

# Addressing territorial disparities in future infrastructure needs in the wake of the COVID-19 crisis

A G20 perspective

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This policy paper sheds light on the type of investments that can maximise social returns and help bridge territorial gaps in access to services. It starts by explaining why it is challenging to balance proximity and cost-efficiency in service provision while maintaining quality across territories, highlighting the key role of subnational governments in providing education and health services. It then assesses the extent of territorial inequalities in access to basic education and health care services in G20 countries based on a comprehensive review of the evidence available. Finally, the report reflects on future needs based on demographic projections and offers two main implications for the future of infrastructure investment: 1) the need to tailor strategic and flexible investments to different demographic realities; and 2) the need to support quality infrastructure investment by subnational governments.

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# Foreword

What investments should governments make to ensure that everybody has access to quality basic education and health care services within their budget envelopes? In many cases the answer has been to focus on ensuring access to services in urban areas where most of the population concentrates. This strategy, however, at least in the short-term, leaves rural inhabitants behind and can work to widen existing spatial gaps in education standards and health outcomes, ultimately leading to lower incomes, job prospects and well-being. An exacerbating factor is that the same level of investment, per capita, in areas with lower density will not ensure equitable access, as travel times may be onerous, and economies of scale are lower compared to cities.

This policy paper sheds light on the type of investments that can maximise social returns and help bridge territorial gaps in access to services. It starts by explaining why it is challenging to balance proximity and cost-efficiency in service provision while maintaining quality across territories, highlighting the key role of subnational governments in providing education and health services. It then assesses the extent of territorial inequalities in access to basic education and health care services in G20 countries based on a comprehensive review of the evidence available. Finally, the report reflects on future needs based on demographic projections and offers two main implications for the future of infrastructure investment: 1) the need to tailor strategic and flexible investments to different demographic realities; and 2) the need to support quality infrastructure investment by subnational governments.

This policy paper is part of the OECD horizontal work on infrastructure that has contributed to the Infrastructure Working Group (IWG) under the Indonesian G20 Presidency.

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# Executive summary

## Bridging territorial disparities in basic service infrastructure can lead to substantial social investment returns

Improving access to quality basic services can offer high social returns to investment through better education and healthcare outcomes, as well as through improved life-long and intergenerational income and well-being outcomes. Indeed, bridging access gaps can also generate higher tax revenues and decreased spending on social support services and more complex and costly health services. As the COVID-19 pandemic demonstrated, investing in reducing inequalities can also improve the resilience of systems to respond to unexpected shocks.

Rural areas, in particular, face twin gaps in transport and digital connectivity that translate into lower access to physical and digital services. In Europe, for instance, students in remote rural areas have to travel on average 5 additional kilometres to reach a school compared to students in other areas. Global estimates of access to healthcare show that around 4 in 10 people cannot reach a healthcare facility within a 1-hour walk. Across OECD and G20 countries, rural areas facing long travel times to healthcare facilities also face below-average access to high-speed broadband: for instance, in Argentina, people in rural areas face 300 percentage points (p.p.) longer travel times and over 50 p.p. lower internet speeds than the national average.

Available evidence for OECD and G20 countries also points to substantial gaps in access to basic education and healthcare within countries. In education, rural-urban reading performance gaps are present in all but two G20 countries with available data and can be substantial. For instance, in China and G20 countries in Latin America, the gap amounts to 40 percentage points, the equivalent of a year of schooling. In many G20 countries, rural-urban gaps in the quality of physical infrastructure and the quality of internet connectivity in schools underpin rural-urban performance gaps. These gaps translate into unequal outcomes. For example, close to one in three residents of rural areas reported suffering from health problems that prevent them from doing things that people their age normally do, compared to only one in four city residents.

## Demographic changes may increase territorial disparities and put pressure on investment

Demographic change affects the demand for services. Whilst a shrinking population is likely to lower local demand for services such as housing and education, an ageing population is likely to lead to increases in demand for other services such as health care. The impact of these changes is likely to be felt more profoundly in sparse rural areas, in part because these already have higher shares of elderly, but also because shrinking populations, will further erode already lower economies of scale and increase already high levels of current expenditure per capita, which will in turn create further pressures on investment envelopes. Indeed, even before the COVID-19 pandemic, health expenditures as a share of GDP across 15 G20 countries were projected to increase from around 9% of GDP in 2015 to around 10% in 2030.

The imbalance in access to services in areas with high versus low demand is likely to accentuate in the coming decades due to demographic change. Available population projections show that fertility rates are



falling, resulting in population decline in most OECD and G20 countries – for instance, China’s population is projected to decrease from 1.4 billion in 2017 to 732 million in 2100 (Vollset et al., 2020<sup>[1]</sup>). Populations are also ageing, resulting in increasing elderly dependency ratios across G20 countries.

## **Comprehensive inter-governmental fiscal frameworks and rules can help manage disparities now and in the future**

The largest disparities in access to services are precisely in those areas where the per capita costs of extending existing infrastructure and operating facilities, or creating new infrastructure, are high (for instance sparse areas with difficult topographic conditions). However, government inaction on this front, in particular in areas experiencing population decline, can lead to a vicious cycle of a lack of growth, an acceleration in shrinking, lower tax revenues, and, ultimately, continued under-investment and potential debt default in small subnational governments.

Subnational governments in OECD and G20 countries where education, healthcare and transport infrastructure responsibilities have been decentralised are responsible for a substantial share of national expenditures in these sectors. Indeed, in OECD and EU countries subnational governments are responsible for over half of public investment, and they are responsible for almost 60 percent in G20 countries. While decentralisation can improve efficiency, improve cost consciousness and contain expenditure growth, accompanying fiscal frameworks do not always account for the unavoidable costs of providing services at small scale in remote places. This can lead to increased financial pressure on rural facilities and under-investment in infrastructure and facility closures, especially in jurisdictions with shrinking tax revenues.

Inter-governmental fiscal frameworks are essential to manage these investment challenges, not least those exacerbated by population growth and decline. Among other areas, appropriate frameworks and rules need to take into account three factors: 1) fiscal autonomy, or the level of control that subnational governments have to raise revenues, manage spending and access borrowing; 2) the size of the tax base, which is intrinsically linked to demographic change, economic growth and productivity; and 3) the stability and pro-cyclicality of taxes and inter-governmental transfer revenue. In some G20 countries, ensuring fiscal capacity requires first establishing enabling regulatory and legal frameworks and building subnational government capacity to allow subnational governments to access external financing in a way that is fiscally responsible, and support the use of specific funding and financing instruments, such as public-private partnerships.

## **Support strategic, flexible and coordinated national and subnational government investments that are tailored to local realities**

Meeting lower demand for services where demand is expected to fall, while operating fewer facilities and maintaining appropriate levels of access to quality services requires clear plans to adapt service networks to changing demands. A critical consideration is that inaction in the face of demographic changes may lead to larger long-term financial costs compared to investment plans that take into consideration the new size of communities and their future needs, as a consequence of compounded maintenance costs and high running per capita costs of small facilities. In many cases, governments have to deal with these high costs in a context of decreasing tax revenues. National long-term strategies with foresight, together with a place-based approach, can guide investments, including the progressive concentration of certain services to the regional-level.

Closing territorial gaps in access to quality services also requires supporting services provided at close proximity and through flexible and digital models. The provision of basic services such as primary care

remains essential in keeping the need for more specialised services at bay. Flexible service provision models, including digitally-based sharing mobility services, can help bridge access gaps in areas lacking other options. These strategies however often need to be accompanied by substantial transversal investments to tackle rural-urban gaps in (digital) skills and connectivity.

To provide services at the right scale, subnational governments often need to coordinate and cooperate with other subnational governments and the central level. In places with sparse demand, the catchment areas of services often cross local boundaries, meaning that the right conditions need to be in place to support service provision at the right scale. Subnational governments need mechanisms to identify shared investment opportunities and bottlenecks, manage joint responsibilities, minimise contradictory investments, and secure funding from adequate resources. Here, spatially integrated planning frameworks can be used to coordinate multiple levels of government and sectors.

Coordination and cooperation between the subnational and central levels are particularly key in contexts where governments recentralise the provision of a service that requires scale to operate, such as intermediate care hospitals offering specialised services. Cross-jurisdiction co-ordination can be encouraged through financial and non-financial incentives, platforms for dialogue, and agreements.

### **Capacity building underpins the effectiveness of quality infrastructure investment**

The effectiveness of quality infrastructure investment hinges upon the existing institutional capacity within national and subnational governments. Smaller subnational governments can lack the broad range of skills needed to identify, plan, finance, construct and manage quality infrastructure. They can also face significant capacity challenges in public procurement and may rely on external support to undertake large or specialised investment projects. Priority areas for capacity building include training and the provision of guidance documents in areas such as planning, project appraisal and procurement.

# Résumé exécutif

## Réduire les disparités territoriales en matière d'infrastructures de services de base peut permettre d'importants retours sociaux sur investissement

L'amélioration de l'accès à des services de base de qualité peut offrir d'importants retours sociaux sur investissement grâce à de meilleurs résultats en matière d'éducation et de santé, ainsi qu'à l'amélioration des revenus et du bien-être tout au long de la vie et entre les générations. En effet, combler les lacunes en matière d'accès peut également générer des recettes fiscales plus élevées et réduire les dépenses en services d'aide sociale et en services de santé plus complexes et plus coûteux. Comme l'a démontré la pandémie de COVID-19, investir dans la réduction des inégalités peut également améliorer la résilience des systèmes pour répondre à des chocs inattendus.

Les zones rurales, en particulier, sont confrontées à des lacunes en matière de transport et de connectivité numérique qui se traduisent par un moindre accès aux services physiques et numériques. En Europe, par exemple, les élèves des zones rurales isolées doivent parcourir en moyenne 5 kilomètres de plus que les élèves des autres régions pour se rendre à l'école. Les estimations mondiales de l'accès aux soins de santé montrent qu'environ 4 personnes sur 10 ne peuvent pas atteindre un établissement de santé à moins d'une heure de marche. Dans les pays de l'OCDE et du G20, les habitants des zones rurales qui doivent parcourir de longues distances pour se rendre dans un établissement de santé sont également confrontés à un accès au haut débit inférieur à la moyenne: en Argentine, par exemple, les habitants des zones rurales doivent parcourir des distances 300 points de pourcentage (p.p.) plus longues et bénéficient de vitesses d'accès à l'internet inférieures de plus de 50 p.p. à la moyenne nationale.

Les données disponibles pour les pays de l'OCDE et du G20 révèlent également des écarts importants dans l'accès à l'éducation et aux soins de santé de base au sein des pays. Dans le domaine de l'éducation, les écarts de performance en matière de lecture entre les zones rurales et urbaines sont présents dans tous les pays du G20 pour lesquels des données sont disponibles, sauf deux, et peuvent être importants. Par exemple, en Chine et dans les pays du G20 d'Amérique latine, l'écart s'élève à 40 points de pourcentage, soit l'équivalent d'une année de scolarité. Dans de nombreux pays du G20, les écarts entre les zones rurales et les zones urbaines en ce qui concerne la qualité des infrastructures physiques et la qualité de la connectivité internet dans les écoles sont à l'origine des écarts de performance entre les zones rurales et les zones urbaines. Ces écarts se traduisent par des résultats inégaux. Par exemple, près d'un habitant de zones rurales sur trois a déclaré souffrir de problèmes de santé qui l'empêchent de faire les choses que les personnes de son âge font normalement, contre seulement un habitant des villes sur quatre.

## Les changements démographiques peuvent accroître les disparités territoriales et exercer une pression sur les investissements

L'évolution démographique influe sur la demande de services. Alors qu'une diminution de la population est susceptible de faire baisser la demande locale de services tels que le logement et l'éducation, une population vieillissante est susceptible d'entraîner une augmentation de la demande d'autres services tels que les soins de santé. L'impact de ces changements risque d'être ressenti plus profondément dans les

zones rurales peu peuplées, en partie parce qu'elles comptent déjà une proportion plus élevée de personnes âgées, mais aussi parce que le recul de la population réduira davantage les économies d'échelle déjà faibles et augmentera les niveaux déjà élevés des dépenses courantes par habitant, ce qui créera à son tour des pressions supplémentaires sur les enveloppes d'investissement. En effet, même avant la pandémie de COVID-19, les dépenses de santé en pourcentage du PIB dans 15 pays du G20 devaient passer d'environ 9 % du PIB en 2015 à environ 10 % en 2030.

Le déséquilibre de l'accès aux services dans les zones à forte demande par rapport à celles à faible demande risque de s'accroître dans les décennies à venir en raison de l'évolution démographique. Les projections démographiques disponibles montrent que les taux de fécondité sont en baisse, ce qui entraîne un déclin de la population dans la plupart des pays de l'OCDE et du G20 - par exemple, la population de la Chine devrait passer de 1,4 milliard en 2017 à 732 millions en 2100 (Vollset et al., 2020<sup>[11]</sup>). Les populations vieillissent également, ce qui entraîne une augmentation des ratios de dépendance des personnes âgées dans les pays du G20.

### **Des règles et des cadres fiscaux intergouvernementaux complets peuvent aider à gérer les disparités, aujourd'hui et à l'avenir**

Les disparités les plus importantes en matière d'accès aux services se situent précisément dans les zones où les coûts par habitant de l'extension des infrastructures et des installations d'exploitation existantes, ou de la création de nouvelles infrastructures, sont élevés (par exemple, les zones faiblement peuplées aux conditions topographiques difficiles). Cependant, l'inaction des pouvoirs publics sur ce front, en particulier dans les zones en déclin démographique, peut conduire à un cercle vicieux de manque de croissance, d'accélération du déclin, de baisse des recettes fiscales et, en fin de compte, de sous-investissement continu et de défaut de paiement potentiel de la dette des petites collectivités infranationales.

Dans les pays de l'OCDE et du G20 où les responsabilités en matière d'éducation, de santé et d'infrastructures de transport ont été décentralisées, les gouvernements infranationaux sont responsables d'une part importante des dépenses nationales dans ces secteurs. En effet, dans les pays de l'OCDE et de l'UE, ces gouvernements sont responsables de plus de la moitié des investissements publics, et elles sont responsables de près de 60 % dans les pays du G20. Si la décentralisation peut améliorer l'efficacité, la prise en compte des coûts et contenir la croissance des dépenses, les cadres budgétaires qui l'accompagnent ne tiennent pas toujours compte des coûts inévitables liés à la fourniture de services à petite échelle dans des endroits reculés. Cela peut conduire à une pression financière accrue sur les installations rurales, à un sous-investissement dans les infrastructures et à des fermetures d'installations, en particulier dans les juridictions où les recettes fiscales diminuent.

Les cadres fiscaux intergouvernementaux sont essentiels pour gérer ces problèmes d'investissement, notamment ceux qui sont exacerbés par la croissance et le déclin de la population. Entre autres, les cadres et règles appropriés doivent tenir compte de trois facteurs : 1) l'autonomie fiscale, ou le niveau de contrôle dont disposent les gouvernements infranationaux pour lever des recettes, gérer les dépenses et accéder aux emprunts ; 2) la taille de l'assiette fiscale, qui est intrinsèquement liée à l'évolution démographique, à la croissance économique et à la productivité ; et 3) la stabilité et le caractère procyclique des impôts et des recettes des transferts intergouvernementaux. Dans certains pays du G20, pour garantir la capacité fiscale, il faut d'abord mettre en place des cadres réglementaires et juridiques favorables et renforcer les capacités des gouvernements infranationaux pour leur permettre d'accéder aux financements extérieurs d'une manière responsable sur le plan fiscal, et soutenir l'utilisation d'instruments de financement spécifiques, tels que les partenariats public-privé.

## Soutenir les investissements stratégiques, flexibles et coordonnés des gouvernements nationaux et infranationaux, adaptés aux réalités locales.

Répondre à une demande de services plus faible là où l'on s'attend à ce qu'elle diminue, tout en exploitant moins d'installations et en maintenant des niveaux appropriés d'accès à des services de qualité, nécessite des plans clairs pour adapter les réseaux de services à l'évolution de la demande. Il est essentiel de tenir compte du fait que l'inaction face aux changements démographiques peut entraîner des coûts financiers à long terme plus importants que les plans d'investissement qui tiennent compte de la nouvelle taille des communautés et de leurs besoins futurs, en raison de l'augmentation des coûts d'entretien et des coûts de fonctionnement élevés par habitant des petites installations. Dans de nombreux cas, les gouvernements doivent faire face à ces coûts élevés dans un contexte de diminution des recettes fiscales. Des stratégies nationales à long terme prévoyantes, associées à une approche territoriale, peuvent guider les investissements, notamment la concentration progressive de certains services au niveau régional.

Pour combler les écarts territoriaux en matière d'accès à des services de qualité, il faut également soutenir les services fournis à proximité immédiate et selon des modèles flexibles et numériques. La fourniture de services de base tels que les soins primaires reste essentielle pour éviter le besoin de services plus spécialisés. Les modèles de prestation de services flexibles, y compris les services de mobilité partagée basés sur le numérique, peuvent contribuer à combler les lacunes en matière d'accès dans les zones qui ne disposent pas d'autres options. Toutefois, ces stratégies doivent souvent s'accompagner d'investissements transversaux importants pour combler les écarts entre les zones rurales et urbaines en matière de compétences (numériques) et de connectivité.

Pour fournir des services à la bonne échelle, les gouvernements infranationaux doivent souvent coordonner et coopérer avec d'autres gouvernements infranationaux et le niveau central. Dans les endroits où la demande est faible, les zones d'attraction des services dépassent souvent les frontières locales, ce qui signifie que les bonnes conditions doivent être réunies pour soutenir la fourniture de services à la bonne échelle. Les gouvernements infranationaux ont besoin de mécanismes pour identifier les opportunités d'investissement partagées et les blocages, gérer les responsabilités conjointes, minimiser les investissements contradictoires et garantir le financement par des ressources adéquates. À cet égard, les cadres de planification territorialement intégrés peuvent être utilisés pour coordonner plusieurs niveaux de gouvernement et secteurs.

La coordination et la coopération entre les niveaux infranationaux et centraux sont particulièrement importantes dans les contextes où les gouvernements recentralisent la fourniture d'un service qui nécessite une échelle pour fonctionner, comme les hôpitaux de soins intermédiaires offrant des services spécialisés. La coordination entre pouvoirs publics peut être encouragée par des incitations financières et non financières, des plateformes de dialogue et des accords.

## Le renforcement des capacités sous-tend l'efficacité des investissements dans les infrastructures de qualité

L'efficacité des investissements dans les infrastructures de qualité dépend de la capacité institutionnelle existante au sein des gouvernements nationaux et infranationaux. Les petites autorités infranationales peuvent manquer de compétences nécessaires pour identifier, planifier, financer, construire et gérer des infrastructures de qualité. Elles peuvent également être confrontées à d'importants problèmes de capacité en matière de marchés publics et peuvent devoir compter sur un soutien extérieur pour entreprendre des projets d'investissement importants ou spécialisés. Les domaines prioritaires pour le renforcement des capacités comprennent la formation et la fourniture de documents d'orientation dans des domaines tels que la planification, l'évaluation des projets et les marchés publics.

# 1 Introduction

Delivering basic health, education and other services of general interest to people, regardless of where they live, is a mandate for G20 countries governments. Meeting the mandate to maintain equitable living standards has been historically challenging in most contexts. Urbanisation, especially when accelerated, has shifted government priorities towards the mounting needs of people living in growing areas. Meanwhile, providing basic services in less dense areas is usually more difficult and costly due to geographic and demographic factors (OECD, 2021<sup>[2]</sup>). Addressing territorial disparities matters because lack of access, especially to education and health services, can result not only in life-time and inter-generational income and well-being gaps, but also in overconcentration of cities and compounded costs of inaction.

The main question of this report is where and how governments can invest to have the largest impact on closing territorial disparities in access to education and health services. Achieving territorial equity in access to basic services while striving for cost-efficiency has to be achieved under tight fiscal budgets in the aftermath of the COVID-19 pandemic crisis, long-term increases in public spending on social and health care services, shrinking tax bases in ageing societies, and insufficient private investment in infrastructure - especially in emerging and developing countries.

Public service provision comprises not only infrastructure investment, but also expenditure on other inputs – most notably human resources. Improving the provision of quality education and health services involves not only policies related to infrastructure investment decisions, but also those that relate to ensuring the right scale of provision (e.g. through the consolidation of facilities, coordination of activities among jurisdictions), the quality of service professionals (e.g. through support for training) and the standards of service (e.g. through regulations on minimum quality) (OECD, 2021<sup>[2]</sup>) (Echazarra and Radinger, 2019<sup>[3]</sup>) (OECD, 2018<sup>[4]</sup>). This report focuses on the former set of policies, acknowledging their intrinsic link with other policies related to service provision.

Subnational governments play a key role in defining and executing infrastructure investment strategies with a territorial lens. The investment needed to bridge territorial disparities in access to quality health and education services adds to already large energy, transport, water and telecommunications global infrastructure needs. Even before the COVID-19 pandemic, these needs were already estimated to require around USD 95 trillion in public and private investments (OECD, 2017<sup>[5]</sup>). Subnational governments are responsible for a substantial share of public investment in G20 countries, and in many countries they have the primary responsibility for providing social infrastructure including for education and health care. As such, subnational governments need to have funding and financing to support inclusive and quality infrastructure investment (G20-OECD, n.d.<sup>[6]</sup>).

This report, together with a complementary policy toolkit (G20-OECD, n.d.<sup>[6]</sup>), contributes to the 2022 Indonesian G20 Presidency's work program for the Infrastructure Working Group (IWG), and in particular the priority on enhancing social inclusion and addressing subnational disparities. It complements previous OECD inputs to the G20 including the 2021 report *Bridging Digital Divides in G20 Countries* prepared for the G20 Italian Presidency for the G20 Infrastructure Working Group (OECD, 2021<sup>[7]</sup>). The report also

aligns with the territorial disparities' implications of achieving the SDGs in G20 countries<sup>1</sup> (United Nations, 2022<sup>[8]</sup>).

The next section of the report addresses current disparities in access to basic education and health infrastructure across G20 countries, highlighting the crucial role of transport and digital infrastructure as access enablers. The third section offers a territorial perspective on future service infrastructure needs, based on the differentiated impact of demographic and climate change within countries. The fourth section concludes by offering implications for the future of infrastructure investment.

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<sup>1</sup> In particular SDG 1 (End poverty in all its forms everywhere), 3 (Ensure healthy lives and promote well-being for all at all ages), 4 (Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all), 9 (Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation) and 10 (Reduce inequality within and among countries).



# 2 Territorial disparities in access to service infrastructure

This section presents an overview of the state of territorial inequalities in access to infrastructure across G20 countries, with a focus on basic education and health care. It starts with a definition of territorial disparities in access to services and an explanation of its drivers, including the quantity and quality of transport and digital infrastructure. It then presents statistical evidence on territorial disparities in access to basic education and health care infrastructure using available data for as many OECD and G20 countries as possible. The analysis makes use of the degree of urbanisation, an internationally comparable definition of cities, towns and semi-dense and rural areas, and a typology of small (TL3) regions based on access to cities (Box 1).

## Box 1. Territorial definitions

### *The degree of urbanisation definition*

The degree of urbanisation was designed to create a simple and neutral method that could be applied in every country in the world. It relies primarily on population size and density thresholds applied to a population grid with cells of 1 by 1 km. The three types of grid cells are classified as follows.

1. Cities consist of contiguous grid cells that have a density of at least 1 500 inhabitants per km<sup>2</sup> or are at least 50% built up. The cluster of contiguous cells must have a population of at least 50 000. Gaps in this cluster are filled and its edges are smoothed.
2. Towns and semi-dense areas (TSAs) consist of contiguous grid cells with a density of at least 300 inhabitants per km<sup>2</sup> and are at least 3% built up. This cluster of contiguous cells must have a total population of at least 5 000. Once the minimum population has been verified, city cells that are part of this cluster are removed.
3. Rural areas are cells that do not belong to a city or a town and semi-dense area. Most of these have a density below 300 inhabitants per km<sup>2</sup>.

### *OECD-EU typology of small (TL3) regions*

The first tier adopts as a threshold of 50% of the population of the TL3 region living in a Functional Urban Area (FUA) of at least 250 000 people; the second tier uses a 60-minute driving-time threshold, a measure of the access to an FUA. The methodology classifies TL3 regions into metro and non-metro regions according to the following criteria:

**Metro TL3 region**, if more than 50% of its population live in an FUA of at least 250 000 inhabitants. Metropolitan regions are further classified into:

- **Large metro TL3 regions**, if more than 50% of its population lives in an FUA of at least 1 million inhabitants.



- **Metro TL3 regions**, if the TL3 region is not a large metropolitan region and 50% of its population lives in an FUA of at least 250 000 inhabitants.
- **Non-metro TL3 region**, if less than 50% of its population live in an FUA. These regions are further classified according to their level of access to FUAs of different sizes into regions:
- **With access to (near) a metropolitan TL3 region**, if more than 50% of its population lives within a 60-minute drive from a metropolitan area (an FUA with more than 250 000 people); or if the TL3 region contains more than 80% of the area of an FUA of at least 250 000 inhabitants.
- **With access to (near) a small/medium city TL3 region**, if the TL3 region does not have access to a metropolitan area and 50% of its population has access to a small or medium city (an FUA of more than 50 000 and less than 250 000 inhabitants) within a 60-minute drive; or if the TL3 region contains more than 80% of the area of a small or medium city.
- **Remote TL3 region**, if the TL3 region is not classified as NMR-M or NMR-S, i.e. if 50% of its population does not have access to any FUA within a 60-minute drive.

Source: (OECD/European Commission, 2020<sup>[9]</sup>) Cities in the World: A New Perspective on Urbanisation, <https://dx.doi.org/10.1787/d0efcbda-en>; (Fadic et al., 2019<sup>[10]</sup>), "Classifying small (TL3) regions based on metropolitan population, low density and remoteness", <https://dx.doi.org/10.1787/b902cc00-en>.

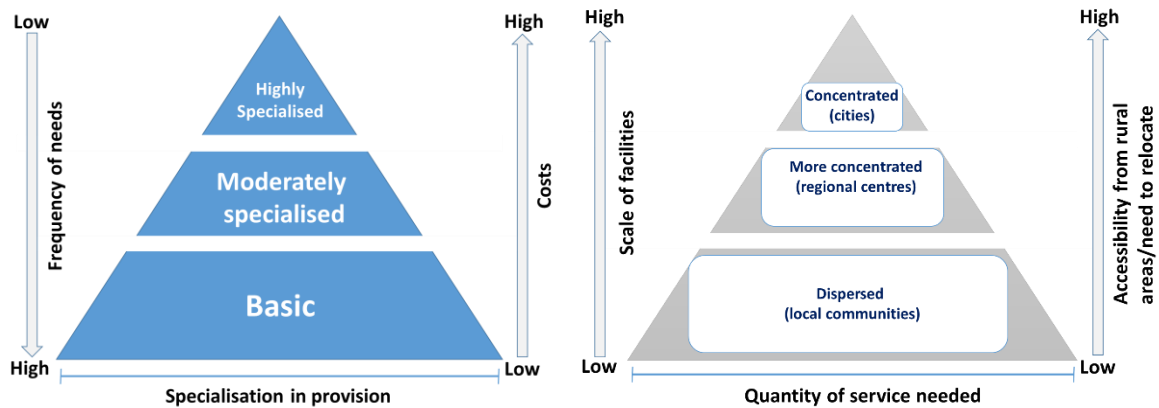
## What drives territorial disparities in access to quality services?

Access refers to the capacity of people to reach and use a service. Access depends not only on the number and location of facilities and users, but also on connectivity, or the extent to which people can move physically or virtually using transport or digital infrastructure; i.e., roads, rail, air, sea, river transport, and digital networks. Access to services is linked to the presence of population and the difficulty of physical access to territories. Extending existing infrastructure networks to connect service facilities is most challenging in places with difficult topographic conditions and where populations are sparsely distributed. For instance, the high cost of deploying broadband networks to rural and remote areas, and the resulting lack of positive business cases has resulted in the existence of unserved, underserved areas and areas with lower than appropriate broadband quality (G20, 2021<sup>[11]</sup>).

The main challenge of territorial equity in service provision is to balance proximity and cost-efficiency while maintaining quality. Service provision across territories involves an unavoidable trade-off between facility scale and proximity to users (Figure 1). A sparse user base means that few users frequent the same facility periodically. In order to stay accessible, many service facilities in rural areas operate at a small scale, often at high per capita costs. At the same time, larger scale may lead to higher quality (Lalloué et al., 2019<sup>[12]</sup>).

Facilities providing more specialised services accessed less frequently or by a narrow segment of the population such as hospitals and universities usually locate in dense areas to spread higher total costs over a larger user base. This means that providing access at short distances to services that need to be provided at scale is unfeasible. In this sense, bridging territorial disparities in access is about linking the provision of local basic services to specialised services provided at a larger scale (e.g. the regional scale).

Figure 1. Infrastructure provision at different territorial scales

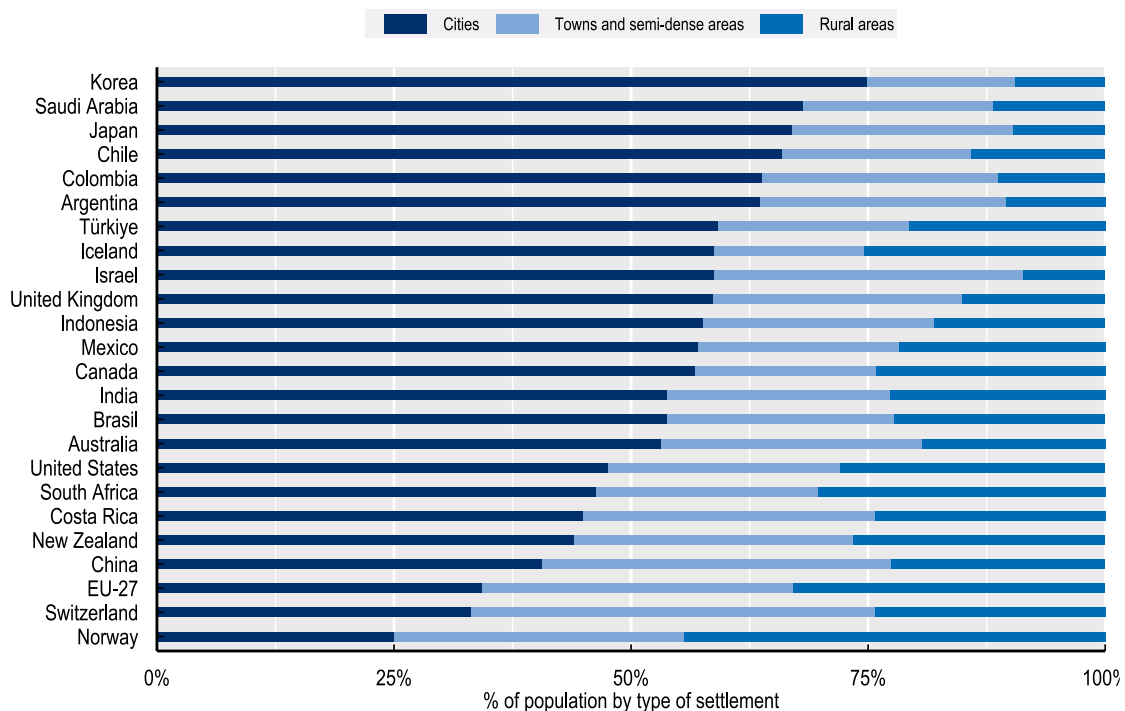


Source: Authors' elaboration based on (OECD, 2021<sup>[2]</sup>).

Urbanisation puts pressure on governments to upgrade and expand infrastructure, but inaction in relation to the needs of areas experiencing population decline can lead to a vicious cycle of lack of growth, under-investment and debt default. Among OECD and G20 countries, the share of population living outside cities ranges from 27% of the population in Korea to 72% in Norway (Figure 2). Across OECD countries, elderly dependency ratios were higher in TL3 regions far from cities than in metropolitan regions in 2021, and 85 out of 110 TL3 regions with 1 elderly person for every 2 working-age persons were non-metropolitan (Figure 3). Decreasing populations and tax bases create fiscal pressure when looking to fund new infrastructure, maintain existing infrastructure, or adapt existing infrastructure to new population scales.

Figure 2. Share of population by degree of urbanisation, OECD and G20 countries

2015

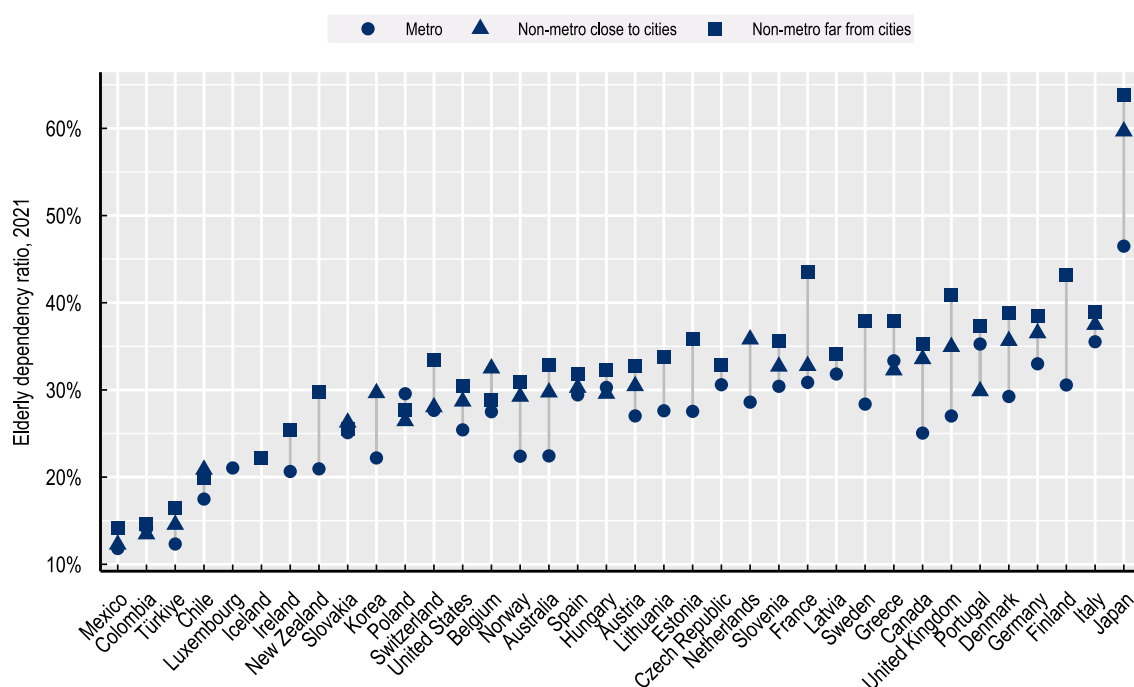


Note: See Box 1 for details.

Source: Own calculations based on (Florczyk, 2019<sup>[13]</sup>) GHSL Data Package 2019 (database), <http://dx.doi.org/10.2760/06297>.

**Figure 3. Elderly dependency ratio by type of TL3 region, OECD countries**

Share of +65 population with respect to the working-age population (15-64 years old), 2021 or latest year available



Note: Latest year available: 1 region in Australia (2018), and 9 regions in United Kingdom (2019), Australia, Mexico, United Kingdom, United States, 8 regions in Belgium, 2 regions in Estonia and 8 regions in Italy (2020). No data available for Israel. Non-metro regions far from cities include non-metro regions with access to (near) a small/medium city and remote regions.

Source: (OECD, 2022<sup>[14]</sup>). OECD Regional Statistics (database), accessible at: <https://www.oecd.org/regional/regional-statistics/>

### ***Territorial gaps in access to service infrastructure can translate into gaps in outcomes***

Territorial disparities in access to quality service are of policy concern because they can translate into differences in outcomes across people living in different places. Lower access to quality services, especially basic ones, can lead to increased spending on social support services and more complex health care and indeed lower taxes (related to lower employment outcomes). In education, lack of access to quality opportunities has been shown to lead not only to lower lifelong employment opportunities, incomes and wellbeing, but also to higher intergenerational inequalities (Hanushek and Woessmann, 2020<sup>[15]</sup>). In health care, lack of access to quality care can translate into worse health outcomes, higher incidence of chronic disease and ultimately to a lower quality of life (OECD, 2021<sup>[21]</sup>). Migration induced by inadequate access to services can lead to brain-drain and exacerbate existing gaps in the availability to educated workers such as doctors and teachers in rural areas.

Available evidence points to the existence of rural-urban gaps on both education outcomes and the quality of infrastructure of schools. Results from PISA<sup>2</sup> show that students in city schools obtained higher scores in reading than their peers in schools located elsewhere in all but two G20 countries with available data (Figure 4). In some countries, including China and G20 countries in Latin America, this gap was above 40 percentage points (p.p.) – more than the equivalent of a year of schooling. This performance gap remains significant in many countries even after controlling for the socio-economic status of students and schools.

<sup>2</sup> The OECD Programme for International Student Assessment (PISA) is an international assessment that measures 15-year-old students' reading, mathematics, and science literacy every 3 years.

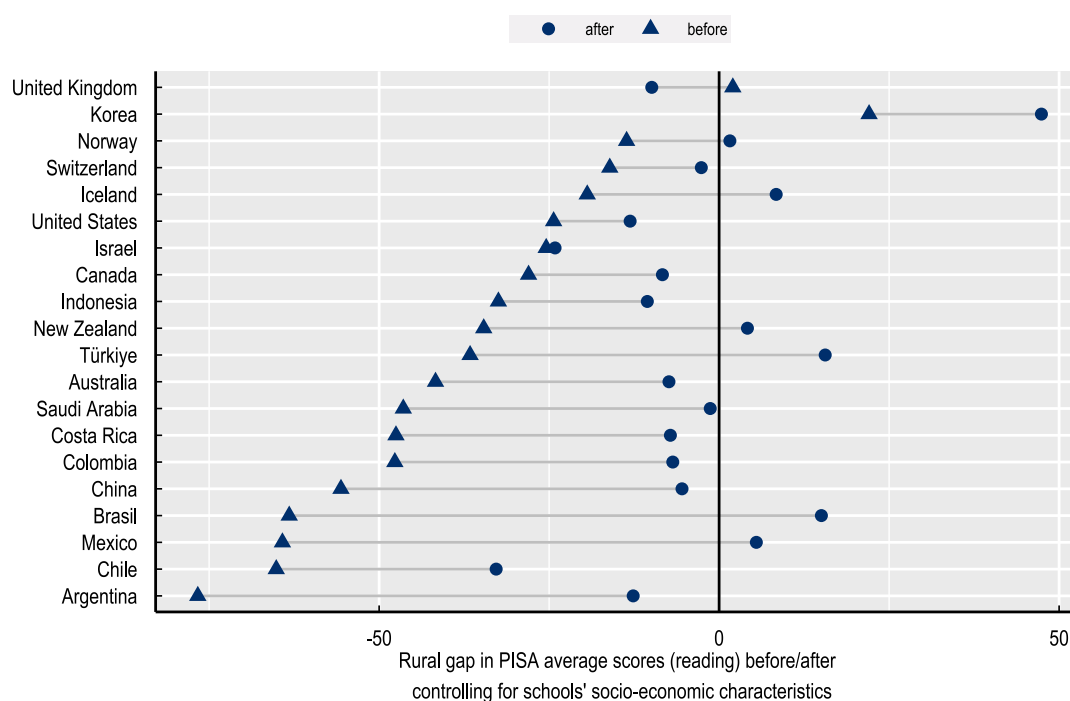
At the same time, physical accessibility to schools is lower in rural areas: a study for Europe shows that students in remote rural areas have to travel on average 5 additional kilometres to reach a school compared to students in other areas, and that 9 out of 10 municipalities without a school were rural (European Commission; Joint Research Centre; Proietti, P.; Sulis, P.; Perpiña Castillo, C., 2022<sup>[16]</sup>).

In health care, existing evidence for OECD and G20 countries points to persisting territorial gaps in the cost, quality and access:

- Across a global sample of countries, more than 31% of residents of rural areas as defined by degree of urbanisation (see Box 1) reported suffering from health problems that prevent them from doing things people their age normally do, a smaller share than city residents reporting similar issues (24.6%) (OECD/European Commission, 2020<sup>[9]</sup>) (Figure 5).
- Across European countries, rural residents reported significantly higher unmet needs for health (4.2% in rural areas versus 3.8% in towns and suburbs and 3.5% in cities) resulting from problems in accessing care such as distance from providers or financial barriers.
- Across 23 OECD countries, about one in five adults reported postponing or forgoing care due to long waiting times or difficulties with transportation, and one in six reported putting off or forgoing care because of cost (OECD, 2019<sup>[17]</sup>).
- In the United States, age-adjusted mortality rates for five leading causes of death are higher in non-metropolitan than in metropolitan areas.
- In Australia, mortality rates increase with the level of remoteness, leading to a gap of about 200 additional deaths per 100 000 inhabitants in very remote areas compared to cities (OECD, 2021<sup>[2]</sup>).

**Figure 4. Rural-city gap in reading performance, OECD and G20 countries**

Based on PISA (2018) scores on test administered to secondary school students

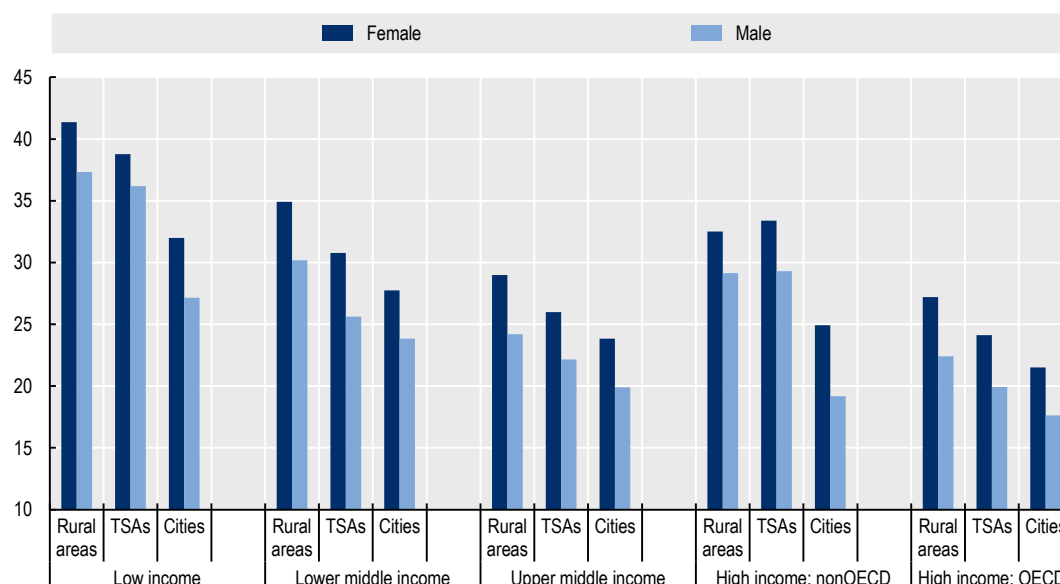


Note: Schools are allocated to “rural” if they are in a village, hamlet or rural area with fewer than 3 000 people and to “cities” if they are in settlements with more than 100 000 people. EU27 average does not include Romania because of lack of data.

Source: Adapted from (OECD, 2020<sup>[18]</sup>). *PISA 2018 Database*, <https://www.oecd.org/pisa/data/2018database/> (accessed on 15 May 2022) based on (Echazarra and Radinger, 2019<sup>[3]</sup>) *Learning in rural schools: Insights from PISA, TALIS and the literature*, OECD Education Working Papers, No. 196, OECD Publishing, Paris, <https://doi.org/10.1787/8b1a5cb9-en>.

**Figure 5. Health problems by gender by degree of urbanisation, countries from all world regions and income groups**

Share of people reporting suffering significantly from health problems. 2016-2017.



Note: TSAs denote towns and semi-dense areas. See Box 1 for definitions. Data come from the Gallup World Poll and consist of countries from all world regions and all country income groups. In total, 13% are high-income countries, 65% middle-income countries (32% upper- and 33% lower-middle income) and 22% low-income countries.

Source: (OECD/European Commission, 2020<sup>[9]</sup>), based on (Gallup, 2017<sup>[19]</sup>), Gallup World Poll, 2016-17, <https://www.gallup.com/analytics/232838/world-poll.aspx>; elaborated by EC and OECD, 2019.

In the presence of inequalities in access to basic education and health services, even small investments with a territorial lens can go a long way in reducing inter-personal and inter-generational inequalities. For instance, a study for Indonesia found that school construction leads to increased government tax revenues that directly offset construction costs in most cases within 40 years, as well as internal rates of return ranging from 13-21% and benefits surpassing costs within 17-30 years after the schools were built after accounting for improved living standards (Akresh, Halim and Kleemans, 2021<sup>[20]</sup>). A large-scale study for Denmark suggests that investment in education can disrupt the inter-generational cycle of reliance on multiple, different health and social services by of adults who have parents that also rely disproportionately on the same services (Andersen et al., 2021<sup>[21]</sup>).

### ***Transport connectivity enables access to services***

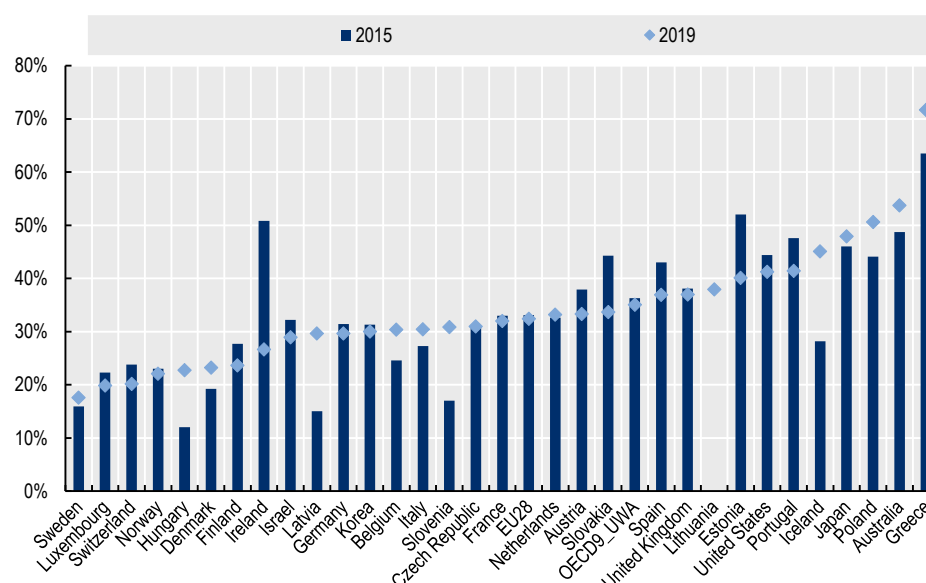
Transport infrastructure, identified as a priority area for sustainable infrastructure investment, plays a crucial role as enabler of access to services. Investment (gross fixed capital formation) in inland transport infrastructure as a share of GDP across OECD and G20 countries with available data varied from 5.5% in China to 0.3% in Mexico (International Transport Forum, 2021<sup>[22]</sup>).

While growth in investment in infrastructure has been exceptionally fast in some countries, including China (+290% in 2008-2019 in constant 2015 prices), transport investment as a share of GDP has remained constant in most countries since 2014. The global financial crisis of 2008 led to a decrease of both private and public investment in transport in OECD countries, including that made by subnational governments (by 18% between 2009 and 2014) (OECD, 2020<sup>[23]</sup>) (Allain-Dupré, Hulbert and Vincent, 2017<sup>[24]</sup>). Part of the decrease in public investment in transport by subnational governments may have been linked to a

deferral of investment in some countries, as the share of investment by subnational governments on economics affairs (the bulk of which corresponds to transport investment) grew in 13 out of 32 OECD countries with available data (Figure 6).

**Figure 6. Share of subnational government spending on economic affairs (including transport), OECD countries and EU28**

2015-2019



Note: Subnational government is defined as the sum of state governments and local/regional governments. Capital expenditure is the sum of capital transfers and investment. Gross fixed capital formation is the main component of investment. The category economic affairs includes transport, communications, economic development, energy, construction, etc. Transport systems and facilities make the bulk of investment in this category. It comprises construction of roads, railways, water transport, air transport and airports, pipeline and other transport systems. OECD9 refer to the averages for OECD federal countries. (UWA) denotes unweighted average.

Source: (OECD, 2022<sup>[14]</sup>), Regional Statistics, <https://www.oecd.org/regional/regional-statistics/>.

From a purely financial point of view, investment in transport infrastructure outside cities may represent a weaker case compared to investments that bring benefits to a larger share of the population. This means that a strong focus on urban infrastructure may become self-enforcing in the context of decreasing quality and stocks of transport infrastructure and increasing needs from urban residents, especially in the context of the green transition (CEB, 2017<sup>[25]</sup>) (OECD, 2020<sup>[23]</sup>). However, poor transport connectivity in rural areas is one important driver in disparities in access to services, as it limits the reach of existing facilities, increases travel times and may discourage people from accessing education and health care services.

### ***Digital connectivity is lacking in areas facing low physical connectivity***

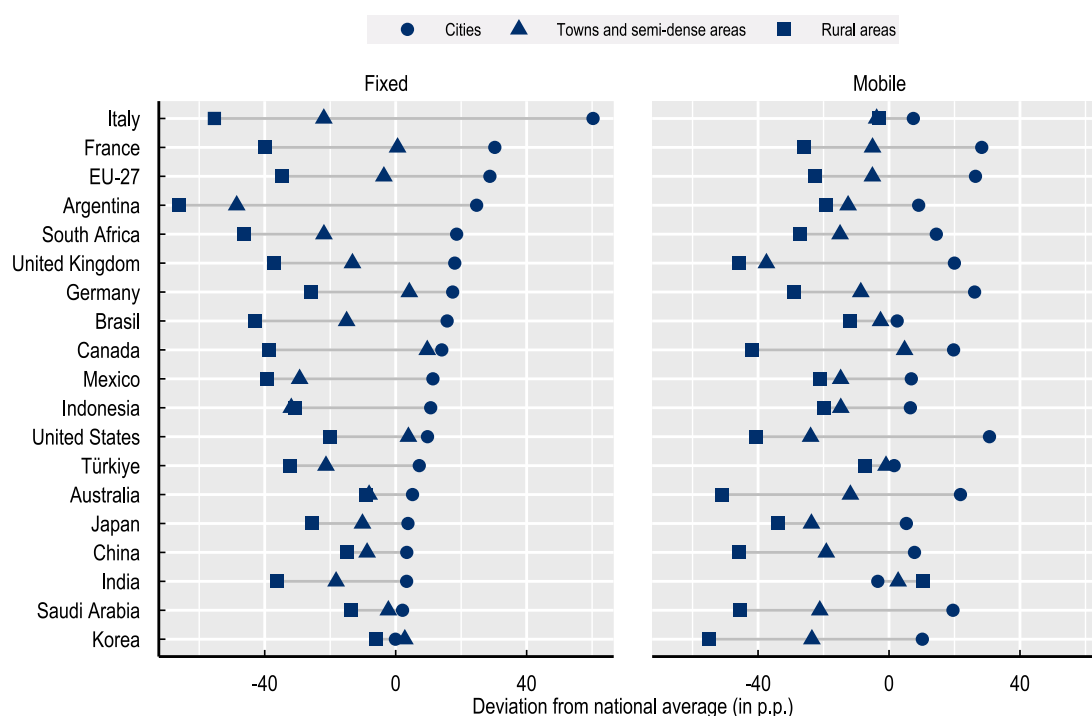
Next to transport infrastructure, investment in expanding digital networks access represents a way to remove the effect of distance on access, while improving asset management by expanding the capacity of existing services (OECD, 2021<sup>[26]</sup>). Governments in OECD and G20 countries including Austria, Italy, France, Germany the United States and the United Kingdom have recently approved multi-billion dollar funding for broadband expansion programmes. The additional investment to meet the targets of the EU digital agenda has been estimated to be around €125 billion per year (European Commission, 2022<sup>[27]</sup>).

Since the 2000s, broadband services have flourished, with 462.5 million (on average 33.8 subscriptions per 100 inhabitants) fixed-line and 1.66 billion mobile subscribers (121.4 subscriptions per 100 inhabitants) across OECD countries in 2021 (OECD, 2022<sup>[28]</sup>). The deployment of 5G networks advanced rapidly during the pandemic in some OECD and G20 countries, including EU countries (5G Observatory, 2022<sup>[29]</sup>).

Despite this progress in coverage and take-up, substantial disparities persist in the extent and quality of connectivity in rural versus urban areas. In 2019, only 59%, 67% and 77% of rural households in Europe, Canada and the United States were located in regions where access to fixed broadband with a minimum speed of 30 Mbps was available, in comparison to 86%, 93% and 94.4% of households in all areas overall (OECD, 2021<sup>[7]</sup>). Data from regulators in 26 OECD countries indicates a persistent rural-urban divide in connectivity speeds: 1 in 3 households in rural areas do not have access to high-speed broadband on average and in only 7 out of 26 OECD countries more than 80% of households in rural regions have access to a high-speed connection (OECD, 2020<sup>[30]</sup>). Available data from self-administered connection speed tests by Ookla (Figure 7) show that download speeds over fixed networks in rural areas in G20 countries are on average 31 percentage points below the national average. Download speeds in cities, on the other hand, are on average 21 percentage points above the national average.

**Figure 7. Gaps in download speeds experienced by users by degree of urbanisation, OECD and G20 countries**

Gaps estimated as percentage deviation from national averages (2020Q4)



Note: Speedtest data corresponds to 2020Q4. The data for average fixed and mobile broadband download Speedtests reported by Ookla measures the sustained peak throughput achieved by users of the network. The measure is a simple average of the deviations in actual download speeds experienced in rural areas with respect to national average download speeds. Measurements are based on self-administered tests by users, carried over iOS and mobile devices. Aggregation according to the degree of urbanisation was based on GHS Settlement Model (GHS-SMOD) layer grids from (Florczyk, 2019<sup>[13]</sup>). The figure presents average peak speed tests, weighted by the number of tests. For further information on the degree of urbanisation, the definition and treatment of the Speedtest data see (OECD, 2021<sup>[7]</sup>).

Source: OECD calculations based on Speedtest® by Ookla® Global Fixed and Mobile Network Performance Maps. Based on analysis by Ookla of Speedtest Intelligence® data for 2020Q4. Provided by Ookla and accessed 2021-01-27. Ookla trademarks used under license and reprinted with permission.



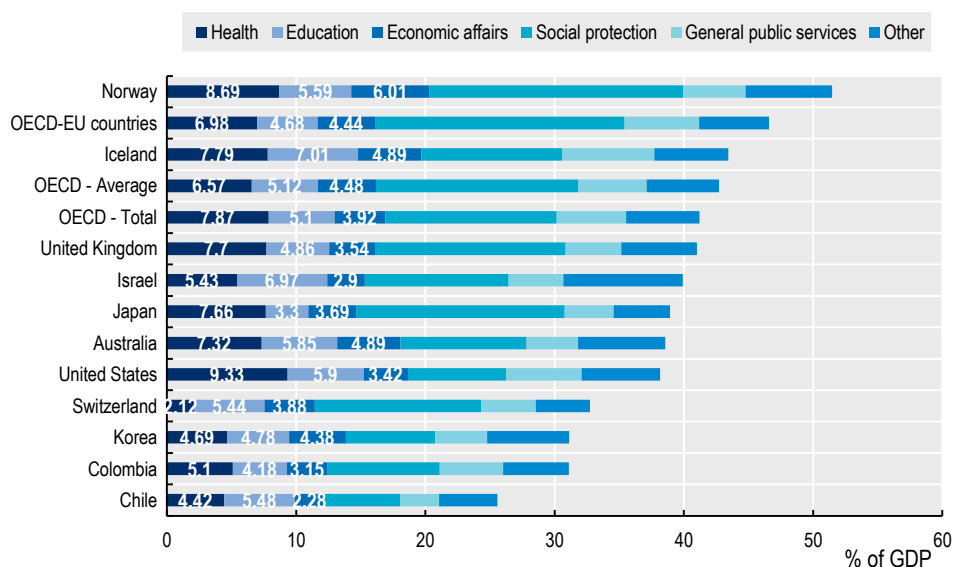
### Subnational governments play a key role in providing service infrastructure

Infrastructure investments by national and subnational governments enable access to basic services, including education and health care. This comprises both horizontal investments in transport and digital connectivity networks and investments in facilities where provision takes place.

Governments in OECD and G20 countries spend a considerable amount in providing education, health and connectivity services. In 2019, expenditure in health and education amounted to 13% of GDP across OECD countries, the largest spending shares next to expenditure in social protection and economic affairs, which includes expenditure transport and telecommunication infrastructure (Figure 8).

**Figure 8. General government expenditures by function as a percentage of GDP, OECD countries**

2019 or latest year available



Note: 2018 values for Australia, Chile, Colombia, Korea and Japan.

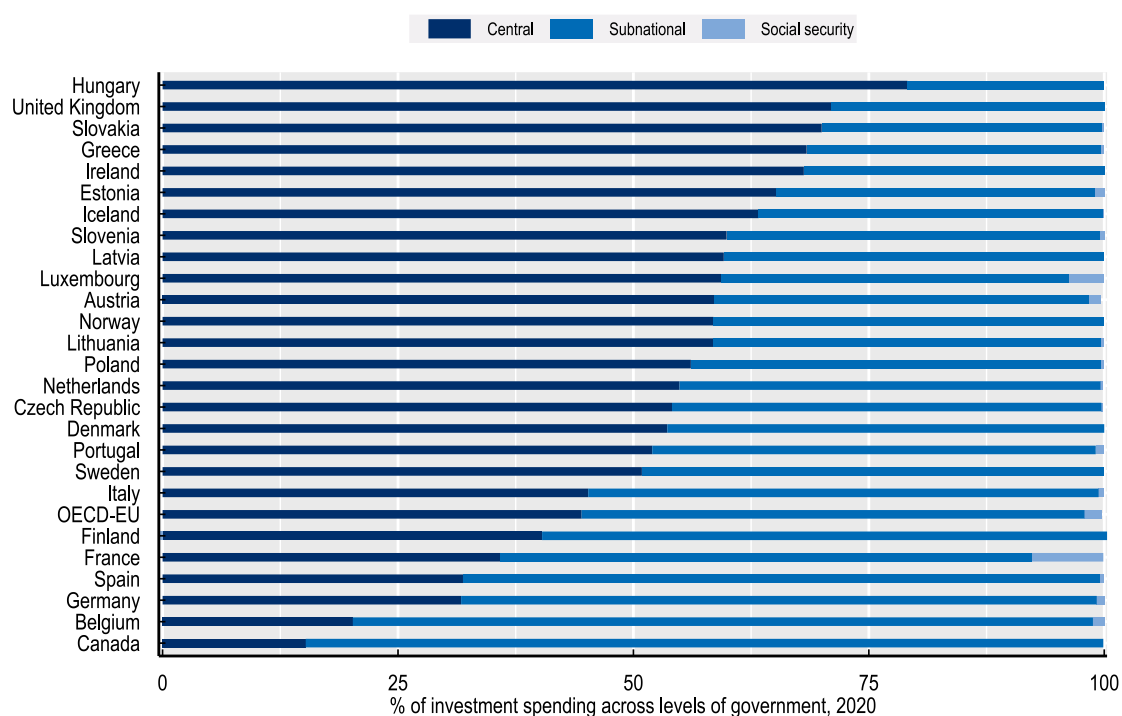
Source: (OECD, 2022<sup>[31]</sup>). Government at a Glance - 2021 edition (database), accessible at: <https://stats.oecd.org/Index.aspx?QueryId=107594>

The responsibilities of different levels of governments to providing public service infrastructure changes with decentralisation trends. Over the past decades, decentralisation (a governance model, which alters the responsibilities within levels of organisation), devolution (the transfer functions from national governments to a subnational government with decision-making powers), and regionalisation have taken place to varying degrees (OECD, 2019<sup>[32]</sup>). Decentralisation in particular has been on the rise across many OECD countries. Today, subnational governments across OECD and EU countries are responsible for 53% of public investment (OECD, 2021<sup>[26]</sup>) (Figure 9), and a substantial share of investment is dedicated to service and transport infrastructure (included in economic affairs) (Figure 10).



Figure 9. Distribution of investment spending across levels of government, OECD countries

2020

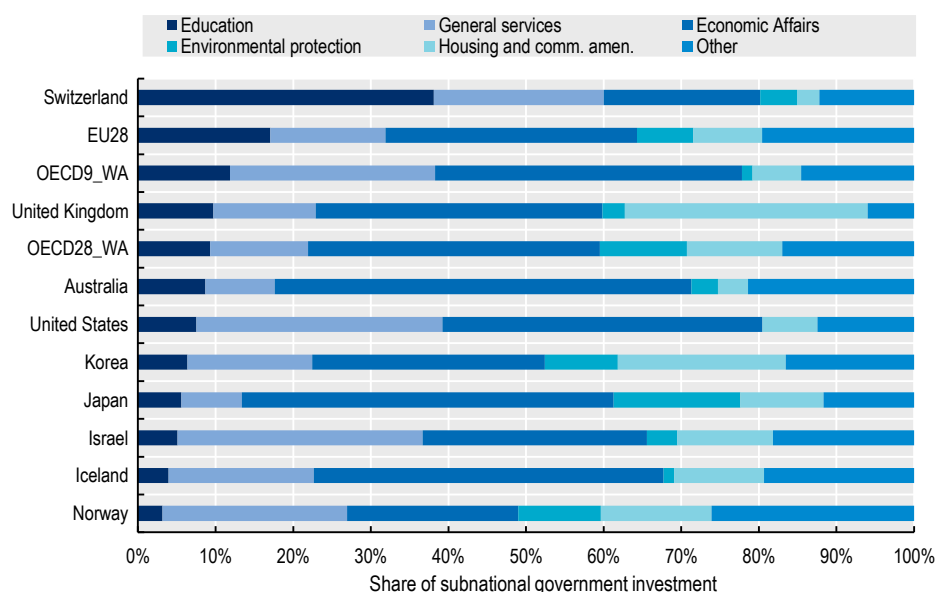


Note: Subnational government is defined as the sum of state governments and local/regional governments. Data for Chile and Colombia are not available. Data for Türkiye not included in the OECD average due to missing time-series. Local government is included in state government for Australia and the United States. Australia does not operate government social insurance schemes. Social security funds are included in central government in Ireland, New Zealand, Norway, the United Kingdom and the United States.

Source: (OECD, 2020<sup>[33]</sup>). OECD National Accounts Statistics (database), <https://doi.org/10.1787/na-data-en>.

**Figure 10. Subnational government investment by sectoral spending shares, OECD countries**

2019, COFOG classification



Note: Subnational government is defined as the sum of state governments and local/regional governments. Capital expenditure is the sum of capital transfers and investment. Gross fixed capital formation is the main component of investment. The category economic affairs includes transport, communications, economic development, energy, construction, etc. Transport systems and facilities make the bulk of investment in this category. It comprises construction of roads, railways, water transport, air transport and airports, pipeline and other transport systems. Category General services include health; recreation, culture and religion; social protection; category Other includes defence; public order and safety. OECD9 and OECD28 refer respectively to the averages for OECD federal countries and OECD unitary countries. (WA) denotes weighted average of countries included.

Source: (OECD, 2022<sup>[14]</sup>), Regional Statistics, <https://www.oecd.org/regional/regional-statistics/>

Multi-level governance challenges can be particularly acute in countries with high levels of fiscal decentralisation without fiscal equalisation mechanisms to support subnational governments to provide equal access to services (OECD, 2021<sup>[21]</sup>). Subnational governments with decreasing tax revenues – for instance those where the working age population is shrinking rapidly - may face an increasing gap between the responsibilities for providing services assigned and their capability to raise capital to finance infrastructure investments or even maintain infrastructure. This situation can lead to vicious cycles and serious financial distress for subnational governments.

## How large are territorial disparities in access to educational infrastructure in G20 countries?

### ***High current expenditure may lead to under-investment in service infrastructure***

Infrastructure investment in education, usually recorded as capital expenditure, includes the construction, renovation or major repair of buildings, and new or replacement equipment. Infrastructure investment in education arises with capacity expansion linked to an increasing number of students, infrastructure renewal linked to obsolescence and ageing of existing structures, and evolving educational, societal or safety needs. Maintenance spending to support existing assets is one of the largest costs associated with infrastructure (OECD, 2021<sup>[26]</sup>).

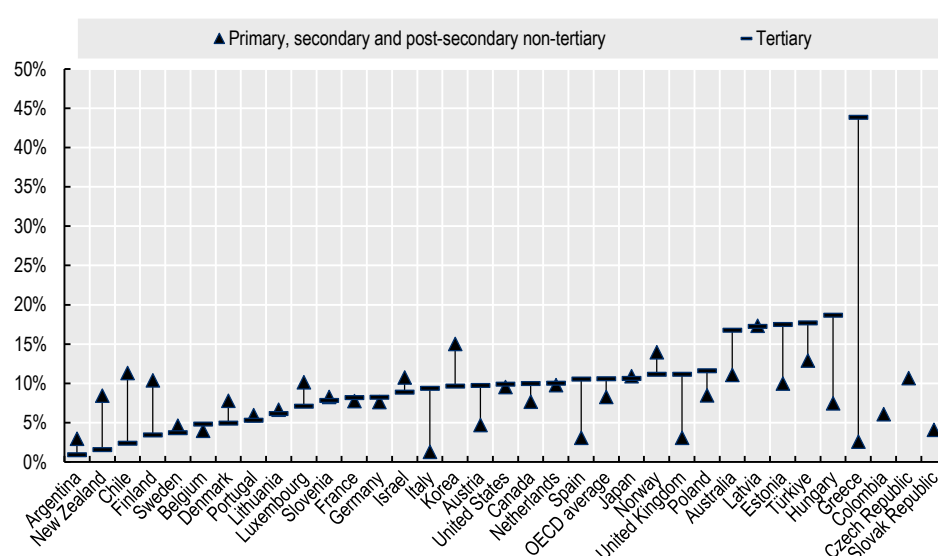
Education is a labour-intensive activity. Consequently, capital expenditure represents a relatively small share in total expenditure. Most expenditure in education goes to staff compensation, which together with

spending on the goods and services needed each year to operate education institutions, make up for current expenditure (OECD, 2021<sup>[34]</sup>).

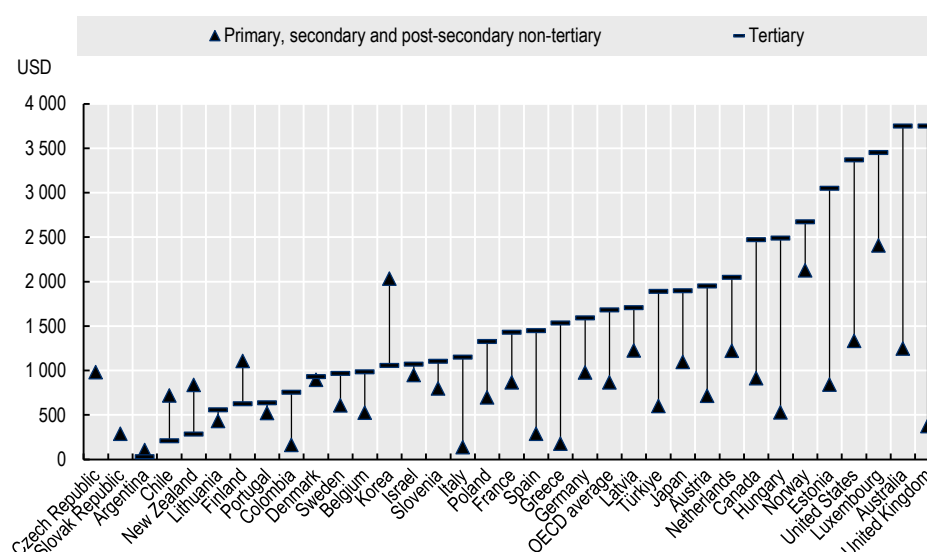
Across G20 and OECD countries with available data for 2018, capital expenditure represented 8% of total expenditure in primary, secondary and post-secondary non-tertiary education, with the share varying from 3% in Argentina to 15% in Korea. The share of capital expenditure is higher for tertiary education (11%), and in 2018 varied from 1% in Argentina to 44% in Greece (Figure 11). These shares do not capture the large fluctuations in capital expenditure over time, with high values corresponding to the implementation of investment plans. Cross-country variations in capital expenditure are large and range from USD 32 per student in Argentina to over USD 3 700 in the United Kingdom.

**Figure 11. Capital expenditure per student and as share of total expenditure, OECD and G20 countries**

Share of capital expenditure in total, 2018



Capital expenditure per student (equivalent USD converted using PPPs), 2018



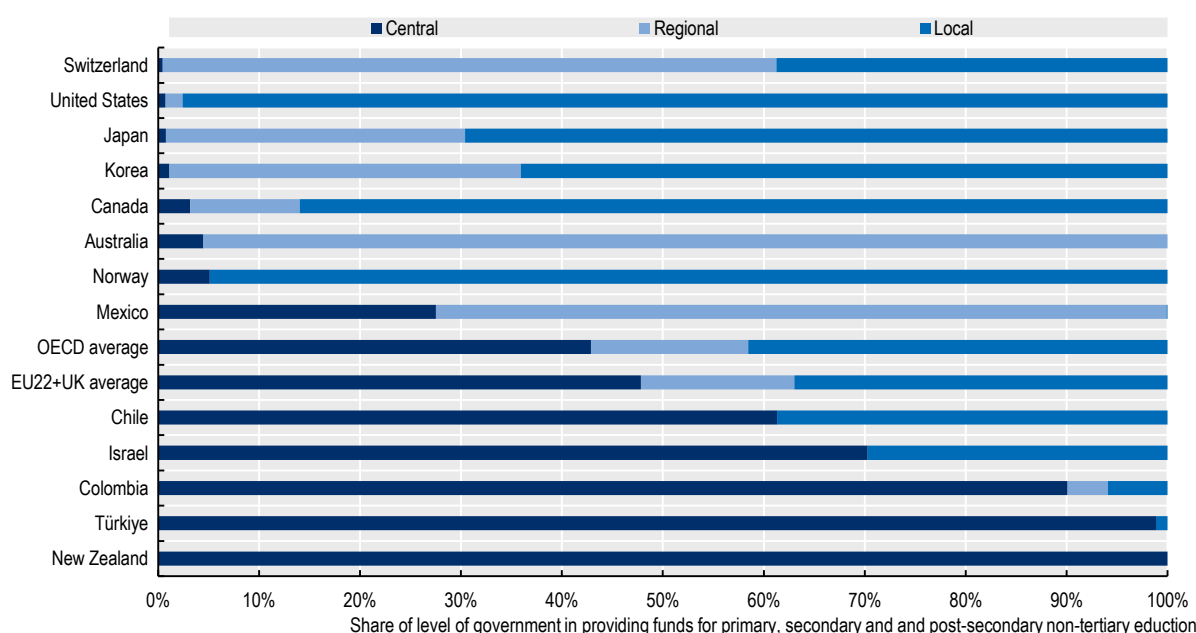
Source: (OECD, 2021<sup>[34]</sup>). Education at a Glance 2021: OECD Indicators, accessible at: [10.1787/b35a14e5-en](https://doi.org/10.1787/b35a14e5-en).

Current expenditure is not used directly to finance infrastructure investments, but tight budgets and high running costs may compromise the ability of schools located in areas with sparse demand to undertake capital infrastructure investments. While expenditure statistics are not available at subnational levels, estimates for 27 EU countries and the UK show that the annual (current) costs per student in sparse rural areas are 20% higher (EUR 720) compared to cities for primary schools and 11% (EUR 681) higher for secondary schools (OECD/EC-JRC, 2021<sup>[35]</sup>). The difference in costs can be higher than 40% for primary schools in Estonia, Finland and Latvia and 16% for secondary schools in Greece and Spain.

Subnational governments, and local governments in particular, have a relatively large share of responsibility in funding education expenditure (Figure 12). While subnational governments may receive block grants from the central government to finance this expenditure, these transfers often do not account for the unavoidable costs of remoteness and smallness (OECD, 2021<sup>[2]</sup>).

**Figure 12. Public funds devoted to primary, secondary and post-secondary non-tertiary education by government level, OECD countries**

Shares %, 2016



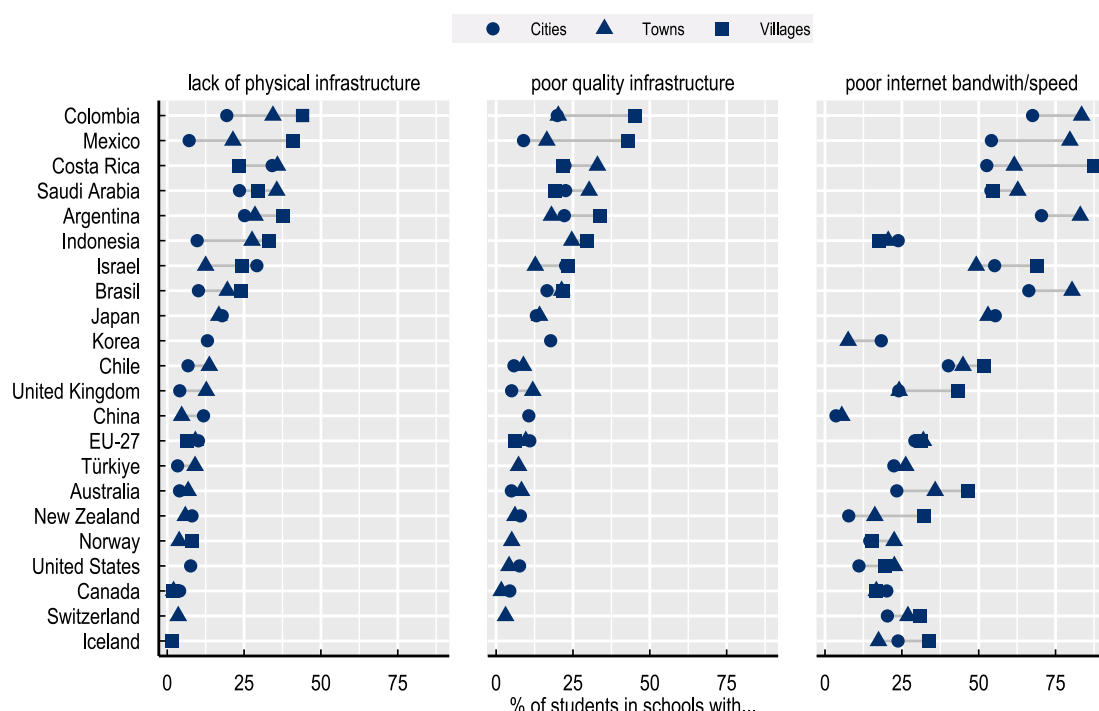
Note: The data covers education from primary to secondary and other non-tertiary levels. Public funds refer to final public spending, which includes direct public purchases of educational resources and payments to educational institutions. No data was available for Denmark.

Source: (OECD, 2019<sup>[36]</sup>), Education at a Glance 2019: OECD Indicators, <https://doi.org/10.1787/f8d7880d-en>.

Low capital investment potentially leading to low and/or poor quality infrastructure varies significantly, not only across countries but also within countries. Globally, about a quarter of primary schools did not have access to basic services such as electricity, drinking water and sanitation in 2020 (United Nations, 2022<sup>[8]</sup>). Two indicators of under-investment, lack of physical infrastructure and poor quality infrastructure, tend to be higher in schools located in villages as compared to schools located in cities across G20 countries with available data for 2018 (Figure 13). In Latin American countries like Colombia, Mexico and Argentina, the gap in the share of schools where principals reported poor quality infrastructure significantly affected instruction can surpass 20 percentage points (p.p.). However, in countries with a low share of schools with infrastructure issues such as Norway and EU27, schools located in villages are not necessarily worse off than schools located in more dense areas.

Figure 13. Level and quality of physical infrastructure by school location, OECD and G20 countries

2018



Note: Lack of physical infrastructure: Share of principals reporting school instruction hindered a lot by a lack of physical infrastructure (e.g. building, grounds, heating/cooling, lighting and acoustic systems). Poor quality infrastructure: Share of principals reporting school instruction hindered a lot by inadequate or poor quality physical infrastructure. Poor internet bandwidth/speed: 100 – the share of 15-year-old students whose principals report that the school's Internet bandwidth or speed is sufficient. Schools are allocated to "villages" if they are in a village, hamlet or rural area with fewer than 3 000 people, to "towns" if they are in settlements with between 3 000 and 100 000 inhabitants; and to "cities" if they are in settlements with more than 100 000 people. EU27 average does not include Romania because of lack of data.

Source: Adapted from (OECD, 2020<sup>[18]</sup>). PISA 2018 Database, <https://www.oecd.org/pisa/data/2018database/> (accessed on 15 May 2022).

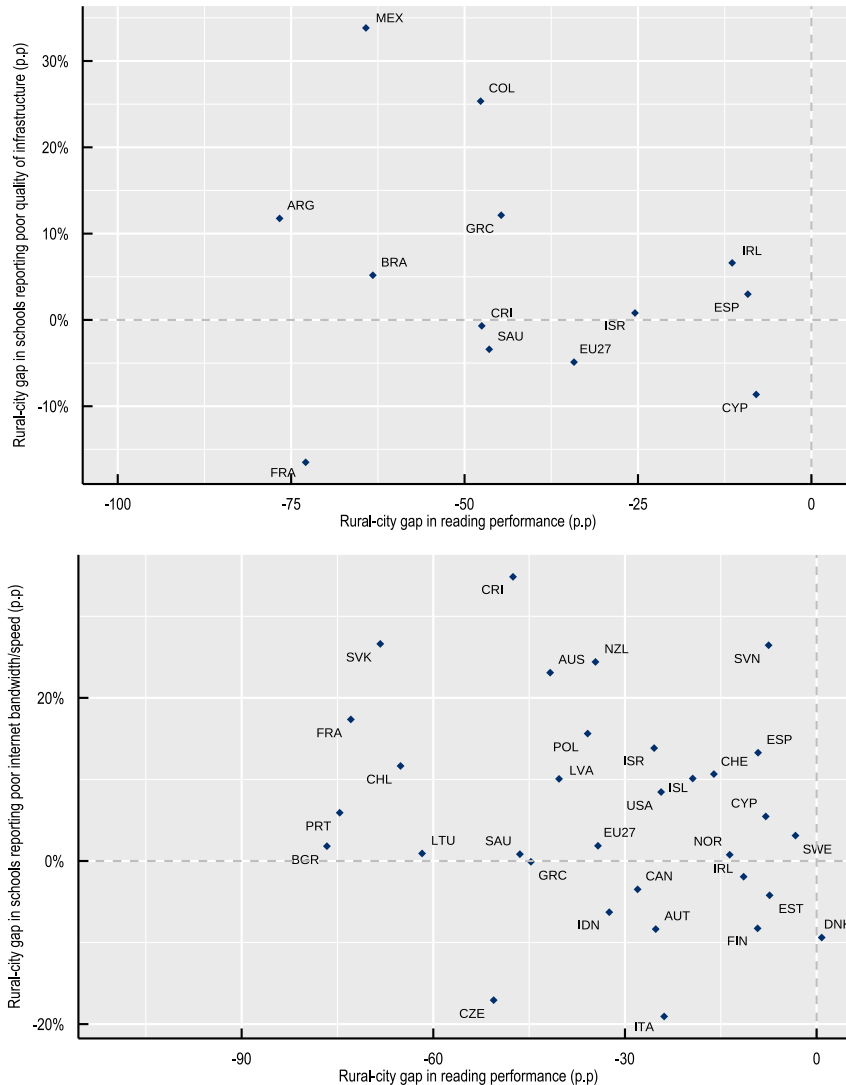
### Gaps in digital infrastructure available for learning are large across and within G20 countries

Rural-urban gaps in digital infrastructure available for learning remain large across many G20 countries. Schools located in cities and towns have larger shares of computers connected to the internet as compared to schools located in rural areas in 10 over 13 G20 countries with data available. The rural-urban gaps are particularly salient in Latin American countries (Figure 14). The contrast across G20 countries reflects not only in part an underlying digital rural-urban divide in broadband connectivity, but also the prioritisation of investments in connecting rural schools. For instance, today China has near universal access after the implementation of an ambitious 2005 ICT plan for rural schools (Bianchi, Lu and Song, 2019<sup>[37]</sup>).

Internet connectivity available for learning is not only necessary for performing digital learning activities; it can also support better learning outcomes, as well as the transition to higher education and online learning up-take in higher education (Sanchis-Guarner, Montalbán and Weinhardt, 2021<sup>[38]</sup>), (Skinner, 2019<sup>[39]</sup>) (Dettling, Goodman and Smith, 2018<sup>[40]</sup>). Data from PISA shows rural-urban reading performance gaps are not only correlated with rural-urban gaps in the quality of physical infrastructure in schools but also with the quality of internet connectivity (Figure 15). The positive correlation between schools' internet bandwidth or speed and equity reading performance (across students from different socio-economic backgrounds) holds after accounting for per capita GDP across OECD countries (OECD, 2020<sup>[41]</sup>).

**Figure 14. Rural-urban gap in reading performance versus quality of physical and digital infrastructure, OECD and G20 countries**

2018



Note: Poor quality infrastructure: Share of principals reporting school instruction hindered a lot by Inadequate or poor quality physical infrastructure. Poor internet bandwidth/speed: 100 – the share of 15-year-old students whose principals report that the school's Internet bandwidth or speed is sufficient. Schools are allocated to “villages” if they are in a village, hamlet or rural area with fewer than 3 000 people, to “towns” if they are in settlements with between 3 000 and 100 000 inhabitants; and to “cities” if they are in settlements with more than 100 000 people. Rural-city gap refers to the indicator for villages (rural) minus the indicator for cities. EU27 average does not include Romania because of lack of data.

Source: Adapted from (OECD, 2020<sup>[18]</sup>). *PISA 2018 Database*, <https://www.oecd.org/pisa/data/2018database/> (accessed on 15 May 2022).

Finally, while the share of students with internet at home has been on the rise in recent years, the COVID-19 pandemic evidenced how territorial gaps in access to adequate internet connectivity for learning can translate into learning gaps (Nusche and Minea-Pic, 2020<sup>[42]</sup>). As countries organised distance education to ensure continuity of learning at all educational levels during lockdowns, access to institutional networks from home or other places of study became more prevalent (OECD, 2021<sup>[43]</sup>). As public wired networks and mobile data access becomes more relevant for both online and hybrid learning, territorial disparities

in access to digital infrastructure can translate into disparities in the capacity to transition to online learning (OECD, 2020<sup>[44]</sup>).

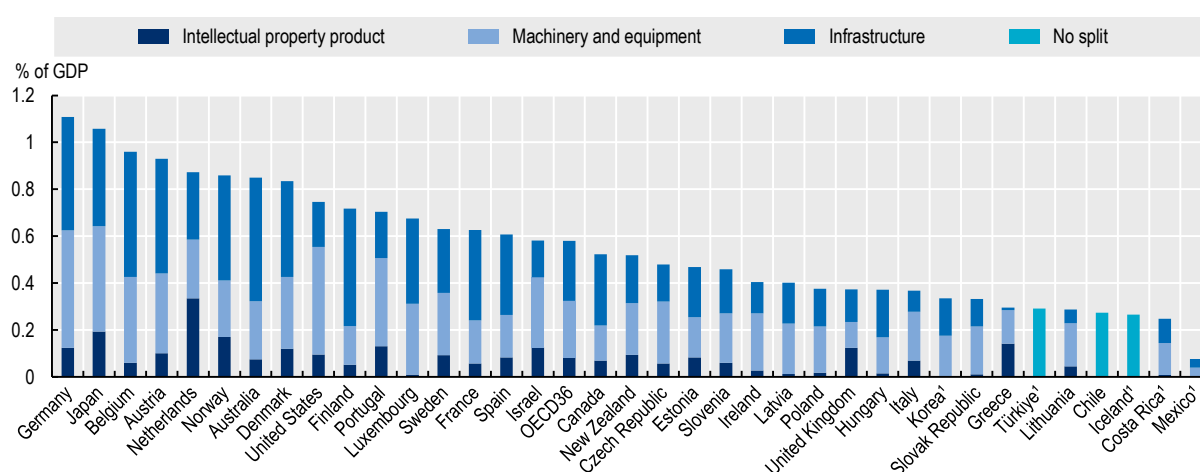
## How large are territorial disparities in access to health care infrastructure in G20 countries?

### *Investment in health care infrastructure underpins access to quality healthcare*

Capital spending on health care covers a broad range of investments, ranging from construction projects (building of hospitals and health care facilities) and equipment (including medical and ICT equipment) to intellectual property (including databases and software). In 2015-2019, average annual capital expenditure in the health sector in OECD countries amounted to around 0.6% of GDP, and varied from 1.1% of GDP in Germany to 0.1% in Mexico (Figure 15), a relatively small share of total expenditure on health (Figure 10). Across OECD countries, 40% of capital expenditure went on construction projects, 46% on equipment and the remaining 14% on intellectual property (OECD, 2022<sup>[45]</sup>).

**Figure 15. Annual capital expenditure on health as a share of GDP by type of asset, OECD countries**

Average over 2015-19 (or nearest year).



Note: 1. Refers to gross fixed capital formation in health providers under the System of Health Accounts. Breakdown by type of asset refers to the last available year based on either National Accounts or Health Accounts data.

Source: (OECD, 2021<sup>[46]</sup>). Health at a Glance 2021: OECD Indicators, accessible at: 10.1787/ae3016b9-en.

To maintain high quality provision of healthcare and meet the needs of the population, countries need to invest considerably in new health facilities, diagnostic and therapeutic equipment, and information and communications technology (ICT) (OECD, 2021<sup>[46]</sup>). The COVID-19 crisis brought to light large gaps in physical health resources available to cope with a large and sudden influx of seriously ill patients. Shortages of physical resources were not only an issue not only in large cities overwhelmed by a large volume of patients, but also in rural areas that had accumulated the effects of health facility closures and underinvestment (OECD, 2020<sup>[44]</sup>).

Any investment in physical infrastructure, however, has to be mindful of existing territorial gaps in human resources in the health sector. As the COVID-19 crisis demonstrated, both human and physical resources in health care are key for building resilient health services that can respond to global health shocks, that

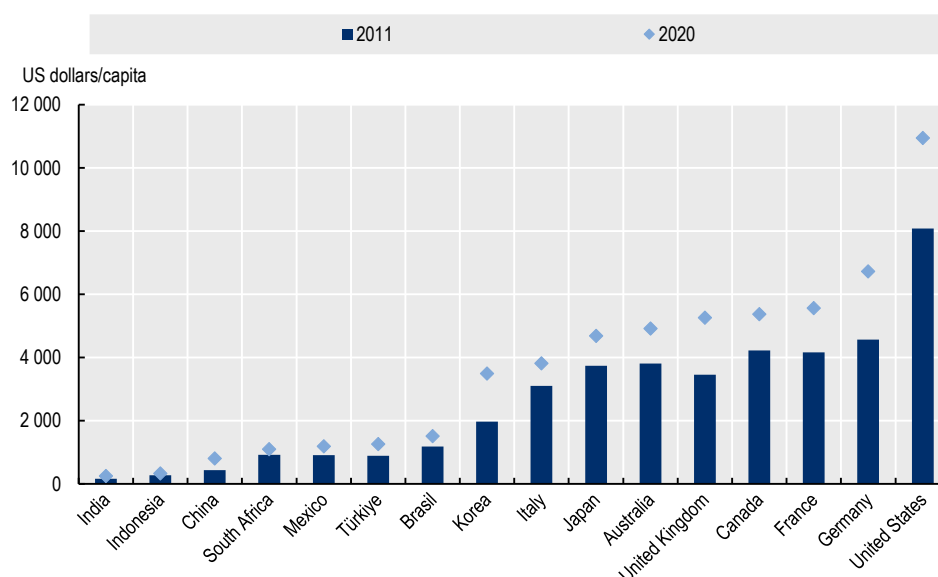
is, systems that are able to plan for, absorb, recover, and adapt to shocks (OECD, 2020<sup>[47]</sup>). Workforce shortages during the COVID-19 pandemic undermined countries' ability to respond to the pandemic and increase capacity suddenly (OECD, 2021<sup>[46]</sup>). Rural and remote areas face more difficulties in attracting and retaining medical professionals and are less likely to benefit from the increased international migration of doctors, nurses and medical students (OECD, 2019<sup>[48]</sup>).

Besides the pressing need to respond to current needs and stay up to date with technological upgrades in the sector, health systems in G20 countries face enormous pressure from ageing and poorly maintained health infrastructure. For Latin America, the IDB has estimated the need for investment to replace old hospitals, clinics and medical equipment and to upgrade infrastructure to meet today's energy efficiency standards to be around \$100 billion (IDB, 2022<sup>[49]</sup>).

Investment on health care infrastructure comes on top of current spending, which varies in relation to demographic, social and economic factors, as well as the financing and organisational arrangements of the health system across countries (OECD, 2021<sup>[46]</sup>). In 2019, average per capita health spending was estimated to be around USD 4 000 on average across OECD countries, reaching a maximum of USD 11 000 in the United States (Figure 16). Per capita spending in China, India and Indonesia was just under 20%, 6% and 8% of the OECD average, respectively. As a consequence of the COVID-19 pandemic and concomitant reductions in economic activity, the average health spending to GDP ratio jumped from 8.8% in 2019 to 9.7% in 2020 across OECD countries with available data (OECD, 2021<sup>[46]</sup>).

**Figure 16. Health spending per capita (PPP adjusted), G20 countries**

2011-2020 (or latest year available). Adjusted for purchase power differences across countries.



Note: Latest year available is 2018 for China, Indonesia, India and South Africa, and 2019 for Australia, Brazil, Canada, Japan, Türkiye and United States.

Source: (OECD, 2022<sup>[45]</sup>). OECD Data - Health Spending, accessible at: <https://data.oecd.org/healthres/health-spending.htm>.

### ***Financial pressures on rural health care facilities can lead to closures and increased distances to care***

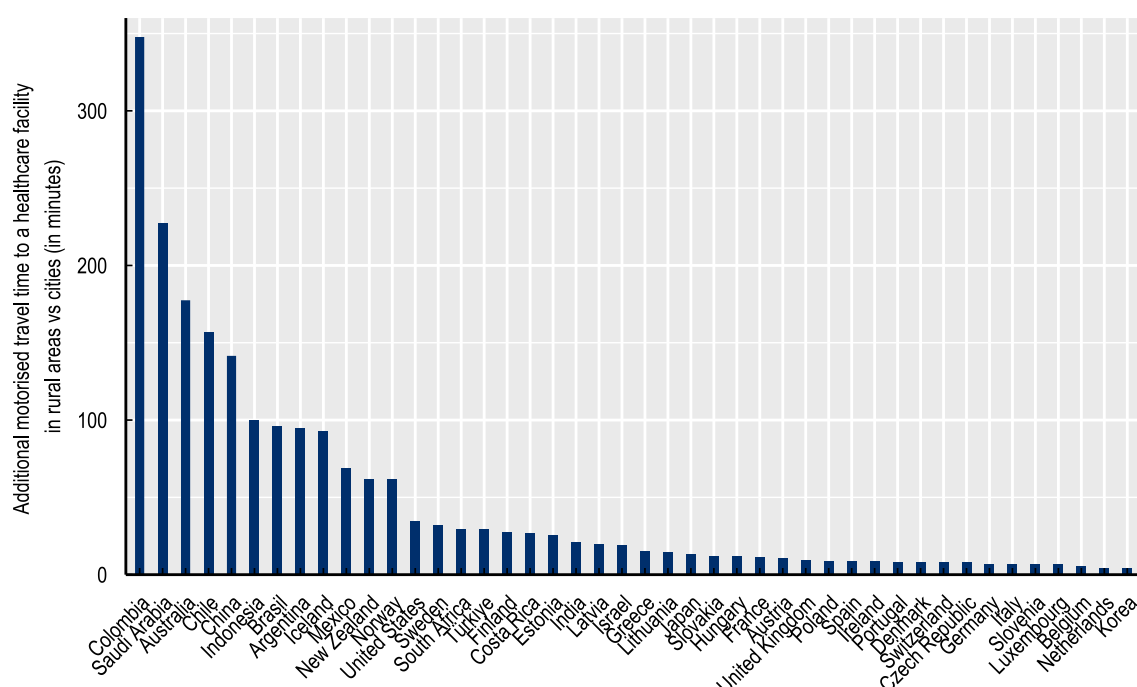
Global estimates of access to healthcare show that 8.9% of the global population (646 million people) cannot reach a healthcare facility (hospital, health centre or pharmacy) within a 1-hour drive using



motorized transport. The share that cannot reach a healthcare facility within a 1-hour walk rises to 43.3% (3.16 billion people) (Weiss et al., 2020<sup>[50]</sup>). Across OECD and G20 countries, the median additional time people living in rural areas have to travel using motorised transport to reach a healthcare facility compared to people living in cities varies from less than 5 minutes in Korea to about 6 hours in Colombia (Figure 17). These median values hide huge variations within rural areas, especially in countries with difficult access and sparsely populated areas.

**Figure 17. Additional travel time to nearest healthcare facility in rural areas compared to cities, OECD and G20 countries**

Median motorised travel times to the nearest healthcare facility. 2020.



Note: Values for Canada not shown due to outliers. Healthcare facilities include hospitals and clinics.

Source: Own calculations based on (Weiss et al., 2020<sup>[50]</sup>) Global maps of travel time to healthcare facilities, <https://www.nature.com/articles/s41591-020-1059-1> and (Florczyk, 2019<sup>[13]</sup>), GHSL Data Package 2019 (database), <http://dx.doi.org/10.2760/06297>.

The cost of rural health depends not only on drivers such as increasing technology use, drugs prices, financial incentives and changing disease burdens, but also on the inability of many health care facilities in rural areas to reap economies of scale and scope. Low population density and more dispersed settlements leading to lower economies of scale, longer ambulance transportation times and financial incentives used to attract health workers to rural areas can all add to the cost of providing health care in rural areas (OECD, 2021<sup>[2]</sup>). The extra costs incurred by rural health make capital investments relatively less efficient than those in more urban settings (Spencer, Palmer and Appleby, 2019<sup>[51]</sup>).

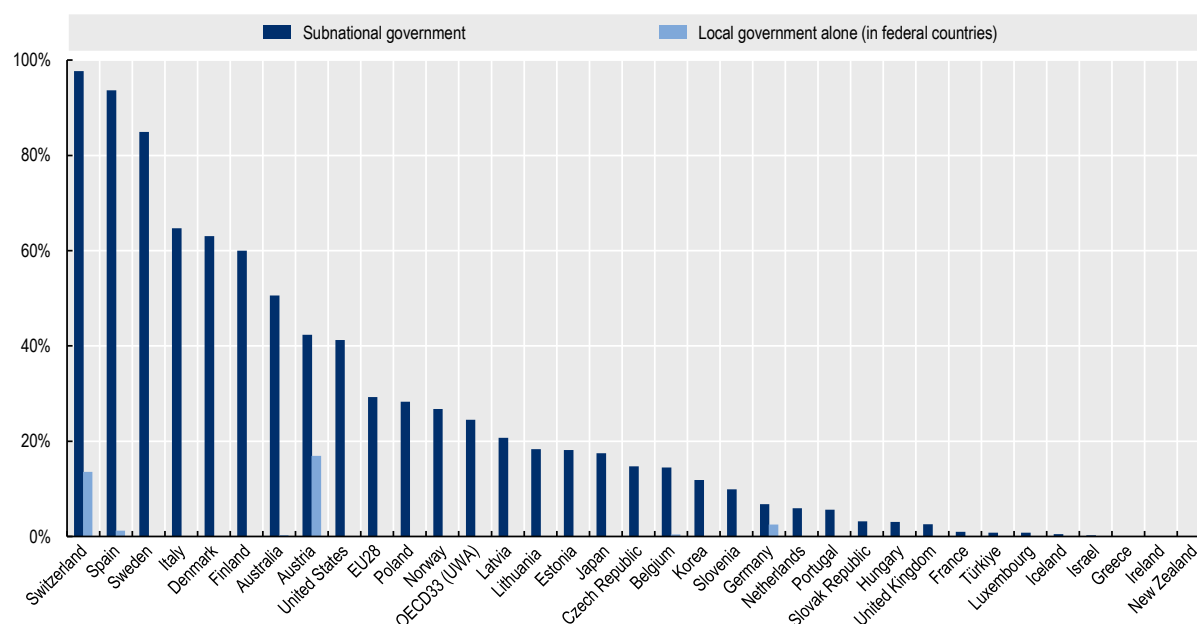
Centralised systems such as those that pay hospitals according to predefined categories of patients do not fully account for the per patient costs due to lack of scale economies in rural areas. The UK, where the National Health Service (NHS) makes higher payments for increasing rurality, is an exception of a system that explicitly considers the higher costs faced by rural health care facilities. A system of transfers that does not account for unavoidable costs can lead to increasing financial pressure in rural hospitals, under-

investment in infrastructure or even facility closures. For instance, in the United States, a number of rural hospitals were forced to close in the late 1980s and early 1990s because of insufficient Medicare reimbursement, as the Medicare's Prospective Payment system relied on costs calculated from larger, urban hospitals (OECD, 2021<sup>[2]</sup>) (Williams and Holmes, 2018<sup>[52]</sup>).

Decentralisation of health care expenditure is a way to improve efficiency, create more cost consciousness and contain health expenditure growth through higher political and fiscal accountability. While subnational governments have a role to play in the financing of health care investment in some countries, the 2008 financial crisis led to the recentralisation of healthcare systems in many countries. The weight of subnational governments on the general government health expenditure is as high as 60%-98% in Denmark, Finland, Italy, Spain, Sweden and Switzerland (Figure 18). Unlike the general trend for decentralisation observed in other sectors, health expenditure decentralisation has declined in the last decades, especially after the 2008 economic and financial crisis (Figure 19).

**Figure 18. Subnational government share of general government health expenditure, OECD countries**

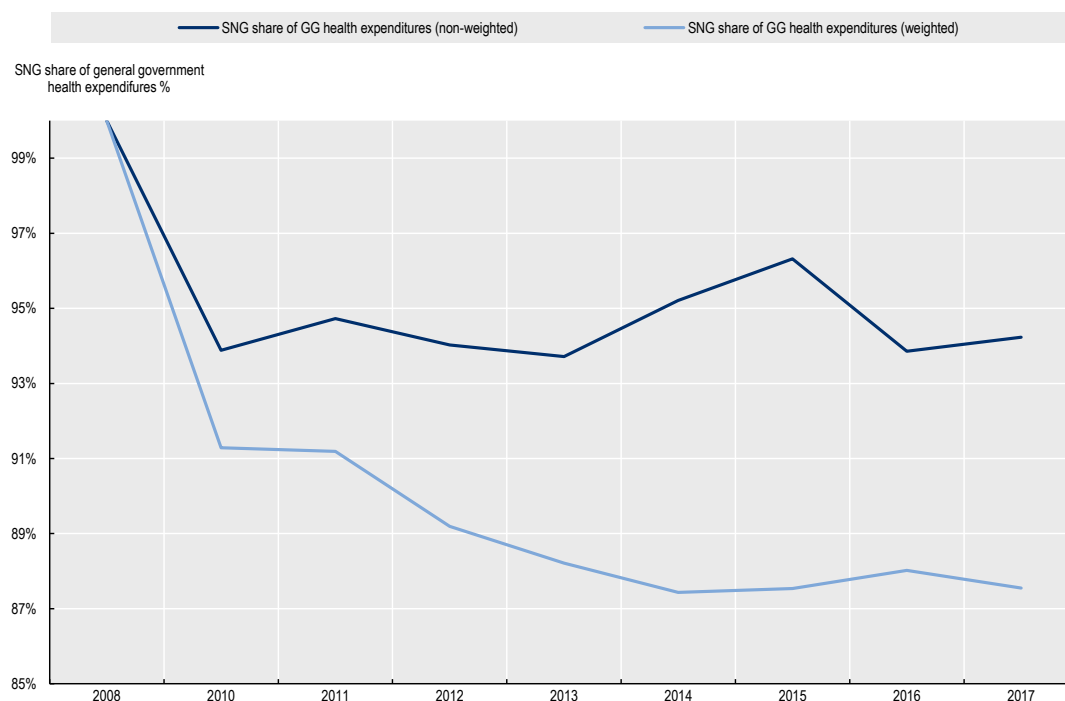
2017 or the latest year available.



Source: (OECD, 2020<sup>[33]</sup>), OECD National Account Statistics, <https://doi.org/10.1787/na-data-en> (accessed on 15 May 2020).

**Figure 19. Trend in average subnational government share of general government health expenditure, OECD countries**

2008-2017, 30 OECD countries. 2008=100



Note: SNG=Subnational government, GG=General government. The graph has been constructed using data on 30 OECD countries. No data for this period was available for Canada, Iceland, Mexico, New Zealand, and Türkiye. For Korea, the year 2017 data was not yet available, instead 2016 share was used twice because without Korea's data, the SNG weighted share would have been excessively high (31%).

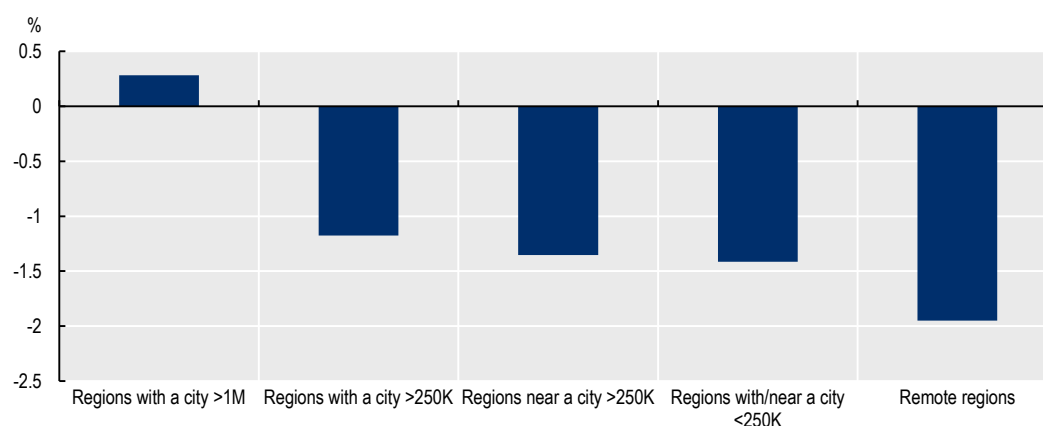
Source: (OECD, 2020<sup>[33]</sup>), OECD National Account Statistics, <https://doi.org/10.1787/na-data-en> (accessed on 15 May 2020).

Financial pressures resulting from the global financial crisis also led to the closure of health care facilities in rural areas. Across OECD countries, the number of hospital beds per capita since the 2008 global financial crisis fell at an average rate of -0.7% per year, while they slightly increased in metropolitan regions (Figure 20). As a result, in 2018, metropolitan regions had 65% more hospital beds per capita than remote regions (OECD, 2020<sup>[30]</sup>) (OECD, 2021<sup>[2]</sup>).

Besides financial pressures, rural health care facilities are subject to a push to centralise services and keep minimum quality requirements. Facilities that face high relative costs, low volumes, poorer overall quality and workforce issues are most at risk. In the United States, more hospitals have closed than opened since 2011, and most closures have concentrated in rural areas. Rural hospitals are losing services including imaging, obstetric and primary care services in countries such as Australia, Canada and the United States (Vaughan and Edwards, 2020<sup>[53]</sup>). The negative impacts on the distance to care, and treatment delays for patients due to hospital closures in rural areas can offset any cost gains (Hsia et al., 2012<sup>[54]</sup>) (OECD, 2021<sup>[2]</sup>).

**Figure 20. Percent yearly change in hospital beds rate by type of region, OECD countries**

2008-2018



Source: (OECD, 2020<sup>[30]</sup>), OECD Regions and Cities at a Glance 2020, <https://doi.org/10.1787/959d5ba0-en>.

***Lack of access to broadband connectivity in rural areas limits the potential of telemedicine to increase access to health care***

Telemedicine, including teleconsultations have the potential to improve access by making health care services available to patients closer to their home or work and widening the access to specialist care to rural populations. Teleconsultations can reduce travel and waiting times to nearly zero, resulting in significant time gains for patients and health workers. For instance, patients in the Canadian Ontario Telemedicine Network avoided travelling 270 million km in 2017 and the network saved CAD 71.9 million in travel grants (Ontario Telemedicine Network, 2018<sup>[55]</sup>). Available evidence associates telemedicine with improvements in access to care, reduced travelling costs and better equity for rural and Indigenous populations (OECD, 2021<sup>[2]</sup>).

Despite the large potential of telemedicine to expand access and bridge gaps, the health sector invests less in information and communications technology (ICT) than other sectors of the economy. Across OECD countries with available data, both the share of gross capital formation on software and databases and the share of ICT services in output in health was the smallest across 11 economic sectors considered (Calvino et al., 2018<sup>[56]</sup>).

In most contexts, the digital provision of health services cannot be seen as a substitute for physical provision given existing digital connectivity and quality gaps. Across OECD and G20 countries, rural areas are subject to a “double divide” in access, or the simultaneous presence of long travel times to healthcare and low access to high-speed internet. Rural areas facing long travel times also face below-average access to high-speed broadband (Figure 21). While some countries such as Australia and China have worked towards reducing disparities in access to high-speed broadband in rural areas, in countries like Argentina, people in rural areas face 300 p.p. longer travel times and over 50 p.p. less internet speeds than the national average.

Telemedicine platforms, such as the remote healthcare platform and doctor for every citizen from the United Arab Emirates, hold great potential for bridging rural urban gaps in access to health care. However, the presence of double divides in access means patients living in rural and remote areas without adequate broadband access who could benefit the most from telemedicine have the most difficulty accessing and using it (Oliveira Hashiguchi, 2020<sup>[57]</sup>). Moreover, lower digital skills in rural and older populations

compound gaps in access to broadband (OECD, 2021<sup>[2]</sup>). Expanding the use of telemedicine without ensuring appropriate digital skills may lead to increased cybersecurity and data privacy threats.

**Figure 21. Location gap in travel time to healthcare versus location gap on internet speed, OECD and G20 countries**

2020



Note: Travel time to healthcare calculated using driving as transport mode. Deviation from the national average calculated from median values by degree of urbanisation weighted by population levels in each 1km<sup>2</sup> grid cell.

Speedtest data corresponds to 2020Q4. The data for average fixed and mobile broadband download Speedtests reported by Ookla measures the sustained peak throughput achieved by users of the network. Measurements are based on self-administered tests by users, carried over iOS and mobile devices. Aggregation according to the degree of urbanisation was based on GHS Settlement Model (GHS-SMOD) layer grids. The figure presents average peak speed tests, weighted by the number of tests.

Source: For travel time to healthcare: own calculations based on (Weiss et al., 2020<sup>[50]</sup>). For fixed broadband speed: Own calculations based on Speedtest® by Ookla® Global Fixed and Mobile Network Performance Maps. Based on analysis by Ookla of Speedtest Intelligence® data for 2020Q4. Provided by Ookla and accessed 2021-01-27 (see (OECD, 2021<sup>[7]</sup>) for details). Ookla trademarks used under license and reprinted with permission.

# 3 A territorial perspective on future service infrastructure needs

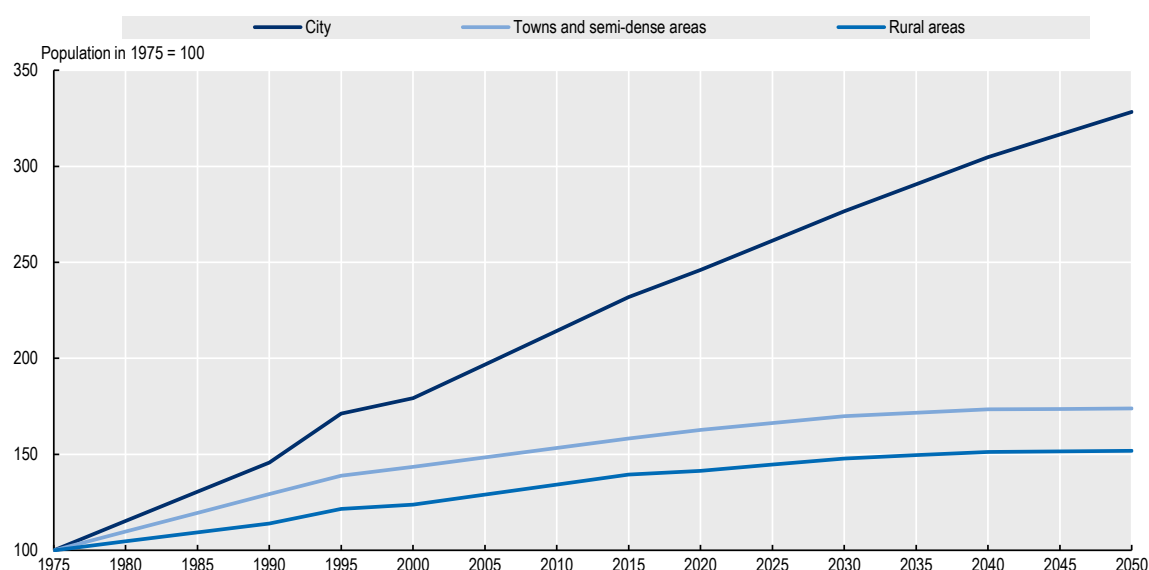
Territorial disparities in access to basic infrastructure are hindering progress on the SDGs. Lack of investment spending in the present can lead to an accumulation of problems and higher costs in the future. Under-investment in service infrastructure has a territorial dimension because places are impacted by and respond differently to economic shocks and megatrends including demographic and climate change. This section offers a forward-looking perspective on service infrastructure needs, looking in turn at the impact of demographic change and climate change.

## Demographic trends will set the pace for service infrastructure provision

The global population is projected to reach 9.1 billion in 2050, up from 7.3 billion in 2015. Urbanisation has been a defining trend across all countries: the total population living in cities reached 3.5 billion in 2015 (about half of the world's population) and is projected to further increase to 5 billion by 2050 (Figure 22). Areas outside cities are also projected to increase in absolute terms, but at a slower pace than cities (OECD/European Commission, 2020<sup>[9]</sup>). By 2050, population in towns and semi-dense areas is projected to increase from 2.1 billion to 2.3 billion, while population in rural areas is expected to expand from 1.7 billion to 1.9 billion.

**Figure 22. Changes in global population by Degree of Urbanisation**

1975-2050



Source: (Florczyk, 2019<sup>[13]</sup>), GHSL Data Package 2019 (database), <http://dx.doi.org/10.2760/06297>; Jones, B. et al. (forthcoming), Projecting Global Population Grids to 2100, Publications Office of the European Union.

### ***Countries will experience further urbanisation but also depopulation and ageing***

Available population projections show that urbanisation will continue in most OECD and G20 countries, but at different paces. About half of OECD countries will experience population decline by 2040, most of which will be concentrated in non-metropolitan regions (OECD, 2022<sup>[58]</sup>), and nearly 30% of metropolitan areas are expected to face shrinking populations, particularly in Europe and East Asian countries (OECD/European Commission, 2020<sup>[9]</sup>).

Shrinking and ageing populations will become more prevalent across OECD and G20 countries in the next decades. Worldwide projections show that increased life expectancy coupled with lower fertility rates will result in population decline in most OECD and G20 countries with sharp projected decreases in countries like China, which is projected to see its population reduced from 1.4 billion in 2017 to 732 million in 2100 (Vollset et al., 2020<sup>[11]</sup>).

The future also holds fundamental changes in age structures across countries: the number of children under 5 years old is forecasted to decline from 681 million in 2017 to 401 million in 2100, whilst the number of individuals older than 80 years is projected to increase six fold, from 141 million to 866 million (Vollset et al., 2020<sup>[11]</sup>). Other available projections show that the number of people over 65 for each working-age person will at least double in most G20 countries by 2060, and the proportion of the population aged 80 and above is projected to be nearly one in twelve people in G20 countries (Rouzet et al., 2019<sup>[59]</sup>) (OECD, 2019<sup>[60]</sup>).

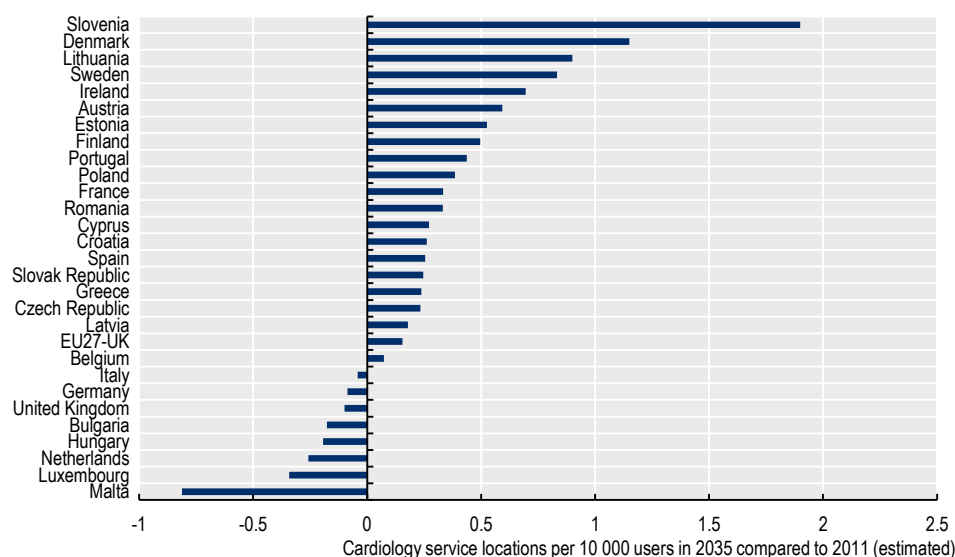
### ***A tailored approach to infrastructure provision in areas experiencing population shrinking***

Urbanisation and population growth have traditionally taken the spotlight in discussions on infrastructure needs. Current projections on infrastructure focus on urban areas experiencing most of the growth in terms of needs (Oxford Economics, 2017<sup>[61]</sup>). The question of how to make infrastructure investment in cities more forward-looking and align with the sustainability agenda has also been put forward (Buchoud et al., 2019<sup>[62]</sup>).

While urbanisation undoubtedly continues to increase infrastructure needs across the world, the infrastructure needs of people living in rural areas experiencing depopulation are different, but equally pressing. A shrinking and ageing population could lower the demand for some types of new infrastructure such as housing and education in some places, but increase the demand for other services such as health care. Estimates for 27 European countries and the UK show that the demand for education in 2035 could be met with fewer schools while maintaining similar levels of access (OECD/EC-JRC, 2021<sup>[35]</sup>). This requires, however, a forward-looking strategy to open schools in places that maximise access. In health care, the need for new health care facilities providing cardiology services arising from population ageing would require building additional facilities to maintain proximity to users (Figure 23).

**Figure 23. Change in cardiology service location counts per 10 000 users (estimated) by country, EU27+UK**

2011-2035



Source: (OECD/EC-JRC, 2021<sup>[35]</sup>) Access and Cost of Education and Health Services: Preparing Regions for Demographic Change.<sup>3</sup>

The need for health and care services will be critically linked to the success of healthy ageing policies (i.e., policies aiming at increasing the capacity to keep people healthy throughout their lives) (OECD, 2019<sup>[60]</sup>) and possible future large-scale shocks. The COVID-19 pandemic demonstrated that most OECD regions were unprepared to deal with a shock of such magnitude, in part due to the rationalisation of health services that followed the 2008 financial crisis (OECD, 2020<sup>[63]</sup>). The focus after the COVID-19 pandemic has been on building resilient healthcare systems that can provide for all the population on a daily basis and respond to unexpected strain while remaining efficient (OECD, 2020<sup>[47]</sup>).

Nevertheless, the future adaptation of service infrastructure to narrow territorial gaps and build resilient systems will happen in a context of increased public expenditure on service provision. Before the COVID-19 pandemic, health expenditures as a share of GDP across 15 G20 countries has been projected to increase from 8.7% of GDP in 2015 to 10.3% in 2030, with increases in 34 out of 37 OECD countries ranging from 0.1% in Greece to 3.4% in the United States (Figure 24) (Lorenzoni et al., 2019<sup>[64]</sup>). Across countries, demographic changes account for about one-fourth of the overall projected change for OECD countries, and contribute significantly more too projected annual spending in Canada (43%), Norway (41%), Mexico (40%), Switzerland (40%), and Korea (38%). Growth rates are expected to be even higher in emerging economies including India, Indonesia and China (OECD, 2019<sup>[60]</sup>). At the same time, depopulation has been projected to increase from already high levels of current expenditure per student in sparsely populated and rural areas in Europe, further aggravating under-investment issue in small facilities (OECD/EC-JRC, 2021<sup>[35]</sup>).

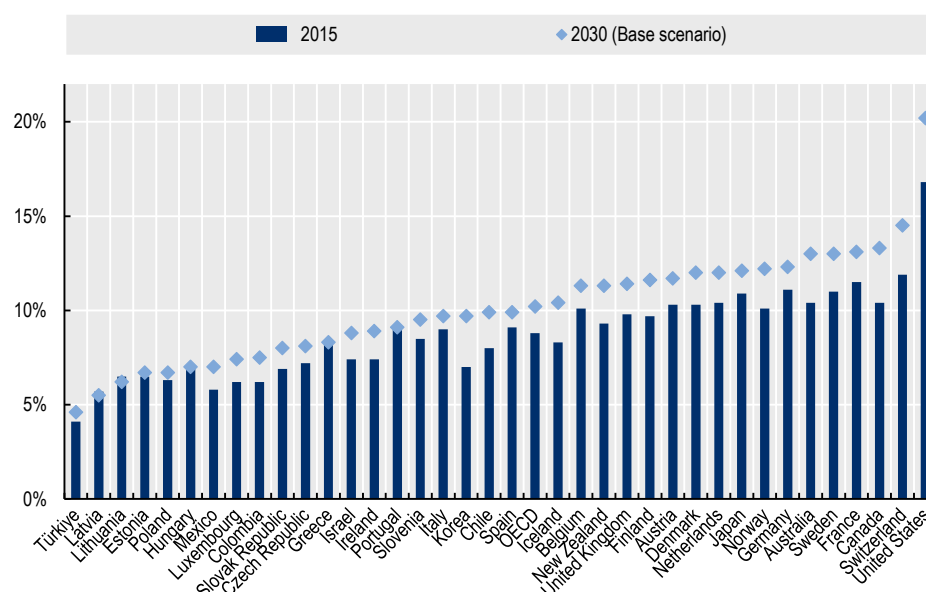
<sup>3</sup> Note by the Republic of Türkiye: The information in this document with reference to “Cyprus” relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Türkiye recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Türkiye shall preserve its position concerning the “Cyprus issue”.

Note by all the European Union Member States of the OECD and the European Union: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Türkiye. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.



**Figure 24. Country-specific growth in health spending per capita, OECD countries**

2015-2030



Note: The baseline scenario estimates health spending in the absence of any major policy change. Empirically, this scenario uses estimates based on the preferred specification for the income elasticity, productivity constraint and time effects. Demographic effects reflect predictions of longevity gains and the evolving demographic structure of the population, accounting for changes in health status. See (Lorenzoni et al., 2019<sup>[64]</sup>) for more details and alternative scenarios. Source: (Lorenzoni et al., 2019<sup>[64]</sup>) "Health Spending Projections to 2030: New results based on a revised OECD methodology", OECD Health Working Papers, <https://doi.org/10.1787/5667f23d-en>.

## Climate change will put further pressure on service infrastructure needs

The future of service provision is also linked to climate change adaptation trends. Besides immediate socio-economic impacts, environmental events linked to global warming can worsen access to service infrastructure, temporarily or permanently. Under a business-as-usual climate scenario, by 2070, some regions in the world may become virtually uninhabitable.<sup>4</sup> People with less capacity or willingness to migrate from areas suffering from extreme weather events and lost agricultural viability will be at highest risk of under-provision, as services concentrate to gain scales and infrastructure investment focuses on areas of population growth.

The uneven impacts of climate change have the potential to further increasing gaps in service infrastructure between areas gaining and losing population. Current projection scenarios do not support a "mass exodus" of population driven by climate change, and instead point to the need to tailor adaption to climate change to local realities (European Union, 2022<sup>[65]</sup>). This means that the prospect of out-migration should not be seen as an alternative to improving basic service provision in places where climate change has disruptive effects.

<sup>4</sup> This analysis is based on a commonly-cited high-emissions climate scenario known as RCP8.5 or *business-as-usual*. Under this scenario it is estimated that roughly 3.5 billion people (~30% of the future human population) would have to migrate in order to remain distributed according to habitable temperatures as it has been for thousands of years.

# 4 Implications for the future of service infrastructure investment

The previous section illustrated how territorial inequalities in access to service infrastructure can deepen as a result of demographic and climate change trends. Closing territorial gaps in access will have to be achieved in a context of these trends and future economic shocks, presenting governments with substantial trade-offs on top of existing fiscal pressures. The costs of inaction on addressing access challenges will be particularly concentrated in some places and will compound year on-year, leading to larger challenges in the future. This section offers a number of implications for service infrastructure investment. It emphasises the need for a territorial approach to investment in infrastructure that takes on board existing territorial inequalities and strategic foresights on emerging and anticipated risks.

## Implement strategic and flexible investments tailored to different demographic realities

The demand for education and health care services in G20 countries will evolve differently across places within countries as urbanisation proceeds and populations age. Bridging disparities in access to basic services requires, more than tackling the present needs where they occur, doing it in a way that makes sense for future populations and for local contexts. It also requires a new approach to investment that complements “brick-and-mortar” approaches where physical access is essential with new forms of delivery that can enhance quality and access in service provision in a cost-efficient way.

### ***Support local and regional investment in integrated, flexible and digital service provision***

Because basic education (including early childhood services), and primary healthcare can have substantial long-life and inter-generational effects, they offer the highest social returns to investment. Investing in reducing inequalities also improves the resilience of systems (OECD, 2020<sup>[47]</sup>). To reap the scale and scope benefits of networks, the provision of education and health care services tailored to the demographic profiles of rural inhabitants is best tackled in an integrated manner (OECD, 2019<sup>[60]</sup>). For instance, in Japan, an Integrated Community Care System, organised at the municipal level, provides medical care, long-term care, prevention programmes, housing services, and other support in the community (Mizanur Rahman, 2018<sup>[66]</sup>).

The COVID-19 pandemic brought forward the need to design resilient, flexible and responsive health care systems that can deliver quality health care to people of all ages, regardless of where they live. Doing this efficiently requires investing in new models of care delivery that work towards relocating acute care outside the hospital, improving access to primary care (especially in low density areas with long distances to health care facilities), realising the potential of home-based care (especially for the elderly) and integrating health and social care and maximising the potential of digital and flexible service provision (OECD, 2020<sup>[67]</sup>) (Barrenho et al., 2022<sup>[68]</sup>).

Flexible service provision models, including mobile health services and sharing mobility services based on mobile applications (Velaga et al., 2012<sup>[69]</sup>) can help maintain and even improve service delivery in rural areas. They require, however, complementary investments in skills and connectivity infrastructure and work best when different services are joined up for the benefit of service users to improve efficiency in delivery by providers. Decisions on changing service provision models not only involve service location but settlement patterns, availability and skills of the local labour force, organisational and cultural change, demographic change and transportation and infrastructure planning (OECD, 2021<sup>[2]</sup>).

### ***Promote smart territorial infrastructure investment tailored to expanding and shrinking areas***

The cost of inaction in the face of population shrinking can be larger than implementing renewal plans that take into consideration the new size of communities and their needs. While population shrinking brings a decline in demand for certain services such as education, it still requires an active investment strategy to adapt provision to new population scales and align with longer-term environmental and social policy objectives, including on addressing climate change. Declining demand for services and shrinking local tax bases can compound the effect of adequate maintenance funding on the rapid deterioration of existing infrastructure (OECD/IMF, 2019<sup>[70]</sup>), leading to ever larger infrastructure gaps and higher maintenance costs.

Tackling access gaps needs a strategic planning lens to go beyond constructing facilities and building new roads to consider which locations maximise not only present but also future access to services in lower density areas, while being mindful of the difficulties in attracting and retaining service professionals in rural areas (OECD, 2021<sup>[2]</sup>). Cost-benefit analysis of investments on service integration in a context of increasing spatial concentration of higher-level services provision requires systematic information collection on present and future local needs and use, the financial situation of facilities operating at small scale (especially in low density areas facing population decline and ageing), and accessibility costs for users and workers, including transport costs. Because it involves multiple spatial levels and sectors, these analysis are best embedded into spatial integrated planning frameworks (OECD, 2021<sup>[2]</sup>). For instance, the National Policy Strategy for Infrastructure and Spatial Planning of the Netherlands links spatial developments and infrastructure within a vision for the future in 2040.

## **Support quality infrastructure investment by subnational governments**

Given the increasingly significant role of subnational governments in providing basic services in the context of decentralisation, it is essential to put the right conditions in place to support subnational infrastructure investment and service provision. This requires getting the right enabling environment to support subnational investment, including implementing vertical and horizontal coordination and cooperation mechanisms, ensuring fiscal and regulatory frameworks are in place and building institutional capacity within subnational governments (G20-OECD, n.d.<sup>[6]</sup>).

### ***Promote coordination and cooperation across and between subnational governments***

Many types of infrastructure investment do not neatly fit within one jurisdiction. In particular, the catchment areas of education and health care services often cross local boundaries, meaning that co-ordination and cooperation across and between levels of government is needed to help identify shared investment opportunities and bottlenecks, manage joint responsibilities, minimise contradictory investments, and secure adequate resources for investment and operations (G20-OECD, n.d.<sup>[6]</sup>). This can contribute to ensuring that infrastructure investments occur at the relevant scale and can promote efficiency by reaping the benefits of economies of scale and by enhancing policy synergies among jurisdictions. Cross-

jurisdiction co-ordination can be encouraged through financial and non-financial incentives, platforms for dialogues, and agreements, among other mechanisms.

Infrastructure responsibilities for the provision of education and health care services are shared across national and subnational governments. In this context, the lack of co-ordination and cooperation across levels of government (vertical coordination) can lead to lower efficiency, effectiveness and complementarities of infrastructure investments (OECD, 2014<sup>[71]</sup>; OECD, 2020<sup>[72]</sup>). Coordination and cooperation are also important in contexts where governments recentralise the provision of a service that requires scale to operate, such as intermediate care hospitals offering specialised services. In this context, coordination between central, regional, local governments is essential to ensure access continues to be appropriate in municipalities that lose facilities, and that primary service provision is strengthened and integrated with secondary health care provision to minimise the need for care in the first place (OECD, 2020<sup>[67]</sup>).

Vertical co-ordination and cooperation can also help identify shared investment opportunities and bottlenecks, manage joint responsibilities, minimise contradictory investments, and secure funding from adequate resources (G20-OECD, n.d.<sup>[6]</sup>). In contexts of restructuring of service infrastructure investments, local governments can play a key role in securing engagement of all stakeholders throughout the project lifecycle, including local residents, civil society organisations, or business associations.

### ***Ensure appropriate inter-governmental fiscal frameworks and rules***

The substantial revenue that subnational governments need to fund service infrastructure requires appropriate inter-governmental fiscal frameworks and rules that work in scenarios of population growth and decline. Three factors are particularly determinant: 1) fiscal autonomy (i.e. the level of control that subnational governments have to raise revenues, manage spending and access borrowing), 2) the size of the tax base (intrinsically linked to demographic change, economic growth and productivity) and 3) the stability and pro-cyclicality of taxes and inter-governmental transfer revenue (OECD, 2021<sup>[26]</sup>).

In some G20 countries, ensuring fiscal autonomy and capacity requires establishing enabling regulatory and legal frameworks to support fiscal responsibility, accompanied by building institutional capacity. The lack of appropriate and clear regulatory and legal frameworks impede both the access of subnational governments to external financing, and the use specific funding and financing instruments, such as public-private partnerships (OECD, 2021<sup>[26]</sup>).

A vision and long-term plan with foresight on how regions will adapt service provision are key inputs to use in conjunction of inter-governmental fiscal frameworks and rules. Shrinking tax bases due to demographic change can misalign responsibilities and resources for service provision for subnational governments in the absence of fiscal equalisation mechanisms. A shortage of service infrastructure provision funding can build up to a vicious cycle of under-investment, and lead to ever-increasing maintenance and repair costs (which already represent the most important infrastructure investment item), higher debt and lower credit worthiness of subnational governments. National plans with a place-based approach can design long-term strategies with population change foresight to find mechanisms to avoid these scenarios, including mechanisms to spark the coordination in the provision of services across municipalities and the progressive concentration of certain services to the regional-level where appropriate.

Finally, ongoing processes of urbanisation and suburbanisation across G20 countries shift demand (and thus tax-payers) for service infrastructure to cities and their suburban areas (OECD/EC-JRC, 2021<sup>[35]</sup>). In rural areas, service demand does not disappear but changes in nature and become a mix between the needs of the remaining (mostly older) local population and people with multi-location lifestyles (for instance those living in cities commuting to rural secondary homes). As resources go increasingly to where the bulk of demand shifts, governments need to design sustainable funding systems that can satisfy the changing demand for services. This raises the question of whether basic service provision should be guaranteed for

every person or for every area, as city dwellers demand access to services both in cities and in the rural areas they access with relative frequency (OECD, 2022<sup>[73]</sup>).

### ***Build institutional capacity of local governments***

The effectiveness of quality infrastructure investment hinges upon the existing institutional capacity within subnational governments. The range of fields requiring skills to identify, plan, construct and manage quality infrastructure is broad and includes strategic planning and priority setting, project appraisal, financing, procurement, financial management, project management, regulatory approvals, operations, maintenance, monitoring and evaluation, among other areas (OECD, 2014<sup>[71]</sup>; OECD, 2020<sup>[72]</sup>). Here, International Organizations and Multilateral Development Banks can play a key role in providing technical assistance and coordinating capacity building at a subnational level to ensure the implementation of quality infrastructure investments.

The need for capacity building varies greatly within countries, usually in relation to the size of local governments and their level of responsibility in infrastructure investment. Smaller subnational governments usually need external support to undertake large or specialised investment projects, and often face significant capacity challenges in public procurement linked to administrative burden and complicated requirements (G20-OECD, n.d.<sup>[6]</sup>). Capacity building can come in a variety of forms, including training and the provision of guidance documents in areas such as planning, project appraisal and procurement. Where present, PPP units can help provide these capacity building activities as well as technical support throughout the lifecycle of an investment project.

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