

Climate change and intergovernmental fiscal relations: Policy reform options

By Luiz de Mello and Teresa Ter-Minassian¹

I. Introduction

1. Climate change is making headlines around the world. The months of July and August 2023 are alleged to have been the warmest worldwide since records began. Forest fires in Canada and Greece; torrential rainfall and floods in Libya, Spain and Guatemala; and episodes of extreme temperatures in Northern Europe are all examples of events that have caused sizeable human and material loss during the latest Northern Hemisphere Summer. In most cases, these events have overwhelmed governments at all levels of administration, drawing attention to their preparedness to cope with natural hazards whose severity and frequency are expected to increase in the years to come because of climate change, as well as policymakers' ability to mitigate and adapt to climate change.

2. Drawing on our recent work (de Mello and Ter-Minassian, 2023a, 2023b) and the scholarly literature (e.g., OECD, 2019, 2023; Martinez-Vazquez, 2021; and de Mello and Martinez-Vazquez, 2022), we argue that there are at least two main reasons why the subnational governments (SNGs) are important actors in the areas of climate change mitigation and adaptation. First, the consequences, as well as the socio-economic costs and benefits, of climate change policy vary within (in addition to across) countries, requiring differentiated, place-based responses that also vary among regions and localities. Second, and perhaps most importantly, the SNGs are solely responsible for, or share with the national government, relevant spending, taxation and regulatory responsibilities that are central to mitigation and adaptation strategies.

3. This paper begins in Section II by briefly outlining a net-zero emissions scenario put forward by the International Energy Agency to meet the internationally agreed objective of carbon neutrality by the

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middle of this century. This scenario puts in perspective the world's climate change mitigation needs and points to areas for policy action. The section then discusses the main reasons for place-based decarbonisation efforts, the roles that the SNGs could play and the main policy reform options in each of these areas.

4. Section III focuses on climate change adaptation. It takes stock of estimates of adaptation investments required to face climate change and discussed the role of the SNGs in this area, the policy instruments they have at their disposal and options for policy reform. Section IV follows up on climate change adaptation and discusses the role of the SNGs in the management of natural disasters, from prevention to crisis management, and post-crisis recovery and reconstruction. This is important, because mitigation and adaptation efforts will not obviate the need for policy action to make sure governments are prepared to deal with the physical risks associated with climate change in a manner that minimises human and material losses when natural disasters occur, while making sure economies and societies recover from those shocks and learn from past experience.

5. Section V highlights the importance of effective intergovernmental cooperation in climate change mitigation and adaptation, as well as in disaster risk management. The section focuses on options to promote the alignment of national and subnational policy agendas, the reasons for -- and potential forms of -- involvement of the national government in subnational initiatives, and the need and possible actions to strengthen intergovernmental cooperation. Section VI concludes by highlighting the significant challenges for effective intergovernmental relations to deal with climate change mitigation, adaptation and related risk management, while stressing the availability of policy tool to face those challenges.

II. The role of subnational governments in climate change mitigation

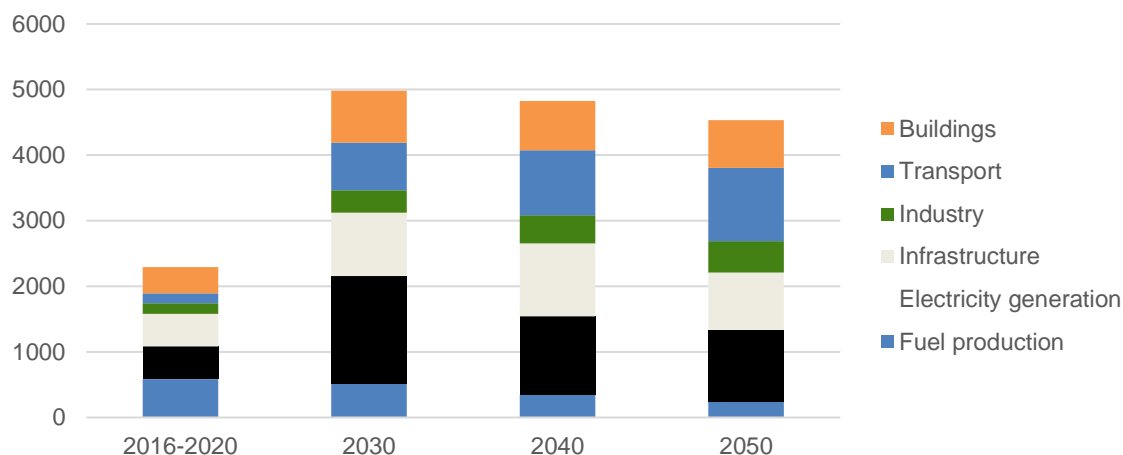
1. Decarbonisation needs to meet climate change targets

6. Climate change mitigation requires considerable policy effort to reach net-zero emissions (NZE) of greenhouse gases (GHG) by mid-century in line with attainment of the 2015 Paris Agreement goals.² However, policy actions have so far been insufficient to put emissions on track to reach those goals. Indeed, the NZE scenario put forward by the International Energy Agency (IEA, 2021, 2022) draws attention to the substantial investments needed to reach emission neutrality by 2050 (**Figure 1**), especially in infrastructure, buildings and transport, along with efforts to reduce energy demand through improvements in energy efficiency and changes in behaviour. By comparison with current outcomes, investment would need to more than double on a yearly basis by the end of the decade to ensure carbon neutrality by mid-century.

² More than 180 countries around the world have committed to ambitious GHG emission reduction targets to limit global warming relative to pre-industrial times to well below 2°C, and preferably 1.5°C, as enshrined in the Paris Agreement. Many of these countries have committed to achieving emission neutrality by 2050.

Figure 1. Investment needs to achieve carbon neutrality by 2050

Annual capital investment in the NZE scenario (USD bn, 2019)



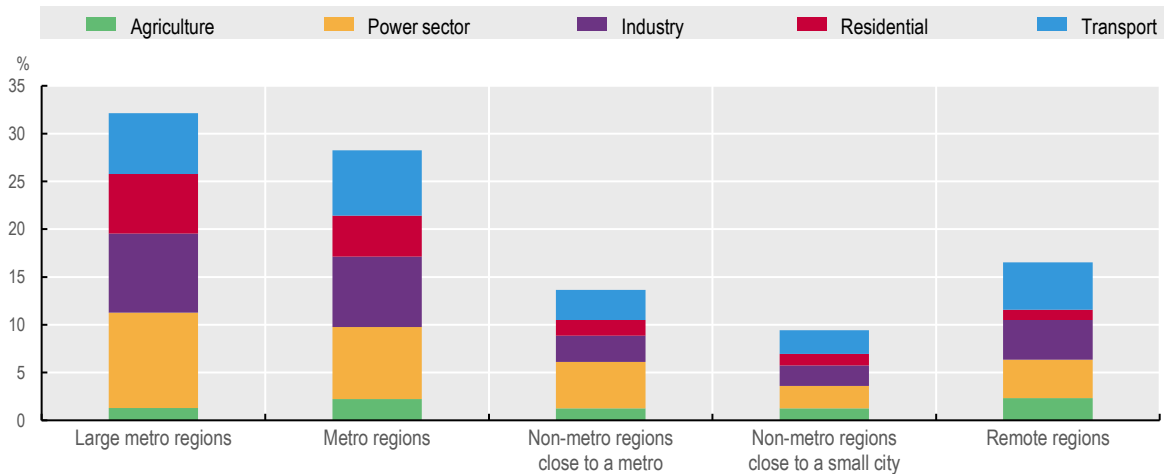
Source: International Energy Agency (2021).

7. Because emissions vary widely within countries, decarbonisation efforts have different economic, fiscal and social costs across the national territory. Metropolitan areas are large emitters, accounting for about 60% of GHG emissions, given the concentration in those areas of users in the transport and real estate sectors (**Figure 2**).³ Regions that are rich in the production of fossil fuels or rely on industries heavily dependent on such fuels tend to have levels of emissions that are several times higher on a per capita basis than their respective national averages. This asymmetry in the geographical distribution of emissions within a country's territory -- and therefore needed decarbonisation efforts -- calls for the involvement of the SNGs in the formulation and implementation of nationwide decarbonisation agendas, given their knowledge of local economic and social conditions, preferences and needs.

³ In per capita terms, however, emissions are higher in rural regions (OECD, 2021d).

Figure 2: Regional distribution of GHG emissions

Contribution by type of region (% , 2018)



Note: OECD countries, Romania and Bulgaria. GHG emissions exclude those from land use and land use change.

Source: OECD calculations based on EDGAR, JRC (2020).

2. The role of the SNGs: Spending mandates

8. The SNGs are important players in most of the sectors where investment in decarbonisation will need to take place according to the IEA NZE scenario. In many countries, regional and local governments are involved in the generation and distribution of electricity,⁴ most often through enterprises in which they have ownership or controlling interest. Thus, they can influence the production, pricing and investment decisions of their SOEs operating in the energy sector. Moreover, the SNGs are important consumers of energy, since they are generally responsible for street lighting and in some case district heating, as well as efficiency in the use of energy for the provision of these services. The regional and local authorities also own or use a large share of the stock of buildings in local communities, including schools, hospitals and public buildings, which are heavy users of energy for lighting, cooling, heating, and the use of appliances and equipment.

10. In the transport sector, the local governments have primary responsibility for the provision of mass transport systems in urban and metropolitan areas. They can contribute to decarbonising the sector by encouraging shifts in transport modes (e.g., increased use of urban and regional public transport, and of railways for long-haul transport), electrifying transport systems, and fostering the use of biofuels and hydrogen in heavy vehicles and aviation. The SNGs can also influence demand for fossil fuels, through for example reduced commuting, greater recourse to carpooling, and increased use of low- or non-emitting vehicles, such as bicycles.

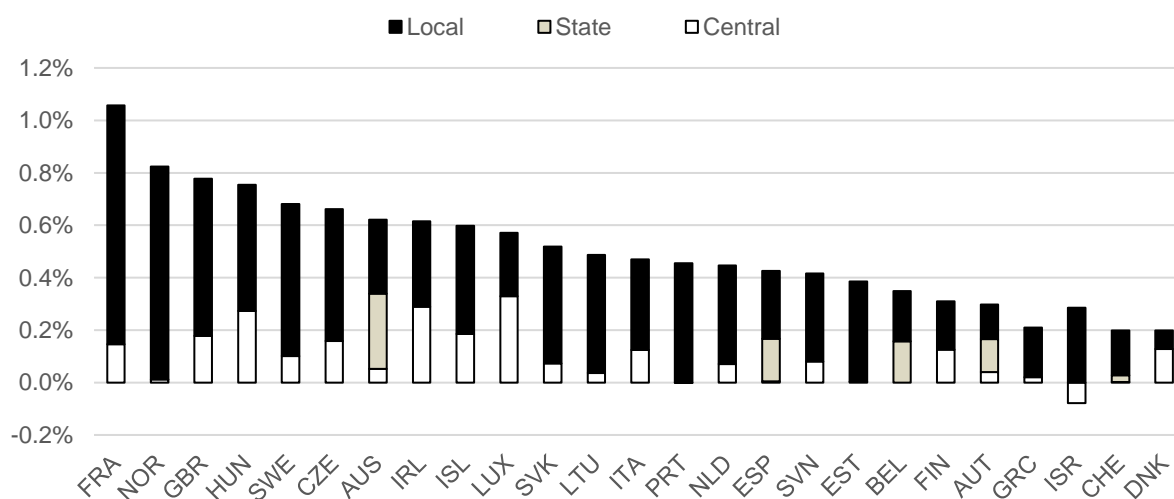
⁴ In contrast, electricity transmission is generally a national responsibility.

11. Moreover, the SNGs account for the lion's share of public spending in the housing sector in OECD countries (**Figure 3**). They are often active in the subsidised market segment, by investing in the construction of new properties to be leased on favourable terms to vulnerable social groups, by financing the upkeep of existing properties, or by subsidising rents in the private housing market. They also often participate in the not-for-profit segment in joint ventures with private-sector developers and managers. Thus, they can directly influence carbon emissions from such buildings by adhering to appropriate standards for the sourcing and efficiency of energy use in new buildings, and by retrofitting old ones so that they meet state-of-the-art standards of efficiency in the use of energy.

12. The SNGs can also promote the decarbonisation of buildings through action affecting their own use of energy. They can do so by retrofitting their own buildings, especially schools and hospitals, to make them more energy-efficient; by incentivising the use of public transport by their employees, and by reducing their commuting frequency by allowing work from home, when appropriate; and by computerising remote access by the population to many public services. Moreover, the SNGs can promote the decarbonisation of private housing through their taxation, subsidization and regulatory policies, as discussed in subsequent sections below.

Figure 3. Government spending on housing

By level of government (% of GDP, 2019)



Source: OECD Fiscal Decentralisation database.

13. Furthermore, several SNGs are involved in supporting the development of new technologies for the production of clean energy. According to the IEA, while most of the targeted global emission reductions in the current decade will utilise existing technologies, successful innovations will need to play a major role in the subsequent decades. Increased public funding of the R&D needed to develop new technologies would help accelerate their design, testing of prototypes and eventual deployment to scale.

This will require reversing the trend decline in global government spending on R&D in energy, which is estimated to have fallen from 0.1% of GDP in 1980 to only 0.03 % of GDP in 2019. While national governments can be expected to carry out most of this effort, given resource availability, economies of scale and externalities of such activities, several SNGs, especially at the regional level, are also investing in green innovation either through direct programs or by supporting universities, corporations and start-ups in this area (OECD, 2021d).

14. Finally, the SNGs can contribute to climate change mitigation in additional areas, including through the use of public land under their control, in particular by limiting or banning the mining of coal and the exploration of fossil fuels in their respective jurisdictions. In addition, they can safeguard existing forests, which are important carbon sinks, as well as expand urban green spaces, and by limiting urban sprawl through land use regulation and zoning requirements. Land use regulations also affect choices regarding the design of transport systems, given the spatial distribution of population and economic activity shaped by the use of land within the catchment area of local communities, which influences energy consumption and options for decarbonisation in urban and metropolitan areas.

3. Investments in green infrastructure and financing challenges

15. The SNGs account for the bulk of investment in OECD countries. This includes nearly two-thirds of climate-related public investments on average, even though such investments were equivalent to only 0.7% of GDP for the general government and 0.4% of GDP at the subnational level (OECD, 2019).⁵ The SNGs will therefore have to bear the brunt of the investment effort required for effective decarbonisation, especially in electricity, buildings and transport, given the concentration of emissions in those sectors.

16. The magnitude of needed investment efforts predicated by the IEA NZE scenario entails significant funding, financing and governance challenges. As for funding, many regional and local governments have limited control over their revenues. Own tax revenues frequently account for less than half of total subnational revenues, nontax revenues are often underexploited, shared revenues are generally determined by formulas set in national legislation, and discretionary transfers from national governments are volatile and often procyclical. On the financing side, the SNGs will need to secure appropriate external resources, especially in areas that are fraught with great technical and policy uncertainties and lower appropriability of returns. In many countries, access to market financing is limited at the subnational level by fiscal rules, which often limit SNGs' borrowing; scale considerations (most

⁵ OECD (2019) use a novel preliminary methodology to track climate-related components of government spending and investments in OECD countries (excluding Israel, Korea, and the United States),

relevant for smaller regions and municipalities), which discourages lending; limited debt management capacities; and governance weaknesses in public investment management processes.⁶

17. The SNGs have increasingly relied on the issuance of “green” bonds to finance investment projects with favourable decarbonisation (and more generally environmental) potential. These bonds aim to attract especially institutional investors seeking to fulfil environmental goals or mandates. The first such bonds were issued by the World Bank and the European Investment Bank in 2007 and their cumulative issuance has now surpassed USD 2.2 trillion, according to the Climate Bonds Initiative (CBI).⁷ Government-issued bonds account for a significant portion of that total, with an increasing share of issuances by regional and local governments, especially large cities.⁸ Their proceeds are earmarked for use in green projects but the stream of future revenues from the projects may or may not be ringfenced to service the bond. Some green bonds are attractive to investors, because they enjoy various forms of tax advantages. Empirical evidence on whether green bonds carry a pricing premium compared with “plain vanilla” ones is limited, but there are initial indications that certified sustainability-linked bonds do so. If confirmed by further evidence, this could incentivise issuers, including SNGs, to seek such certification.

18. The SNGs will need strong public investment management (PIM) systems to deliver additional investment for climate change mitigation and adaptation. This is an essential precondition for success, regardless of the investment delivery mode, including direct public procurement, public-private partnerships, or alternative mechanisms to finance and implement decarbonisation investments. In practice, governments at all levels often see PPPs as a way of mobilising private capital for public investments, or even of circumventing restrictions imposed by fiscal rules limiting or prohibiting subnational borrowing, even though the choice between PPPs and other delivery modalities should be based in principle on relative value-for-money, rather than just availability of financing.⁹ PPPs entered into without appropriate processes of project selection, risk sharing arrangements and monitoring of implementation often result in costly renegotiations or even costlier early terminations.¹⁰ These

⁶ Diagnostics of the state of public investment management processes (such as the IMF’s Public Investment Management Assessments (PIMAs), which recently have been expanded to include a new module for the assessment of climate-related investments, or C-PIMA (IMF, 2021).

⁷ [Climate Bonds Initiative | Mobilising debt capital markets for climate change solutions.](#)

⁸ Green bonds are self-labelled. Only a small share of them is certified by the Climate Bonds Standards Board to meet the relevant sectoral criteria for “greenness” developed by the Board, meaning that there is still significant scope for “greenwashing” in the characterisation of this type of bonds.

⁹ de Mello and Sutherland (2015) review the main modalities for the delivery and financing of subnational infrastructure investment.

¹⁰ World Bank (2023) provides empirical evidence of significant fiscal risks from inappropriate PPPs in a range of emerging economies.

complexities apply to all levels of government, and they are particularly challenging for the subnational jurisdictions, given the technical and human capital capacity constraints they frequently face.

4. Subnational revenues

19. Subnational tax authority is important for two main reasons. First, by using the tax instruments at their disposal – including those of sole and shared subnational responsibility – the SNGs can raise the revenue needed to fund mitigation and adaptation action. Second, tax instruments have the potential to change the relative price of emissions, which plays a crucial role in decarbonisation efforts.

20. Price-based mitigation mechanisms -- such as explicit carbon taxes, excise taxes on the use of fossil fuels, and tradeable emissions permit systems (ETS) -- vary widely across countries (OECD, 2022a; IMF, 2019; D’Arcangelo et al., 2022a, 2022b). Carbon taxes and ETS tend to be administratively complex and have uneven distributional effects on households and businesses. They are therefore more appropriate for national, rather than subnational, governments, even though several SNGs have introduced their own carbon taxes or ETS, in some cases ahead of the national governments themselves. According to the World Bank’s Carbon Pricing Dashboard, such mechanisms are in place or scheduled for implementation at the subnational level in several Canadian provinces, and U.S. and Mexican states.

21. By contrast, taxes and non-tax levies on fuel products are common at the subnational level. These instruments are easier to administer than explicit carbon taxes, but they are less effective than explicit taxes on emissions because they are limited to one source of emission. However, since the price elasticity of demand for fuel products tends to be relatively low in the short run, these taxes can raise significant revenues for the SNGs. Moreover, many SNGs levy taxes or surcharges on the consumption of electricity as a means of encouraging households and enterprises to increase their energy efficiency, but they may also have the unintended consequence of encouraging the use more polluting sources of energy, unless these alternatives are also taxed at similar or preferably higher rates. These taxes also tend to have undesirable distributional effects, since lower-income households tend to consume a higher share of their income on electricity and are less well equipped to manage consumption than their more affluent counterparts. To minimise adverse distributional effects, electricity taxes generally exempt household consumption below relatively low thresholds.

22. In addition, the SNGs often tax motor vehicles. These levies apply at the time of sale and/or on annual basis, and they may encourage the use of public transport. Their main purpose is revenue mobilisation, rather than decarbonisation. Where the tax is levied on an ad-valorem basis, they may discourage the purchase of newer, more fuel-efficient and more expensive, vehicles. In other cases, polluting vehicles may be taxed more heavily (OECD, 2022b). Differentiating the rates in favour of electric or lower fuel-consuming vehicles would make these taxes “greener”, to the extent that electricity generation is “green”, but probably also regressive.

23. Moreover, the SNGs can also incentivise energy efficiency and/or shifts to lower-carbon energy sources through credits against their individual or corporate income taxes (or surcharges on national taxes). In theory, explicit budgetary subsidies for abatement activities or investments should be preferred to tax expenditures because their cost and distributional impact are more transparent, and thus their cost-effectiveness is more open to scrutiny and evaluation. However, in practice at both the subnational and national levels, political economy considerations often weigh in favour of the use of tax incentives.

24. As for non-tax measures, the SNGs have powerful instruments in their policy toolbox. They include congestion levies on vehicles entering the city centre during peak traffic hours, which are imposed by several large metropolitan areas, such as London, Milan, Singapore and Stockholm. Other regional or local governments in various countries use fees or fines on selected carbon-intensive activities (Martinez-Vazquez, 2021). In some cases, betterment fees can also be levied to finance the energy retrofit of urban infrastructure and amenities, in pursuit of broader decarbonisation objectives. In addition, SNGs can use fees that capture the value created by installing green infrastructure, by using tax increment financing and other land value capture measures,¹¹ although these are more frequently used in connection with adaptation than decarbonisation activities.

25. Despite their mitigation potential, and notwithstanding associated administrative and distributional constraints, the use of price-based mitigation instruments is often discouraged for political economy reasons, especially where the overall tax take is already high. Public opinion support for explicit pricing instruments, such as carbon taxes, tends to be low because of their direct effect on the cost of emissions and hence consumption. This is the case at the national or subnational levels. Evidence nevertheless shows that support tends to rise to the extent that the revenue associated with these instruments is used to finance the provision of services and infrastructure related to climate change mitigation (OECD, 2022a).

5. Subnational regulatory activities

26. Non-price instruments, such as norms, standards and regulations, can do much to encourage a shift towards green energy sources, especially where demand is relatively irresponsive to price signals. This is the case, for example, of the housing sector, where evidence shows limited effects of energy price hikes on consumption, in part due to a lack of awareness by residents about the thermal characteristics of their dwellings, and therefore energy consumption, as well as a lack of access to modern energy demand management tools, such as smart meters (de Mello, 2023). The cost for economic agents to comply with regulatory standards and mandates can be seen as an implicit (typically less visible) carbon price, in contrast to emission pricing schemes that set an explicit one.

27. The SNGs exercise regulatory powers for decarbonisation purposes mainly in the areas of transport, land use and buildings. In the case of mass public transport in metropolitan areas, the SNGs

¹¹ See Ingram and Hong (2012) for a comprehensive discussion of value capture policies.

can influence energy use through the choice of technologies (e.g., oil, gas or alternative fuels) and the design of networks (e.g., dedicated lanes and pedestrian zones). The SNGs also often set emission standards for vehicles registered in their respective jurisdictions and regulate the availability of charging stations for electric vehicles.

28. In the area of land use, the SNGs are at the forefront in most countries of the design and enforcement of regulations. These regulations cover the amount and location of land for different uses, which have different emission-reduction potential. Zoning regulations also influence the scope for densification or sprawl in urban areas, which have different implications for emissions. As for buildings, SNGs play an important role in setting standards of energy efficiency in new buildings. However, while building codes are now commonplace and generally appropriately enforced in advanced economies, they are not always available or properly enforced in emerging-market and developing countries, where construction activity is expected to be strongest due to more rapid population growth (OECD, 2021a). Moreover, SNG play an important regulatory role in areas that create incentives for the retrofitting of those properties that do not meet acceptable standards based on current regulations (Cournède et al., 2023; de Mello, 2023). They include energy performance certification and labelling systems,¹² as well as subsidisation programmes for needed investments, information dissemination campaigns among the population to raise awareness of energy consumption and emissions in the real estate sector. SNGs can also regulate the minimum percentage of owners of common properties (condominiums) required to approve measures to energy retrofit such properties. While policies to electrify energy generation fall most often under the purview of national governments, those related to energy efficiency in buildings tend to be joint or exclusive responsibilities of SNGs.¹³

III. Adaptation to climate change: the role of the SNGs

29. The need for economies and societies to adapt to climate change calls for government action in addition to those related to mitigation, discussed above. This action cuts across a variety of policy domains, including not least urban and regional planning, and the provision of critical infrastructure, such as energy, transport and telecommunications. Needed interventions also vary, often substantially so, within countries, reflecting the diversity of regional and local geographic and economic conditions, especially in countries with large land masses. Specific policies have both short- and longer-term economic benefits, in many cases of national macroeconomic relevance, as well as short-term private

¹² Certification is an important tool to raise awareness about the energy performance of properties, which is a pre-condition for homeowners/landlords to invest in home improvements. Studies indeed show that most people do not know the energy performance of where they live, cannot manage their energy use at home, and do not understand well how electricity bills are calculated (de Mello, 2023).

¹³ A survey of European regional and local authorities, conducted by the OECD and the Committee of the Regions in 2021, shows that most such jurisdictions have developed their own plans and policies for decarbonising buildings, but also face capacity constraints and funding gaps to ramp up efforts in those areas (OECD, 2022c).

and fiscal costs. Managing these costs and benefits requires an assessment of relevant risks based on scientific analysis, their distribution and differentiated impacts across the national territory, the costs of adaptation measures and the associated financing requirements.¹⁴

30. Investment needs in adaptation are estimated to be large. Estimates vary between 0.05 percent and 0.25 percent of projected global GDP in 2030, rising to as much as 0.3 percent of GDP by 2050 (Aligishiev and others, 2022). Also, the Global Commission on Adaptation estimated in 2019 global investments in five key areas of adaptation (improvements in early warning systems, infrastructure resilience, dryland cultivation, water resource management and mangrove protection) to be equivalent to USD 1.8 trillion over the current decade and that these investments would yield economic benefits nearly four times as large. Country-specific estimates are often larger than cross-country ones (Buchner et al., 2019), and they tend to be larger for developing countries than advanced economies and small island countries, given their exposure to hurricanes and rising sea levels. Beyond regional impacts, climate change also has a distributional dimension within each community, since the poorer segments of the population are more likely to be disproportionately impacted by extreme weather events.

31. Governments have several adaptation instruments at their disposal, including taxation, spending and regulatory powers. As argued in de Mello and Ter-Minassian (2023b), the SNGs can:

- Affect land use in a number of ways. For example, they can shape households' and firms' location decisions (including relocation from more disaster-prone areas) through appropriately enforced regulation, subsidies, and levies and fees related to climate risks.
- Provide financial and technical support to farmers to shift to drought-resistant crops; they can also invest in improving irrigation networks and build water management infrastructures to cope with floods.
- Control deforestation to help minimize the risk of landslides and can exercise or mandate forest management techniques that reduce the risk of wildfires. They can invest in expanding green spaces in urban areas to mitigate the impact of heat waves.
- Strengthen and appropriately enforce building codes, with a view to reducing the vulnerability of houses and other private and public buildings to fires, floods and strong winds.
- Increase the resilience of electricity grids to extreme weather events through direct investments, investments by controlled SOEs, or by regulation of private electricity companies, as relevant in each case.

¹⁴ Annex 1 in Aligishiev et al. (2022) contains a useful discussion of simulation models and other econometric tools to assess CC costs and adaptation benefits.

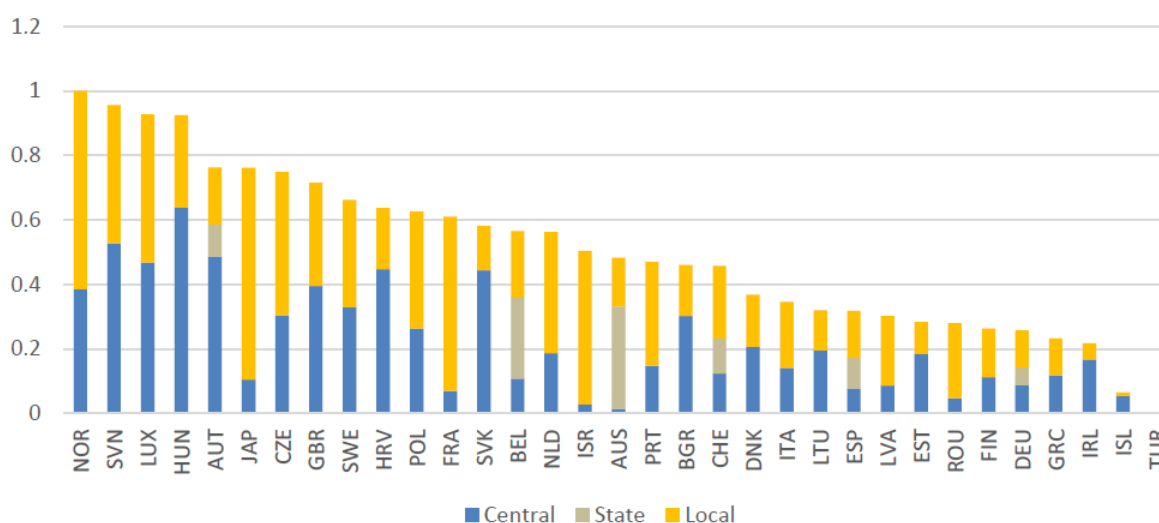
- Improve the resilience of other infrastructures, such as ports, levees, bridges and roads, to weather-induced damages through improved maintenance, as well as through new investments, as appropriate.

32. These considerations suggest that place-based policies, well-tailored to the nature, causes and distributional effects of damages related to climate change, are even more necessary for adaptation than for mitigation. Local governments, by virtue of their being closest to their respective communities, can bring the benefit of their knowledge of local conditions, needs and preferences to the design and implementation of such policies. For their part, the regional governments, which in many countries have oversight power and responsibility over the local governments, can help avoid negative spillovers and strengthen positive ones from local adaptation policies across their regions.

33. Unfortunately, there is limited empirical evidence on the extent and modalities of SNG involvement in climate change adaptation, as well as in mitigation. Efforts to “green-tag” and track spending, even at the national government level, have not yet produced comprehensive and internationally comparable databases. In recent years, the OECD has been spearheading efforts to compile a database on climate-significant spending and investments for its member countries (**Figure 4**). Overall climate-significant investments (both mitigation and adaptation) vary widely across countries, with the local governments accounting for the lion’s share of subnational investments, except in Australia and Belgium, where the regional governments undertook the largest share (Dougherty and Nebreda, 2023a).

Figure 4. Climate significant investment

In % of GDP, 2019



Source: Dougherty and Nebreda, 2023.

IV. Natural disaster management

34. The human and economic losses associated with climate change are expected to rise in the future, even if mitigation efforts are ramped up well beyond their current levels (Global Commission on Adaptation, 2019). The SNGs have a substantial stake in the success of climate change mitigation and adaptation strategies, since they tend to be in the frontline of climate-related natural disasters, such as floods, droughts, wildfires and extreme weather events.¹⁵ This is, as argued above, because natural disasters are local in nature, given that their hazard distributions depend on climate and geographical conditions that vary within a country's territory. Indeed, as pointed out by de Mello and Jalles (2022) using conventional chronologies of natural disasters, these events are more frequent in large countries (in terms of landmass and population), which also tend to be more decentralised.¹⁶

35. The regional, and especially the local, governments therefore play an important role in the prevention, management and recovery from natural disasters. They are responsible for issuing and monitoring compliance with several aspects of regulation that are essential for risk prevention, including land use (with an appropriate mapping of risk zones) and building codes, as discussed above. They also provide services that are crucial for effective crisis management, including health care, civil protection, and public order and safety. They typically take the lead in rebuilding lost or damaged physical infrastructure in the recovery phase. Indeed, for all these reasons the Sendai Framework for Disaster Risk Reduction emphasizes the role of local governments at all phases of a disaster, from prevention to recovery (UNISDIR, 2015).

36. In addition to their current prerogatives, the SNGs will need to prepare for changes in the nature of the natural disasters they may face in the years to come. This is to the extent that climate change will reshape the distribution of natural hazards and therefore increase the exposure of local communities and economic infrastructure to extreme weather events. Indeed, the impacts of climate change are expected to rise with temperature increases (IPCC, 2022): between 2030 and 2050, climate change is expected to cause 250 thousand additional deaths annually, mostly in developing countries (WHO, 2021). These developments will challenge the SNGs to devise appropriate, often spatially differentiated prevention, management and recovery mechanisms to minimise adverse outcomes (when hazards materialise) and improve the resilience of economies and societies to climate change (de Mello and Ter-Minassian, 2022).

¹⁵ For a discussion of complementarities and possible trade-offs between mitigation and adaptation policies, see OECD (2021c).

¹⁶ For a typology and chronology of natural disasters, see the Emergency Events Database (EM-DAT) compiled by the Centre for Research on the Epidemiology of Disasters (CRED). EM-DAT also contains information on climate change vulnerabilities, defined as "a country's exposure, sensitivity, and capacity to adapt to the impacts of climate change," including indicators of six life-supporting sectors: food, water, health, ecosystem services, human habitat and infrastructure. This dataset has been used extensively in the empirical literature, as discussed in greater detail by de Mello and Jalles (2022).

37. Because policy action in all these areas cuts across the different layers of government, an evolution in the distribution and characteristics of natural hazards brought about by climate change is likely to influence, and ultimately prompt institutional change to, intergovernmental relations. In the near term, policy responses will need to be conditioned by existing intergovernmental arrangements, legal provisions and institutional practices. They involve in many countries formal requests for assistance by the SNGs to the national government when the severity of the shock overwhelms local capabilities. This in turn triggers the involvement of national disaster risk management agencies, the transfer of funds to support local budgets and typically the negotiation of dedicated programmes for recovery and reconstruction, often with the financial assistance of the national government. This process often leads to an increase in subnational spending in the years following natural disasters, financed at least in part though an increase in grants and transfers from national governments, without necessarily a concomitant increase in the policymaking prerogatives of the SNGs in this area.¹⁷

38. Over time, and depending on the severity of the shock, the occurrence of a natural disaster may trigger deeper legal and institutional changes to intergovernmental relations. It can be argued that, to the extent that climate change makes natural hazards more frequent and severe, there may be a need for more effective risk sharing among the different subnational jurisdictions and greater involvement of the national government in risk pooling within the national territory. The extent to which these responses may affect the composition of government spending/revenue and/or changes in the assignment of related responsibilities across the levels of administration remains unclear, and empirical evidence is mixed (de Mello and Jalles, 2022). Improved risk pooling may also affect the design of intergovernmental grants and transfers in order to ensure that financial support is spent where it is intended. This may involve conditionality on the use of funds and mechanisms to encourage local revenue mobilisation, as in the case of matching grants and other co-financing arrangements for climate change adaptation initiatives (Martinez-Vazquez, 2021).

39. Moreover, there is much scope for improving the design of insurance mechanisms to face evolving natural hazards due to climate change. As noted in de Mello and Jalles (2022), countries can invest more in the resilience of critical infrastructure, such as those that produce and deliver electricity, gas, water and telecommunications, in the form of system redundancies, diversification of suppliers and availability of back-up productive capacity. Mechanisms could therefore be considered, including for instance grants or financial rewards, regulatory provisions and financial penalties for service disruption, to encourage critical infrastructure operators to invest in resilience. More can also be done to encourage the SNGs to maintain inventories of critical infrastructure assets, systems, functions or operators, as well as estimating the value of physical assets at risk and developing risk registries with relevant mitigation strategies. Governments could also prepare for effective crisis management by purchasing insurance, as is the case of utility companies, including those owned or controlled by government. Governments at all

¹⁷ This pattern is consistent with empirical evidence reported by de Melo and Jalles (2022) for a variety of natural disasters.

levels should also maintain appropriate contingency reserves to face upfront costs when shocks materialise and, where applicable, to support affected lower-level jurisdictions through ad-hoc grants for the management of crisis and during post-shock recovery.

V. Scope for intergovernmental cooperation

40. Even though the SNGs have appropriate instruments at their disposal, several aspects of mitigation and adaptation policies, as well as natural disaster risk management, involve shared responsibilities across the levels of administration. This requires effective interjurisdictional cooperation for successful policy design, implementation and follow-up. Specific challenges include the presence of interjurisdictional externalities (positive and negative), administrative difficulties in design and implementation, as well as capacity constraints to design and implement subnational mitigation policies.

41. Engagement of national governments in subnational mitigation strategies is important for several reasons. First and foremost, it is the national, rather than the subnational, governments that are responsible for defining and delivering on international commitments to reduce emissions, such as those enshrined in the Paris Agreement and the NDCs. In many cases, they do so without appropriate consultations with, and engagement of, subnational partners. Moreover, the national governments are better placed than the SNGs to deal with adverse distributional effects, which may require supporting those sectors of the economy and social groups most adversely affected by transition costs, such as active labour market policies to facilitate matching and job search, as well as training and re-training programs for displaced workers. Tailoring these initiatives to the needs and preferences of the regions and local communities in need is part of a broader strategy to reconcile nationwide decarbonisation ambitions with regional asymmetries in the incidence of transition costs (OECD, 2021d). Finally, the national governments have greater financial resources (in terms of revenues and access to financing sources) to support subnational investments in decarbonisation and technical expertise in measuring emissions from various activities and in assessing the impact of mitigating policies on them.

42. The involvement of national governments in subnational mitigation and adaptation efforts varies significantly across countries. Specific situations reflect constitutional and other legal constraints, various characteristics of the intergovernmental fiscal relations system, and the priority attached by the national government to climate change goals. *Caeteris paribus*, national government involvement tends to be higher in unitary than in federal countries. Moreover, involvement can take several forms, including setting nationwide minimum standards for public and private activities that have significant impact on emissions, leaving to SNGs to go beyond such standards, if they so wish. The national governments can also support subnational revenue mobilisation, which is important for both mitigation and adaptation, by removing obstacles to the levying by SNGs of green taxes, surcharges on national carbon taxes, where available, or taxes on the consumption of fossil fuels. They could even set floors on the rates of such

taxes.¹⁸ Alternatively, they could levy their own carbon or fuel taxes at higher rates and share them with SNGs on a derivation basis. Finally, national governments can support subnational decarbonisation efforts, including in dealing with transition costs, through grants and transfers to fund decarbonisation-oriented activities and investments, and to mitigate asymmetries in the impact of decarbonisation policies across the national territory.¹⁹

43. Given the complexity and multifaceted nature of climate change mitigation, effective intergovernmental dialogue is essential for the success of national and subnational strategies. Cooperation is particularly important for stakeholder consultations prior to the enactment of policies, such as national mandates, which may be challenged by SNGs, especially in federations, and to ensure that some relevant local specificities are given due consideration and that SNGs are compensated for any significant financial burdens imposed by such mandates on them. Cooperation is also important to foster intergovernmental dialogue to align national and subnational decarbonisation policies, reflecting different perspectives in the decision-making process, especially in areas of joint responsibility. Moreover, cooperation can do much to identify – and avoid – the emergence of unfunded mandates, promote adequate fiscal autonomy of SNGs, and align investment priorities in the decarbonisation agenda. International experience shows that the institutionalization of such dialogue through the creation of intergovernmental cooperation fora is important to its effectiveness.²⁰

44. Beyond vertical – national and subnational – cooperation, there is much scope for horizontal cooperation in decarbonisation efforts. This is particularly the case among the constituent municipalities of metropolitan areas, where intra-metropolitan socio-economic flows do not necessarily match administrative boundaries. Institutions (metropolitan governance structures, or at least well-functioning cooperation fora) that facilitate the achievement of intermunicipal consensus on relevant spending, revenue, and regulatory policies can be instrumental in the success of decarbonisation within the area. Both vertical and horizontal cooperation fora can also be very useful vehicles for the sharing of knowledge, good practices and successful experiences, and also of lessons from unsuccessful ones. Cooperation fora can also promote positive demonstration effects.

¹⁸ An example in this respect is the Canadian federal backstop for carbon pricing.

¹⁹ Given the specific policy objective being pursued with such transfers, special-purpose grants are preferable to untargeted ones. They may be also accompanied by conditionalities, policy or outcome based. See OECD (2021d) for a discussion of possible types of conditionality and country examples.

²⁰ Ter-Minassian and de Mello (2016) discuss in some detail the benefits of vertical (among different levels of government) and horizontal (among governments at the same level) cooperation and provide a range of examples of such fora in advanced and selected emerging countries.

VI. Conclusions

45. Governments at all levels around the world are being called upon to act to adapt to climate change and manage increasingly more severe natural disasters brought about by climate change. They are also expected to put in place needed mitigation policies to reduce emissions of greenhouse gases in line with international agreements. This is a tall order for any government, regardless of its level, because the success of all these policies – climate change mitigation and adaptation, as well as natural disaster risk management – call for a combination of well thought-out strategies, effective use of price and non-price instruments, sizeable investments and effective interjurisdictional cooperation, given the important role played by the regional and local governments in the relevant policy areas.

46. Against this background, this paper has reviewed the main channels through which the SNGs can influence the outcomes of countries' decarbonisation, climate change adaptation and natural disaster management strategies. In most countries, the SNGs have sole or concurrent responsibility in several critical areas, including investment and service delivery (in areas as far apart as electricity distribution, transport, commercial and residential buildings, and telecommunications), regulations (of land use, economic activity zoning, construction norms and standards, energy use), as well as pricing and taxation (of carbon, fossil fuels, motor vehicles, emissions trade). The mix of subnational policies in these areas varies widely both across and within countries, reflecting a host of factors, such as geography and size (in land mass and population), climate and endowment of fossil fuels, level of socio-economic development, economic structure and the state of their public finances. Institutional, political and legal factors also matter, depending on the country's federal or unitary structure, the main features of its intergovernmental fiscal relations, the level of capacity of the jurisdictions in question, and the political orientation of the national and subnational leadership.

47. For all these reasons, the paper draws attention to the importance of effective intergovernmental cooperation. This is important because of shared responsibilities across the levels of administration in most areas that are relevant for climate change mitigation, adaptation, and the management of natural disasters, which requires mutual consistency in the strategies pursued by different jurisdictions and alignment with national ones – supporting each country's international commitments and their implementation in practice. The paper also argues that the national governments have various instruments to promote and support subnational policies, not least by avoiding unfunded spending mandates, reviewing (and expanding, as appropriate) the assignment of own-revenue sources (including green taxes) to SNGs, and by helping strengthen the capacity of subnational tax administrations and public financial management. Well-functioning general and sectoral intergovernmental cooperation fora can be effective venues for needed interjurisdictional dialogue to achieve all these objectives.

48. An important constraint to further policy-oriented and scholarly work in this area is statistical. Currently there is a lack of comparable and adequately detailed data on decarbonisation-relevant subnational spending, revenue and regulatory mandates, with associated assessments of their

respective potential to reduce emissions; on subnational adaptation strategies, including assessments of investment needs and associated funding gaps; and on weaknesses and good practices in the area of natural disaster risk management, including assessments of assets at risk and their respective valuations. The development of such a database, which would include qualitative and quantitative information based on a standardised methodology, should rank high in the international climate change policy agenda.

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