenues available to meet the needs. It also explores how public revenues could be complemented by external funding, such as borrowing and innovative financing schemes involving the private sector. Among the OECD countries for which data are available, the majority of spending on climate and the environment (approximately 55%) occurs at subnational level. Compared to spending, investment in climate and the environment occurs to an even greater degree at subnational level, with on average around 64% of climate and environmental investment by subnational governments.

The paper provides a number of recommendations for national and subnational governments to support greater mobilisation of funding to address climate priorities.

This paper also examines in greater detail the climate change-inclusive growth nexus in cities. It makes the case for applying an inclusion lens to climate change policies and financial mechanisms, and assesses the distributional impacts of a selection of financing tools that aim to boost subnational governments' capacity to address climate change. It then identifies several opportunity areas for policy makers to leverage both climate and inclusion objectives to finance urban infrastructure.

1. From resolve to results: Cities and regions are critical actors in the global response to climate change

Climate action has gained increasing momentum, thanks in part to the targets, goals and commitments of the international community through the Paris Agreement. The objective to limit the global temperature rise to below 2° Celsius above pre-industrial levels will require effective policy responses, financial flows and investments in low-emission infrastructure and technology development. In parallel, other international agendas support global efforts to transition from resolve to results on climate change and environmental sustainability, notably the Sustainable Development Goal 13 (SDG 13). Achieving these ambitious global targets will mean net-zero emissions by the second half of the century, implying a radical and rapid change to infrastructure, technologies and behaviours (OECD/The World Bank/UN Environment (2018)).

Significant financial resources are required to anticipate, adapt and manage climate change impacts. Resources will be required to invest in climate mitigation, adapt existing infrastructure, facilitate changes in systems and lifestyles, and respond to the aftermath of climate-related natural disasters, including powerful storms, droughts or heatwaves. This is because climate change comes at a significant environmental, economic and human cost. Globally, 2017 was one of the costliest years in losses to natural disasters, estimated at USD 330 billion, according to reinsurer Munich Re (Tabuchi, 2018). But investing in climate change mitigation can also have costs-saving potential. The National Institute of Building Sciences estimated that in the United States every USD 1 spent on hazard mitigation can save USD 6 in future disaster costs; mitigation measures included investing in wind resistance, flood resistance, earthquake resistance, and fire resistance tools and technologies (National Institute of Building Sciences (Multihazard Mitigation Council, 2017)).

This paper is organised as follows:

- *Section 1* provides an overview of the climate change investment challenge, highlighting the critical role of subnational actors in the global climate change response.
- *Section 2* explores the trends and challenges in financing environmental and climate-related priorities at the subnational level and provides a preliminary methodology to better assess such spending and investment at subnational level.
- *Section 3* examines a selection of financing mechanisms that could help increase the subnational revenues available to meet the spending and investment need, including budgetary resources (grants and subsidies, taxes, user charges and fees, property income, including land value capture instruments) and external financing through credit markets (green and climate bonds) and the private sector.

- *Section 4* takes the assessment of climate financing mechanisms one-step further, making the case to apply an inclusion lens to such spending and investment tools. The section assesses the distributional impacts of a selection of financing mechanisms that aim to boost subnational governments' capacity to address climate change and identifies several opportunity areas for policy makers to leverage both climate and inclusion objectives to finance urban infrastructure.
- *Section 5* proposes a series of key recommendations and ways forward to align subnational financial flows and investments for climate change and inclusive growth in cities and regions.

1.1. Cities and regions matter in the global climate change response

Cities and regions are critical actors in financing and investing in the global response to climate change, and particularly in meeting the infrastructure needs required to transition to a low-emission future.

First, cities are part of the climate change problem. Cities concentrate people, economic activities and industries, and infrastructure, with 55% of the global population and over 80% of global GDP (World Bank, 2018b; Dobbs, et al., 2011). Globally, they are responsible for 70% of greenhouse gases and two-thirds of energy consumption (Bloomberg/OECD, 2014). Over the next three decades, urbanisation is expected to continue: by 2050 68% of the global population is expected to live in cities. These urbanisation trends will further burden existing infrastructure and increase demand for new infrastructure to support population growth and movement (World Bank, 2018b). Setting the foundation for growth that is sustainable in developed and emerging market cities alike will be essential for an effective global response to climate change.

Second, cities are susceptible to climate change and have a lot to lose from its impacts. Nine out of ten cities are located in areas at high risk of significant human and economic loss from natural disasters (UN, 2016). A large share of the world urban population resides in low-lying coastal areas that are susceptible to flooding (OECD, 2010a); 70% of Europe's largest cities are only a few metres above sea level (Kamal-Chaoui and Robert, 2009). Cities are also first responders to natural disasters and the primary local planners of infrastructure (OECD, 2010a). These pressures will increase with continued urbanisation.

Third, cities and regions are key financial, investment and policy actors in the transition towards a low-emission economy. Subnational governments are major spenders and investors: their budgets account for an increasing share of public expenditures, carrying out 40% of total public spending in the OECD and 57% of public investment in 2016. In federal countries, the rates are higher at 50% and 62%, respectively (OECD, 2018a). Globally, subnational governments represent 24% of public spending and 39% of public investment in 2013 (OECD/UCLG, 2016). Moreover, as this paper will demonstrate, relative to central governments, subnational governments are responsible for the majority of environmental and climate-related spending and investment. In just under a third of 30 OECD countries for which data are available, 70% or more of climate-related spending occurred at the subnational level (Section 1.2). Further, many of the domains that fall under the jurisdiction of cities – land use planning, zoning, water provision, sanitation and drainage, housing construction, urban renovation, regulation, economic development, public health and emergency management, transport, environmental protection – are not only directly vulnerable to climate change impacts; they also represent opportunities to develop adaptive capacities and strategies (Hallegatte et al., 2016).

Finally, choices made in cities today about long-lived urban infrastructure will determine the extent and impact of climate change, our ability to achieve emission reductions and our capacity to adapt to changing circumstances. The OECD estimates that, in addition to the USD 6.3 trillion of infrastructure investment required annually on average between 2016 and 2030 to meet development needs globally, an additional USD 0.6 trillion annually are needed over the same period to make these investments climate compatible (OECD, 2017a). Spending on infrastructure will continue to increase everywhere, but particularly in emerging market cities as their industries change and grow, with China and other parts of Asia accounting for roughly half of all infrastructure spending (Oxford Economics/PWC, 2014). Meanwhile, older, developed cities will have to spend the majority of resources upgrading and retrofitting their current stock.

1.2. With vulnerable populations in the climate change crosshairs, climate actions must also contribute to more equitable and inclusive outcomes

Getting urban infrastructure right is also a major development agenda: income inequalities are already higher in cities relative to their respective national averages (OECD, 2016). OECD research has also shown that inequalities are a challenge across countries worldwide, and even more acute in cities. Across the OECD, the average income of the richest 10% of the population has grown from seven to ten times that of the poorest 10% in a single generation. Income inequality tends to be higher in cities relative to their respective national average, and higher in *larger* cities (OECD, 2016a) (Box 1.1).

Box 1.1. Inclusive Growth in cities and OECD Champion Mayors coalition

Inequalities across the OECD have risen, on average, over past several decades. Across the OECD, the average income of the richest 10% of the population has grown from seven to ten times that of the poorest 10% in a single generation. However, inequalities are not just about money: they affect every dimension of people's lives and well-being, such as life expectancy, education outcomes, and job prospects. In 2012, the OECD launched the Inclusive Growth initiative as a response to a widening gap between the rich and the poor. The OECD defines Inclusive Growth as "growth that creates opportunities for all segments of the population to participate in the economy and distributes the dividends of increased prosperity fairly across society" (OECD, 2014a). The OECD takes a multidimensional approach, going beyond income to take into account a range of well-being outcomes and policy domains.

Inequalities can be even more acute in cities:

- Income inequality tends to be higher in cities relative to their respective countries (in 10 out of 11 OECD countries surveyed). This is because cities have a wider polarisation of high and low skills and top earners capture a higher share of total income (OECD 2016). Income inequality tends to be higher in larger cities.
- Inequality goes beyond income, affecting every dimension of an individual's life, such as employment opportunities, health and education outcomes. For instance, in London (United Kingdom) and Baltimore (United States), life expectancy can vary by 20 years across neighbourhoods.
- Moreover, income inequality has a clear spatial dimension, with the persistence of neighbourhoods of concentrated wealth and poverty. OECD research found that the most income segregated cities in the Netherlands and France are at comparable levels to the least segregated cities in the United States.
- Even within the same country, income segregation can vary across cities depending on region-specific factors such as labour productivity, the degree of spatial decentralisation, and demography as well as the level of wealth (OECD, 2018b).

In recognition of the key role of cities in tackling inequalities, the OECD created a global coalition of Champion Mayors for Inclusive Growth in March 2016. Together, Champion Mayors delivered the *New York Proposal for Inclusive Growth in Cities* (OECD, 2016b) and the *Paris Action Plan for Inclusive Growth in Cities* (OECD, 2016c), which outlined a series of commitments and policy priorities, along four main pillars: 1) Education; 2) Labour markets; 3) Housing and the urban environment; and 4) Infrastructure and public services. With the *Seoul Implementation Agenda for Inclusive Growth in Cities*, Champion Mayors took these commitments one step further (OECD, 2017b). The Agenda focuses on the implementation of two critical dimensions of the *Paris Action Plan*: bridging efforts around climate change and inclusive growth; and supporting small businesses in view of a more inclusive local economy.

Source: Adapted from OECD (2018, Seoul); OECD (2014a); OECD (2016a); OECD (2016b); OECD (2016c); OECD (2017b).

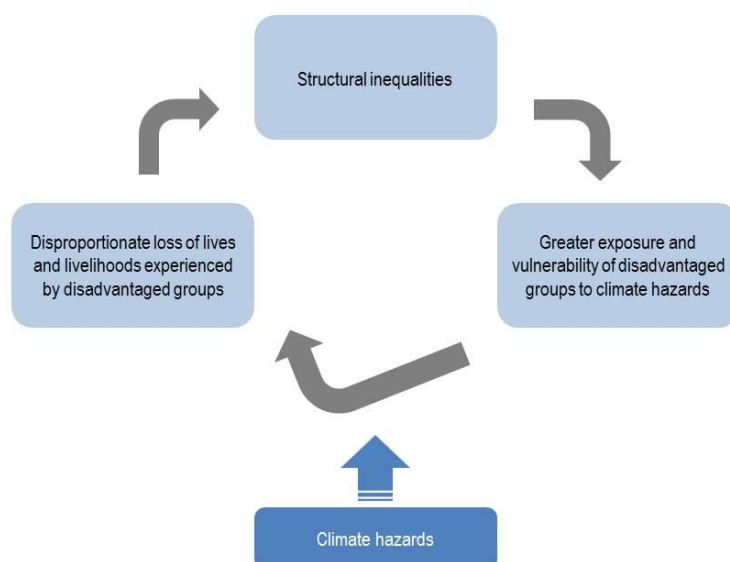
Climate change is poised to exacerbate the effects of structural inequalities in cities.

The impact of climate change on inequalities is still an emerging field of research, and large uncertainties remain. Yet evidence suggests that climate change, if not mitigated, will increase inequalities and slow down growth (Hsiang et al, 2017). This is because the number of extreme weather events will increase, often disproportionately affecting vulnerable communities. While wealthier populations have more assets at risk from climate change, vulnerable populations are more exposed to climate change impacts (IPCC, 2014). A 2017 study found that climate change could result in “the largest-ever transfer of wealth from the poor to the rich” in the United States, with poorer regions enduring disproportionate economic losses from climate change impacts (Hsiang et al, 2017). The case of Seoul, Korea, provides a compelling case of how climate change impacts are likely to further entrench structural inequalities (Box 1.2). Moreover, cities with a poor environment or high climate risk will be less attractive and hence potentially less economically productive (OECD, 2010a). As outlined in OECD (2018c), several factors render low-income populations more vulnerable to climate change impacts (Figure 1.1) (UNDESA, 2016; Hallegatte et al., 2016):

- **Increased exposure to climate risk and hazards:** low-income populations are likelier to live in neighbourhoods that are more exposed to flooding or landslides than more affluent areas, as the cost of housing often reflects exposure to risk.
- **Higher susceptibility to damage:** disadvantaged groups are likelier to live in homes that are not designed to face climate risks (e.g. poor insulation, underground flats, low-lying structures). For instance, low-income households may struggle to cope with heatwaves if they cannot afford air conditioning.
- **Lower ability to recover:** low-income populations have more difficulty recovering from climate-related damages and losses, as they often lack access to social insurance systems and safety nets. They also may have limited access to public infrastructure (hospitals) to help them cope with climate disasters.

Figure 1.1. Low-income populations are more vulnerable to climate hazards

The vicious cycle of climate change and inequalities



Source: OECD (2018c), adapted from UNDESA (2016).

Box 1.2. Climate change and inequalities: The case of Seoul, Korea

Seoul is particularly exposed to climate risks. Seoul's climate is already changing, as inhabitants face rising temperatures and increased frequency of extreme weather events. It is also changing faster than in other parts of the globe: between 1911 and 2010, the average temperature increase in Korea was nearly double the global average. Seoul faces more warming than the national average: between 1975 and 2004, the annual mean temperature increased by 1.5°C, compared to an increase of 0.6°C in rural and coastal areas of the country due to the urban heat island effect (Chung et al., 2004). Seoul has also seen an increased frequency in extreme weather events, such as torrential rains, floods and heatwaves (Kim, 2015). Seoul's vulnerability to floods and heatwaves is driven by its intense urbanisation over the past decades that saw a rapid expansion of the city's built-up areas. Between 1975 and 2014, the built-up area of the metropolitan area has doubled. In the meantime, farmland decreased from more than 20% to 2% of the metropolitan area, while forested areas decreased slightly, from 28% to 24%.

Climate change damages are expected to escalate in Seoul. While annual average temperature is currently around 13°C (2001-2010), it is expected to increase to 15.2°C between 2071 and 2100 (Seoul Metropolitan Government, 2012). This will lead to more extreme hot days and heat waves, increased water scarcity and drought, inland and groundwater floods and an increased risk of vector-borne diseases (Seoul Metropolitan Government, 2012). Heat wave-related deaths could double to about 1.5 deaths per 100 000 people over the period 2036-2040, compared to 0.7 deaths per 100 000 people over 2000-2010 (Seoul Metropolitan Government, 2015).

Climate change damages will disproportionately affect already vulnerable groups in Seoul. Such populations are either more vulnerable to health impacts, or lack insurance and social safety nets to help them recover from damages. Vulnerable groups in Seoul include non-regular workers¹, low-income households as well as those with lower levels of education, women and the elderly. Over the period 2000-2010, mortality rates increased by 8.4% overall in Seoul during heat waves, compared to non-heat wave days – more than double the Korean average. Estimated risks were higher for women versus men, older versus younger residents, and those with no education versus some education (Son et al., 2012). Poorer households also have a limited capacity to recover from climate change damages. Non-regular workers in particular are vulnerable to climate shocks, as many are not covered by unemployment or property insurance should they lose their jobs or source of income in a climate disaster. Women and the elderly cumulate disadvantages, as they often belong to low-income groups: many women are non-regular workers, and half of the elderly people are poor (OECD, 2018c). The increased frequency of floods could also affect access to safe water and sanitation, and particularly the homeless (OECD, 2015a).

¹ Non-regular workers have a fixed-term contract with generally lower salaries and poor social coverage relative to workers with a regularised status.

Source: Chung et al. (2004); Kim (2015); OECD (2018c); OECD (2015a); Seoul Metropolitan Government (2012); Seoul Metropolitan Government (2015); Son et al., 2012.

Subnational governments thus have a key role to play in the low-emission, inclusive transition. Just as local authorities have at their disposal a range of tools to reduce GHG emissions and adapt to climate change, they also have a hand in many policy areas that can help reduce inequalities and promote more inclusive economic growth, including education, labour markets, health, housing and urban development, mobility and public services (OECD, 2016a; OECD, 2016b).

Some cities are incorporating an explicit equity dimension into their climate change strategies. Based on preliminary results from a 2018 OECD survey (OECD, n.d.), cities in different regions of the world – including Cape Town, South Africa; Los Angeles, United States; Medellin, Colombia; New York, United States; Philadelphia, United States; Quillota, Chile; and Santa Monica, United States – have included an explicit focus on inclusion and equity in their climate change planning; New York’s OneNYC is one example (Box 1.3). The most common concerns of cities surveyed related to how climate change may affect spatial planning, segregation and urban development; human health; and economic stratification. Section 1.4 will further explore the climate change-inclusive growth nexus, with a particular view to assess the distributional aspects of a selection of climate financing tools.

Box 1.3. OneNYC: A roadmap for an inclusive, sustainable and resilient New York City

OneNYC is a holistic roadmap for the City of New York to become a growing, just, sustainable and resilient city in the forthcoming decades. It is a long-term plan, which includes provisions to mitigate and adapt to climate change in a just manner.

New York City (NYC) was a frontrunner in mitigation even prior to the Paris Agreement. The City committed to reducing emissions by 80% by 2050 (known as 80 x 50) as well as an interim target of 40% by 2030 in September 2014. The City subsequently undertook an extensive analysis to identify the maximum potential for GHG reductions in energy, buildings, transportation, and waste. The City released their findings in September 2016, which found that OneNYC already puts the City on a track to significantly reduce GHG emissions. OneNYC sets specific targets for each of the following: i) significantly enhancing the energy efficiency of buildings, ii) replacing buildings' fossil fuel-based heating and hot water systems with renewable or high-efficiency electric systems, iii) transitioning towards a renewables-based electric grid, iv) reducing the number of miles driven in New York City while replacing remaining vehicles to zero-emissions vehicles, and v) achieving zero waste to landfills.

OneNYC also includes steps for adaptation. In particular, the roadmap includes measures and objectives to improve the city's response to extreme weather events like Hurricane Sandy, both in terms of continuing to deliver basic functions and services to all residents during such events, as well as eliminating long-term displacement from homes and jobs after such events. In the coming decades, NYC plans to upgrade private and public buildings to be more energy efficient and resilient to the impacts of climate change; adapt infrastructure, such as transport, telecommunications, water, and energy to withstand severe weather events; and strengthen coastal defences against flooding and sea level rise.

Moreover, the pursuit of these mitigation and adaptation goals is not at the expense of social justice and equity. OneNYC also intends to lift 800 000 New Yorkers out of poverty by 2025 by raising the minimum wage to USD 15, in addition to a number of education and retraining initiatives. OneNYC includes measures to reduce premature mortality amongst New Yorkers by 25% by ensuring access to medical and mental health services.

Source: OECD (2018c); New York City (2013); New York City (2014); New York City (2017).

2. Trends and challenges in financing environmental and climate-related infrastructure and priorities at subnational level

Meeting the goals of the Paris Climate Agreement to keep overall global warming to below 2 degrees Celsius requires a significant increase in climate spending, including by raising investment in low-emission climate resilient infrastructure. While national and subnational governments have announced commitments to meeting the goals of the Paris Climate Agreement, data on actual spending and investment have been harder to track.

Worldwide, infrastructure needs are substantial – estimated by the OECD at USD 6.3 trillion per year between 2016 and 2030 in energy, transport, water and telecommunications infrastructure to sustain growth (OECD, 2017a). The New Climate Economy estimates that, globally, USD 93 trillion in infrastructure investment is needed over 2015-2030: of that, USD 4 trillion represents the difference between traditional low-emission climate resilient infrastructure and what is needed. This amount only takes capital expenditures into account; accounting for operating expenditures could result in overall savings of USD 1 trillion (Global Commission on the Economy and Climate, 2014).

There is a growing interest in the multi-level governance of climate spending and investment. This is in part due to increasing recognition of the critical role of subnational governments in spending and investment (particularly for infrastructure) and in reducing greenhouse gas emissions. While the action plan that emerged from the 1992 Earth Summit in Rio de Janeiro, Agenda 21, called attention to the role of local communities in achieving sustainable development, subnational governments do not yet have a formal recognition in the United Nations Framework Convention on Climate Change (UNFCCC). However, interest in their role is growing and was highlighted at COP 21 in Paris.¹

Mobilising traditional finance for climate finance is a crucial priority, but data is limited

Many subnational governments have set climate targets and are incorporating to climate change adaptation and mitigation into their budget priorities. This includes both current and capital expenditure, including indirect investment (capital transfers) and direct investment in low-emission and climate-resilient infrastructure.

However, it is not possible to compare their progress across countries in any standardised way. This section represents a preliminary attempt to track this spending and compare efforts at the subnational and central government levels, using OECD National Accounts Data and the OECD database on Subnational Government Structure and Finance. This section presents some of the methodological obstacles in making use of this dataset and discusses national approaches to tracking subnational climate-related expenditures, which could present potential models for internationally comparable indicators.

Limited tracking of climate-relevant spending leads to large data gaps

A main finding from tracking subnational climate-related spending is how difficult it is to do. Despite the importance of this topic and its implications for national growth and well-being, it is currently not possible to track public financial flows for climate change adaptation and mitigation. Data are even less available at the subnational level, despite the fact that many cities and regions have taken a leadership role in addressing climate change.

Data on climate-related spending are limited in terms of how they are categorised into the COFOG (classification of the Functions of Government). National accounts data do not have a climate-specific category. Climate-relevant spending is captured piecemeal across almost all categories, as all functional areas may have a climate dimension. For example, spending related to hospitals or school-building and renovation programs aiming at reducing energy consumption and developing renewable energies should be classified as climate relevant spending. The same applies to the construction and renovation of public buildings integrating environmental standards for sustainability and energy efficiency, which are classified under the COFOG category, *General public services*.

This paper provides a preliminary methodology to better assess spending and investment by subnational governments on environment and climate-related infrastructure and priorities. To do so, this paper focuses on three categories most directly linked to climate: *Environmental protection*, *Economic affairs*, and *Housing and community development*. The most obvious is the *Environmental protection* category. Although it does not include a climate-specific sub-category, all sub-categories have been included in the assessment and considered climate-related: Waste management, Wastewater management, Pollution abatement and Protection of biodiversity and landscape. However, it is important to note that some activities included in these sub-categories that are included in the methodology may not ultimately contribute to low-emission and climate-resilient objectives that are consistent with the Paris Agreement. For instance, this can be the case of some solid waste management activities, such as landfills or incinerators, which are responsible for generating 10-20% of GHG emissions in cities.

In the other two sectors, several sub-areas have been considered: for *Economic affairs*, *Agriculture*, *Transport and Energy*; and for *Housing and community development*, *Street Lighting*, *Water*, *Housing Development*. However, it can nevertheless be difficult to differentiate within each sub-area spending that is “climate-friendly” and spending that is not. For example, Transport and Energy data appear under *Economic affairs* spending, and do not differentiate between emission-intensive and low-emission activities (such as public transport vs. roadway investments, or renewable vs. fossil fuel-based energy sources). To overcome this obstacle, this section makes a first attempt to create proxies based on data related to investment or consumption of low-emission forms of transport, energy and other infrastructure.

In addition, even when proxies can be created from existing subcategories, data at the subcategory level may not exist. Some OECD countries do not have COFOG data at all, or only have it at the general government level for the subcategories, including Australia, Austria, Germany, Japan and Korea. In the case of the United States, environmental data are included in the COFOG category *Housing and community amenities*, and therefore cannot be analysed using our metric. Comparable data on subnational spending are even less available for non-OECD countries, including some members of the G20. While the IMF publishes COFOG data for the central and subnational levels, it does not provide the breakdown between the different types of expenditure, in particular for direct investment.

Together, these data gaps present a fundamental challenge to achieving a clear mapping of the subnational financial flows that are explicitly dedicated to the implementation of the Paris Agreement. This proposed methodology is therefore a first step to better identify and track climate-relevant spending and would need further refinement, for example, *i*) in the *Environmental protection* functional category, the ability to distinguish between activities that are directly related to climate change and those that are climate-resilient and contribute to the objectives of the Paris Agreement; *ii*) include other functional categories that may also have climate-relevant spending (e.g. education, health, general services, etc.), as well as *iii*) include a broader geographic expansion to cover additional countries that are excluded from this analysis due to data and methodological issues.

Comparison of national approaches to tracking climate-related spending and infrastructure investment

Most countries do not comprehensively track their subnational climate-related spending and infrastructure investment. Only three European Union (EU) countries track comprehensive data about climate change mitigation spending, and none keep comprehensive data about adaptation spending (Trinomics, 2017). The EU requires its member countries to report their total environmental protection expenditures, but this is only a small piece of total climate-related spending. Still, it is worth noting that, in 2016, EU governments spent a combined EUR 111.7 billion on environmental protection, or 0.7% of GDP (EU28) and 1.6% of all public expenditure, which is quite low. At subnational level, subnational governments account for 65% of total public expenditure in the environment sector, and 77% for investment in the OECD (OECD, 2018 g).

Some EU countries have developed approaches to tracking climate expenditures. Belgium, France, and Germany generally track climate mitigation investment in six broad sectors: *Energy, Infrastructure, Industry, Buildings, Transport* and *Agriculture*. The categories are not entirely consistent across the three countries. France combines energy and infrastructure into “Centralised energy production and networks” (Institute for Climate Economics, 2016). Belgium, in addition to the above categories, also tracks separate investment in “Climate adaptation and climate services” (Trinomics, 2016). It is unclear whether France and Germany are including analogous spending in their reports.

Other countries’ tracking systems provide incomplete data models. The United States Government Accountability Office has released in the past an annual report detailing climate change spending by department, but it only aggregates that spending into three categories: Science, Technology, and International Assistance (Government Accountability Office, 2018). The future of climate change reporting is uncertain under the current administration. The U.S. state of California keeps careful track of the spending of revenues from its Cap and Trade Emissions Trading System (ETS) but does not track any climate-related infrastructure investments from other funding sources. California tracks revenues from its ETS in three categories: Investments in Transportation and Sustainable Communities, Investments in Clean Energy and Energy Efficiency, and Investments in Natural Resources and Waste Diversion (California Climate Investments, 2018). The Australian government, when they commissioned a report to look at climate change expenses in 2013, used four categories: *Emissions reduction - Energy efficiency*, *Emissions reduction - Other*, *Adapting to climate change*, and *Shaping a global solution* (Talberg, 2013). Neither the U.S. nor Australia systematically tracks climate-related expenditures at lower levels of government as part of the above-mentioned systems.²

2.2. Snapshot of subnational expenditures and revenues associated with addressing climate priorities: An international overview

A review of subnational spending trends provides a first overview of the role of subnational governments in environmental and climate-related spending, but does not yet permit a comprehensive assessment of the progress governments are making towards meeting the Paris Climate Agreement goals. This section reviews data from the OECD National Accounts database and database on Revenues, as well as the OECD database on Subnational Government Structure and Finance, supplemented by additional international data sources.

Methodological approach

Given the above gaps and data challenges, how can we measure subnational spending on climate resilient infrastructure? The analysis in this paper derives from a preliminary methodological approach developed by the OECD as a pilot experiment to better assess climate-related spending and based on proxies applied to National Accounts data. This approach provides a window into overall trends in climate-related spending and investment, but is based on assumptions that in some cases may overstate climate-related spending and in other cases understate it. Some national approaches to tracking subnational spending on climate, further discussed below, may provide more accurate estimates, but they are not currently comparable across countries.

To allow comparison across countries, a series of proxies were used to determine the share of each of the previously mentioned categories that can be considered as relating to environmental and climate objectives. These include:

- *Agriculture, forestry, fishing, and hunting (category 402).* All spending in this category was considered to be related to climate.
- *Fuel and energy (403).* Using the World Bank Development Indicator on renewable energy consumption as a percentage of total final energy consumption³, each country's share of energy use that came from renewable sources, as reported by the World Bank, was considered to be the same share of fuel and energy spending, as reported by the OECD, which was considered related to climate. Each country had a specific share designated for each year evaluated in the study.
- *Transport (404).* Using the OECD dataset "Transport infrastructure investment and maintenance spending," transport is divided into five categories: Rail, roads (including motorways), maritime ports, inland waterways, and airports. It was determined that of these, rail has the lowest carbon emissions. As such, the share of each country's transport infrastructure that was spent on rail between 2000 and 2016 was determined to be the share of overall transport spending that could be considered climate resilient. For years that there was no data available, the average of the existing years' share of rail spending was used in its place.
- *Environmental (50): Waste management (501), Wastewater management (502), Pollution abatement (503), Protection of biodiversity and landscape (504), R&D environmental protection (505), Environmental protection NEC (506).* For all subcategories of environmental spending, 100% of spending was determined to be related to climate.
- *Housing development (601).* To determine the share of housing development spending that is low-emission, a proxy was created to determine the share of housing development that takes place in dense, transit-accessible areas. Alain Bertraud and Harry W. Richardson's "Transit and Density: Atlanta, the United States and Western Europe"⁴ was used as the methodological basis by which the decision was made that 500 persons per km² was a dense, transit-viable region. Using the OECD database "Regional demography: Demographic indicators by typology (rural/urban)," the national share of the population that lived in territory level 3 (TL3) that reached at least 500 persons per km² in each country each year was determined to be equivalent to the percent of housing development that was better aligned with climate objectives.
- *Water supply (603).* All spending under the water supply category was considered to be environment and climate-related.
- *Street lighting (604).* Because most street lighting is powered by electricity, we used the U.S. Energy Information Administration's dataset "Total non-hydro renewable electricity net generation" to find the share of all electricity in each country each year that came from renewable sources. This percentage of overall electricity was applied to all electricity spending to estimate the share of street lighting spending that was climate-resilient.

Expenditure and investment data was based primarily on the OECD Statistics database, Government Expenditure by Function (COFOG), which includes data up to 2016. For every available country, data on annual spending (total government expenditure) and investment (gross fixed capital formation, less disposals of non-financial non-produced assets) was used between the years 2000 and 2016. When this study refers to “environment and climate-related spending” it refers to total expenditures under the above categories; “environment and climate-related infrastructure investment” refers to total gross fixed capital formation under the above categories.

The decision was made to use all countries for which there were relevant, appropriate and usable data in each dataset, regardless of whether those countries were present in both datasets. As such, there are fewer countries included in the expenditure and investment data analysis, due to limitations described in the next section, than there are in the revenue dataset. When the two are compared, only the countries that are present in both datasets are used. It was decided to focus on inclusiveness, rather than symmetry, for the purpose of this analysis. Certain countries were eliminated from the analysis due to missing data. The United States was not included in the analysis of COFOG expenditures data because its environmental expenditures are reported as a part of housing and community amenities spending, rather than part of environmental spending, making comparisons difficult.

Some countries were included, despite incomplete data. These include Iceland, where no data is available before the year 2013, and Japan, where no data is available before the year 2005. Korea did not provide any data for gross fixed capital formation, which we used to measure investment. Australia did not provide data after 2015.

Analysing certain countries was made more difficult because of a lack of subcategory environmental data at the subnational level. Austria, Germany, and Japan only provided subcategory data (e.g. wastewater spending, versus overall environmental spending) at the general government level. Australia did not provide subcategory data at any level.

In some sub-categories mentioned above, it was possible to estimate spending activities that specifically are more climate-resilient (e.g. spending on rail in the case of transport). However, in other cases, while the activities are clearly related to climate, the data do not allow us to identify whether these activities directly contribute to climate-resilient low emission objectives. For instance, as mentioned above, in the category of “environment spending”, certain activities relating to waste management (such as spending on landfills) may not be climate resilient practices.

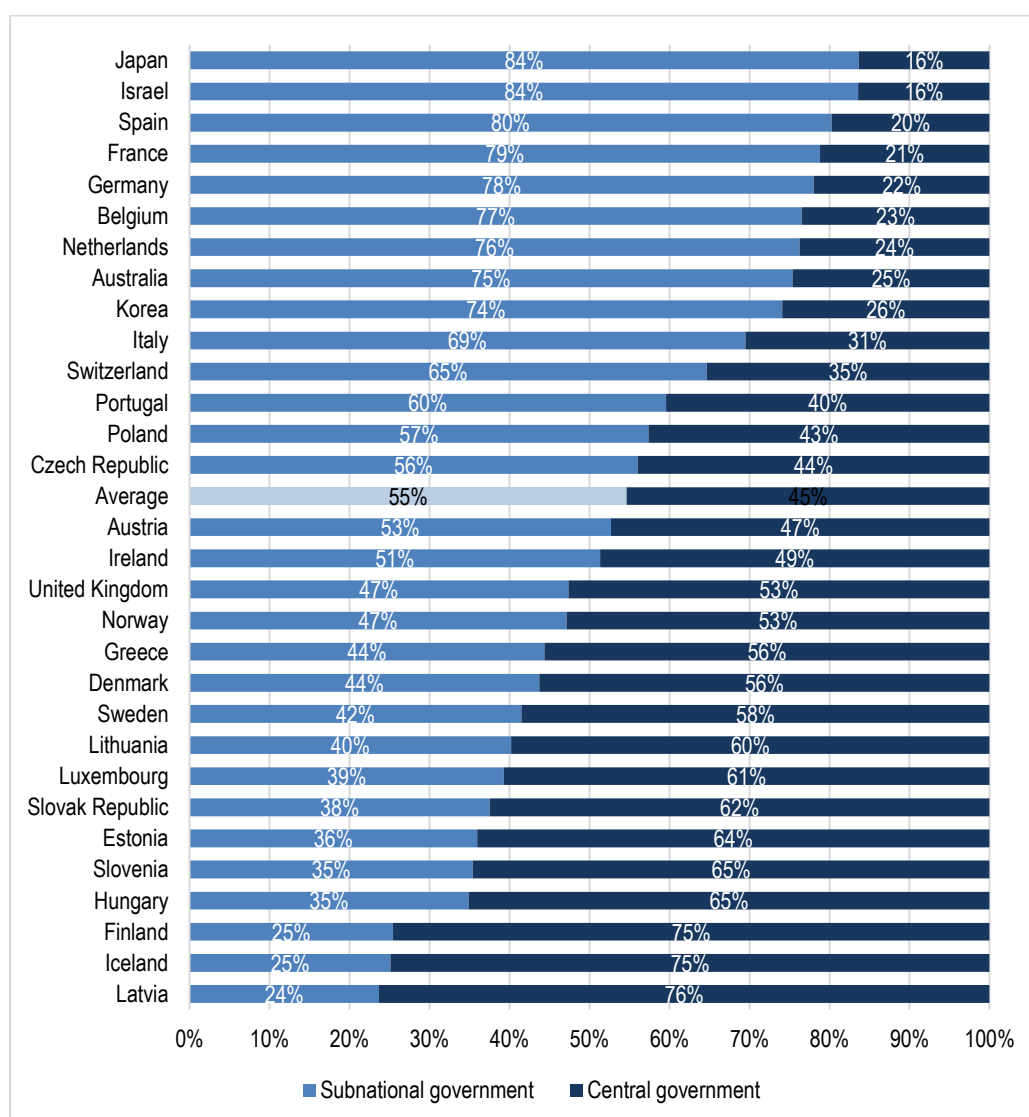
2.3. Trends in climate-related spending and infrastructure investment

Most environment and climate-related spending and investment occurs at the subnational level

On average, across the OECD, the largest share of climate-related spending occurs at the subnational level. In the 30 countries sampled, subnational governments are responsible for more than half (55%) of environment and climate-related spending, on average over 2000-2016 (unweighted) (Figure 2.1). In just under a third of the countries, 70% or more of climate-related spending occurred at the subnational level and in three countries, the ratio exceeds 80%: Japan, Israel and Spain. By contrast, central governments were responsible for 70% or more of climate-related spending in only three countries: Finland, Iceland and Latvia.

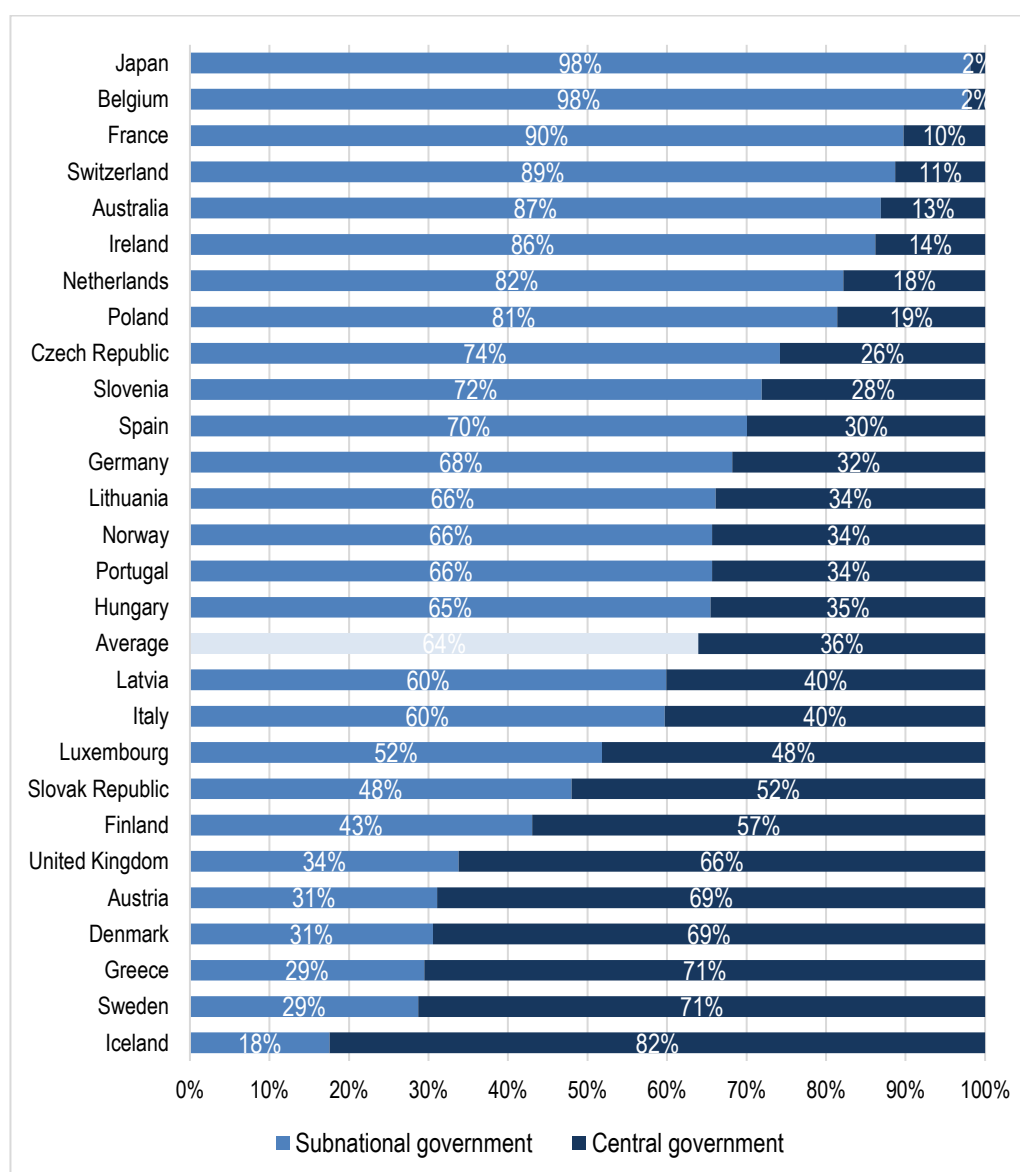
Nevertheless, environmental and climate-related spending represented just 2.3% of GDP (general government) on average over 2000-2016 in OECD country sample. At the subnational level, the share of environmental and climate-related spending represents around 1.3% of GDP on average over 2000-2016.

Compared to spending, an even larger share of environment and climate-related investment occurs at the subnational government level. On average, subnational governments are responsible for 64% of environmental and climate-related infrastructure investment over the period 2000-2016 (Figure 2.2). General government environmental and climate-related investment represented only 0.7% of GDP on average over 2000-2016, while at subnational level it represented around 0.4%.

Figure 2.1. Environmental and climate-related spending by level of government

Note: Calculated by dividing the total amount of subnational climate-related spending by the total amount of general government climate-related spending from 2000 to 2016. The United States is not included in this analysis because their environmental spending is categorized as housing and community development spending. Japan's spending data begins in 2005, Lithuania in 2004, and Iceland in 2013. Australia's spending data ends in 2015. Average represents the unweighted average of all countries presented in this graphic, rather than average for all OECD countries. Information on data for Israel: <http://dx.doi.org/10.1787/888932315602>

Source: OECD (2017c), "Government Expenditure by Function (COFOG)," OECD Statistics (database).

Figure 2.2. Environmental and climate investment by level of government, 2000-2016

Note: Calculated by dividing total amount of subnational climate direct investment spending by the total amount of general government climate-related infrastructure investment, 2000-2016. Average represents the unweighted average of all countries presented in this graphic, rather than average for all OECD countries. The United States is not included in this analysis because their environmental spending is categorised as housing and community development spending. Japan's spending data begins in 2005, Lithuania in 2004, and Iceland in 2013. Australia's spending data ends in 2015. Korea was omitted because it does not provide subnational investment data; Israel was omitted due to negative investment information on data for Israel: <http://dx.doi.org/10.1787/888932315602>

Source: OECD (2017c), "Government Expenditure by Function (COFOG)," OECD Statistics (database).

Subnational governments spend a larger share of their overall budget on climate-related priorities compared to central governments

Meanwhile, on average, subnational governments dedicate a larger share of their overspending spending to climate priorities relative to central governments. Environmental and climate-related spending at the subnational level is on average approximately 13% of all spending. This is in contrast to central government environmental and climate-related spending, which is an average of 5% among the countries sampled. Environmental and climate-related investment represents on average approximately 26% of all investment at the subnational level, compared to an average of 12% at the central government level. Twelve countries score much more higher (more than 30%) and even five countries more than 40% (Slovenia, Netherlands, Lithuania, Hungary and Czech Republic). At the other end of the spectrum, climate investment represents a very small share of subnational investment in countries such as Austria and Iceland.

It is nonetheless worrisome that climate-related public spending has not substantially increased since 2000, both as a share of GDP and in real terms. As a share of GDP, climate-related spending remained stable on average in the country sample between 2000 and 2016, both at subnational and central government levels. In real terms, subnational climate spending increased around 2% each year on average from 2000 to 2016 across the countries sampled (unweighted average), while at the central government level it increased by around 2.8% on average per year.

Climate-related public investment also saw very small changes. As a share of GDP, it remained stable on average at general government level between 2000 and 2016, with a very small decrease at subnational level. There are, however, important variations from one year to another, and a noticeable decrease between 2015 and 2016. In real terms, climate-related infrastructure investment over 2000-2016 also features very little average annual growth across the countries sampled (i.e. 0.5% on average annually for subnational level, compared to 2.6% for the central government level).

Subnational governments allocate a larger share of environmental and climate-related spending to infrastructure investment

Of their overall environmental and climate-related spending, subnational governments allocate more to infrastructure investment than central governments do. Across the countries sampled, on average 29% of climate-related spending at the subnational level is on infrastructure investments, compared to an average of 16% at the central government level. Subnational environmental and climate-related spending occurs primarily in transport (28%) and waste management (25%), followed by wastewater management (16%). The share of spending on transport remained the same between 2000 and 2016, while those on waste management substantially increased (+10 percentage points), while wastewater management decreased (-5 percentage points).

Subnational investment in environmental and climate also occurs primarily in transport (41%), followed by wastewater management (29%) and waste management (13%). The first two sectors account for around 70% of subnational investment across all study countries. Between 2000 and 2016, the share of climate-related investment in transport in total investment significantly increased (+10 points from 34% to 44%), while those of waste management and wastewater management decreased.

2.4. Revenue trends

In contrast to data on subnational expenditures, data on subnational revenues do not specify environment related sources. Subnational revenues data nonetheless provide an instructive complement to data on subnational expenditures, as they offer a sense of the revenues that could be made available to increase subnational governments' spending on climate generally, and on low-emission climate-resilient infrastructure in particular.

Revenue data came from the OECD Statistics database *Subnational government structure and finance: subnational government revenue by type*. The revenue dataset is larger and includes more countries than the expenditure dataset, which as mentioned above excluded countries from this analysis for data limitations. For the revenue dataset, the analysis focuses on a snapshot of 2016 data, rather than trends between 2000-2016.

What are the sources of subnational revenues?

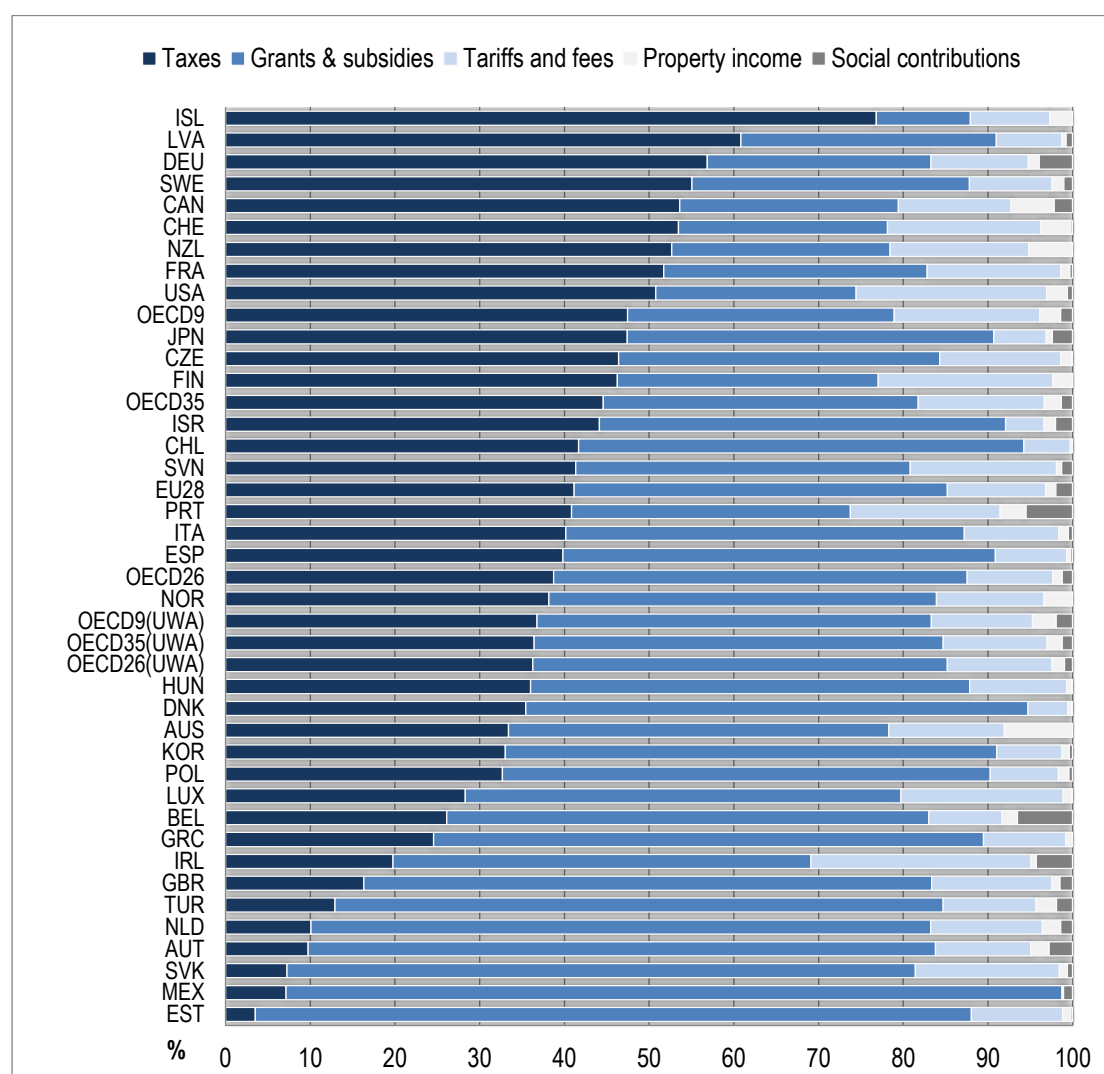
In 2016, subnational governments represented 15.9% of GDP and 42.4% of public revenue on average in the OECD. Considering the potential gap between the share of climate-related spending and investment for which subnational governments are responsible, it is useful to identify the different categories of subnational government revenues.

Four categories of revenues are particularly important to climate objectives: taxes, grants and subsidies, tariffs and fees and property income. The two most important sources of revenue are taxes (45% of subnational revenue in the OECD on average in 2016) and grants and subsidies (37%). Revenue deriving from local public service charges (tariffs and fees) and property income (sale and operation of physical and financial assets) represented 15% and 2%, respectively, of subnational revenue. Figure 2.3 presents a comparison of sources of revenues, and shows large variations from one country to another.

In countries where subnational government revenue relies heavily on grants and subsidies (such as in the Netherlands, Austria, Slovak Republic, Estonia and Mexico), this implies that subnational governments depend more on central government transfers or other providers (e.g. international organisations) and have limited room for manoeuvre. This is especially the case when grants are earmarked; earmarked grants are allocated for specific tasks or projects and come with guidelines, stricter controls and reporting obligations, reducing subnational governments' decision-making powers. In numerous countries around the world, transfers are generally earmarked to finance delegated functions and pay staff wages (education, social protection, health). With non-earmarked general grants, subnational governments have more freedom to use central government transfers. It is important to note, however, that grants and subsidies earmarked to climate-related spending are a good way for international organisations and central governments to influence and direct spending and investment towards climate priorities.

The level of tax revenue varies considerably from one country to another. Unsurprisingly, it is very low in countries where grants and subsidies are predominant, and high in countries where grants and subsidies are more limited. In nine OECD countries, tax revenues exceed 50% of subnational governments and even more than 55% in Sweden, Germany, Latvia and Iceland. But this ratio is not sufficient to assess the fiscal capacity of subnational governments to raise sufficient and adequate revenues for two reasons: i) a high share of tax revenue in subnational revenue does not imply a high level of tax revenue; and ii) tax revenues include both shared taxes and own-sources (or "autonomous") taxes, implying that the tax revenues indicator is not always a measure of the tax autonomy of subnational governments.⁵ In some countries, subnational governments can also create local taxes, in particular in environmental matters.

Figure 2.3. Structure of subnational government revenue, 2016 (%)



Note: Information on data for Israel: <http://dx.doi.org/10.1787/888932315602>

Source: OECD (2018a), Subnational Governments in OECD countries: Key data.

All categories of taxes can be potentially used to finance climate objectives. Some taxes that specifically target environmental protection have also been developing. Environmental taxes, earmarked for financing environmental protection, can be classified into four broad sectors: energy (carbon taxes, taxes on energy products, tax on electricity, etc.), transport (cars sales/registration taxes, annual vehicle circulation taxes), pollution taxes (including waste taxes and taxes on the use of pesticides and/or fertilisers) and taxes on water abstraction and resources extraction. It is thus essential that subnational governments have the possibility to benefit from tax resources, through tax sharing arrangements and own-sources taxes.

Subnational government revenue may also be derived from tariffs and fees. Tariffs and fees include revenues generated by the sale of public goods and services. This source of revenue can help finance a number of local public services and facilities in areas such as water treatment and distribution, collection and treatment of waste, sporting facilities and activities, cultural activities and facilities, public transport, car parks, school meals, energy, nursing homes, etc. It is thus particularly important for subnational governments to develop a fiscal strategy based on climate-friendly user fees and charges (e.g. congestion charges). The distinction between taxes and fees is sometimes unclear, and there are borderline cases (e.g. between a tax on waste collection and a waste fee, or a drainage tax or drainage fee, whereby the fees are not paid by the taxpayer-resident but by the user for “service rendered”).

Finally, property income, which comprises revenue from financial (e.g. interest on deposits and investments, dividends of income of quasi-corporations e.g. local public companies, loans, etc.) and non-financial assets (e.g. land and subsoil assets, royalties/rents). This type of revenue may offer some flexibility to subnational governments and be directed towards climate-related spending and investment. Revenues from local public companies may be very important in some countries where local public companies are well developed. Royalties can also be directed to climate-related activities to offset the negative impacts of the exploitation of mineral and oil resources.

Challenges and barriers to increasing investment in climate change-related projects at the subnational level

Building the infrastructure needed to transition towards a low-emission economy will require deep financial commitments from a variety of stakeholders, particularly subnational governments. Given the need to increase climate-related spending and investment on low-emission climate-resilient infrastructure at subnational level, it is necessary to identify ways to increase the size of their revenue base so that they can direct a larger part of their revenues to climate priorities. Today, many subnational governments in OECD countries – and even more at global level – do not have the sufficient fiscal capacity to carry out their responsibilities (under or unfunded mandates). Many subnational government budgets are already constrained by the day-to-day public needs and urban management expenditures. They often focus on their core tasks and short-term obligations, at the expense of other objectives like climate change, which may be seen as a lesser priority, taking too long to bring a return or facing resistance from different stakeholders.

The fiscal framework should thus ensure that traditional budgetary resources are commensurate with subnational government responsibilities, including those related to climate protection and mitigation for which larger room for manoeuvre is needed. Cities will need to generate additional revenues to fulfil the great financial needs for new climate responsive infrastructure.

3. Better exploiting and diversifying fiscal resources to finance subnational climate spending and investment

In addition to an effective fiscal decentralisation framework, it is important to consider the opportunities to raise additional revenue for climate-related spending and infrastructure. This can be done by i) “greening” subnational government’s traditional budgetary resources through specific fiscal instruments that are earmarked for climate objectives, and ii) mobilising external financing mechanisms and attract private investors, including through public-private partnerships arrangements, given that public funding can only finance a portion of the need.

This section explores several avenues for boosting subnational revenues to fund climate-related infrastructure. It explores the extent to which existing fiscal resources of subnational governments may be further developed, diversified and “greened” to serve climate priorities; this includes grant and subsidies (green/climate funds), taxes (environmental and “climate-friendly” taxes), user charges/fees or property income). It also explores how this revenue can be complemented by external sources of funding, such as through credit markets and the private sector. It identifies challenges and barriers to increasing and diversifying the subnational revenue base and to developing innovative schemes to raise additional funds for climate action. The focus of this discussion is not on how these mechanisms work – for that, please see World Bank (2018a) – but rather on evidence of use of these mechanisms by subnational governments, barriers to their expansion and examples of successful implementation.

3.1. Budgetary resources

Many of subnational governments’ existing sources of revenue can be designed or adjusted to create funding sources specific to low-emission climate resilient priorities. All revenue sources should be mobilised to finance both operating expenditure (such as the purchase of goods and services, operating and maintenance costs, etc.) and capital expenditure (such as capital transfers and direct investment in infrastructure), which are directed towards climate mitigation and adaptation. Both operating and capital budgets are crucial, and a systemic approach is needed – one that is not only focused on direct investment (which represents only 11% of subnational expenditure on average in the OECD), but also takes into consideration the entirety of public interventions and the diversity of internal and external sources of funding.

Adopting a comprehensive approach can help to better identify obstacles to more significant and effective financial involvement of subnational actors in climate change adaptation and mitigation. In particular, there are several preconditions to fulfil to allow subnational governments to develop and implement fiscal green strategies and action plans. This should be done with the support with the central government, but also implies effective vertical coordination across levels of government as well as genuine horizontal cooperation, in particular at the scale of metropolitan areas.

Traditional sources of revenues should be further developed, diversified and “greened” to serve climate priorities. This applies to i) grants and subsidies, ii) taxes, iii) user charges and fees, iv) property income and v) emissions trading systems, which will be discussed in turn below.

Better channelling climate funds, grants and subsidies to subnational governments

The international community, national governments and some state and regional governments have made a strong commitment to reducing GHG emissions by putting in place, among other things, financial support to help regions and cities integrate climate issues into their policies. In particular, the international community (multilateral banks such as the World Bank, as well as bilateral banks, UNDP, the Global Environment Facility, the European Commission) has taken action in climate funding by establishing a series of funds earmarked to environment protection and climate action. One can cite the Least Developed Countries Fund; the Special Climate Change Fund, the Adaptation Fund and the Green Climate Fund, among others.

However, these funds are still largely insufficient and do not always target the right level of government. Most donors and funds channel their resources through national governments of recipient countries, and there is a limited access for regional and local governments. Few donors are permitted to work directly with subnational governments. When they are, they often require a sovereign guarantee to allocate resources to subnational governments. However, subnational governments, even when they are accredited as intermediaries, often face capacity challenges. Many donors prefer large-scale projects, which are perceived to have lower transaction costs than small-scale ones (which tend to be found in cities) (Colenbrander et al., 2018). Although the Green Climate Fund and the Adaptation Fund have introduced a number of relatively new institutional features with the aim of channelling a larger share of climate finance to the local level, to date, these have been little utilised and subnational governments remain mostly excluded (Colenbrander et al., 2018).

The limited access of subnational governments to international climate funds can also be attributed to information asymmetries, the complicated financial engineering necessary to implement programmes and the significant time needed to approve projects (Schwarze et al, 2016). Finally, subnational governments willing to benefit from these funds will have to negotiate access with their national government and ensure compatibility with bilateral agreements negotiated between the fund and the government.

Given that many climate-compatible projects are developed at the regional and local levels, it is necessary to overcome these limits and barriers and develop the access, incentives and capacity for subnational government to tap into international climate funds. At the national level, funds for climate-related investments and activities can be an important lever for central governments to incentivise subnational climate action and catalyse further investment. Since 200, Germany has funded climate-related projects through its National Climate Initiative, while Canada more recently created the Low Carbon Economy Fund (Box 3.1). An explicit goal of both funding mechanisms is to catalyse additional investments, and both are a primary means for the federal government to implement their climate goals at the state/provincial level.

National governments should further increase their direct financial support to subnational governments through earmarked grants and subsidies to develop climate-compatible infrastructure and demonstration projects in cities. National governments could also green urban finance by re-designing grants to sub-national governments to correct incentives for unsustainable behaviour and reward cities that create environmental benefits beyond their borders (OECD, 2010a). As stressed in the *Chicago Proposal for Financing Sustainable Cities* (OECD, 2012), where appropriate, intergovernmental grants should take into account environmental objectives. This will help compensate cities for the

opportunity costs of green behaviour (e.g. the loss of development charges if an area is designated as a public park). Environmental considerations should mainstream all the national transfers' policy to subnational governments, including general and earmarked grants. Climate objectives and indicators as well as assessment of climate change impacts should be more systematically integrated in intergovernmental transfers. Specific or matching grants could be established to support climate-related projects and to compensate subnational governments for the spill overs generated by green policies that incur localised costs but generate broad benefits. The national system of grants should also ensure cross-sectoral policy coherence (e.g. with the energy, agriculture, transportation and land-use planning sectors), in particular with climate objectives.

Box 3.1. National funds for subnational climate action

Germany

Germany's National Climate Initiative (NKI) is the main source of funding for co-financing agreements between the federal government, the Länder and municipalities. Over 2008-2017, it invested EUR 790 million in over 25 000 projects domestically, catalysing a total investment of EUR 2.5 billion. Funded projects resulted in the reduction of 600 000 tonnes of CO₂ equivalent, plus an additional 555 000 tonnes reduced through non-investment projects (BMUB, 2018). The activities the NKI funds align with existing programmes, including funding programmes for municipalities, and federal funding for local authorities under the NKI is set to increase (BMUB, 2014). They cover a range of sectors, including transport, energy and sanitation services.

Canada

In Canada, the Low Carbon Economy Fund, announced by the Ministry of Environment and Climate Change in June 2017, is a primary means for the federal government to implement the Pan-Canadian Framework on Clean Growth and Climate Change at the provincial and territorial levels. The CAD 2 billion fund leverages investments in projects that mitigate climate change and contribute to Canada's fulfilment of its Paris Agreement pledges. The Low Carbon Economy Fund is comprised of two parts:

- *Low Carbon Economy Leadership Fund*, which makes CAD 1.4 billion available to provinces and territories that have adopted the Pan-Canadian Framework on Clean Growth and Climate Change to implement their commitments. Allocation of funding is based in part on population size.
- *Low Carbon Economy Challenge*, which makes CAD 500 million available to support innovations in clean growth and GHG emissions reduction.

Source: BMUB (2014); BMUB (2018); Government of Canada (2018).

Finally, several state governments in federal countries and regions in unitary countries also are on the frontlines of climate change work, providing financial support to local governments, but also to firms and the civil society. Some states and provinces operate their own funds, as in the case of the State of California Cap and Trade Fund, which will be further discussed below.

At local level, some cities have used their power to establish special funds to create climate funds (Box 3.2, including the cities of Amsterdam, London, Melbourne, New York City, Toronto and Paris (Box 3.3). Together, these funds have invested over USD 325 million in sustainable projects, primarily related to energy (C40 Cities Climate Leadership Group, 2016a). London's Green Fund, which began in 2009, leverages funding from both public and private sources, including USD 79 million from the London European Regional Development Fund Programme, USD 32 million from the Greater London Authority, USD 24 million from the London Waste and Recycling Board, and USD 13 million from private project-level funding. Initially set up with USD 1332 million in funding, it grew to USD 761 million funding by 2016 (C40 Cities Climate Leadership Group, 2016b).

Box 3.2. Dedicated resources, fiscal flexibility, coordination, and financing climate change responses

Cities and regions are turning to the creation of dedicated green and climate funds as a new way to pay for their response to climate change. Large and expensive projects, especially those related to building and expanding transport systems and other public infrastructure, generally require multiple sources of funding, financing tools, financial actors, and effective planning and coordination. As a result, cities are routinely involved in fund coordination, funding innovations, and multi-level government engagement:

- To pay for large regional transportation projects, cities such as **Stockholm** (Sweden) use a co-financing system between the state, region, and the municipality. In addition, congestion charges that are captured locally are managed at the national level and routed to the region for use toward public infrastructure.
- In **Braga** (Portugal), the city council-approved funds are a secondary source of funding for the city's low-emission, climate resilient infrastructure. Instead, resources from the central government and international institution budgets are directed toward their climate infrastructure ambitions.
- **Wellington** (New Zealand) has set up two funds to respond to climate change finance needs: a smaller fund replenished annually by the city's budget to invest in energy efficiency solutions, alongside a larger fund (through central government budget) developed to respond to low-carbon transport solutions.
- For **Santa Monica** (United States), in addition to its municipal budget, it has also relied on state grants, utility grants and financing, structured in-kind financing deals and bonds, such as a lease revenue bonds for large projects. The combination of these financing schemes has led the city to take on an ambitious climate response agenda, including transitioning the city to 100% renewable energy mix in 2019.

Source: OECD (n.d.).

Better exploiting the potential of taxes at subnational level

To the extent possible, taxes should be designed to confront agents with the full marginal social cost of actions affecting the environment, as stressed in *The Chicago Proposal for Financing Sustainable Cities* (OECD, 2012). At a minimum, this means eliminating the anti-green bias of some existing local tax provisions. For example, property taxes should avoid favouring urban sprawl and encourage development in the urban core and around transport linkages. But going even further, national governments can green subnational finance by re-designing taxes to subnational governments to correct incentives for unsustainable behaviour and reward cities that create environmental benefits beyond their borders. A comprehensive greening of urban finance would also increase the coherence between urban finance and urban planning frameworks to enhance urban sustainability and to contain unlimited urban growth (OECD, 2010).

Box 3.3. Paris Green Fund: An innovative fund to finance climate objectives

In 2018, the city of Paris launched the Paris Green Fund (*Paris Fonds Vert*) to support its mid- and long-term climate goals to achieve carbon neutrality by 2050. The main objective of the fund is to raise private money to allocate towards private innovation and SMEs in support of the ecological transition of Paris. The city of Paris allocated EUR 15 million into the fund initially, with a first target to reach EUR 200 million.

The creation of the fund required changes in the French legal framework. Notably, a law was passed in 2017 to allow the city of Paris to create a territorial investment fund (in France, it is not easy for subnational entities to create such a tool). The mandate for the Fund is narrow, in that it is limited to support the ecological transition (which thus makes its scope narrower than that, for instance, of investment funds of French regions).

Under the new law, the Paris Green Fund will raise capital from the private sector to finance companies developing innovative solutions to accelerate the ecological transition in Paris. The Fund will target enterprises with proven success or high growth potential and provide late-stage or growth equity.

Three key characteristics of the Fund are important to keep in mind:

- ***It is a growth equity fund:*** its aim is to finance companies that are already in a growth phase (e.g. rather than higher-risk start-ups) and/or at a more mature stage in their development.
- ***It is a green fund:*** the fund is dedicated to the ecological transition. There are several sectors in which the fund will invest. Including transport, energy, energy efficiency, waste management, buildings and digital innovation.
- ***It is a territorial fund:*** all activities funded through the Paris Green Fund must demonstrate a positive impact on the ecological transition of the city of Paris. The territorial impact of the Fund will be evaluated by an external body according to six main metrics: carbon impact (induced and avoided emissions); energy impact; impact on air quality; overall economic impact and just transition; resilience to the consequences of climate change; recycling and waste reduction.

Source: City of Paris (n.d.); additional meetings between the OECD and the City of Paris (June 2018).

Environmental taxes, including carbon taxes, offer a potential source of expanded revenue, for both national and subnational governments. Environmental taxes could make up an additional 2% of GDP in most countries if carbon taxes are included (OECD, 2018d). While many OECD countries put a price on carbon emissions (either through taxes or emissions trading systems), effective carbon tax rates vary significantly across countries. The highest effective tax rates on carbon tend to be imposed on roads. Today, many environmental taxes are national, although in some areas (waste, water, vehicle registration and circulation, etc.) subnational governments are the most important recipients.

While there has been progress in the area of environmental taxation, more needs to be done. In the EU, the number of environmental taxes applied by member states (EU-28) increased between 2006 and 2014, but revenues from environmental taxes increased more slowly than GDP growth in the same time period (9.5% and 13.9%, respectively). An exception was the period following the financial crisis (2009-2014), when revenues from environmental taxes grew by 9.4% and GDP grew by 5% (EEA, 2016). In some EU Member States, the ratio of environmental tax revenues to GDP grew considerably between 2002 and 2014, notably in Greece, Estonia and Slovenia. Interestingly, this ratio dropped in three European countries that are considered leaders in environmental policies: Denmark, Sweden and Norway (EEA, 2016). Subnational governments are limited in their use of tax revenues for low-emission climate resilient infrastructure investment only to the extent that their overall powers of taxation are limited.

National governments should, on the one hand, allocate the full benefit (or a share) of certain national environmental taxes to subnational governments, and also, on the other hand, provide them with more flexibility and taxing power. In Italy, regions can impose additional surtaxes to several national environmental taxes. Several regions and cities in the United States, Germany, Sweden and Italy have also developed specific climate-friendly taxes (e.g. taxes on impervious surfaces, also knowns as rain, drainage or stormwater taxes). These are generally imposed on the surface area of impervious areas, such as concrete or asphalt, that do not absorb rain. Other examples that have proven effective include a parcel tax on property owners; the creation of special districts to tax a subset of a city's property owners who will benefit directly from an investment (including adaptations to protect from the impact of climate change); fuel taxes, whether collected at the national level or at the subnational level, as sources of revenue for climate-related spending (World Bank, 2018a). In addition, the widely used Property Assessed Clean Energy (PACE) mechanism in the United States is essentially an additional property tax through which property owners reimburse local governments for loans to install solar energy panels (OECD, 2010a).

More taxing power would provide subnational governments with the possibly to implement a regional or local climate-friendly tax policy. This can be done through rates and bases, but also by creating local eco-taxes. However, given that, in many cases, voters must approve new or modified taxes, it is important for subnational governments to demonstrate to the public the multiple benefits of proposed climate change mitigation and adaptation investments. Some of these tax arrangements are linked to land-value capture and further developed below.

Making better use of user charges and fees

Subnational governments also tend to have some level of control over how fees are set, which can constitute additional sources of revenue for climate-related investments. Fees that can both raise revenue and incentivise GHG emissions reduction and adaptation to climate change include congestion charges, parking fees, high occupancy toll lanes, and water and wastewater user fees (Merk et al., 2012). Congestion charges in particular can shift ridership to public transportation modes, which increases the population paying public transportation user fees and supporting those systems. In Stockholm, London, Milan and Singapore, congestion charges have resulted in reduced carbon emissions, and in the case of Singapore and Milan have been tied to the level of pollution emitted from vehicles (OECD, 2013a).

Even if subnational governments have more flexibility in this field, their freedom to create a fee and to set tariffs can be restricted by national regulations (regulated prices and/or ceilings). In some “strategic” or essential areas related to security and social cohesion (e.g. energy sector), subnational governments may not have the possibility to set user charges, which could be offered to the population free of charge or with prices determined at national level. Restrictions also result from the capacity to pay by the local public service users because of limited financial revenues, as well as their willingness to contribute. Resistance from citizens, businesses and lobby groups can be a strong barrier to the development of climate-friendly tariffs and fees, such as congestion charges, urban tolls, parking fees or utility fees (water, waste and energy).

Making the most of property income and land-based financing instruments

Land value capture (LVC) policies help local authorities reclaim gains from investments or changes in land regulations, thereby generating revenue to meet local needs. As outlined in OECD (2017d), LVC refers to fiscal instruments through which public authorities can capture increases in property values that are unrelated to actions of landowners. Some form of LVC mechanism exists in the majority of OECD countries. LVC typically aims to capture either the windfall gain to land owners that can occur through zoning decisions or the increase in land values that occur through public investment (for example, infrastructure investment).

There are a variety of LVC tools with differing levels of sophistication; these include taxes, fees or charges, in addition to building rights and certificates that can be used to generate revenues to apply to climate-related investments (Smolka 2013). Currently, adoption of LVC tools has been intermittent, with a range of LVC tools in use (Table 3.1). In the case of climate change, which generates significant costs and investment needs, land value capture can be a way to close some of the funding gaps.

Significant potential remains to further exploit LVC as a revenue-raising mechanism for subnational governments. When LVC has been successful, it is largely attributed to deep local support, technical competences, institutional mechanisms and a commitment from leadership. Before determining the appropriate tools and projects, cooperation between subnational and national government is needed to ensure that LVC is legally feasible; in some cases, the devolution of certain fiscal controls from higher levels of government to local authorities may be required. Data on the rate of use of land value capture by subnational governments could not be found. However, one estimate stated that infrastructure investments could be paid for by capturing 16% of total land value increases (LILP, 2017).

Table 3.1. Land value capture mechanisms across the OECD

Land value capture mechanism	Description	OECD countries in which the instrument is used
Impact fees	A one-time fee required from the land developer to help pay for new public infrastructure and other services, as well as infrastructure to sustain the new construction by the developer	Australia, Austria, Estonia, Finland, France, Germany, Greece, Israel, Italy, Japan, Korea, Netherlands, New Zealand, Slovak Republic, Sweden, Switzerland, United States
Joint developments	A private public partnership, where public action can be attached to private development, for instance a transit facility, and both parties (private and public) share the costs, revenues, and risks	Austria, Czech Republic, Denmark, Estonia, Finland, Israel, Japan, Korea, Mexico, Netherlands, New Zealand, Norway, Slovak Republic, Switzerland, United States
Property tax (only countries that update tax-base regularly)¹	Property or land value taxes automatically capture a share of the increase in property values as long as the assessed property price on which they are based is regularly updated to reflect market values	Australia, Chile, Denmark, Finland, Japan, Korea, Mexico, New Zealand, Portugal, Turkey, United States
Land banking/pre-emptive purchase rights at unimproved valuations	The practice assembling plots of undeveloped or underdeveloped for further development or sale; land banks make profits by reselling land at higher prices than they bought it	Austria, Finland, Germany, Japan, Korea, Norway, Spain, United States
Tax increment financing	An accounting technique through which investments are financed by borrowing against expected increases in future tax revenues	Canada, Finland, France, Korea, Spain, United States
Betterment levy or special assessment	Similar to impact fees, a betterment levy can be charged to capture the increase in property values due to a public action (e.g. rezoning of land or provision of infrastructure)	Israel, Poland, United States
No value capture		Belgium, Hungary, Ireland, Slovenia, United Kingdom

Note: (1) lists only those countries whose property taxes have characteristics that make them effective value capture instruments. Due to the high degree of fiscal decentralisation in federal countries, the availability of any of these instruments may vary significantly from state to state.

Source: Adapted from OECD (2017d); Smolka (2013).

Emissions Trading Systems (ETS): Success stories in regions and cities

While many emissions trading systems (ETS) operate at the national level, some subnational governments operate their own. Cap and trade is a policy mechanism to reduce greenhouse gas emissions. High polluting industries are required to pay when they exceed pre-determined emission amounts. In order to emit over the prescribed amount, companies are forced to purchase emission allowances. This has proven to be a very effective policy in decreasing carbon emissions because emissions are limited to the allowances that are issued (Environmental Defense Fund, n.d.). The Regional Greenhouse Gas Initiative established the United States' first market-based greenhouse gas emissions reduction program, and has grown to include the states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island and Vermont. Proceeds from the sale of emissions allowances fund programmes to increase energy efficiency and the use of renewable energy (RGGI, 2018). The Western Climate Initiative features a combined ETS market for greenhouse gas emissions allowances and is comprised of the state of California (United States), the province of Québec (Canada), and up until mid-2018, the province of Ontario (Canada) (WCI, 2018). The California Cap and Trade system is the main source of funding for the state of California's climate investments (Box 3.4).

Box 3.4. California's cap and trade system

The state of California's GHG emissions cap-and-trade programme funds the state's Greenhouse Gas Resource Fund and provides most of the funding for the State's climate-related projects. The goal of the fund is to both make investments that implement the state's climate legislation (Assembly Bill 32) and also benefit disadvantaged communities throughout the state. The state is required by law to allocate at least 25% of the fund to projects that benefit disadvantaged communities and at least 10% to projects located within disadvantaged communities (CARB, 2017; CARB, 2018)

The Air Resources Board administers the Greenhouse Gas Resources Fund (GGRF), and individual funding programmes are designed and allocated by the agencies responsible for them. These agencies solicit proposals and design criteria. Investments that are eligible for GGRF funding can be implemented by state, local or regional agencies, collaborations of local or regional governments, or non-profit organisations working with local governments (State of California, 2018). Priority areas for investments include:

1. Air Toxics and Criteria Pollutants
2. Low and Zero-Carbon Transportation
3. Sustainable Agricultural Practices
4. Healthy Forests and Urban Greening
5. Short-lived Climate Pollutants
6. Climate Adaptation and Resiliency
7. Climate and Clean Energy Research (State of California, 2018).

CARB (California Air Resources Board) (2017); CARB (2018); State of California (2018).

3.2. External financing: Accessing credit markets and attracting private investors

Public finances are insufficient to close the infrastructure funding gap; private financing must be mobilised. Banks and private institutional investors such as pension funds and insurance companies are fundamental actors in supporting the bulk of the transition to low-emission, resilient economies, but gaps in private sector climate finance remain significant. McKinsey (2016) estimates that private investment comprises as much as half of total infrastructure spending – equivalent to USD 1 trillion to USD 1.5 trillion annually – and that an additional USD 1 trillion to USD 1.5 trillion annually could be mobilised if private institutional investors could find projects that both contribute to sustainability targets and provide the needed return on investment. This could in turn contribute towards the USD 3 trillion to USD 4 trillion annual sustainable infrastructure investment gap estimated by the Global Commission on the Economy and Climate (2014).

The challenges of attracting private investment are important at both the national and subnational levels, but even more acute at the subnational level, given the capacity constraints and lack of creditworthiness. National governments have an important role to play; for example, by assisting in the provision of technical support in building capacity for enhancing access to private capital markets (OECD, 2014b).

There are a number of potential instruments for tapping private finance in support of urban greening and aligning private investment with policy priorities. This section will focus on specific dimensions for subnational governments in mobilising external financing options for climate change. It will focus in particular on i) creditworthiness; ii) green bonds; iii) subnational public private partnerships and iv) equity funds.

Improving the credit-worthiness of subnational governments

Improving the credit-worthiness of cities is key to unlocking private finance. Estimates suggest that less than 4% of the largest 500 cities in developing countries are deemed creditworthy in international markets. Creditworthiness can be affected by the inability to collect revenue, which limits a city's capacity to borrow and enter to partnership with the private sector. The lack of transparent accounting practices is another important barrier, particularly in developing countries (OECD, 2014b). Assisting cities through strengthened financial performance and enhancing city leaders' knowledge of revenue management, expenditure control, debt management, asset maintenance and capital investment planning is central to unlocking and improving creditworthiness (World Bank, 2018a). According to the World Bank, just USD 1 of investment in improving city creditworthiness in a developing country can leverage more than USD 100 in private investment in sustainable urban infrastructure (World Bank, 2013).

In parallel, it is necessary to consider the borrowing framework. In many developing countries, SNGs are not allowed to borrow. In a great number of countries around the world, including the OECD, SNGs and especially cities, are not allowed to issue bonds on capital markets. So, while subnational fiscal capacity should be strengthened to improve creditworthiness, borrowing frameworks should be adapted to allow borrowing for SNG investments.

Further developing green and climate bonds

Long-term borrowing to finance investment permits a better allocation of resources over time and intergenerational justice, and is also a financial necessity due to a lack of local savings and capital transfers in many countries. In all OECD countries except Chile, subnational governments have the ability to borrow. The subnational outstanding gross debt accounted for 24.5% of GDP and 20.7% of total public debt in 2016 (OECD 2018a). However, it is very unevenly distributed among OECD countries: in particular, it is higher in federal countries relative to unitary countries. Unlike central and state governments, in most OECD countries, local governments are subject to the "golden rule," which only allows long-term borrowing to finance investment in infrastructure and large facilities (local governments are not permitted, for instance, to borrow to cover current expenditure as central and many state governments can). In addition, cities' borrowing capacity is also constrained by strict prudential rules on debt stock and service, and many cities cannot issue bonds on the international or domestic capital markets, but can only borrow on public credit and the private market.

In the majority of OECD unitary countries, local bond issuance remains limited or non-existent, and notably in countries where bond financing is forbidden for local governments. As a result, loan financing is the most widespread form of external funding in unitary countries (58% of total local debt and 69% of financial debt). Such rules limit the level of local government indebtedness in most OECD countries (with some exceptions, such as Japan, Norway, Iceland or Sweden); however, they can also be considered a constraint to funding climate-related infrastructure projects, which cannot cover 100% of their costs through self-financing and capital transfers. At global level the issue is even more striking, as many local governments cannot access borrowing at all, let alone issue bonds, because of poor fiscal capacity, creditworthiness and strict borrowing rules.

Despite these limitations, subnational governments in several OECD countries have the authority to issue bonds and other debt instruments, including for green investments. Debt securities are widespread at state level in several federal countries (Canada, United States, Germany, Switzerland, Germany and Spain), as well as at local level in some unitary countries (New Zealand, Japan, Norway, Korea, Iceland and Sweden). Among debt securities, green and climate bonds are fundamentally the same as traditional bonds, except that they are applied to environmentally related investments. Bonds that meet the eligibility criteria for the Climate Bonds Initiative's Climate Bond Certification can be considered climate bonds. This includes bonds that fund renewable energy, low-carbon buildings, energy efficiency, waste and pollution control, low-carbon transport, informational technologies, nature-based assets and climate-responsive water investments (Climate Bonds Initiative, 2017).

Although the green bond market is considered modest in comparison to the larger bond market, globally green bonds issued in 2017 exceeded USD 150 billion. Globally, 47 countries allow the use of green bonds, with the US, France and China issuing the highest amounts. In 2017, the largest share (33%) of green bonds was issued for renewable energy, followed by low-carbon buildings and energy efficiency (29%); clean transport (15%) and sustainable water management (13%) (Climate Bonds Initiative, 2018a).

Subnational governments are becoming significant issuers of green bonds or climate bonds, in particular in the United States (Climate Bonds Initiative, 2017). Cities have begun to issue green bonds at record pace in order to help finance infrastructure. The first green bonds for cities were issued in 2013 by the state of Massachusetts which initiated this bond form, authorising the municipal issuance of USD 100 million in green bonds (Schwarze, 2016). Major cities such as New York plan to use their green bond revenues on wastewater adaptation and a USD 1.7 billion subway expansion. Wuhan in central China has a total issuance of USD 8.7 billion, with planned projects including flood protection and a public bicycle service. Gothenburg, Johannesburg, Mumbai, Tokyo, Amsterdam, and Lagos are all potential green bond issuers (Climate Bonds Initiative, 2017). The Water and Sewer Authority of the City of Washington, DC, issued the United States' first environmental impact bond, which funded green infrastructure projects to absorb and slow stormwater and prevent combined sewer overflow. DC Water constructed the green infrastructure, and shares with its investors the risk associated with meeting the water quality performance standards identified within the contract (World Bank, 2018a; Goldman Sachs, 2016).

Green bonds issued by local governments or government-backed entities represented 21% of total 2017 volume (Climate Bonds Initiative, 2018a). Local governments in France and Sweden dominate the local government green bonds in Europe, together accounting for 86% of European municipal green bonds (Climate Bonds Initiative, 2018b). While this does not indicate the share of green bonds within the total European municipal bonds market, it is instructive to note that in the United States, 2.4% of municipal bond issuance in 2017 were green bonds (S&P Global Ratings, 2018).

Develop public private partnerships to finance climate investment

Public-private partnerships (PPPs) represent another potential source of external funding for climate investment. PPPs provide governments with the opportunity to shift some of the risk – and return on investment – of infrastructure development to the private sector, in exchange for a certain level of return on investment. Limited data exist on the frequency with which subnational governments use PPPs for infrastructure investments, much less on climate-related investments.

Although the average value of PPPs is generally higher at the national level, the number of PPPs is often greatest at subnational level (OECD, 2018). In France, for example, subnational governments granted 79% of the *contrats de partenariat* between 2005 and 2011 (EPEC, 2012). These contracts primarily went to small building, street lighting or road maintenance projects. Due to the smaller size of local PPP contracts, they accounted only for approximately 25% of the amounts invested in PPPs (Bergere, 2016). In Australia, about 90% of PPPs occur at the (subnational) state level (EIU, 2012). In Germany, subnational PPPs constitute approximately 80% of PPP investment. In the United Kingdom, local authorities acted as the contracting authority for the majority of Private Finance Initiatives projects through March 2014. In the United States, the amount invested by PPPs has increased greatly in recent years. The value of PPP projects in progress by the end of 2017 was greater than the total value of all completed PPPs transactions over 2000-2017. Over 2015-2017, 30 states, the District of Columbia and Puerto Rico each completed or initiated one or more PPPs (Brattle Group, 2018).

Subnational PPPs confront challenges and come with specific risks. The multi-level context in which they occur and the complexity of PPPs raise issues for their successful implementation (OECD, forthcoming -c). Challenges emerge in areas such as financing and funding, intergovernmental regulatory coherence, and cross-jurisdictional co-ordination and economies of scale. The complexities of PPPs and the skills required to undertake them raise questions regarding administrative capacity and accountability in the public sector (OECD, forthcoming -c). Thus, if PPPs clearly represent another potential source of external funding for climate investment at the subnational level, their use at subnational level for climate investment will be limited to large jurisdictions, metropolitan areas or regions with sufficient capacities to enter in such complex arrangements.

With respect to climate-related PPPs, another challenge is the potential for lower returns on green investments. In addition, the economic benefits green investments do generate may be difficult for investors to appropriate. Climate resilient investments face an additional hurdle in that it is difficult monetising the avoided costs associated with climate-related damages (Corfee-Morlot et al., 2012).

Attracting private sector financing through equity funds

Private institutional investors, such as pension funds and insurance companies, are another important potential source of funding. They have some USD 70 trillion in assets under management in OECD countries, and should, in principle, find sustainable urban infrastructure an attractive addition to their portfolios (Allianz, 2013). Despite this potential and the significant investment need, such actors are currently investing very little in climate-related projects at subnational level. There are several barriers that must be overcome, relating to inadequate international (notably European Union) and national legal frameworks for private long-term investments and public-private co-investments rules, as well as the size of urban projects which increases the cost for private investors and often exceeds the return on investment.

There are, however, some successful experiences to attract more private money into the greening of regional and urban infrastructure, such as equity funds. In particular, investment can take place through specialised infrastructure equity funds, which may also involve other private investors, such as urban developers. Larger cities can, for example, set up exchanges to match public infrastructure projects with financial backers, as was done by the city of Chicago in 2012 through the Chicago Infrastructure Trust (CIT). The CIT pursues projects that leverage private sector resources through alternate financing and procurement methodologies and harness private sector expertise to help close the infrastructure gap (CIT, 2018).

4. Applying an inclusion lens to climate-resilient infrastructure financing and investment

Investments in low-emission urban infrastructure can have positive impacts on low-income and vulnerable populations. For instance, investments to boost energy efficiency of housing can also generate important dividends for low-income populations, as it can result in lower energy bills. In addition, increased investment in low-emission urban transport systems generally improves access to jobs for residents, including low-income populations. Low-emission infrastructure development creates the potential for job creation among those with lower-skills. Moreover, public policies and investments that result in lower GHG emissions and pollution levels generate positive health outcomes for all residents.

Yet policies and financing tools designed to address climate change can also have important distributional impacts, disproportionately affecting low-income populations. This is the case, for instance, of financing tools that effectively put a price on carbon, such as carbon taxes or congestion charges. This section makes the case for applying an inclusion lens to climate-resilient infrastructure financing and investment. It first identifies some of the trade-offs and opportunities between climate change financing tools and inclusive growth objectives. It then proposes a selection of financing tools and strategies that offer potential for achieving both climate and inclusion objectives in cities.

4.1. Climate financing and investment tools offer both opportunities and trade-offs more inclusive growth

Financing tools to reduce GHG emissions include both *explicit* climate mechanisms as well as tools *outside* the climate portfolio that can also influence climate outcomes. Explicit tools include those relating to energy, transport and carbon taxation; subsidy and pricing reforms; financial support for renewable and energy efficiency programmes. Other tools that can influence climate outcomes include local tax policies that affect the costs and benefits of housing and land use (OECD, 2017e). In both cases, such tools have the potential to affect household spending and the affordability of energy, transport services and housing, particularly for low-income households (OECD, 2018c).

Generally, there is a lack of empirical analysis of the distributional impacts of the low-emission transition. Studies have focused on the impacts of climate policies on income, for instance, demonstrating that, in the absence of redistribution mechanisms, carbon pricing will have a regressive impact and risk disproportionately affecting low-income or energy-poor people (McInnes, 2017). Less is known, however, about the impacts of many climate policies on household welfare, mobility, health and social inclusion.

Climate financing and investment tools present both opportunities and challenges for inclusive growth. Use of climate related financial tools needs to be accompanied with proper planning, management, and legal and regulatory frameworks to achieve maximum impact in climate protection and inclusion. Table 4.1 assesses the opportunities and trade-offs of a selection of climate financing and investment tools along several dimensions of inclusive growth: *affordability, access to jobs and services, job creation, and improved health outcomes.*

Table 4.1. Selected climate financing tools and inclusive growth: Opportunities and trade-offs

Climate financing tools	Impacts on inclusive growth outcomes		
	Dimensions of inclusive growth	Trade-offs	Opportunities
Carbon pricing, subnational taxes and trading systems	Income (energy affordability) Health (reduced carbon emissions can have positive health benefits)	Higher energy and transport prices affect low-income households, potentially resulting in such households spending a higher share of income on energy-related costs	Revenues from carbon pricing instruments can be invested in energy efficiency measures for low-income households or other measures that support vulnerable populations
Transport demand management tools (congestion charges)	Income (transport affordability) Access to jobs and services Health (reduced carbon emissions can have positive health benefits) Job creation (operating the transport management systems)	Higher transport prices can restrict access to jobs and city centres to low-income populations Restrictions on older and/or diesel vehicles disproportionately affects poor households	Proceeds of the charge can be invested in better public transport systems to improve transport access, quality, safety and affordability
Land-based financing instruments (e.g. land value capture)	Income (housing affordability) Spatial development/segregation Access to jobs and services Access to public transport Job creation	Concentrated infrastructure investments in one neighbourhood, if poorly managed, may be at the expense of investments in other neighbourhoods, creating an imbalance of quality infrastructure of services throughout the city	Revenues from land value capture can be invested in public realm to support climate and inclusion objectives, namely relating to the development and expansion of public transport, social housing, and municipal infrastructure
Green bonds and other debt-raising mechanisms	Income (transport) Health (reduced carbon emissions, sustainable water management systems)	The tool may not be available for local authorities in all areas, as it requires creditworthiness and an effective enabling environment	Green bonds can include both environmental and social criteria

Source: Adapted from OECD (2018c), World Bank (2018a).

4.2. Opportunities to align financing tools to achieve climate change and inclusive growth objectives

This section identifies several priority opportunity areas for policy makers to leverage both climate and inclusion objectives to finance urban infrastructure:

1. Get the governance right for infrastructure planning: integrate land-use and transport policies
2. Invest revenues from environmental taxes and fees in measures that also boost inclusive growth
3. Make greater use of land value capture tools to support climate and inclusive growth objectives
4. Take advantage of skills development and job-creation opportunities in urban infrastructure financing and investment, particularly relating to energy efficiency investments
5. Explore the potential for green bonds to achieve both climate *and* inclusion goals

Opportunity area: Get the governance right for infrastructure planning by integrating land-use and transport policies

Infrastructure investment needs in cities cannot be disconnected from land-use planning. Urban forms influence the demand for infrastructure services, as denser developments reduce the demand for mobility, as well as the supply of infrastructure services. OECD (2018f) found that in most OECD countries, urban sprawl has increased since 1990. Specifically, cities have become more fragmented and the share of land allocated to very low-density areas has increased. Urban areas have become denser on average, but 60% of urban space is sparsely populated (OECD, 2018f). Making cities more compact and connected will lower investment requirements by as much as 10% (New Climate Economy, 2014). In older cities that have developed around the use of private cars, there is an urgent need to shift towards cleaner modes of transport and towards “good density” practices, such as functionally and socially mixed neighbourhoods with access to green spaces, comfortable and affordable housing for all, and high-quality public transport networks (New Climate Economy, 2018).

Opportunity area: Invest revenues from environmental taxes and fees in measures that also boost inclusive growth

There is potential for environmental taxes and fees (including carbon pricing instruments) to be further exploited to contribute to inclusive growth. As mentioned, environmental taxes could make up an additional 2% of GDP in most countries if carbon taxes are included (OECD, 2018d). Yet as outlined in Table 4.1, some of these tools can be regressive. Carbon pricing, for instance, can disproportionately affect low-income or energy-poor people in the absence of redistribution mechanisms (McInnes, 2017), because they increase household energy costs. Congestion charges are another example: for low-income populations living outside of the city centre with limited public transport access, congestion charges can result in unfair cost burdens, as lower-income groups tend to pay more than higher-income households relative to their income (OECD/ITF, 2017; OECD, 2018c). In addition, other taxes or restrictions placed on older and/or diesel vehicles can disproportionately affect poor households that may not have the financial resources to invest in more energy-efficient vehicles.

Policy makers thus should assess and address *ex ante* potential regressive impacts, and invest their revenues in measures that *also* advance inclusive growth objectives. For instance, authorities can invest the income earned through carbon pricing instruments toward sustainable, low-carbon investments that benefit low-income populations. This has been done in London (Box 4.1), by which revenues from congestion charging are invested in efforts to extend access and services in public transport improvements, which can defray some of the regressive impacts on low-income populations over the long-term.

Box 4.1. London's experience with congestion pricing

In 2003, London introduced congestion charging in Central London. The goal was to increase speeds within the city by reducing traffic and congestion and related ills, through charging a fee to drive into central zones in London (Transport for London, n.d.). By law, the net revenue generated by the congestion charge is required to be spent on improvements to transport across London (Transport for London, n.d.). As a result, since the launch of the congestion charging programme, GBP 1.7 billion net has been invested in transport infrastructure, namely improvements to the bus network, maintenance of roads and bridges, and investments in increasing walkability in London (Transport Committee London Assembly, 2017).

The benefits from congestion pricing in London were hard-won, as realities did not always match up to anticipated results. For instance, the amount of money to operate the programme amounted to almost one-third of the revenues earned in the first years (Transport for London, 2014). Moreover, the programme contributed to a significant drop in driving, which impacted revenues from the programme and presented an unanticipated shortage of GBP 65 million (Transport for London, 2014). However, reinvesting in increased transportation provision could impact future earnings, between 2014- 2015 revenues earned from fares from public transit (bus and metro) reached GBP 3.5 billion, whereas revenues from congestion pricing that same period reached GBP 257.4 million, demonstrating the weight that transportation fares still have on the transit revenues (Transport for London, 2014).

Source: Transport Committee London Assembly (2017); Transport for London (n.d.); Transport for London (2014).

Emissions trading systems also hold potential to leverage inclusive growth objectives. This is the case in California, for instance, where the state has been allocating revenues from its cap and trade programme to a range of low-carbon and climate-responsive efforts, such as public transport and renewal energy, and at least 35% of the investments must be made in disadvantaged and low-income communities (California Climate Investments, n.d.- a). Funding vehicles have been created to help distribute with direct investments such as the Transformative Climate Communities fund. The purpose of the fund is to give back to communities in California which are most affected by environmental degradation and GHG emissions (California Strategic Growth Council, n.d. - a). Most recently, the cities of Fresno and Los Angeles were awarded grants in the amount of USD 70 million and USD 35 million, respectively, to be allocated towards activities that contribute to a greener, cleaner, sustainable, low-carbon future (California Strategic Growth Council, n.d.-b). Since 2015, Los Angeles has received USD 150 million in cap and trade funding; with the newest allocation of funds, the city is shifting to a neighbourhood strategy and community investment approach to advance the city's climate change goals (Box 4.2) (City of Los Angeles, 2018).

Box 4.2. Adopting a neighbourhood approach to the climate response: California's USD 35 million community investment climate change strategy

The Watts Rising Collaborative is designed to generate a set of community development investments to address climate change and economic development challenges in the neighbourhood of Watts in Los Angeles.

The programme will focus on both environmental and economic development challenges in the community, by supporting activities such as energy retrofits, photovoltaic cells, public housing redevelopment, green and open space, and electrification of transportation through a car sharing programme and bus upgrades. Workforce development programmes will also provide community members with training for jobs relating to the community improvement and environmental upgrading projects.

Investing at the neighbourhood level is important to addressing the nuanced impacts of climate change. The Watts Rising Collaborative has put in place measures to ensure that current residents benefit from the improvements to come. This includes measures to maintain housing affordability increasing job opportunities, and maintaining the accessibility of public amenities.

Source: City of Los Angeles (2018).

Opportunity area: Make greater use of land value capture tools to support both climate and inclusive growth objectives

Land value capture (LVC) tools are another financing tool that could be further exploited to achieve climate and inclusive objectives. The main objective of LVC is to generate new capital for investment in public infrastructure – whether through fees, taxes, or additional building rights. As outlined in OECD (2017e), LVC tools are attractive on equity grounds “because they target windfall gains from land and form a largely untapped source of funds for infrastructure investments.” Such instruments can also enable the development of welfare-enhancing infrastructure that would otherwise not be constructed due to funding constraints. However, across the OECD, LVC tools have not been widely used and represent an important potential in cities worldwide.

One LVC mechanism in particular – the Certificate of Additional Construction Potential, or CEPAC – has considerable potential to advance inclusive growth objectives. CEPACs are one of the more sophisticated LVC tools on the market, by which the land increment (income) is earned through the sale of air rights to enable developers to build beyond the standard height allowable stipulated by the city's zoning regulations (Smolka, 2013). Certificates are purchased through an auction and the income earned is restricted for use in the area where the certificate is purchased (called Urban Operations). CEPAC auctions result in increased density throughout the Urban Operations neighbourhood (Sandroni, 2018). Investments from CEPACs can be used to pay for infrastructure, to support public transport development and energy efficiency investments, or to develop social housing. CEPACs been used to a significant degree in São Paulo (Brazil), where it generated USD 2.8 billion in revenue between 2004 and 2016 for the municipality (Sandroni, 2018). In the Agua Espraiada area in São Paulo, revenue from CEPACs contributed to a bridge over the Pinheiros River and 252 units of social housing in a nearby slum for a total investment of USD 150 million, in addition to a metro line for USD 150 million. The Brazilian municipalities of Rio de Janeiro and Curitiba have also launched CEPACs auction markets.

CEPACs are most effective in specific market contexts, and require proper management. These tools tend to be most successful in strong economies and growing cities, where property markets are stable and in demand (Smolka, 2013). The complexity and sophistication of the instrument require that the CEPACs market is well managed and regulated to avoid the overselling and overpricing of air rights. There are added complications that can result in displacement and development imbalances because of the restriction of investment to Urban Operations (Smolka, 2013). Without proper management, CEPACs can result in one part of the city seeing an infusion of capital for infrastructure upgrades and development, while another area remains disinvested (Smolka, 2013). Affordability and accessibility objectives should be prioritised to ensure that infrastructure built via CEPACs serves low-income and vulnerable populations.

Opportunity area: Take advantage of job-creation opportunities in urban infrastructure financing and investment

Investments in large-scale energy efficiency and renewable energy programmes present opportunities to optimise climate change and inclusive growth, particularly in terms of workforce training and job creation in low-emission sectors. Many cities are taking on the challenge to reduce GHG emissions, setting ambitions toward carbon neutrality over the next 20 to 30 years. Finding ways to include low-income populations in renewable energy and energy efficiency programmes can produce potential wins on both sides, driving down household transit and energy costs and emissions through shifting the reliance from expensive individual transport to accessible and reliable public transit, and extending retrofitting and energy efficiency programmes to lower-income multi-family households. Often energy efficiency is offered as a premium and increasing housing prices and other costs (OECD 2015c). The case of the *Energy Welfare Public-Private Partnership Programme* in Seoul, Korea, is an innovative example to combine investments to energy efficiency for low-income households with training opportunities in the energy sector for vulnerable populations (Box 4.3).

Energy efficiency and urban transport represent key opportunity areas for urban investments. Among city respondents to a 2018 OECD survey (OECD, n.d.), energy efficiency retrofits and urban transport represented the top two sectors in which cities are dedicating the most significant financial resources to address climate change.

Box 4.3. Combining energy efficiency investments with training and job creation opportunities: The case of Seoul, Korea

Energy poverty is a reality for many low-income urban dwellers. In a city like Seoul, Korea, over 10% of households are unable to afford heat or air conditioning. In addition, low income households are more likely to reside in low efficiency buildings and operate energy inefficient appliances (OECD, 2018 Inclusive Growth in Seoul).

In 2015, Seoul launched the *Energy Welfare Public-Private Partnership Programme* to target vulnerable low-income families who would become even more at risk of energy poverty with the acceleration of climate change. The programme aims to increase the energy independence of energy-poor households by providing at-risk communities with home energy upgrades, including energy efficiency improvements, decentralised rooftop solar panels, and LED lights and mini-photovoltaic cells. It also supports disadvantaged job seekers through training and employment as energy consultants to assess energy performance of low-income households.

The programme operates with an innovative and sustainable financing method to ensure its long-term sustainability. This includes public funding from the city government for energy-efficiency building retrofits for low-income households, as well as the training of energy consultants. The programme also receives private funding from the *Energy Welfare Civic Fund*, into which citizens and businesses can make monetary and in-kind contributions. Contributions can come from savings earned through the *Eco-mileage programme* or the innovative “virtual power plant,” through which 17 municipal buildings and 16 universities save electricity consumption during peak hours and donate profits towards the Fund.

Source: OECD (2018c).

Opportunity area: Explore the potential to leverage green bonds to achieve climate and inclusion goals

Finally, green bonds offer an opportunity to achieve both climate and inclusion objectives. In the 2018 OECD survey of cities (OECD, n.d.), green bonds were identified as a key area of interest among cities to further explore as a financing tool. Mexico City in particular has been a pioneer in leveraging green bonds to improve climate-resilient infrastructure for the city’s poor and vulnerable populations (Box 4.4).

However, there is still significant progress to be made in terms of the assessment process for green bonds on both environmental and social dimensions. There is no standardisation in the assessment of environmental impacts: some reviewers have rating processes that denote the environmental impacts using “shades of green” (CICERO Second Opinions), while others review using categories such as Environment, Social, Governance (Vigeo EIRIS). Although there is a general conclusion that the funds should be directed towards a greener future, most green bonds assessments operate on voluntary guidelines produced by organisations like the International Capital Market Association which has developed the Green Bonds Principles and Climate Bonds Initiative and the Climate Bond International Standards offering guidelines and principles for green bond issuance (Climate Bond Initiative, n.d.).

In addition, there are no standards or mechanisms to measure or reward green bond issuers for any positive outputs of a project that are not strictly environmental.

Inclusion and social equity are not embedded into the assessment process for green bond issuance, and it is not a requirement to issuing a green bond. While Vigeo EIRIS evaluates the social and governance aspects of the issuer is assessed (e.g. whether the issuer of green bonds engages in transparent and high-road business practices), this does not necessary track whether the projects are leading to any social benefits. Others reviews include specific references to the alignment to global guidelines like the SDGs.

Box 4.4. Mexico City's poverty response through green bonds

Mexico City became a pioneer in Latin American by issuing the first municipal green bond in 2016 for USD 50 million (Apolitical, 2017; Swope, 2017). A second “sustainability” bond was issued for USD 105 million, which focused on green and social investments.

A good plan presents a way forward. The city's Climate Action Programme 2014-2020 is a planning tool to guide its climate change response; the Programme takes into account the environmental, social, and economic risks posed by climate change. It also identifies the impacts on people, in particular the most vulnerable populations and especially the poor. This is important, because it also influences the kind of investments the city will make regarding its low-emission, climate-resilient infrastructure.

The city prioritises water infrastructure, energy efficiency, and public transport projects in its issuance of green bond projects. In terms of water infrastructure, the city aims to upgrade and repair pipes to address water leakage, inadequate piping, and increase drinking water access. In the districts of Iztapalapa and Tláhuac, which have both received green bond infrastructure investments, over one-third of the population lives in poverty (Tonon de Toscano, 2017). The city is also investing in potable water wells and wastewater management. Flooding has also been lifted up as a particular issue for poor populations, as well as lack of access to clean drinking water.

As public amenities continue to be upgraded within these city districts, especially growing districts like Tláhuac, it will be necessary to track displacement pressures for those living in poverty as the infrastructure investments start to improve quality of life and access.

Source: Ciudad de Mexico (2014); Rodriguez (2017); Peyraud Senior Advisor et al. (2017)

5. Key recommendations and way forward: Harnessing the potential of subnational governments to finance low-emission, inclusive growth

5.1. Overall recommendations for national and subnational governments

- Strengthen data collection, statistical systems and methodological approaches to track the implementation of the Paris Agreement, in coordination with international organisations and other supranational institutions. The G20 should support this at both national and local levels.
- Mobilise more funding from international organisations and national governments to help subnational governments address climate priorities and more effective management of funding and green budgeting.
- Leverage additional external funding, in particular from the private sector, as a complement to public resources directed at climate change.
- Strengthen institutional, financial and strategic capacities to address climate priorities. This is a long-term agenda, and requires sustained efforts to mainstream climate objectives across policy areas and levels of government.
- Apply an inclusion lens to climate-related spending and financing, given that climate change impacts are poised to disproportionately affect low-income and vulnerable people and places. Several priority areas stand out:
 - Get the governance right for infrastructure planning: Integrate land-use and transport policies.
 - Invest revenues from environmental taxes and fees in measures that also boost inclusive growth.
 - Make greater use of land value capture tools to support climate and inclusive growth objectives.
 - Take advantage of skills development and job-creation opportunities in urban infrastructure financing and investment, particularly relating to energy efficiency investments.
 - Explore the potential for green bonds to achieve both climate and inclusion goals.

5.2. Specific recommendations for national governments

- To avoid under or un-funded mandates, provide subnational governments with sufficient sources of revenue to carry out their responsibilities in areas related to climate change adaptation and mitigation. This means a balanced and sustainable basket of resources based on grants/transfers (international, national and regional), taxes (shared and own-source), tariffs and fees and property income.
- Provide subnational governments with sufficient leeway to adjust and manage their revenues to respond to climate needs.

- Provide subnational governments with the possibility to mobilise external funding, including the ability to borrow (and to access capital markets for most capable subnational governments) and to establish public-private-partnerships (PPPs arrangements, equity funds). This implies a suitable regulatory framework, sufficient fiscal capacities and creditworthiness, but also a willingness of the private sector to enter into partnerships with local authorities.
- Ensure the right framework conditions and adequate coordination mechanisms are in place to boost public investment towards climate objectives, as outlined in the *OECD Recommendation on Effective Public Investment across Levels of Government*.
- Enable subnational investment in low-carbon climate resilient infrastructure. This includes providing a framework for longer-term, more systemic approaches than can be achieved at subnational levels; providing needed technical assistance and capacity; setting national targets and price signals; and structuring taxes and grants in a way that incentivises sustainable behaviour.
- Foster effective horizontal cooperation, in particular in metropolitan areas. For instance, some financing instruments (e.g. congestion charges, eco-taxes) should be applied at the regional/metropolitan scale, not only in centre-cities.
- Strengthen subnational institutional, financial and strategic capacities to address climate priorities. This is a long-term agenda, and requires sustained efforts from the central government.

5.3. Specific recommendations for subnational governments

- Make climate resilience a priority that is mainstreamed in all sectors of activity within the city and region.
- Develop a green fiscal strategy and action plan, and integrate green priorities in budgeting.
- Make the most of taxes, user charges and fees, property income, land-value capture instruments, etc.

Notes

¹ For example, the Under2 Coalition was established at COP 21 by the US state of California and the German state of Baden-Württemberg to bring together subnational governments committed to reducing greenhouse gas emissions. As of August 2018, the Under2 Coalition had 200 subnational government signatories, representing over 1.3 billion people and nearly 40% of the global economy (Under2 Coalition, n.d.).

² None of these reports go into detail about the sources of their public funds, with the exceptions of California and Belgium. Since California only tracks the funding from one source to begin with, however, there is still not much detail to go into. Belgium notes the amount of funding it received from the EU Emissions Trading System (EUR 151 million) and from its national energy taxes (EUR 4.8 billion), but not all of this funding is necessarily spent on climate-related infrastructure investment.

³ <https://data.worldbank.org/indicator/EG.FEC.RNEW.ZS>

⁴ http://courses.washington.edu/gmforum/Readings/Bertaud_Transit_US_Europe.pdf

⁵ First, a high share of tax revenue in subnational revenue does not imply a high level of tax revenue. While subnational tax revenue accounted for 31.9% of public tax revenue and 7.1% of GDP in the OECD in 2016, there are great variations from one country to another: in 15 OECD countries, subnational tax revenue accounted for less than 10% of total public tax revenue and less than 1.5% of GDP, the lowest ratios being found in Estonia, Turkey, the Slovak Republic, Ireland and Greece. By contrast, subnational tax revenue ratios were particularly as both a share of public tax revenue and GDP in Sweden, Finland, Switzerland, Germany and Canada. Second, tax revenues include both shared taxes and own-sources (or “autonomous”) taxes, implying that the tax revenues indicator is not always a measure of tax autonomy. Depending on the category of taxes, flexibility can vary significantly from no taxing power to significant leeway. With “shared taxes” (national taxes shared between the central/federal government and subnational governments), autonomy is very low: rates are defined nationally and tax receipts are redistributed according to allocation criteria which are defined by the State. Subnational governments have varying degrees of power depending on the country. With own-source taxes (taxes on which subnational governments have a certain leeway with regard to the tax base or tax rates), there is more leeway.

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Financing Climate Futures

RETHINKING INFRASTRUCTURE

Governments recognise that scaling up and shifting financial flows to low-emission and resilient infrastructure investments is critical to deliver on climate and sustainable development goals. Efforts to align financial flows with climate objectives remain incremental and fail to deliver the radical transformation needed. The OECD, UN Environment and the World Bank Group, with the support of the German Ministry of Environment, Nature Conservation and Nuclear Safety, have joined forces under a new initiative – *Financing Climate Futures: Rethinking Infrastructure* – that provides a roadmap to help countries make the transformations in their infrastructure, investment and finance systems that are needed to make financial flows consistent with a pathway towards a low-emission, resilient future.

For more information on *Financing Climate Futures: Rethinking Infrastructure* visit: oe.cd/climate-futures

Financing climate objectives in cities and regions to deliver sustainable and inclusive growth

The investment choices we make in the coming years will either lock-in a climate-compatible, inclusive growth pathway, or a high-carbon, inefficient and unsustainable pathway for decades to come. Cities and regions, responsible for 60% of public investment in OECD countries, are significant contributors to spending and investment related to climate. With high levels of inequalities in many cities, the success of the transition will depend on the ability of local governments to engage in a “just” transition. This paper focuses on how national and sub-national governments can align subnational financial flows to transition towards low-carbon, resilient and inclusive cities. The paper is a contribution from the OECD Champion Mayors for Inclusive Growth initiative and to the OECD Programme on Subnational Finance and Investment.