Built Environment through a Well-being Lens

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BETTER POLICIES FOR BETTER LIVES

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Foreword

This report, *Built Environment through a Well-Being Lens*, draws on the OECD Well-being Framework, to highlight how key components of the built environment (i.e. housing, transport, infrastructure and urban design/land use) interact with different dimensions of well-being and suggests an integrated well-being policy approach for the built environment. It has three chapters. Chapter 1 defines the built environment through a well-being lens and outlines implications for its measurement, leveraging literature, current practice and official data. Chapter 2 describes the state of the built environment and its components in OECD countries and their inter-relationships with well-being and sustainability. Chapter 3 highlights policy examples of an integrated well-being policy approach in the built environment context. This report is intended to “scope” relevant data and existing research in order to lay ground for further work on this issue.

The report was prepared by the OECD’s Centre for Well-being, Inclusion, Sustainability and Equal Opportunity (WISE). Jihye Lee and Elena Tosetto authored the report, with valuable contributions from the Well-being Data Insights and Policy Practice Unit of WISE. Elena Tosetto also led the statistical work for this publication. Jihye Lee led the project and content editing under the supervision of Carrie Exton, who provided additional editing. The report was published under the direction of Romina Boarini. Martine Zaïda and Anne-Lise Faron coordinated and assisted communications and publishing. Patrick Hamm copy edited the work, and the Korean language translation of the report was prepared by the OECD Translation team.

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Conventions for figures in the report

- In each figure, data labelled "OECD" are simple mean averages of the OECD countries displayed, unless otherwise indicated. Whenever data are available for less than all 38 OECD countries, the number of countries included in the calculation is specified in the figure (e.g. OECD 33).

- Each figure specifies the time period covered, and figure notes provide further details when data refer to different time periods for different countries. Countries are referred to by their ISO codes (Table 1).

Table 1. ISO codes for countries and world regions

AUS	Australia	**FIN**	Finland	**LVA**	Latvia
AUT	Austria	**FRA**	France	**MEX**	Mexico
BEL	Belgium	**GBR**	United Kingdom	**NLD**	Netherlands
CAN	Canada	**GRC**	Greece	**NOR**	Norway
CHE	Switzerland	**HUN**	Hungary	**NZL**	New Zealand
CHL	Chile	**IRL**	Ireland	**OECD**	OECD average
COL	Colombia	**ISL**	Iceland	**POL**	Poland
CRI	Costa Rica	**ISR**	Israel	**PRT**	Portugal
CZE	Czech Republic	**ITA**	Italy	**SVK**	Slovak Republic
DEU	Germany	**JPN**	Japan	**SVN**	Slovenia
DNK	Denmark	**KOR**	Korea	**SWE**	Sweden
ESP	Spain	**LTU**	Lithuania	**TUR**	Türkiye
EST	Estonia	**LUX**	Luxembourg	**USA**	United States

- In this report, colour coding in figures is used as follows: the colour blue describes the **quantity** of the built environment and components; dark green describes the **quality** features of housing; purple describes the **quality** features of transport; orange describes the **quality** features of technical infrastructure; light blue describes components of urban design/land use, except for green areas (for which green is used) and information relative to the city/core centre (for which dark pink is used, to differentiate it from information relative to the commuting area). The OECD average is highlighted using the colour complementary to the main colour used (e.g. orange, if the main colour is blue; red, if the main colour is green) to ensure greater accessibility for people with colour vision deficiency (colour blindness).

Executive summary

The built environment shapes the living conditions and quality of life for individuals, families and communities. Its scope includes individual elements, such as buildings, and its interaction with nature and society. This report identifies four key components of the built environment (i.e. housing, transport, urban design/land use and technical infrastructure) as having particular relevance to people's well-being, inclusion and sustainability. Each of these four key components of the built environment plays a role in economic well-being, shaping people's ability to access jobs and other economic opportunities. The built environment, however, also has strong influence over non-economic aspects of people's well-being, such as health, safety, environmental quality and social connections. This report focuses on these latter dimensions in particular, as they are often less well understood and appreciated.

Key findings

- The built environment can have both positive and negative impacts on people's lives; policy decisions about individual elements of the built environment need to be considered from multiple well-being and sustainability perspectives. Positive impacts range from the satisfaction of basic human needs (e.g. providing shelter) to the provision of space for various activities (e.g. working, studying, caring). However, the built environment can also undermine people's current and future well-being by generating significant costs or creating pressures on the environment and ecosystems. Furthermore, when the overall built environment is degraded or has poor functional or aesthetic quality, it can significantly compromise people's quality of life. Adopting a well-being lens is crucial in helping us understand both the benefits and the challenges of the built environment, and how policy makers and other actors can best manage it to support better lives.
- Housing provides essential shelter, but insecure, unaffordable and low-quality housing puts pressure on people's well-being. High and increasing housing costs or unstable tenures can make households vulnerable. Almost 20% of lower-income households spend more than 40% of their income on housing. According to the OECD Risks that Matter 2020 survey, some 44% of people in OECD countries report being concerned about not being able to find or maintain adequate housing in the short term. Poor housing conditions, such as damp, mould, cold and household crowdedness, are associated with poor physical health, undermining mental health and life satisfaction. The overcrowding rate stands just above 10% in OECD countries on average, but 16% of households in the lowest income quintile are overcrowded.
- Transport is another important component closely linked to individual and collective well-being. It enables life-enhancing activities like education and recreation, but also provides access to job opportunities. More than 80% of people living in OECD's large cities have convenient access to public transport. 84% of people in OECD's Functional Urban Areas (composed of a city and its commuting zone) have access to buses within 10 minutes' walk, and 33% to a metro or tram. However, there is a large gap between the cities with the best and worst access in many countries, most starkly in Mexico, Colombia and Chile, where the gap is above 80 percentage points. In terms

of transport safety, road death rates across the OECD were nearly 5 per 100 000 people in 2021. Certain measures of promoting road safety can trigger modal shift, enabling people to walk and cycle more on safer streets, which can in turn contribute to public health and environmental quality.

- Technical infrastructure, such as water, sewerage and energy networks, provides essential services and is also pivotal for well-being and sustainability. Water quality is related to people's health, but also indirectly to life satisfaction through enabling recreational activities. While 95% of the OECD population have access to improved drinking water sources, investment is still required to tackle emerging issues of water stress as well as pollution by microplastics and pharmaceutical residue. Energy poverty is also a pressing issue, with one in eight low-income households in Europe struggling to keep their dwelling sufficiently warm.

- Lastly, people's well-being is profoundly shaped by the physical setting of neighbourhoods and cities, and especially how they are designed and arranged. This is an important factor affecting both physical and mental health. Built environments that promote walking and cycling enhance people's health and lead to more liveable communities by facilitating social interactions. Walkable neighbourhoods can foster social networks, increase civic participation and reduce crime. Green areas, in addition, can bring environmental benefits by mitigating exposure to air pollution and excessive heat and noise. In OECD countries, 46% of Functional Urban Areas are covered by green areas and 65% of city area is, on average, open for public use.

Going forward, well-being evidence can improve the decision-making process of built environment policies. The role of the built environment in shaping people's living conditions is already acknowledged in the well-being frameworks of several OECD countries – which often include indicators relating to housing, technical infrastructure and environmental quality. When it comes to policy, a well-being lens can be used to *refocus, redesign, realign and reconnect* built environment policies to better support both well-being and sustainability. Well-being evidence can support policy makers in *refocusing* built environment policies towards the outcomes that matter most to people and help *redesign* policy content from a more multi-dimensional perspective. Horizontal and vertical policy coherence is crucial to ensuring the effectiveness of built environment policies, and a well-being lens can help *realign* the interests of different stakeholders. Finally, a well-being approach can *reconnect* government with the communities they serve as well as the private sector actors who play a major role in shaping the built environment. Certain examples of built environment policies, such as the inclusive housing policies of New Zealand and Korea and Ireland's sustainable mobility strategy, shed light on how refocusing, redesigning, realigning and reconnecting can be instrumental in promoting an integrated policy approach for the built environment, well-being and sustainability.

1. Viewing the built environment through a well-being lens: What it means for definitions and measurement

This chapter discusses the definition and measurement of the built environment, as seen through the lens of the OECD Well-being Framework. Interactions between well-being and the built environment span material, social, relational and environmental aspects of people's lives. The OECD Well-being Framework, which monitors current well-being as well as resources for the future, can thus be helpful in systematically assessing the impact of the built environment both on people's well-being in the present and on sustainability. This chapter examines a wide spectrum of definitions of the built environment, from both governments and academia, and identifies the key components of the built environment (i.e. housing, transport, urban design/land use and technical infrastructure) that have particular relevance for people's well-being. The chapter then introduces 25 indicators, selected to help assess the quantity and the quality of the built environment and highlight its inter-relationships with people's well-being.

1.1. How is the built environment defined, and what are its key components?

1.1.1. Introduction

The built environment shapes living conditions and quality of life for individuals, families and communities. In distinction to the natural environment, the built environment refers to human-made structures, which includes housing, parks, workplaces, transport facilities and digital infrastructure. It plays an important role in driving the well-being of people and communities, affecting their health, learning, mobility, their social interactions and their participation in public life. Because of their long-term impact, public policies and private decisions that contribute to shaping the built environment have implications for the sustainability of human activities and people's future quality of life.

Recent economic, social and environmental developments further highlight the critical role of the built environment. Digital technologies, in particular, have radically changed the way people work, consume and communicate (OECD, 2019[1]), and this transformation has only reinforced the need for a new approach to the built environment. Trends like teleworking will impact people's preferences in regard to housing and urban environment in the long term. The built environment can act as an important lever to improve people's well-being when its planning, construction and operation are adapted to the digital age. The COVID-19 pandemic has further highlighted how the built environment affects people's well-being, through its influence on people's life satisfaction, social connections, physical and mental health and environmental quality. During lockdown periods, people in overcrowded housing or living alone faced greater risks to mental health – both of these situations are shaped by public policies and private practices bearing on the built environment (OECD, 2021[2]).

In this context, this report explores how the built environment interacts with people's lives and affects their well-being and sustainability. It draws primarily on the OECD's Well-Being Framework – which provides a holistic and people-centred view of societies' conditions – to highlight the many inter-relationships between the built environment and both material and non-material aspects of people's lives. It will explore the inter-relationship between the built environment and some key dimensions of the well-being framework (e.g. health, safety and social connections). It will also examine how the built environment shapes the risk and resilience factors that influence sustainability (e.g. vulnerability to extreme weather events, learning opportunities, the creation of a dynamic and inclusive economic system). The built environment influences economic, social and environmental sustainability through both its inherent qualities and its externalities such as the construction sector's impact on climate change.

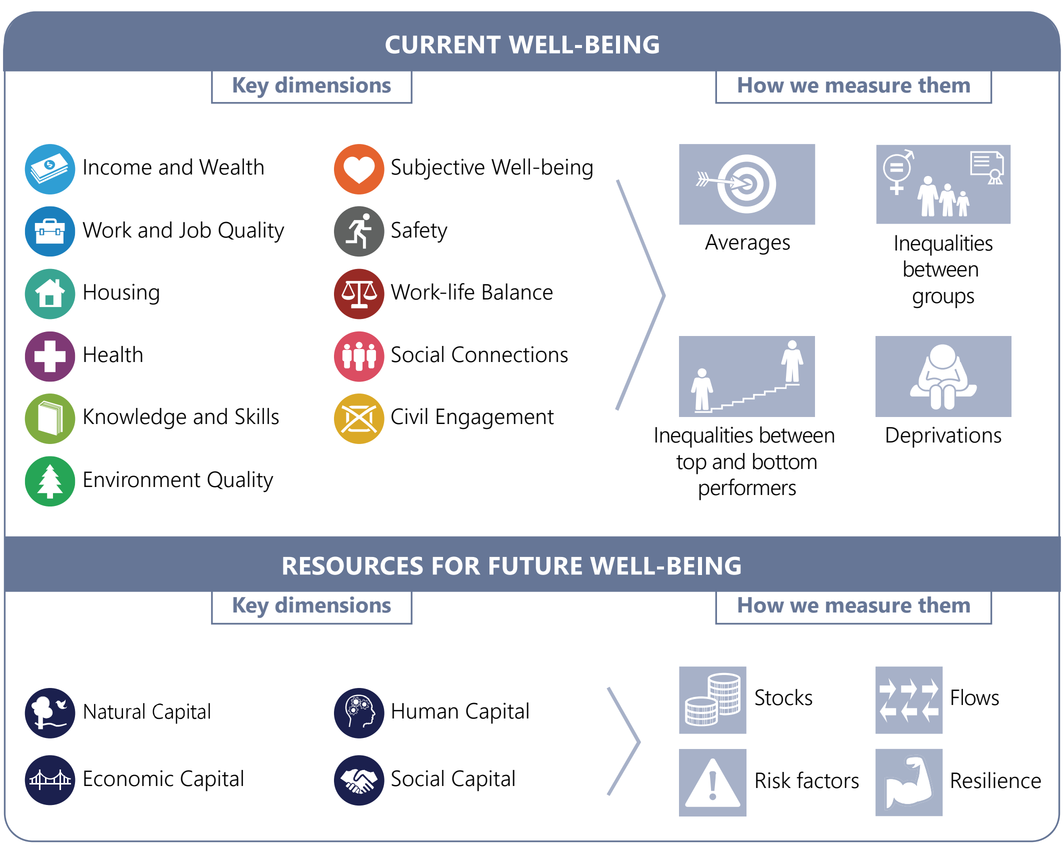
This report aims to provide both evidence on the importance of the built environment for people's well-being and society's sustainability by leveraging available data from official sources. While the built environment is a fundamental component of countries' economic capital, the inherent quality of its stock is not accounted for adequately by existing measures. This report will fill this gap and help accelerate awareness in the wider society and broaden the policy paths to include more indicators related to the built environment's relationship to well-being and sustainability. In particular, this report will adopt a well-being lens to examine the quality and availability of internationally comparable data from official sources on various dimensions of the built environment in OECD countries. It will establish how holistic well-being approaches can serve as a tool for more integrated policy solutions. And it will help shine a light on dimensions of well-being where more work is needed to build on policy synergies with the built environment. It will also draw on recent OECD-wide work on different components of the built environment, including work on housing, territorial development, urban sprawl and infrastructure, so as to systemically assess how the built environment affects various aspects of people's lives and sustainability.

This chapter lays the foundations for an in-depth analysis of the relationship between the built environment and well-being and sustainability by first covering the wide spectrum of definitions and aspects of the built environment. It then explores the internationally comparable data available from national statistical sources that can help assess the quality of the built environment and highlights the factors shaping its future evolution.

1.1.2. The OECD Well-being Framework: Why this holistic approach matters for the built environment

The analysis of this report is based on the OECD well-being framework. The OECD Well-being Framework (herewith “the Framework”) (Figure 1.1), based on the recommendations made in 2009 by the Stiglitz, Sen and Fitoussi-led Commission on the Measurement of Economic Performance and Social Progress and various national initiatives in the field, guides the OECD’s work on monitoring trends in people’s diverse experiences and living conditions, as well as in the sustainability of well-being across member and partner countries. It underpins the *How's Life?* report series, published regularly since 2011, which is operationalised with a dashboard including more than 80 indicators. The Framework includes both material (e.g. income, wealth, jobs, housing) and non-material (e.g. environment, education, safety) dimensions, as well as more relational aspects of well-being (e.g. social connections).

Figure 1.1. The OECD Well-being Framework



Source: OECD (2020), *How’s Life? 2020: Measuring Well-Being*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9870c393-en.

The holistic approach of the OECD well-being framework is helpful in systemically assessing various impacts the built environment has on people's well-being and sustainability. Each of the four key components of the built environment may shape material well-being dimensions, such as income and wealth, and work and job quality. Beyond these economic dimensions, however, the built environment also matters for well-being dimensions such as health, safety, environmental quality and social connections. In this report, the relationship between the built environment and people's well-being is analysed through three broad clusters: material conditions, grouped with economic capital; quality of life factors, examined with natural and human capital; and community relations, explored alongside social capital. Furthermore, beyond national averages, which often mask large inequalities between population groups, the distribution of current well-being is also examined by looking at three types of inequality: 1) gaps between population groups (i.e. horizontal inequalities); 2) gaps between those at the top and those at the bottom of the achievement scale in each dimension (i.e. vertical inequalities); and 3) deprivations.

1.1.3. How is the built environment defined?

The issue of scope in defining the built environment

The built environment, as opposed to the natural environment, is the human-made environment that has been built to serve human purposes. In other words, the built environment generally refers to "the man-made surroundings that provide the setting for human activity, ranging from the large-scale civic surroundings to the personal places" (Moffatt and Kohler, 2008[3]). The built environment provides essential services on which societies rely to satisfy primary needs (e.g. shelter, mobility, energy production and transmission and water distribution) and improve social and economic conditions (e.g. communication network, waste collection and facilities for education, work, health care, or entertainment) (Lanau et al., 2019[4]). In higher education, it refers to "a range of practice-oriented subjects concerned with the design, development and management of buildings, spaces and places" (Griffiths, 2004[5]).

The challenge of defining the built environment comes from the fact that the socio-economic perceptions and cultural contexts of the built environment keep changing over time. Over a longer historical horizon, the 18th century industrial revolution (by focusing on resource constraints and energy and material flows), as well as the 19th century romantic movement (by reflecting the new perspective on the relation between society and nature) all impacted people's perspectives on the built environment (Moffatt and Kohler, 2008[6]). The industrial era, with its increased use of concrete, steel and glass, changed the fundamental structure and functionality of the urban environment and its buildings (Kamei, Mastrucci and van Ruijven, 2021[7]). More recently, 20th century modernism called for methods of production to be "reconceived in the light of scientific reasoning" (Rabeneck, 2008[8]). Sennett (2018[9]) presented how the 19th century city-makers tried to connect the built (”*ville”*) with the lived (”*cité"*”), but the 20th century saw the separation of the two, with urban planning focusing more on the ”built”, with less consideration for the people living inside.

The complexity and ambiguity of the built environment (Cairns, 2008[10]) **make defining and scoping the built environment challenging**. Components of the built environment can be as diverse as everything that surrounds us that is human-made, which can include not just rooms, buildings, cities and transport systems, but also material products that have been produced artificially, such as furniture, as well as intangible infrastructure like the Internet. Architects, urban planners, transport engineers, economists, policy makers as well as professions such as health-care workers, psychologists and sociologists among many others, will all have different takes on how the built environment can be defined. Thus, the approach undertaken in this report provides a framework for understanding the built environment in the OECD countries by listing a number of scalable components of the built environment to highlight their inter-relationships with people's lives and society's sustainability. This builds on the identification of the major streams of literature that analyse the built environment from a number of distinct perspectives.

Academic approaches to the built environment

One approach to defining the built environment focuses on its individual elements, such as buildings (Anderson, Wulfhorst and Lang, 2015[11])**.** Oftentimes, the word "building" is used interchangeably with the term "built environment". Some studies focus on individual buildings and the experiences of the building's users. A user-centred theory of the built environment focuses on the fact that "the building user's experience incorporates the interactive effects of both how occupants are affected and how they act on and respond to the environment" (Vischer, 2008[12]). With this approach, the inter-relationship between the built environment and people's lives can be examined on a more measurable human-scale. For example, focusing on key physical factors (e.g. light, temperature, sound and air quality) of indoor environmental quality that strongly influence occupants' perception of built spaces could possibly lead to better monitoring of the occupants' comfort and the well-being outcomes of building practices and standards (Altomonte et al., 2020[13]). This view also facilitates an environmental assessment of the built environment, focusing on energy use in buildings, the "sick building syndrome" (i.e. occupants feeling sick or discomfort when spending time in a building), the indoor climate and building materials containing hazardous substances (Forsberg and von Malmborg, 2004[14]), and also on forecasting the fulfilment of climate targets by the built environment sector (Francart, Malmqvist and Hagbert, 2018[15]). The Center for the Built Environment (CBE) at the University of California, Berkeley, for example, has been able to document people's levels of comfort, workplace efficiency and environmental satisfaction by conducting occupant surveys of building systems (Graham, Parkinson and Schiavon, 2021[16]).

An alternative approach to defining the built environment takes a broader scope, focusing on its interaction with nature and society as a whole. A number of published research papers look at the built environment as a system of interactions between individual components of the built environment and nature, as well as society. This approach often warns against separating the built environment from the wider urban and natural environment, including the risk of separation between building design, construction and use (Rabeneck, 2008[8]). Instead, this approach calls for attention on the entire systems within the built environment rather than on individual elements such as buildings (Anderson, Wulfhorst and Lang, 2015[11]; Moffatt and Kohler, 2008[6]). Some analysts also argue that the identity of the built environment should not be defined in terms of particular professions, which would undermine its interdisciplinary characteristics (Haigh and Amaratunga, 2010[17]). The built environment should be able to describe "in one holistic and integrated concept the creative (and not so creative) results of human activities throughout history" (McClure and Bartuska, 2011[18]).

The field of urban planning has also used a variety of terms to refer to the built environment. Handy et al. (2002[19]) define the built environment as comprising urban design, land use and the transportation system, and lists dimensions of the built environment at the neighbourhood scale, such as density and intensity, land use mix, street connectivity, street scale, aesthetic qualities and regional structure. Their importance is stressed in distinguishing the terms "urban design", which usually refers to "the design of the city and the physical elements within it including both their arrangement and their appearance", and "land use", which typically refers to "the distribution of activities across space, including the location and density of different activities", such as residential, commercial, office, industrial and other activities (ibid.). Along this line, Hürlimann et al. (2022[20]) undertook a review of literature for climate change preparedness across sectors of the built environment, using search terms such as "urban planning", "property", "construction", "design (architecture, urban design and landscape architecture)" and the "built environment" as a whole. This list of key components of the built environment paints a multi-dimensional view of the economic, social and environmental aspects of the built environment. Lanau et al. (2019[4]) categorised the built environment into mobile stock (e.g. consumer durables) and nonmobile stock, with the latter including residential and non-residential buildings as well as infrastructure such as transportation infrastructure and technical infrastructure (e.g. for energy supply, telecommunication, water distribution and waste collection networks). Butt et al. (2015[21]) also point out that individual commodities that are used in the buildings and structures, industries and their associated manufacturing and processing plants, technologies, inventories and stock, and supply chains could fall under the phrase "built environment".

This report embraces both these approaches to the built environment, looking into individual buildings as well as the broader environment that constitutes the built environment. For example, characteristics of individual buildings such as housing conditions are studied, but also the housing sector's role in the overall financial security of households, the overall impact on the economy, and the contribution to climate change (i.e. impact on environment and sustainability). Advocating for an ambivalent approach to theorising the built environment, Cairns (2008[10]) argued that conceptualising the built environment does not necessarily have to make exclusive either/or choices between different theories and modes. This may prove to be beneficial in ensuring that different stakeholders may be able to participate in the decision-making process over the life-cycle of the built environment. An inclusive manner will also help bridge the knowledge gap between the building scale and urban scale in the built environment (Anderson, Wulfhorst and Lang, 2015[11]).

Governments' definitions of the built environment

Governments are undertaking various measures to ensure that the built environment is built and maintained to uphold people's quality of life. A preliminary stocktaking of the OECD countries' definitions or inventories of components of the built environment, mostly from a review of relevant websites on the national level, has been instrumental in categorising governments' different approaches to the built environment. As was the case for the academic community, this report finds that interpretations of the built environment vary widely amongst countries, and also among different Ministries or agencies within a single country. Some focused on the built environment with specific policy tools, such as building codes or building standards, while others were more interested in the broader-scale built environment, such as land use planning and infrastructure investment. However, in general, governments often approach the built environment in a more holistic way, in the process of planning, implementing or revising their national plans, policy assessments and legal systems for the built environment. There is also the tendency to interpret the definition of the built environment in the broader sense, when dealing with policy issues such as the environment, energy, health and culture.

- **The Australian Department of the Environment and Energy** published the report, **"Australia state of the environment 2016: built environment"** (Coleman, 2017[22]), which carried out an assessment of Australia's built environment by looking at various aspects of the built environment, including land use, housing, transport, air and water quality, as well as the natural environment within urban areas. The built environment is defined here as "the human-made surroundings that provide the setting for people to live, work and recreate. It encompasses physical buildings and parks, and their supporting infrastructure such as transport, water and energy networks."
- **The European Commission** committed itself in 2020 to put forward a sustainable built environment strategy and has stated that the built environment "corresponds to everything people live in and around, such as housing, transport infrastructure, services networks or public spaces" (European Parliament, 2023[23]).
- **In Finland, the "Land Use and Building Act"** has a chapter (Chapter 22) that deals with the care of the built environment. It states that buildings and their surroundings should be kept in "a condition that meets standards of health, safety and fitness for use at all times and does not cause environmental harm or damage the beauty of the environment". This act also states that the built environment must be kept in good condition, and that an authority should ensure that "traffic ways, streets, market places and squares, and parks and areas intended for the enjoyment of residents meet the standards of a satisfactory townscape and of pleasantness and comfort" (Ministry of the Environment, n.d.[24]). **Finland's Ministry of the Environment** and **Business Finland** also run the **"Low-Carbon Built Environment Programme"**, offering funding to support climate work

related to the built environment by boosting "the development and dissemination of products, technologies, services and practices for the built environment that mitigate climate change and promote decarbonisation". Although the programme has assisted many projects that support the transition to a low-carbon construction sector, its scope covers not just buildings and their low-carbon properties but extends to the built environment in the broader sense (Ministry of the Environment, n.d.[25]).

- **Ireland's 2022 Analysis of Well-being ("Understanding Life in Ireland: The Well-being Framework")** includes "Housing and the Built Environment" as one of the key dimensions of its well-being framework. This dimension is elaborated as "the physical infrastructure that shapes the ability of an individual to meet basic needs such as shelter, security and social belonging" and "the local built environment that determines access to infrastructure and broader services, for example safe, sustainable and accessible transport choices" (Government of Ireland, 2022[26]). It is noteworthy that the title of one of the dimensions was changed in 2022 to explicitly refer to the built environment. They explain that the purpose of the change was to allow "infrastructure (including public transport) to be more visible" and also to allow "issues such as recreation areas and accessibility to be more clearly included" (Government of Ireland, 2022[26]).
- **In the Netherlands**, **"the Environment and Planning Act"** was recently introduced (Netherlands Enterprise Agency, n.d.[27]), which incorporates 26 existing acts around the built environment, housing, infrastructure, environment, nature and water, in order to focus on "a healthy physical environment that meets the needs of society" (IPLO, n.d.[28]). Although the aim of this revision is to make it easier to start projects such as the construction of housing on former business parks, or the building of wind farms (Government of the Netherlands, n.d.[29]), this newly revised act combines existing laws on the broader built environment, including land use, residential areas, infrastructure and the built environment's interactions with the natural environment.
- **New Zealand's Ministry of Health** describes the built environment as "urban areas, the form, shape and accessibility of homes, work and play", which all have a direct influence on the quality of lives. It stresses the importance of "easy and efficient access to everyday facilities such as grocery stores, medical centres, pharmacies, workplaces, schools, living areas and recreational areas" (Ministry of Health, n.d.[30]).
- **Sweden's Ministry of Culture** has published "Policy for Designed Living Environment" (Ministry of Culture, 2019[31]), in which a holistic view of shaping the physical environment is taken, incorporating not just architecture and design but also art, historical contexts and social values. It calls for "an awareness of the importance of architecture and design issues" in areas of community planning, housing, culture and public art, the environment, social issues, education, research, transport, trade, and accessibility and consumer policy".
- **The United States Environmental Protection Agency (EPA)**'s **"Sustainable Materials Management (SMM) Strategic Plan"** states that "the built environment touches all aspects of our lives, encompassing the buildings we live in, the distribution systems that provide us with water and electricity, and the roads, bridges and transportation systems we use to get from place to place" and defines the built environment as "the man-made or modified structures that provide people living, working and recreational spaces" (EPA, n.d.[32]).

Governments or public agencies may also view the built environment as individual buildings independent of the external environment, or more generally as the construction or infrastructure sectors, depending on the relevant policy context.

- In the **UK, the Green Construction Board**, which was established in 2011 as a consultative forum for government and the UK design, construction, property and infrastructure industry, has developed the *Low Carbon Routemap for the Built Environment* (The Green Construction Board, 2013[33]), which gives a breakdown of the built environment in order to show the amount of its carbon emissions. Here, the scope of the built environment includes domestic buildings, non-domestic buildings and infrastructure but excludes emissions from the use of transport infrastructure (e.g. use of cars).

- In **Canada**, the **"Canada Green Buildings Strategy"** (Government of Canada, n.d.[34]), focuses on buildings, including building materials and construction sector supply chains, and uses the word "built environment" synonymously with "buildings". The Canadian Standards Association has published "Accessible design for the built environment" (CSA Group, n.d.[35]), which aims to "make buildings and the exterior built environment accessible and safely usable by persons with physical, sensory, or cognitive disabilities". Hence, the scope of the built environment discussed here is narrower, as in the building codes, and more detailed in describing both internal and exterior circulation, spaces and amenities.
- Similarly, **the International Organization for Standardization (ISO)** has published the standard document, "Building construction - Accessibility and usability of the built environment" (ISO, n.d.[36]), which specifies a range of requirements and recommendations for the elements of construction, assemblies, components and fittings that comprise the built environment. This document does not deal with the external environment, such as public open spaces, which is unrelated to the use of one specific building.

1.1.4. Key components of the built environment with relevance to people's well-being

The definition and scope of the built environment need to be fit for the purpose of analysing people's well-being. The definitions and scope of the built environment vary extensively among academics, governments and businesses, ranging from personal shelters, buildings, streets and neighbourhoods to cities and national-level infrastructures. Although evidence is abundant that whatever the definition of the built environment, it closely interacts with people's lives, it is important to carefully consider the most appropriate definition and the spatial scale/extent for the particular aim (Mavoa et al., 2019[37]). For the purpose of analysing the impact of the built environment in terms of people's well-being and sustainability, this report provides a framework for understanding the built environment in OECD countries by listing a number of components to highlight their inter-relationships with people's lives and well-being and society's sustainability.

In this context, the components of the built environment examined are: 1) Housing (i.e. residential buildings); 2) Urban Design/Land Use; 3) Transport; and 4) Technical infrastructure (i.e. water, energy, waste management and digital infrastructure). The rationale for selecting each of these elements of the built environment is given below, by providing a glimpse of each element's main interactions with people's lives and well-being. A more detailed description of the inter-relations of the built environment and its key components with people's well-being and sustainability will be presented in Chapter 2.

Housing (residential buildings)

The first layer of the built environment to be examined is housing, or residential buildings. Buildings are usually categorised into residential and non-residential buildings, with the latter being mainly comprised of commercial and industrial buildings as well as public buildings such as educational and health facilities. The building sector, in general, has a greater climate change impact than any other sector (Andrić, Koc and Al-Ghamdi, 2019[38]), and therefore has a large role in making the green transition to net zero. For example, buildings and construction account for almost 40% of global energy-related CO_2 emissions, so decarbonising buildings is a major driver for the low-carbon transition (OECD, 2022[39]). Housing accounts for more than a quarter of CO_2 emissions in the OECD, and the burning of fossil fuels in homes will need to make way for carbon-free energy sources in order to meet agreed net-zero emission targets by 2050 (OECD, 2023[40]). In addition to their environmental impact, buildings come with financial and economic impacts, as they are closely related to the construction industry and real estate/property market. Policies and regulations concerning buildings, in particular building codes, influence urban design in general, and have implications in terms of safety, health, aesthetic design, culture and even socio-economic opportunities. Commercial and industrial buildings affect people's well-being, most profoundly in terms of workers' productivity (Esfandiari et al., 2017[41]; Miller et al., 2009[42]), but this report will focus foremost on residential buildings (i.e. housing) which have multifaceted impact on people's lives .

Housing provides space for socialising, studying, caring and working. It impacts people's wealth, as high housing costs undermine household income. Poor housing conditions also threaten physical and mental health. Housing is the most widely owned asset in households' wealth (OECD, 2021[43]), while property debt is the largest liability in households' portfolios (Causa, Woloszko and Leite, 2019[44]). *Where people live* has a foundational role in their quality of life, impacting the availability of jobs, health and education services, through to access to clean air, green space and recreational facilities (OECD, 2014[45]). And since housing expenditure is such a significant outlay, it has a dramatic impact both on the goods and services that households can afford to support their well-being today and on their ability to build savings to help guard against future income shocks. Housing could also be examined from the perspective of the construction and maintenance of buildings, which influence real estate and financial markets. More recently, the COVID-19 pandemic reshaped the way people distinguish between housing and the workplace, increasing the importance of housing from a new angle. The pandemic broke the cultural and technological barriers that prevented widespread remote work in the past, setting in motion a structural shift in where work takes place (Lund et al., 2020[46]). This trend also impacted the real estate market. For example, one study in the US showed that the shift to remote work may explain over one-half of the 23.8 percent national house price increase since late 2019 (Mondragon and Wieland, 2022[47]).

Urban Design/Land Use

The physical setting in neighbourhoods, streets and cities, and especially how they are designed and arranged, influences people's lives. It is hard to define the boundaries of the urban environment, and its scope is often fuzzy. This requires a multi-dimensional and integrative approach, as was the case when defining the built environment. In the context of this report, urban design and land use is investigated with the aim of understanding how the physical setting and its arrangement shape people's lives in terms of well-being. It is difficult to list all the dimensions of well-being that are interlaced with urban design/land use, but a few examples are given here to highlight the intangible impacts of urban design/land use on people's lives. It influences both physical and mental health. Urban design/land use that promotes walking and cycling will help create active, healthier and more liveable communities (Papas et al., 2007[48]; Handy et al., 2002[19]). It is also an important factor affecting the health of the elderly (Yan, Shi and Wang, 2022[49]; Tuckett et al., 2018[50]) and mental health outcomes, such as suicide rates (Jiang et al., 2021[51]). Urban design may also promote or hinder opportunities for social interactions and increased life satisfaction. Measures that promote walkability and conviviality in neighbourhoods may lead to potentially more opportunities for stronger personal relationships (Mouratidis, 2018[52]), whereas extremely dense areas with high-rise buildings are thought to contribute to loneliness, fear of crime and lower community spirit (Gifford, 2007[53]). The nexus between urban design/land use and environmental quality is complex and intertwined. For example, in terms of air pollution, fragmented urban areas experience higher concentrations of NO_2 and PM10 (i.e. pollutants driven by road transportation), but densely populated urban areas suffer from higher SO_2 concentrations (from fuel combustion in power stations and domestic heating systems) (Cárdenas Rodríguez, Dupont-Courtade and Oueslati, 2015[54]).

Transport

Transport is another important component of the built environment that is inextricably linked to individual and collective well-being (ITF, 2021[55]). Transport impacts people's well-being through providing access to job opportunities as well as life-enhancing activities. An equitable transport system will allow everyone to satisfy their needs, but inequalities in transport accessibility, in particular lack of access to education or employment, will be detrimental to society (ITF, 2021[55]). People in disadvantaged communities often have a less well-maintained infrastructure – notably roads, less access to reliable public transport services, and lower ownership of private cars (OECD, 2018[56]). Lack of public transport connections between disadvantaged neighbourhoods and places of employment hinders job opportunities for residents of these neighbourhoods (OECD, 2018[57]). In addition to work and job quality, transport can alleviate or aggravate traffic safety problems (Asadi et al., 2022[58]; Saha, Dumbaugh and Merlin, 2020[59]). Inadequate and unsafe transport infrastructure has a greater negative impact on the economic opportunities and well-being of women than on those of men (OECD, 2021[60]). The recent global energy crisis and the ensuing rise of transport costs have also posed grave threats for vulnerable populations, further highlighting the necessity of exploring the transport sector in terms of people's well-being. Higher fuel prices for vehicles have a disproportionate effect on certain communities, households and individuals (OECD, 2021[61]), and tackling the accessibility challenges that people in remote areas face will also become more urgent as energy prices rise (ITF, 2021[62]).

Technical Infrastructure (Energy, water, waste management and digital infrastructure)

The fourth component of the built environment examined in this study is the technical infrastructure, with a focus on energy, water, waste management and digital infrastructure.

Energy has long been regarded as a prerequisite to people's well-being. Coleman (2017[22]) lists energy use in the context of the built environment as including "energy use by households, manufacturing and commercial and service industries, including construction and transport". Household energy use (i.e. lighting, heating and cooling) and energy use in mobility are important drivers of people's well-being. Energy use is driven by both economic and non-economic factors, such as behaviour, lifestyle, culture, religion and the desire for improved well-being. Different lifestyles influence levels of energy consumption (Roy et al., 2012[63]; Rao and Wilson, 2022[64]), which rely on the relevant energy infrastructure. Energy use and infrastructure are also closely related to environmental quality and natural capital. In addition to the energy infrastructure related to conventional fuel, cross-cutting energy infrastructure related to clean energy, such as carbon capture, utilisation and storage (CCUS), district heating and data centres, and data transmission networks, are increasingly gaining attention for their role in enabling decarbonisation (IEA, 2022[65]).

Water security and access to the Internet also have significant implications for well-being. Water infrastructure is essential in providing access to clean water, and almost all the OECD population enjoy access to drinkable water. Recently, however, the OECD has underscored the importance of water security investment and called for continued attention to water-related investment, including infrastructure that contributes to the delivery of water and sanitation services, the management of water resources, and water-related risks. Examples include dams, reservoirs, pipelines, water supply networks and waste-water infrastructure (OECD, 2022[66]). Also, the digital infrastructure that provides stable access to Internet at home increasingly underpins people's well-being. Over the years, the digitalisation of human activities has progressively increased, making digital access indispensable for working, studying and accessing basic services.

1.2. How can the built environment be measured and assessed? What are the factors that shape its future evolution?

1.2.1. Which national statistical sources deal with the built environment?

Information to describe the built environment is available from a variety of statistical sources. Data available from national statistical sources (National Accounts, general social surveys, population and household surveys, geospatial data) are of particular interest, because they are usually of better quality (accuracy, credibility, timeliness and punctuality), which allows sound measuring and monitoring over time.[1] Table 1.1 summarises the information on the built environment available in national statistical sources.

Table 1.1. National statistical sources providing information on the built environment

National Statistical Sources	Information type
National Accounts (core and satellite accounts)	• Value of stocks and investment in various components of the built environment • Household expenditure on housing and transport • Estimates of selected air pollutants emissions by economic activities related to the built environment
General social surveys and household surveys	• Affordability (e.g. housing cost overburden) • Quality of housing (e.g. overcrowding, availability of toilets) • Characteristics of the neighbourhood (e.g. noise, pollution)
Population and household censuses	• Access to basic services (e.g. improved drinking water, electricity)
Geospatial data combined with other data sources and/or modelling (e.g. administrative data)	• Description of the geographical surface: changes in land use • Accessibility and proximity to services or amenities (e.g. access to green spaces in urban areas) • Average building height
International surveys or calculations conducted by international organisations (e.g. OECD, ITF, IEA, UNFCCC, World Bank), also leveraging national sources (such as data collected by Ministries)	• Characteristics of technical infrastructure (energy, waste, etc.) and transport (e.g. volume in millions of passengers per km) • Environmental (e.g. contribution to CO_2 emissions) and social impact (e.g. road fatalities) of some elements of the built environment • Perceptions of social protection (e.g. people's perceptions of the social and economic risks they face)

National Accounts provide internationally comparable information on the value of stocks and the volume of investment in components of the built environment (European Commission et al., 2009[67]). The values also account for the reduction in the original value of the asset due to physical deterioration, normal obsolescence or normal accidental damage. Information is available disaggregated by the following components of the built environment:

1. **Dwellings** (residential buildings);
2. **Non-residential buildings** (industrial, commercial, educational, health care, public, religious, amusement, sport, recreational and community, non-residential farm buildings, etc.);
3. **Civil engineering works** (such as highways, streets, roads, railways and airfield runways; bridges, elevated highways, tunnels and subways; waterways, harbours, dams and other waterworks; long-distance pipelines, communication and power lines; local pipelines and cables, ancillary works; constructions for mining and manufacture; and constructions for sport and recreation);
4. **Transport equipment** (equipment for moving people and objects, such as motor vehicles, trailers and semi-trailers; ships; railway and tramway locomotives and rolling stock; aircraft and spacecraft; and motorcycles, bicycles, etc.).

National Accounts also provide internationally comparable information on household expenditure on housing and transport services, which is useful for capturing the quality of housing from the household perspective. Data are disaggregated as follows:

1. **Housing, water, electricity, gas and other fuels**: i) actual rentals for housing; ii) imputed rentals for housing; iii) water supply and miscellaneous services relating to the dwelling; and iv) electricity, gas and other fuels;
2. **Furnishings, household equipment and routine maintenance of the house:** i) furniture and furnishings, carpets and other floor coverings; ii) household textiles; iii) household appliances; iv) glassware, tableware and household utensils; v) tools and equipment for house and garden; and vi) goods and services for routine household maintenance;
3. **Transport services** (including public and private transportation services).

The System of Environmental and Economic Accounts (SEEA) **has recently been added in the National Account to include estimates of emissions for a number of selected air pollutants[2] by economic activities related to the built environment**. Estimates are available on air pollutants emissions by economic activities such as 1) construction; 2) electricity, gas, steam and air conditioning supply; 3) water supply; 4) sewerage, waste management and remediation activities; 5) transport; 6) real estate activities; and 7) information and communication. SEEA also include estimates of selected air pollutants emitted by households via transport or other activities classified under the National Accounts category "housing, water, electricity, gas and other fuels", as described above, which mainly relate to heating or cooling (Eurostat, 2015[68]).

General social surveys and household surveys collect information on housing affordability and quality and on the characteristics of the neighbourhood. Information on mortgages and rent costs, as well as their burden on household income, is available. Quality features of housing include data on the space available to members of the household, the availability of facilities such as toilets or bathrooms, the conditions of the roof, ceiling, floor, walls and windows, and the presence of issues such as leaks or damp. Information on the neighbourhood includes the presence of 1) noise from neighbours or from the street; 2) pollution grime or other environmental problems; and 3) crime, violence or vandalism in the area. Population and household censuses are also valuable sources of information on access to (basic) services. They include information on access to improved drinking water, sanitation and electricity. Access to the Internet can be collected through population and household censuses, general social surveys or household surveys.

Geospatial data can help examine the urban environment more accurately, in terms of both current land use and the changes in wider geographical spaces. Geospatial data inform us about the changes in natural and semi-natural land, as well as in artificial surfaces, defined as continuous and discontinuous urban fabric (housing areas), industrial, commercial and transport units, road and rail networks, dump sites and extraction sites, and also green urban areas (United Nations et al., 2021[69]). Combining geospatial data with administrative or household surveys data enables estimation of the accessibility and proximity to services or amenities, as well as average building height. Indicators include access to green spaces in urban areas, access to public transport and selected services (hospitals, schools, recreation, food shops, restaurants) and average building height.

There is still room to develop information based on geospatial data. From the production side, greater accessibility to geospatial data (some are available for free, e.g. OpenStreetMap) and technological, computational and methodological advances (such as the use of machine learning) have created the ideal technical conditions for generating more data on the overall status of the built environment. For example, the OECD used satellite imagery and deep learning to map and analyse built-up areas in residential and business-related use for 687 European metropolitan areas (Banquet et al., 2022[70]). The demand for data has also surged in the midst of growing international awareness that the built environment contributes to economic growth as well as to well-being and sustainability. This awareness has been widely reflected in the United Nations Sustainable Development Goals (UN SDGs) 6, 7, 9 and 11.[3] The European Commission's Global Human Settlement Layer (GHSL), which aims to produce and analyse global built-up surface, population density and human settlement thematic maps (European Commission, n.d.[71]), is used by international organisations, including the OECD, to monitor various SDG 11 indicators related to land consumption (e.g. land use per capita). The OECD Laboratory for Geospatial Analysis (The Geospatial Lab), which is an interdisciplinary and diverse network of researchers and policy makers, aims to better integrate geospatial information, statistical data and spatial modelling (OECD, n.d.[72]).

International surveys being conducted by various international organisations also provide detailed information on the built environment. The International Energy Agency (IEA), the International Transport Forum (ITF), the OECD, the United Nations Framework Convention on Climate Change (UNFCCC) and the World Bank, among many others, collect detailed information on the characteristics of technical infrastructure and transport, as well as on the environmental and social impact of individual elements of the built environment**.** These data cover energy consumption, transport and infrastructure volumes (e.g. millions of kilometres travelled by passengers (millions of passenger-km), millions of kilometres covered transporting freight tonnes (millions of tonne-km)), infrastructure investment and maintenance spending, water and waste management (e.g. annual freshwater abstractions, share of municipal waste that is recycled), contribution to air pollution (greenhouse gasses, PM2.5) by the residential and transport sector, as well as road fatalities and casualties. There are also surveys that monitor people's perceptions about social protection (e.g. OECD's *Risks that Matter* survey) that can be useful in tracking subjective indicators related to the built environment.

Finally, while national data are essential in measuring and assessing the built environment, it should also be noted that national data may mask important territorial disparities. For example, the determinants of school dropout rates can vary between rural and urban locations, between cities and even between neighbourhoods in the same city (OECD, 2014[45]). The quality of the built environment is largely determined by place-specific assets, and local performances and territorial disparities can in turn impact national well-being outcomes and broader societal challenges (OECD, 2014[45]).

1.2.2. How is the built environment assessed?

Quantity and quality are two fundamental dimensions to consider in order to assess and measure the built environment. The *amount* of built environment can be quantified in different ways: in terms of volume (e.g. millions of passenger-km, tonne-km) or value (e.g. the stock value, as available in the National Accounts). However, it cannot be determined from a single perspective whether more or less quantity of the built environment is desirable, as quantity may be interpreted differently in different contexts. For example, expanding road infrastructure in rural areas may improve the well-being of the remote population, but building more roads could also generate more traffic and pollution.

As for quality, while there is no single definition of *quality* of the built environment, some features such as accessibility, safety and sustainability are recurrent across the definitions. One primary feature of the built environment's quality is accessibility, which can be decomposed into accessibility to basic services and accessibility to destinations of interest to people. Another important quality feature is safety, as how the built environment is constructed and designed would determine the safety of the setting for people to live, work and recreate. In addition to accessibility and safety, sustainability is a crucial quality criterion for the built environment. As the built environment is conceptualised and constructed for long-term use, it is related to the concept of sustainability on two levels: both the sustainability of the built environment itself as a stock (e.g. resilience to earthquakes or to other natural hazards, whose frequency is increasing due to climate change) and its impact on the sustainability of human activity and its development. In this context, a useful reference is the UN SDGs, with a number of the goals and targets specifically referring to different components of the built environment. Analysing how the built environment is defined and measured in the UN SDGs helps us understand the key features that have been internationally agreed to be essential in improving and sustaining people's living conditions. The UN SDGs are also the bedrock of the UN *New Urban Agenda (NUA)* (UN Habitat, 2017[73]), which was adopted at the Habitat III Conference in 2016 to promote sustainable development, with a focus on sustainable urban development. Annex Table 1.A.1 gives more detailed illustrations of how the components of the built environment are included in the UN SDGs. The importance of accessibility and safety as quality features of the built environment is highlighted in the SDGs, which also expand the quality boundaries to affordability, equity, inclusiveness, sustainability and resilience.

1.2.3. Which indicators are both important and relevant?

Given that the built environment (and its quality features) is strongly interlinked with people's well-being, the quality criteria used to select and populate the OECD Well-being dashboard can help guide the selection of the most suitable indicators to describe the built environment. These quality criteria are adapted from the OECD Statistical Quality Framework (OECD, 2012[74]) to the well-being context. Below are the quality criteria (relevance, credibility and comparability, timeliness and frequency, interpretability and working constraints) that have been prioritised for this report.

- **Relevance**: the indicator has policy relevance, and its value has to be clear. When describing the quality of a component of the built environment, it has to pertain to either households or individuals.
- **Interpretability**: the meaning of the indicator has to be obvious, and a change in the indicator must be unambiguously good or bad.
- **Timeliness and frequency**: wherever possible, data should be based on recurrent data collections, and data with no more than a five-year lag in data publication have been prioritised. Whilst ideally time series should be available to assess changes over time, some indicators have only been developed with no available time series yet. As highly relevant, they have been included.
- **Credibility and comparability**: data are sourced from national statistical sources as identified earlier in this chapter, based on internationally comparable definitions.
- **Working constraints**: indicators with data coverage for at least more than half of the OECD countries have been prioritised, preferably not referring to only one geographical area.

Some criteria have been relaxed to allow the coverage of a wider range of quality features of components of the built environment. For example, highly relevant indicators that are part of a one-off data collection (but referring to the last five years) or with a coverage limited to EU countries or cities have been included. Indicators not strictly internationally comparable or with very limited country coverage have been excluded. For example, information on transport infrastructure capital value, investment and maintenance spending is annually collected by the International Transport Forum (ITF), but country coverage is limited, and data are not strictly comparable across countries, due to differences in definitions and practices. Therefore, these indicators have been excluded from this report. On the other hand, this report features some descriptive indicators to "quantify" the built environment, its components and the typology of urban designs or lands (e.g. surface of built-up areas, height of buildings) whose interpretability is sometimes not unambiguous (e.g. higher is not necessarily better for people's well-being). These indicators have been included as necessary to picturing and understanding the overall built environment.

As the built environment is part of a country's economic capital, its quantity can be assessed in terms of volume or value. In the OECD Well-being Framework, economic capital is measured in terms of stock (value) and flows (i.e. investment) on the basis of data available in the National Accounts. Given the heterogeneous nature of the built environment (dwellings, transport, energy and water infrastructure), assessing it in terms of value allows having a common metric to quantify it.

While it is possible to broadly quantify the built environment as a whole, its quality can be assessed only individually for each of its key components on the basis of available data. Components of the built environment share common quality features (accessibility, affordability, safety, equity, inclusiveness, sustainability and resilience) that have been assessed separately. Measuring quality at the component level is definitively the first step in understanding the built environment, as it is easier than measuring the quality of the more complex *entire* built environment. In order to better target well-being interventions, it is also necessary to disentangle information and evidence on the built environment. Components of the built environment are often measured, monitored and analysed separately, and responsibility for components of the built environment falls to different actors at the governmental level (e.g. housing conditions and infrastructure or transport are not always supervised by the same Ministry), as well as at the business and private level (e.g. architects and urban planners have different roles, responsibilities and focuses that sometimes overlap and often complement each other).

Table 1.2 illustrates the indicators available to assess quantity and quality features of the built environment by component on the basis of the selection criteria presented above. More details on their data quality features are available in Annex 1.B. Annex 1.B provides information on the frequency and regularity of the indicators and some interesting breakdowns are available. When deprivation measures (i.e. focusing on the bottom part of the distribution of the indicator) and horizontal inequalities (i.e. looking at differences between population groups) can be assessed, these are also specified.

Table 1.2. Indicators (featured in this report) to assess the quantity and quality of the built environment

Component	Indicator	Measurement	Source
Overall built environment	Built environment (buildings (residential and non-residential) and civil engineering works) stock value *Quantity*	USD at 2015 PPPs, per capita	*National Accounts*, as available in the OECD *National Accounts Statistics* database: 9B. Balance sheets for non-financial assets, http://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE9B
	Investment in the built environment (buildings - residential and non-residential - and civil engineering works) *Quantity*	Growth rate and as a percentage of GDP	*National Accounts*, as available in the OECD *National Accounts Statistics* database: 1. Gross domestic product, http://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE1
Housing	Housing (residential buildings) stock value *Quantity*	USD at 2015 PPPs, per capita	*National Accounts*, as available in the OECD *National Accounts Statistics* database: 9B. Balance sheets for non-financial assets, http://stats.oecd.org/Index.aspx?DataSetCode='SNA_TABLE9B
	Investment in housing (residential buildings) *Quantity*	Growth rate and as a percentage of GDP	*National Accounts*, as available in the OECD *National Accounts Statistics* database: 1. Gross domestic product, http://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE1
	Housing affordability (current expenditures) *Quality*	Percentage of household gross adjusted disposable income that is available to the household after deducting housing current expenditures	*National Accounts*, as available in the OECD *National Accounts Statistics* database: 5. Final consumption expenditure of households, http://stats.oecd.org/Index.aspx?DataSetCode='SNA_TABLE5' and in the OECD *How's Life? Well-being* database, https://stats.oecd.org/Index.aspx?DataSetCode=HSL
	Housing cost (rents and mortgage) overburden *Quality*	Percentage of households in the bottom 40% of the income distribution spending more than 40% of their disposable income on housing cost (i.e. mortgage and rent)	*General Social Surveys or Household surveys*: as available in the OECD *Affordable Housing* database: http://oecd.org/social/affordable-housing-database and in the OECD *How's Life? Well-being* database, https://stats.oecd.org/Index.aspx?DataSetCode=HSL

Component	Indicator	Measurement	Source
	Overcrowding rate *Quality*	Percentage of households living in overcrowded conditions (Eurostat definition)	*General Social Surveys or Household surveys* as available in the OECD *Affordable Housing* database, http://oecd.org/social/affordable-housing-database and in the OECD *How's Life? Well-being* database, https://stats.oecd.org/Index.aspx?DataSetCode=HSL
	Poor household lacking access to basic sanitary facilities (toilets) *Quality*	Percentage of households below 50% of median equivalised disposable household income without indoor flushing toilet for the sole use of their household	*General Social Surveys or Household surveys* as available in the OECD *Affordable Housing* database, http://oecd.org/social/affordable-housing-database and in the OECD *How's Life? Well-being* database, https://stats.oecd.org/Index.aspx?DataSetCode=HSL
	Housing distress *Quality*	Percentage of respondents reporting being either "somewhat concerned" or "very concerned" by not being able to find/maintain adequate housing	OECD *Risks That Matter* survey, https://www.oecd.org/social/risks-that-matter.htm as available in the OECD *Affordable Housing* database, http://oecd.org/social/affordable-housing-database
Infrastructure (including transport & technical infrastructure)	Infrastructure (civil engineering works) stock value *Quantity*	USD at 2015 PPPs, per capita	*National Accounts*, as available in the OECD *National Accounts Statistics* database: 9B. Balance sheets for non-financial assets, http://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE9B
Transport	Convenient access to public transport (all transport modes) *Quality*	Percentage of population that has convenient access to public transport	*Geospatial data*, as available in the UN *Global SDG Indicator* database, indicator 11.2.1, https://unstats.un.org/sdgs/dataportal
	Access to various public transport modes *Quality*	Percentage of the population having access to a bus/metro/ tram public transport stop within 10 minutes walking distance	*Geospatial data*, as available in the OECD *Regions and Cities, City statistics* database, https://stats.oecd.org/Index.aspx?DataSetCode=FUA_CITY
	Transport effectiveness in providing access to destinations *Quality*	Ratio	*Geospatial data*, as available in the OECD ITF Urban access framework, https://stats.oecd.org/Index.aspx?DataSetCode=ITF_ACCESS
Technical Infrastructure	Access to improved drinking water sources *Quality*	Percentage of the population with access to improved drinking water sources	*Population and household censuses and surveys*, as available in the UN *Global SDG Indicator* database, Indicator 6.1.1, https://unstats.un.org/sdgs/dataportal and in the OECD *Green Growth indicators* database, https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH
	Connection to public sewerage (primary, secondary, tertiary, or other treatment) *Quality*	Percentage of the population connected to public sewerage	*International data collections*, as available in the OECD *Green Growth indicators* database, https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH
	Access to electricity *Quality*	Percentage of the population with access to electricity	*Population and household censuses and surveys*, as available in the UN *Global SDG Indicator* database, indicator 7.1.1, https://unstats.un.org/sdgs/dataportal
	Ability to keep the dwelling warm (energy poverty) *Quality*	Percentage of households who cannot afford to keep their home adequately warm	*General Social Surveys or Household surveys* (EU-SILC countries only), as available in the *European Survey on Income and Living Conditions* (EU-SILC), https://ec.europa.eu/eurostat/web/income-and-living-conditions/data/database
Urban design/land use	Artificial surfaces *Quantity*	As a percentage of total land	*Geospatial data*, as available in the OECD *Land cover change in countries and regions* database, https://stats.oecd.org/Index.aspx?DataSetCode=LAND_COVER_CHANGE

Component	Indicator	Measurement	Source
	Change in artificial surfaces (to and from) *Quantity*	Percentage change (2004-2019)	*Geospatial data*, as available in the OECD *Land cover change in countries and regions* database, https://stats.oecd.org/Index.aspx?DataSetCode=LAND_COVER_CHANGE
	Urban built-up areas *Quantity*	Sqm per capita	*Geospatial data*, as available in the OECD *Regions and Cities, City statistics* database, https://stats.oecd.org/Index.aspx?DataSetCode=FUA_CITY
	Average urban building height *Quantity*	Metres	*Geospatial data*, as available in the OECD *Regions and Cities, City statistics* database, https://stats.oecd.org/Index.aspx?DataSetCode=FUA_CITY
	Urban green areas *Quantity*	As a percentage of the functional urban area and in sqm per capita	*Geospatial data*, as available in the OECD *Regions and Cities, City statistics* database, https://stats.oecd.org/Index.aspx?DataSetCode=FUA_CITY
	Open space for public use *Quantity*	Percentage of area of cities that is open space for public use	*Geospatial data and ground assessments*, as available in the UN *Global SDG Indicator* database, indicator 11.7.1, https://unstats.un.org/sdgs/dataportal
	Access to recreational green space in urban areas *Quality*	Percentage of the urban population with access to recreational green space within 5 minutes walking distance from their home	*Geospatial data*, as available in the OECD *How's Life? Well-Being* database, https://stats.oecd.org/Index.aspx?DataSetCode=HSL
	Proximity to services *Quality*	Number of services by type (hospitals, schools, recreation, food shops, restaurants, green areas) within a given distance or time	*Geospatial data*, as available in the OECD ITF Urban access framework, https://stats.oecd.org/Index.aspx?DataSetCode=ITF_ACCESS

Note: The transport effectiveness ratio is computed as the ratio between the absolute accessibility (the number of destinations reachable within a fixed amount of time) for a given transport mode and proximity to potential destinations (the number of destinations within a certain distance). A ratio of one or more means the transport mode performs well, as the number of accessible destinations through the transport mode is higher than those in proximity. A ratio close to zero means that the mode performs poorly, even in providing access to nearby destinations. In the case of public transport, transport effectiveness captures the frequency of services, the in-vehicle speed, the number of transfers, and the distance to the nearest bus stop or station, as its effective performance is compared to a theoretical reference. Proximity to services is assessed for functional urban areas and components (core centre and commuting area), by mode of transport (driving, walking, cycling and public transport), by destination (hospitals, schools, recreation, food shops, restaurants, green areas), and by time intervals or distance thresholds (15 minutes/4km (1km walking); 30 minutes and 45 minutes). Functional urban areas (FUAs), as defined by the OECD and the EU, are composed of a city and its commuting zone. This definition overcomes the purely administrative perimeter to encompass the economic and functional extent of cities based on people's daily movements (OECD, 2012[75]).

Internationally comparable, detailed information on the stocks and flows of all the components of the built environment is currently not available. This report, therefore, will present stock and investment/flows for an overall measure of the built environment (covering buildings – residential and non-residential – and civic engineering works) and the two main broad components (housing – residential buildings) and infrastructure (grouping together transport and technical infrastructure: water, energy, waste management, information and communication technology), mirroring data availability in the National Accounts. Transport equipment, as available from the National Accounts, does not allow separation of public and private equipment (which have different impacts on people's well-being and sustainability, for example when concerning environmental matters), and its interpretation is relatively ambiguous (i.e. a higher stock or investment is not unambiguously instrumental in improving or preserving well-being), and therefore was not included in this report. Finally, as it is not possible using the OECD National Accounts to distinguish information on investment in infrastructure from that in non-residential buildings, only investment on housing and the overall built environment will be considered. Urban design/land use is treated differently from other elements of the built environment, because it refers to the organisation of the space, rather than to specific assets. Here it is described using indicators that allow to understand how the space is organised in terms of some main categories, such as artificial surface, urban green areas and built-up areas.

Internationally comparable information on quality features is relatively more abundant for housing than for other components of the built environment. This may be due to the fact that housing has long been at the core of national social policies, and it has already been closely associated with welfare and well-being also at the international level (e.g. OECD Well-being Framework, OECD *Affordable Housing* and OECD Housing project). Existing indicators, however, do not fully capture trade-offs and tensions between different policy options to improve the quality of housing OECD's report, *Brick by Brick*, tried to identify both limitations and advantages of different housing policies (OECD, 2023[40]). As for transport, more information is in the process of development for transport accessibility, as the call to shift from "mobility" to "accessibility" has been relatively recent. Information on transport and urban design/land use is often available for metropolitan or functional urban area level, as their administration primarily pertains to local authorities, and an overall national measure would not allow to grasp the wide local diversity.

Subjective measures of housing distress are also available, but they are not collected on a regular basis. Most recent measures developed in response to the COVID-19 pandemic (e.g. by Eurofound) include indicators such as "inability to pay the rent or mortgage as scheduled at some time in the last 3 months" or "likelihood to leave the accommodation within the next 3 months as can no longer afford it". The OECD also collects a subjective measure of housing distress (i.e. "Concern by not being able to find/maintain adequate housing") via the *Risks That Matter* survey. This survey has been conducted three times since 2018, drawing on 25 000 responses from 25 OECD countries. The question on housing distress has been included from the 2020 wave, and results from the 2022 wave were not available when preparing this report. Additional subjective indicators related to the built environment are available from non-official sources (e.g. the Gallup World Poll). As the objective of this chapter is to present information based on national statistical sources, non-official sources have not been included. Complementary indicators from non-official sources will be introduced and discussed in Chapter 2 to present the built environment through a well-being and sustainability lens.

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Annex 1.A. The built environment in the Sustainable Development Goals (SDGs)

Annex Table 1.A.1. The built environment in the Sustainable Development Goals (SDGs)

SDGs goals and targets	SDGs indicators	Built environment and quality features
Goal 1. End poverty in all its forms everywhere		**Water infrastructure**
1.4 By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance	1.4.1 Proportion of population living in households with access to basic services (drinking water services and sanitation services)	Equitable, accessible
Goal 6. Ensure availability and sustainable management of water and sanitation for all		**Water infrastructure**
6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all	6.1.1 Proportion of population using safely managed drinking water services	Universal, equitable access, affordable and safe
6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations	6.2.1 Proportion of population using (a) safely managed sanitation services and (b) a hand-washing facility with soap and water	Safe and accessible
6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimising release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	6.3.1 Proportion of domestic and industrial wastewater flows safely treated	Safe and accessible
	6.3.2 Proportion of bodies of water with good ambient water quality	Safe and accessible
6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity	6.4.1 Change in water-use efficiency over time	Sustainable water management
	6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	Sustainable water management
Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all		**Energy infrastructure**
7.1 By 2030, ensure universal access to affordable, reliable and modern energy services	7.1.1 Proportion of population with access to electricity	Universal, equitable and affordable access
	7.1.2 Proportion of population with primary reliance on clean fuels and technology	Sustainable (use of clean fuels and technology)
7.2 By 2030, increase substantially the share of renewable energy in the global energy mix	7.2.1 Renewable energy share in the total final energy consumption	Sustainable (use of renewable energy)
Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation		**Transport**
9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure,	9.1.1 Proportion of the rural population who live within 2 km of an all-season road	Accessible, reliable, sustainable, resilient transport infrastructure

SDGs goals and targets	SDGs indicators	Built environment and quality features
to support economic development and human well-being, with a focus on affordable and equitable access for all	9.1.2 Passenger and freight volumes, by mode of transport	
9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities	9.4.1 CO_2 emission per unit of value added	Sustainable (CO_2 emissions)
Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable		**Housing, transport, urban design and land use**
11.1 By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums	11.1.1 Proportion of urban population living in slums, informal settlements or inadequate housing	Adequate, safe and affordable housing and basic services
11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons	11.2.1 Proportion of population that has convenient access to public transport, by sex, age and persons with disabilities	Equitable, accessible, safe, affordable transport system
11.3 By 2030, enhance inclusive and sustainable urbanisation and capacity for participatory, integrated and sustainable human settlement planning and management in all countries	11.3.1 Ratio of land consumption rate to population growth rate	Sustainable land use
	11.3.2 Proportion of cities with a direct participation structure of civil society in urban planning and management that operate regularly and democratically	Inclusive urban planning and management
11.4 Strengthen efforts to protect and safeguard the world's cultural and natural heritage	11.4.1 Total per capita expenditure on the preservation, protection and conservation of all cultural and natural heritage, by source of funding (public, private), type of heritage (cultural, natural) and level of government (national, regional and local/municipal)	Sustainability of the world's cultural and natural heritage
11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations	11.5.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100 000 population	Sustainable (reduce deaths and casualties caused by natural climate-related hazards)
	11.5.3 (a) Damage to critical infrastructure and (b) number of disruptions to basic services, attributed to disasters	Sustainable (reduce deaths and casualties caused by natural climate-related hazards)
11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management	11.6.1 Proportion of municipal solid waste collected and managed in controlled facilities out of total municipal waste generated, by cities	Sustainable (waste management)
	11.6.2 Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population-weighted)	Sustainable (air quality)
11.7 By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities	11.7.1 Average share of the built-up area of cities that is open space for public use for all, by sex, age and persons with disabilities	Universally accessible, inclusive green and public spaces
	11.7.2 Proportion of persons victim of physical or sexual harassment, by sex, age, disability status and place of occurrence, in	Safe public space

SDGs goals and targets	SDGs indicators	Built environment and quality features
	the previous 12 months	
11.c Support least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings utilising local materials	*No suitable replacement indicator was proposed. The global statistical community is encouraged to work to develop an indicator that could be proposed for the 2025 comprehensive review. See E/CN.3/2020/2, paragraph 23.*	Sustainable and resilient buildings with local materials (circular economy)

Source*:* Adapted from the UN Global indicator framework for the Sustainable Development Goals and targets of the 2030 Agenda for Sustainable Development, https://unstats.un.org/sdgs/indicators/indicators-list/.

Annex 1.B. Data quality description of selected indicators to describe the built environment and its components

Annex Table 1.B.1. Selected indicators to describe the overall built environment

Indicator	Measurement	Breakdowns	Frequency and regularity	Source
Built environment (buildings – residential and non-residential – and civil engineering work)	USD at 2015 PPPs, per capita	By institutional sector	Annual (with possible infra-annual updates)	*National Accounts*, as available in the OECD *National Accounts Statistics* database: 9B. Balance sheets for non-financial assets, http://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE9B
Built environment (buildings – (residential and non-residential – and civil engineering works)	Growth rate and as a percentage of GDP	n.a.	Annual (with possible infra-annual updates)	*National Accounts*, as available in the OECD *National Accounts Statistics* database: 1. Gross domestic product, http://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE1

Note*:* If data can be broken down by socio-economic characteristics of the population ("Horizontal inequality") or are available for a subset of the population falling under a specific poverty threshold ("Deprivation"), it is specified under the column "Breakdowns". n.a. stands for "not available". The value of land underlying buildings is available only for a very limited number of countries in the National Accounts, therefore it is not included so as to ensure cross-country comparability.

Annex Table 1.B.2. Selected indicators to describe housing (residential buildings)

Indicator	Measurement	Breakdowns	Frequency and regularity	Source
Housing (residential buildings)	USD at 2015 PPPs, per capita	From the *OECD Wealth Distribution database*: By household principal residence and other real estate properties HORIZONTAL INEQUALITY: By gender, age, education of the head of the household From the *OECD Affordable Housing Database*: HORIZONTAL INEQUALITY: By urban/rural area	For *National Accounts*: Annual (with possible infra-annual updates) *For General Social Surveys or Household surveys:* Annual or every 2-5 years (depending on the country)	*National Accounts*, as available in the OECD *National Accounts Statistics* database: 9B. Balance sheets for non-financial assets, http://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE9B *Household surveys*, as available in the OECD Wealth Distribution database, https://stats.oecd.org/Index.aspx?DataSetCode=WEALTH *General Social Surveys* or *Household surveys,* as available in the OECD *Affordable Housing* database, http://oecd.org/social/affordable-housing-database
Housing (residential buildings)	Growth rate and as a percentage of GDP	n.a.	Annual (with possible infra-annual updates)	*National Accounts*, as available in the OECD *National Accounts Statistics* database: 1. Gross domestic product, http://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE1
Housing affordability	Percentage of household gross adjusted	n.a. (see Housing cost overburden)	Annual (with possible infra-annual updates)	*National Accounts*, as available in the OECD *National Accounts Statistics* database: "5. Final consumption

Indicator	Measurement	Breakdowns	Frequency and regularity	Source
(current expenditures)	disposable income that is available to the household after deducting housing costs			expenditure of households", http://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE5 and in the OECD *How's Life? Well-being* database, https://stats.oecd.org/Index.aspx?DataSetCode=HSL
Housing cost (rent and mortgage) overburden	Percentage of households in the bottom 40% of the income distribution spending more than 40% of their disposable income on housing cost (i.e. mortgage and rent)	DEPRIVATION: it is a deprivation measure HORIZONTAL INEQUALITY: by disposable income quintile; by tenure (Own outright, Owner with mortgage, Rent (private), Rent (subsidised)) and by disability status	Annual or every 2-5 years (depending on the country)	*General Social Surveys or Household surveys*: as available in the OECD *Affordable Housing* database, http://oecd.org/social/affordable-housing-database and in the OECD *How's Life? Well-being* database, https://stats.oecd.org/Index.aspx?DataSetCode=HSL
Overcrowding rate	Percentage of households living in overcrowded conditions (Eurostat definition)	DEPRIVATION: It is a deprivation measure HORIZONTAL INEQUALITY: by (disposable) income quintile; by tenure (Own outright, Owner with mortgage, Rent (private), Rent (subsidised)); by age group for bottom household income quintile and by disability status	Annual or every 2-5 years (depending on the country)	*General Social Surveys* or *Household surveys* as available in the OECD *Affordable Housing* database, http://oecd.org/social/affordable-housing-database and in the OECD *How's Life? Well-being* database, https://stats.oecd.org/Index.aspx?DataSetCode=HSL
Poor households without access to basic sanitary facilities	Share of households below 50% of median equivalised disposable household income without indoor flushing toilet for the sole use of their household	DEPRIVATION: It is a deprivation measure HORIZONTAL INEQUALITY: relative income poor/not poor; by tenure (Own with or without mortgage, Rent (private or subsidised))	Annual or every 2-5 years (depending on the country)	*General Social Surveys* or *Household surveys* as available in the OECD *Affordable Housing* database, http://oecd.org/social/affordable-housing-database and in the OECD *How's Life? Well-being* database, https://stats.oecd.org/Index.aspx?DataSetCode=HSL
Housing distress	Percentage of respondents reporting being either "somewhat concerned" or "very concerned" by not being able to find/maintain adequate housing	Question asked referring to the short term (next year or two) and also to the long term (beyond 10 years) HORIZONTAL INEQUALITY: for young people (short-term)	Available years: 2020 (2022 forthcoming)	*OECD Risks That Matter* survey, *https://www.oecd.org/social/risks-that-matter.htm* as available in the OECD *Affordable Housing* database, http://oecd.org/social/affordable-housing-database

Note*:* If data can be broken down by socio-economic characteristics of the population ("Horizontal inequality") or are available for a subset of the population falling under a specific poverty threshold ("Deprivation"), it is specified under the column "Breakdowns". n.a. stands for "not available". The value of land underlying buildings is available only for a very limited number of countries in the National Accounts; therefore it is not included so as to ensure cross-country comparability.

Annex Table 1.B.3. Selected indicators to describe transport and technical infrastructure (water, energy, waste management and digital infrastructure)

Indicator	Measurement	Breakdowns	Frequency and regularity	Source
Infrastructures				
Infrastructure (Civil engineering works)	USD at 2015 PPPs, per capita	n.a.	Annual (with possible infra-annual updates)	*National Accounts*, as available in the OECD *National Accounts Statistics* database: 9B. Balance sheets for non-financial assets, http://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE9B
Transport				
Please refer to "Infrastructures", as a specific measure of stock for transport infrastructure is not available				
Access to public transport	Percentage of the population having access to a public transport stop within 10 minutes walking distance	Information is available for OECD largest metropolitan areas	Available year: 2022	*Geospatial data*, as available in the OECD *Regions and Cities, City statistics* database, https://stats.oecd.org/Index.aspx?datasetcode=FUA_CITY
Convenient access to public transport	Percentage of population that has convenient access to public transport	Information is available for largest metropolitan areas	Available year: 2020 or latest available year (update of the indicator every three years for each country)	*Geospatial data*, as available in the UN *Global SDG Indicator* Database, indicator 11.2.1, https://unstats.un.org/sdgs/dataportal
Transport effectiveness in providing access to destinations	Ratio	Information is available for European functional urban areas (FUA) only. HORIZONTAL INEQUALITY: By functional urban area (FUA) and components (core centre and commuting area), by mode of transport (driving, walking, cycling and public transport), by destination (hospitals, schools, recreation, food shops, restaurants, green areas) and by time intervals or distance thresholds (15 minutes/4km (1km walking); 30 minutes and 45 minutes)	Available year: 2018	*Geospatial data*, as available in the OECD ITF Urban access framework, https://stats.oecd.org/Index.aspx?DataSetCode=ITF_ACCESS
Technical infrastructure				
Please refer to "Infrastructures", as a specific measure of stock for technical infrastructure is not available				
Access to improved drinking water sources	Percentage of the population with access to improved drinking water sources	HORIZONTAL INEQUALITY: By urban/rural area	Annual	*Population and household censuses and surveys*, as available in the UN *Global SDG Indicator* Database, indicator 6.1.1, https://unstats.un.org/sdgs/dataportal and in the OECD *Green Growth indicators* database, https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH
Connection to public sewerage (primary, secondary,	Percentage of the population connected to public sewerage	n.a	Annual or every 2-5 years (depending on the country)	*International data collections*, as available in the OECD *Green Growth indicators* database, https://stats.oecd.org/Index.aspx?DataS

Indicator	Measurement	Breakdowns	Frequency and regularity	Source
tertiary or other treatment)				etCode=GREEN_GROWTH
Access to electricity	Percentage of the population with access to electricity	HORIZONAL INEQUALITY: By urban/ rural area	Annual	*Population and household censuses and surveys*, as available in the UN *Global SDG Indicator* database, indicator 7.1.1, https://unstats.un.org/sdgs/dataportal
Ability to keep the dwelling warm (energy poverty)	Percentage of households who cannot afford to keep their home adequately warm	Comparable information available for EU-SILC countries only. DEPRIVATION: It is a deprivation measure. HORIZONTAL INEQUALITY: by disposable income quintile; by tenure (Own outright, Owner with mortgage, Rent (private), Rent (subsidised))	Annual	*General Social Surveys or Household surveys* (EU-SILC countries only), as available in the *European Survey on Income and Living Conditions* (EU-SILC), *https://ec.europa.eu/eurostat/web/income-and-living-conditions/data/database* And in the OECD *Affordable Housing* database, http://oecd.org/social/affordable-housing-database

Note*:* If data can be broken down by socio-economic characteristics of the population ("Horizontal inequality") or are available for a subset of the population falling under a specific poverty threshold ("Deprivation"), it is specified under the column "Breakdowns". n.a. stands for "not available". The transport effectiveness ratio is computed as the ratio between the absolute accessibility (the number of destinations reachable within a fixed amount of time) for a given transport mode and proximity to potential destinations (the number of destinations within a certain distance). A ratio of one or more means the transport mode performs well, as the number of accessible destinations through the transport mode is higher than those in proximity. A ratio close to zero means that the mode performs poorly, even in providing access to nearby destinations.

Annex Table 1.B.4. Selected indicators to describe urban design/land use

Indicator	Measurement	Breakdowns	Frequency and regularity	Source
Artificial surfaces	As a percentage of total land	HORIZONTAL INEQUALITY: By large and small subnational region	Available years: 2004, 2015, 2018, 2019 (as part of a regular data collection)	*Geospatial data*, as available in the OECD *Land cover in countries and regions* database, https://stats.oecd.org/Index.aspx?DataSetCode=LAND_COVER_CHANGE
Change in artificial surfaces (to and from)	Percentage change (2004-2019)	HORIZONTAL INEQUALITY: By large and small subnational region	Periods: 2004-2019 and 1992-2019 (as part of a regular data collection)	*Geospatial data*, as available in the OECD Land cover change in countries and regions database, https://stats.oecd.org/Index.aspx?DataSetCode=LAND_COVER_CHANGE
Urban built-up areas	Sqm per capita	Information available for Functional urban areas (FUA). HORIZONTAL INEQUALITY: By large and small subnational region, by functional urban area (FUA) and components (core centre and commuting area) and by main purpose (residential, commercial)	Available year: 2021	*Geospatial data*, as available in the OECD *Regions and Cities, City statistics* database, https://stats.oecd.org/Index.aspx?datasetcode=FUA_CITY
Average urban building height	Metres	Information available for Functional urban areas (FUA). HORIZONTAL INEQUALITY: By large and small subnational	Available year: 2020 (annual update)	*Geospatial data*, as available in the OECD *Regions and Cities, City statistics* database,

		region, by functional urban area (FUA) and components (core centre and commuting area)		https://stats.oecd.org/Index.aspx?datasetcode=FUA_CITY
Urban green areas	As a percentage of the core centre of the functional urban area and in sqm per capita	Information available for Functional urban areas (FUA). HORIZONTAL INEQUALITY: By large and small subnational region	Available year: 2020	*Geospatial data,* as available in the OECD *Regions and Cities, City statistics* database, https://stats.oecd.org/Index.aspx?datasetcode=FUA_CITY
Open space for public use	Percentage of built-up area of cities that is open space for public use for all	n.a.	Available year: 2020 or latest available year (update of the indicator every three years for each country)	*Geospatial data and ground assessments,* as available in the UN *Global SDG Indicator* database, indicator 11.7.1, https://unstats.un.org/sdgs/dataportal
Access to recreational green space in urban areas	Percentage of the urban population with access to recreational green space within 5 minutes walking distance from their home	Information available for European urban areas only	Available year: 2012 and 2018	*Geospatial data,* as available in the OECD *How's Life? Well-Being* database, https://stats.oecd.org/Index.aspx?DataSetCode=HSL
Proximity to services	Total number of services within a given distance or time	Information available for European functional urban areas (FUA) only. HORIZONTAL INEQUALITY: By FUA and components (core centre and commuting area), by mode of transport (driving, walking, cycling and public transport), by destination (hospitals, schools, recreation, food shops, restaurants, green areas) and by time intervals or distance thresholds (15 minutes/4km (1km walking); 30 minutes and 45 minutes)	Available year: 2018	*Geospatial data,* as available in the OECD ITF Urban access framework, https://stats.oecd.org/Index.aspx?DataSetCode=ITF_ACCESS

Note*:* If data can be broken down by socio-economic characteristics of the population ("Horizontal inequality") or are available for a subset of the population falling under a specific poverty threshold ("Deprivation"), it is specified under the column "Breakdowns". n.a. stands for "not available". Proximity to services is assessed for functional urban areas and components (core centre and commuting area), by mode of transport (driving, walking, cycling and public transport), by destination (hospitals, schools, recreation, food shops, restaurants, green areas) and by time intervals or distance thresholds (15 minutes/4km (1km walking); 30 minutes and 45 minutes). Functional urban areas (FUAs), as defined by the OECD and the EU, are composed of a city and its commuting zone. This definition overcomes the purely administrative perimeter to encompass the economic and functional extent of cities based on people's daily movements (OECD, 2012[75]).

Notes

[1] Information collected and produced by National and International Statistical Institutes abide by international data quality standards, such as the UN Fundamental Principles of Official Statistics (https://unstats.un.org/unsd/dnss/gp/fundprinciples.aspx) and more subject-specific international standards and classifications.

[2] The selected air pollutants are CO_2, CH_4 (methane), N_2O (nitrous oxide), HFCs (hydrofluorocarbons), PFCs (perfluorocarbons), (SF_6 +NF3) (sulphur hexafluoride and nitrogen trifluoride), SO_x (sulphur oxides, NO_x (nitrogen oxides), CO (carbon monoxide), NMVOC (non-methane volatile organic compounds), PM2.5 (particulates less than 2.5 μm), PM10 (particulates less than 10 μm) and NH3 (ammonia).

[3] The Sustainable Development Goals that refer to components of the built environment are Goal 6 ("Ensure availability and sustainable management of water and sanitation for all"), Goal 7 ("Ensure access to affordable, reliable, sustainable and modern energy for all"), Goal 9 ("Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation") and Goal 11 ("Make cities and human settlements inclusive, safe, resilient and sustainable).

2. The state of the built environment and how it impacts well-being and sustainability

The built environment has multiple impacts on people's well-being and sustainability: from the satisfaction of basic human needs to the provision of space for various activities. The built environment can also undermine people's current and future well-being by generating significant costs or creating pressures on the environment and ecosystems. A poor-quality built environment (i.e. housing, transport, infrastructure, urban design/land use) may also aggravate the ingrained inequalities between population groups in the society. This chapter presents the main inter-relationships between the built environment, well-being and sustainability and provides an overview of its current state in OECD countries, drawing from available internationally comparable data.

2.1. Using a well-being lens to examine the built environment

The built environment impacts well-being in several ways. It satisfies basic human needs (e.g. providing shelter), while giving access to amenities and services that support several dimensions of people's well-being (e.g. health, education, culture and nature). It provides space for various activities such as working, studying and caring. When carefully planned, it can help people access opportunities for life-enhancing activities such as socialising and education. On the other hand, the built environment can undermine people's current and future well-being by generating significant costs or creating pressures on the environment and ecosystems (OECD, 2019[1]). When the overall built environment is degraded or has poor functional or aesthetic quality, it can significantly compromise people's quality of life, particularly through its impact on safety, as well as on physical and mental health. The built environment may also aggravate the ingrained inequalities between population groups in a society. For example, workers without the means to commute longer distances will have fewer employment opportunities (Seltzer and Wadsworth, 2023[2]). Furthermore, the built environment affects well-being through numerous unexpected channels. A study in the US showed that congested highways influenced people to make less healthy food store choices due to time lost (Bencsik, Lusher and Taylor, 2023[3]). Hence, analysing the built environment through a well-being lens leads to a multi-dimensional perspective that can consider both the benefits and the challenges of the built environment that bear on people's well-being, which can assist policy makers to be more cognizant of its mixed impact on people's lives when making decisions about the built environment and evaluating its performance.

This chapter explores the inter-relationships between the built environment, well-being and sustainability. The analysis is conducted in terms of three broad factors of current well-being (i.e. material conditions, quality of life factors, community relations) as well as four types of capital (i.e. economic, human, natural and social capital) that are related to sustainability. Material conditions are grouped with economic capital; quality of life factors are examined with human and natural capital; and community relations are explored along with social capital. The built environment and its components are examined with a well-being lens in terms of quantity and quality, based on both a review of existing literature and an analysis of internationally comparable data (available as of March 2023). Before going further, a snapshot of the current state of the overall built environment in OECD countries (Table 2.1) is presented below, with more detailed illustrations provided later in the chapter. Definitions and sources for each indicator are available in Annex 2.A.

Table 2.1. At a glance: The built environment in OECD countries

Selected indicators to assess the quantity and quality of the built environment

Component	Quantity/ Quality	Indicator and unit of measurement	OECD average levels and country range
Overall built environment	*Quantity*	**Built environment (buildings and civil engineering works) stock** USD per capita at 2015 PPPs	USD 111 273 (Range: USD 154 317)
		Investment in the built environment (buildings and civil engineering works) *% growth rate or percentage of GDP	11.5% over 2011-2021 (12.3% of GDP in 2021) (Range: 13 pp over 2011-2021)
Housing	*Quantity*	**Housing (residential buildings) stock** USD per capita at 2015 PPPs	USD 53 816 (Range: USD 76 991)
		Investment in housing (residential buildings) *% growth rate	24.4% over 2011-2021 (Range: 267 pp over 2011-2021)
	Quality	**Housing affordability (current expenditures)** **% of available household disposable income after deducting housing current expenditures*	79.7% (Range: 14 pp)
		Housing cost (rent and mortgage) overburden	18.4%

Component	Quantity/ Quality	Indicator and unit of measurement	OECD average levels and country range
		***% of households in the bottom 40% of the income distribution spending more than 40% of their disposable income on housing cost**	(Range: 39 pp)
		Overcrowding rate **% of households living in overcrowded conditions*	11.2% (Range: 34 pp)
		Poor households lacking access to basic sanitary facilities (toilets) **% of households below 50% of median equivalised disposable household income without indoor flushing toilet*	5.3% (Range: 53 pp)
		Housing distress **% of respondents somewhat or very concerned by not being able to find/maintain adequate housing*	44% (short-term)/ 51% (long-term) (Range: 45 pp (short-term) / 48 pp (long-term))
Infrastructure	Quantity	**Infrastructure (civil engineering works) stock** USD per capita at 2015 PPPs	USD 23 229 (Range: USD 61 000)
Transport	*Quality*	**Convenient access to public transport** **% of population in large metro areas with convenient access to public transport*	83% (Range: 71 pp)
		Access to various public transport modes **% of population in large urban areas with a public transport option in 10 mins*	84% (bus); 33% (metro or tram) (Range: 73 pp (bus); 80 pp (metro or tram))
		Transport effectiveness in providing access to destinations *ratio (above 1: transport is effective, below 1: transport has poor performance)	0.9 (Range: 2)
Technical Infrastructure	*Quality*	**Access to improved drinking water sources** **% of population with access to improved drinking water*	95% (Range: 57 pp)
		Access to public sewerage (primary, secondary, tertiary or other treatment) **% of population connected to public sewerage*	90% (Range: 74 pp)
		Access to electricity **% of population with access to electricity*	100% (Range: 1 pp)
		Ability to keep the dwelling warm **% of households who cannot afford to keep their home adequately warm (energy poverty)*	12.5% (Range: 38 pp)
Urban design/land use	*Quantity*	**Artificial surfaces** **% of total land*	1% (Range: 11 pp)
		Change in artificial surfaces (to and from) **% of land change compared to 2004*	27.4% change to artificial surfaces (2004-2019) (Range: 115 pp)
		Urban built-up areas *sqm per capita	292 sqm (Range: 601 sqm)
		Average urban building height *metres	7 metres (Range: 9 metres)
		Urban green areas **% of functional urban areas covered by vegetation*	46% (Range: 55 pp)
		Open space for public use **% of built-up area of cities which is open for public use*	65% (Range: 85 pp)
	Quality	**Access to recreational green space in urban areas** **% of urban population with access within 10 mins walking distance from home*	69% (Range: 85 pp)
		Proximity to services **of services within 15 minutes walking distance (10 km) in European capital cities*	57 restaurants, 28 food shops, 13 schools, 5 recreation destinations, less than one hospital or one urban green space

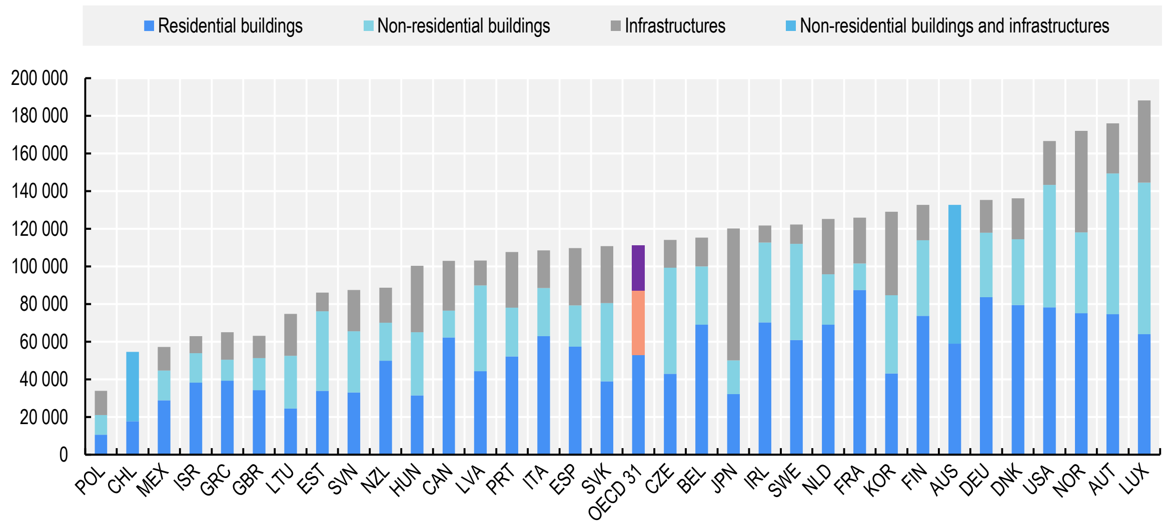
Note: Country range is a descriptive measure of variability across OECD countries. It is calculated as the difference between the highest and lowest available country value in the OECD. A detailed description for each indicator is presented in Annex 2.A. “pp” stands for percentage points.

The most comprehensive, internationally comparable, monetary market estimation of the built environment can be sourced from the National Accounts. The National Accounts are an internationally coherent, consistent and integrated set of macroeconomic accounts and balance sheets that measure economic activity. In the National Accounts, data are available for dwellings (residential buildings), non-residential buildings and civil engineering works (infrastructure).[1] There exists no single value that summarises the quantity (and the quality) of the overall built environment, however. Despite being the most comprehensive internationally comparable measure of the built environment, the National Accounts' estimation is limited to its monetary market value. It does not account for some quality features of the built environment (e.g. its accessibility). It also does not fully capture the value for well-being or the hidden costs (e.g. pressures on the environment) associated with construction and maintenance of the built environment. Nevertheless, quantifying components of the built environment in monetary market value can help picture its overall state across OECD countries in terms of both stock and investment, laying the ground for further analysis on its inter-relationships, as well as the tensions and trade-offs, with different dimensions of well-being and sustainability.

The stock value of the built environment in terms of USD per capita ranges widely among OECD countries: from almost USD 34 000 per capita in Poland to over USD 188 000 per capita in Luxembourg (Figure 2.1). Most countries, however, are clustered around the OECD average value of about USD 111 000 per capita. On average, the monetary market stock value of residential buildings generally constitutes most of the built environment stock in OECD countries (almost 50%), followed by non-residential buildings and infrastructure. Together, residential and non-residential buildings account for 80% of the stock value of the built environment in OECD countries, on average. Japan is the only country where infrastructure composes more than 50% of the total stock of the built environment, whereas in France the stock value of residential buildings amounts to almost 70% of the total monetary market stock value of the built environment, the highest in OECD countries. Here, it is again important to note that a larger stock or share of a certain component of the built environment may not necessarily be linked to a higher level of people's well-being or society's sustainability. Indicators related to the stock (monetary) value of the built environment can be used as a reference, to compare relative sizes/shares between OECD countries and change over time.

Figure 2.1. The monetary market average stock value of the built environment in OECD countries ranges from USD 34 000 to USD 188 000 per capita

USD per capita at 2015 PPPs, 2021 or latest available year



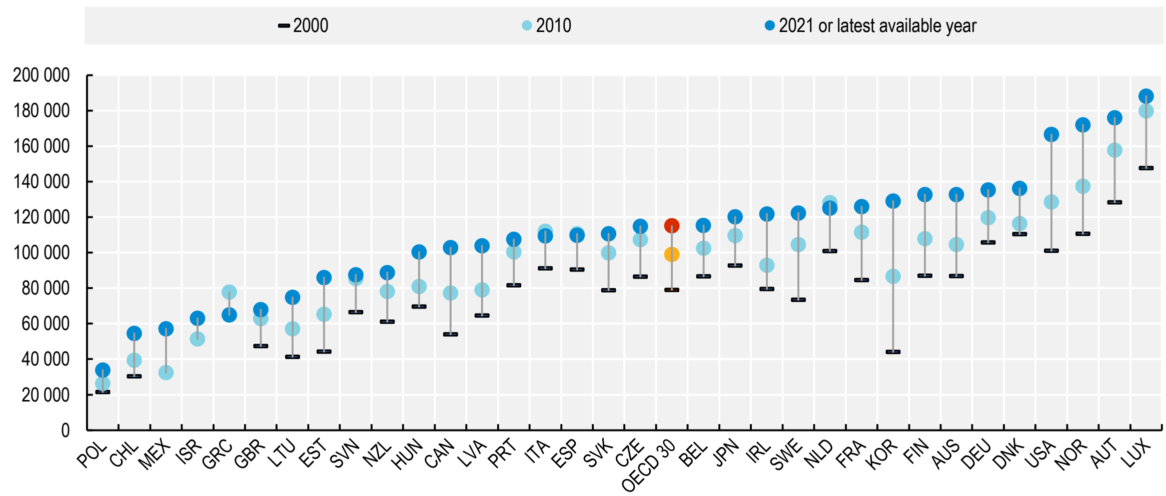
Note: Data refer to 2021 for Australia, Belgium, Chile, the Czech Republic, Denmark, France, Finland, Korea and the United States. Data refer to 2019 for Estonia, Greece, Latvia, Lithuania, Norway, Poland and Sweden. Data refer to 2017 for New Zealand. Data refer to 2020 for all the other countries. The OECD average excludes Australia, Chile, Colombia, Costa Rica, Iceland, Switzerland, Türkiye, due to lack of data. Data for non-residential buildings and infrastructures are available only at aggregate level for Australia and Chile.
Source: OECD Calculations based on the OECD *National Accounts Statistics* (database): 9B. Balance sheets for non-financial assets, http://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE9B.

StatLink https://stat.link/qkgbl9

The monetary market value of the built environment stock has evolved to differing degrees across OECD countries in the last two decades (Figure 2.2). On average, the real stock value of the built environment stood above USD 111 000 per capita in 2021 for OECD countries, up from about USD 80 000 per capita in 2000 and around USD 100 000 in 2010. With the exception of Greece, where the real stock value of the built environment decreased from 2010 to 2021, most countries have experienced real growth in the total monetary market value of the built environment over the last two decades. Korea marked the largest leap, from around USD 44 000 per capita in 2000 to almost USD 130 000 in 2021. Luxembourg, Austria, Norway and the United States showed the highest levels for the built environment in 2021 or the latest available year, with the stock amounting to over USD 160 000 per capita. Changes in the monetary market stock value of the built environment were mainly driven by changes in the values of residential buildings. However, a comprehensive repository of internationally granular comparable data on the number, dimension and value of buildings and infrastructure is not available, therefore it is not possible to assess whether the growth has been driven by the increasing number of assets or by their increasing value, or by both. Detailed statistics on the value of residential buildings and land could help identify the driving elements that cause macroeconomic imbalances related to households and help understanding the causes of households' vulnerability in times of financial instability (OECD, 2015[4]).

Figure 2.2. The monetary market stock value of the built environment has evolved to differing degrees across OECD countries in the last 20 years

USD per capita at 2015 PPPs



Note*:* The OECD average excludes Colombia, Costa Rica, Greece, Iceland, Israel, Mexico, Switzerland and Türkiye, due to lack of data or breaks in the series.

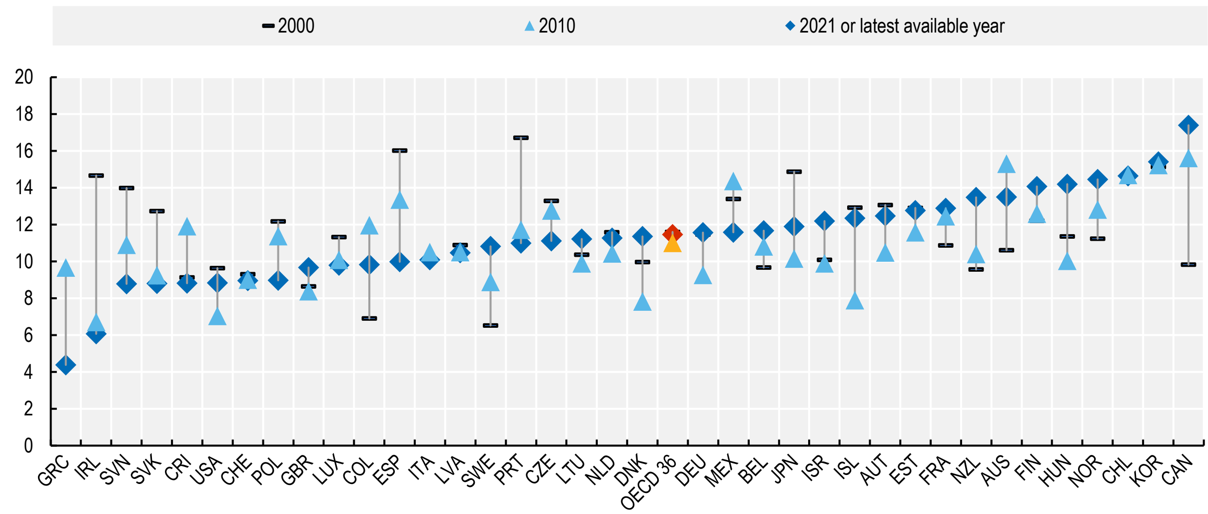
Source: OECD Calculations based on the OECD *National Accounts Statistics* (database): 9B. Balance sheets for non-financial assets, http://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE9B.

StatLink https://stat.link/zqs7bo

As a share of Gross Domestic Product (GDP), total (public and private) annual investment in the built environment stands at 12% on average in the OECD. It ranges from below 7% of the GDP in Greece and Ireland to above 15% of the GDP in Korea and Canada. In the last 20 years, investment in the built environment as a share of GDP has fallen the most in Ireland (more than 8 percentage points), Spain and Portugal (6 percentage points), and increased the most in Canada (almost 8 percentage points) and New Zealand (almost 4 percentage points). Comparable data before 2010 are not available for Greece, but since 2010, its investment as a share of GDP has dropped by more than 5 percentage points, the highest drop across OECD countries in the last 10 years (Figure 2.3). In absolute terms, in the OECD, on average, investment in the built environment cumulatively grew by 12% in the last ten-year period, compared to a cumulative drop of 9% over the 2000-10 period. Investment made in the built environment during the 2011-21 period was notably high in Iceland, with a cumulative growth above 120%. Investment in the built environment is crucial in maintaining its current state and in improving its quality; for example, increasing the housing supply may support affordability objectives.

Figure 2.3. Annual investment in the built environment ranges from below 7% to above 15% of GDP in OECD countries, and has cumulatively grown over the last 10 years

Annual investment in the built environment as a percentage of GDP



Note: The OECD average excludes Greece and Türkiye, due to lack of data or breaks in the series.
Source: OECD Calculations based on the OECD *National Accounts Statistics* (database): 1. Gross domestic product, http://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE1.

StatLink https://stat.link/die9nf

Both the monetary stock value and the size of investment in the overall built environment are shown to have grown in most OECD countries over the last ten years. The following sections will examine the inter-relationship between key components of the built environment and well-being, while also presenting some findings on the state of the quality of the built environment.

2.2. Well-being and the built environment: Housing

2.2.1. The inter-relationship between well-being and housing

Material conditions and economic capital

Wealth and consumption

Housing is important for the financial security of households. Housing is the most widely owned asset in households' wealth (OECD, 2021[5]), while property debt is the largest liability in households' portfolios (Causa, Woloszko and Leite, 2019[6]). Housing costs typically take up a significant portion of household expenditure, particularly for low-income households. Average current housing expenditure for rent (actual and imputed, in the case of homeowners) and maintenance accounts for around 20% of household disposable income in OECD countries. It is the single-largest household expenditure item, accounting for around 22% of final household consumption expenditure, followed by food and non-alcoholic beverages (around 14%) and expenditure on transport (around 13%) (OECD, 2021[7]). On the other hand, job losses and reduced earnings and working hours threatened people's ability to meet housing costs during the pandemic, exacerbating existing socio-economic divides and longstanding housing challenges (OECD, 2021[8]). Inequalities in housing affordability were particularly pronounced in urban areas and among low-income households, renters in the private market and youth. In some countries, youth are increasingly living with their parents, while seeking their way in a challenging labour market. Many OECD countries introduced emergency support to avoid some of the worst effects of the crisis on housing, with mortgage forbearance and eviction bans among the most common measures (OECD, 2021[9]).

Housing is the main source of wealth for low-income households. The relative importance of the main residence varies across the wealth distribution, being more important for lower-wealth households. Accounting for an average 51% of households' gross assets (i.e. not deducting liabilities), the main residence is the physical asset that, on average, constitutes the core of their wealth (OECD, 2021[5]). The main residence accounts for 61% of gross assets for the bottom 40% of households, while this share is only 34% for the top 10%. Lower-wealth households own a smaller share of financial wealth, compared to wealthier households, making them more vulnerable to financial shocks, as financial assets are more easily liquidated than real estate and can be a source of resilience in the short term. Also, inequality in net wealth is higher than in net housing wealth, with the highest gap at the top of the wealth distribution, reflecting a higher share of non-housing sources of wealth, such as business and financial wealth, at the top of the distribution. Countries with low homeownership exhibit greater wealth inequality, even when income inequality is low (Causa, Woloszko and Leite, 2019[6]).

Property debt is the largest liability in households' portfolios, in particular for homeowners at the bottom of the wealth distribution and young homeowners. The average share of liabilities in households' gross wealth is 12%, 10% of which is property debt and 2% consumer debt. In terms of the distribution, low-wealth households have much higher *relative* debt and property debt than wealthier households: liabilities account for 56% (40% is property debt and 16% consumer debt) of gross wealth among the bottom 40% of households but only 6% (5% is property debt and 1% consumer debt) among the top 10% (OECD, 2021[5]).

There is great variation in the mix of housing tenures across OECD countries, with different implications for financial security of homeowners and tenants. Housing tenure mix is defined in terms of homeownership rates and the relative proportion of outright owners and owners with mortgages. With an OECD average at around 60%, homeownership rates vary from around 80% in the Slovak Republic, Hungary and Spain to around 40% in Germany, Denmark and Austria. Cross-country differences partly reflect historical legacies (e.g. high homeownership rates in Eastern European countries, as a consequence of mass privatisation at submarket prices to sitting tenants) and differences in policies and institutions that affect housing demand and supply (such as regulations of mortgage markets and rental markets, the provision of social housing, taxation and land-use policies). Differences in households' socio-demographic characteristics also contribute to the variation in the housing tenure mix, notably the structure of households in terms of age and size. For example, retirement age household members and larger households are more likely to be owners, whereas younger household members and single person households are more likely to be renters (Causa, Woloszko and Leite, 2019[6]). While no universal *appropriate* housing tenure mix exists, the implications of policies to foster well-being may differ for homeowners and tenants (e.g. rental market restrictions, landlord-tenant regulations) (OECD, 2021[10]).

Work and job quality

Housing's role as a crucial determinant of people's well-being was highlighted during the COVID-19 pandemic. With the enforcement of lockdowns and physical distance measures, work and school activities moved online whenever possible, forcing people to reorganise their housing space and activities. The availability of the option to work from home, however, differed for different population groups and places. For example, in OECD countries, it became mainstream for many high-skilled workers, but remained marginal in many low-skilled occupations (OECD, 2021[8]). The actual uptake of remote work also varied widely across European regions, the share of remote workers increased by 70% in rural areas but it almost tripled in cities between 2019 and 2020 (OECD, 2022[11]).

Economic capital

At aggregate level, housing represents a long-term resource for the sustainability of well-being. The monetary value of housing accounts for almost 50% of the value of the overall built environment. Not only is housing an important part of household wealth, but it also plays a crucial role in countries' economic capital. For instance, taking a mortgage provides an opportunity for households to accumulate wealth and for the country to boost the economy in the short term. However, when too high and widespread, it can also expose the most vulnerable households and become a risk for the whole economy. While indebtedness does not necessarily imply financial distress, household debt ratios and mortgage cycles are closely linked to house prices, impacting on economic resilience (OECD, 2017[12]). OECD countries that have seen the steepest rise in house prices since the 2007 financial crisis were those with the strongest increase in household debt (OECD, 2017[12]).

Quality of life, human capital and natural capital

Physical and mental health

Poor housing conditions are associated with poor physical health conditions. There is evidence that indoor damp, mould, cold and household crowding are strongly associated with adverse health outcomes (World Health Organization (WHO), 2018[13]; OECD, 2021[14]), even after controlling for other confounding factors, like income (Riggs et al., 2021[15]). Living in a cold, damp home is likely to exacerbate or induce respiratory and cardiovascular conditions (Centre for Aging Better, 2020[16]). Overcrowding is linked to risks of respiratory (and other) infections in children (Krieger and Higgins, 2002[17]). Households living in overcrowded conditions, unhealthy house conditions (cold, damp house), or lacking or with poor basic sanitation were also more at risk to contract COVID-19 (OECD, 2021[14]). Young people and low-income households are the most at risk, as they are more likely to live in poor-quality dwellings, be overburdened by housing costs or face problems with housing affordability (OECD, 2021[14]). The relationship between housing and health has been internationally recognised, and the WHO *Housing and health guidelines* (World Health Organization (WHO), 2018[13]) provide practical recommendations to reduce the health burden due to unsafe and substandard housing. Based on systematic reviews, the guidelines provide recommendations relevant to inadequate living space (crowding), low and high indoor temperatures, injury hazards in the home, and the accessibility of housing for people with functional impairments.

As for mental health, there is a two-way relationship with housing. Housing costs and unstable housing tenure can undermine mental health, whereas satisfaction with housing conditions and home ownership usually contribute to higher well-being. Housing unaffordability, debt, foreclosure and instability are related to levels of stress and the incidence of mental health conditions (Taylor, Pevalin and Todd, 2007[18]; Robinson and Adams, 2008[19]; Alley et al., 2011[20]; McLaughlin et al., 2011[21]). The stress of homelessness can worsen mental health outcomes, and mental health conditions can increase the likelihood of becoming homeless (Nilsson, Nordentoft and Hjorthøj, 2019[22]; Moschion and van Ours, 2022[23]; Liu et al., 2021[24]; OECD, 2015[25]; Hammen et al., 2009[26]; Zhang et al., 2015[27]; OECD, 2023[28]). Housing conditions such as overcrowding and poor housing quality are also significant drivers of severe mental health conditions (Keller et al., 2022[29]; Morganti et al., 2022[30]; OECD, 2023[28]). Poor quality housing (in terms of structural condition, maintenance, damp, rot, mould) is related to poor psychological well-being (stress, anxiety and low life satisfaction) (Evans, Wells and Moch, 2003[31]; Fujiwara, n.d.[32]). On the other hand, better quality housing can improve mental health outcomes and life satisfaction (Cattaneo et al., 2009[33]; Boarini et al., 2012[34]). Dwelling characteristics, such as the dwelling's plan, design, size, the adequacy of interior space, construction quality, amenities and price, are all linked to housing satisfaction (Wang and Wang, 2019[35]; Nguyen et al., 2017[36]; Aigbavboa and Thwala, 2016[37]). Housing satisfaction is positively associated with life satisfaction, happiness and eudaimonia (Mouratidis, 2020[38]; Clapham, Foye and Christian, 2017[39]; Foye, 2016[40]; Tsai, Mares and Rosenheck, 2011[41]). Home ownership is also associated with higher life satisfaction, higher levels of resilience to financial shocks and social prestige (Ruprah, 2010[42]; Mason et al., 2013[43]; Zumbro, 2013[44]). The quality and aesthetics of housing and the local neighbourhood also promotes positive mental health (Bond et al., 2012[45]).

Environmental quality and natural capital

Indoor air pollution is hazardous for human health and exacerbates outdoor air pollution. Indoor air pollution in the house can occur due to heating, cooking, smoking, cleaning and even to furnishings or building materials, which are important indoor sources of gaseous pollutants and particles (He et al., 2004[46]; Isaxon et al., 2015[47]). Pollution levels are measured in terms of the concentrations of particulate matter (PM10 or PM2.5) in houses, which are dangerous for human health (OECD, 2019[1]). They are also directly correlated with carbon emissions, through the residential combustion of wood and the impact on air quality at the local and regional levels, especially during the winter (heating) period (Guerreiro et al., 2016[48]).

The housing sector accounted for 23% of total CO_2 emissions in the OECD in 2020 (Hoeller et al., 2023[49]). The residential sector's emissions emanated from space and water heating, cooling, ventilation, lighting and the use of electrical appliances. The construction of residential buildings contributed an additional 6% to total CO_2 emissions, largely reflecting the heavy use of concrete and steel in current building technologies. Carbon emissions are also correlated with the residential combustion of wood and have an impact on air quality at the local and regional scales, especially during the winter (heating) period (Guerreiro et al., 2016[48]). Since 2000, the OECD-wide total CO_2 emissions of the residential sector have fallen by 17%, despite an increase in the population and number of dwellings. This reduction is being driven by improvements in the energy efficiency of homes and appliances and the reduction of the carbon content of the energy supply in many countries. The OECD average, however, hides a stark variation across countries: emissions have fallen by more than 50% in Denmark, Estonia, Lithuania and Sweden, while they have risen by more than 50% in Chile, Colombia and Türkiye (Hoeller et al., 2023[49]).

Greenhouse gas (GHG) emissions directly generated by buildings and dwellings are relatively well understood, but data are often not sufficiently granular. GHG emissions comprise both direct emissions (i.e. burning gas/oil for heating) and indirect emissions (i.e. from electricity consumption). However, one challenge is the limited granularity of the available information: data on GHG emissions are typically available only at the national scale, using simple averages, hence, there is limited understanding of GHG emissions from the residential sector at the neighbourhood and city levels, or across territories.[2] Additionally, even where available, such data are not always disaggregated according to households' characteristics, such as household type, housing tenure and dwelling type (OECD, 2019[1]), although (Hargreaves et al., 2013[50]) found that household characteristics such as the number of bedrooms, the number of occupants and the property type were relevant for determining energy use in the home. Securing sufficiently granular data may help to design a more effective roadmap for reducing GHG emissions in the housing sector.

2.2.2. The state of housing in OECD countries

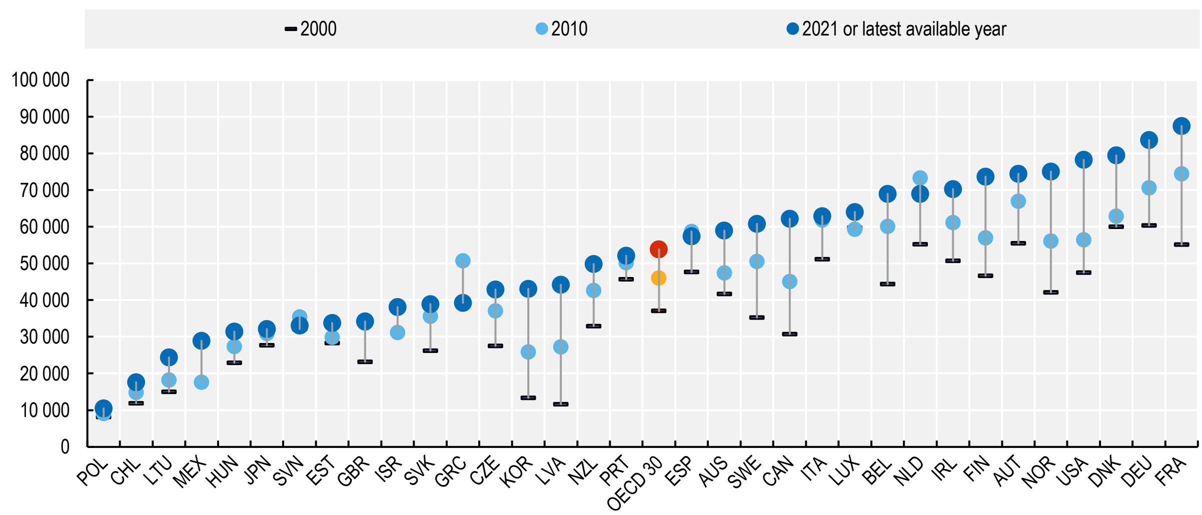
Housing quantity

In 2021, the OECD average real monetary market stock value of residential buildings per person was close to USD 54 000 (Figure 2.4). The real monetary market stock value of residential buildings per capita is the highest (over USD 80 000) in Germany and France, and the lowest (below USD 20 000) in Poland and Chile. Between 2000 and 2021, the OECD average real monetary market value of residential buildings cumulatively increased by nearly 45%, with a 17% cumulative increase between 2010 and 2021 (up from around USD 37 000 per capita in 2000 and from USD 46 000 per capita in 2010). The largest increases occurred in Latvia and Korea, where the cumulative real increase since 2000 was more than

200%, and more than 60% since 2010, with the largest drop examined in Greece (-23% since 2010). Again, the monetary stock value of housing should be interpreted with caution; for example, high values could signal an increase in housing prices or an increase in housing supply, or both.

Figure 2.4. The real monetary market stock value of residential buildings has cumulatively increased by nearly 45% since 2000 in OECD countries, on average

USD per capita at 2015 PPPs



Note: The latest available year is 2021 for Australia, Belgium, Canada, Chile, the Czech Republic, Denmark, France, Finland, Korea and the United States; 2019 for Estonia, Greece, Latvia, Lithuania, Norway, Poland and Sweden; 2017 for New Zealand, and 2020 for all the other countries. The OECD average excludes Colombia, Costa Rica, Greece, Iceland, Israel, Mexico, Switzerland and Türkiye, due to lack of data or breaks in the series.
Source: OECD Calculations based on the OECD *National Accounts Statistics* (database): 9B. Balance sheets for non-financial assets, http://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE9B.

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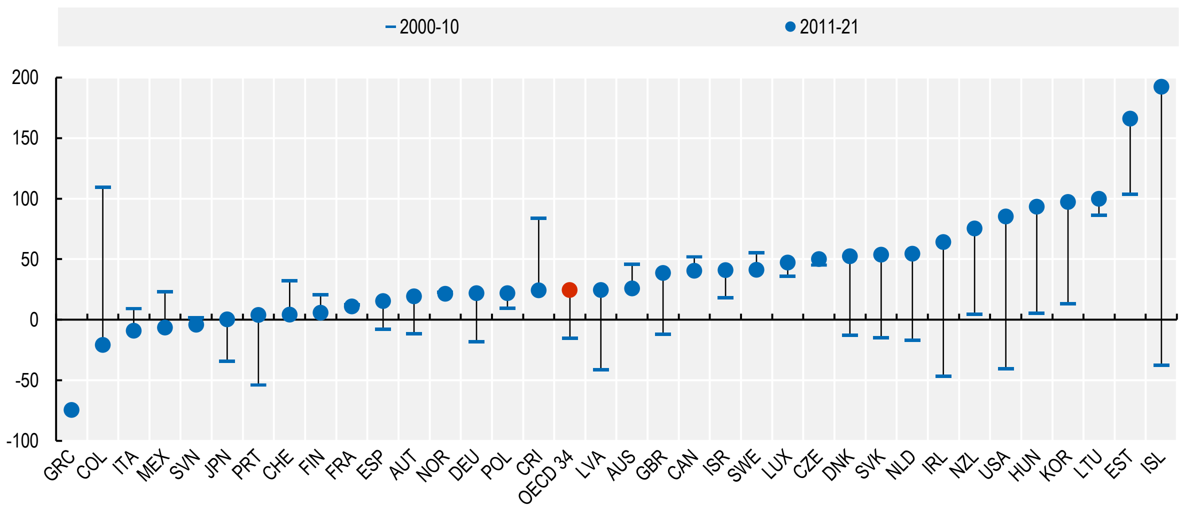
In terms of total public and private investment in residential buildings in the OECD area, on average, this cumulatively grew by 24.4% over the last decade (2011-21) (Figure 2.5). It is up from -15.4% in the previous decade (2000-10), a reduction that was an outcome of the global financial crisis, which itself originated in the housing sector. The size of investment in residential buildings varies more widely than for the overall built environment across OECD countries, from a cumulative negative investment in Greece and Colombia to a cumulative increase of 100% or more in Lithuania, Estonia and Iceland over the 2011-21 period.

Figure 2.5. OECD average investment in residential buildings cumulatively grew by 24.4% over the last decade (2011-21), up from -15.4% in the previous decade (2000-10)

Cumulative growth, percentage



Note: The latest available year is 2021, except for Colombia, Japan and New Zealand (2020). The OECD average excludes Belgium, Chile, Greece and Türkiye, due to lack of data or breaks in the series. Cumulative growth is calculated on investment in constant prices and constant PPPs.
Source: OECD Calculations based on the OECD *National Accounts Statistics* (database): 1. Gross domestic product, http://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE1.

StatLink https://stat.link/hyflm9

Housing quality

Housing quality is a multidimensional concept, profoundly impacting people's lives and well-being. This section explores some of the main quality features of housing, such as affordability, the availability of indoor space and the presence of basic facilities, as well as people's concern for finding and maintaining adequate housing. *(For a detailed description of the indicators included, please refer to Annex 2.A.)*

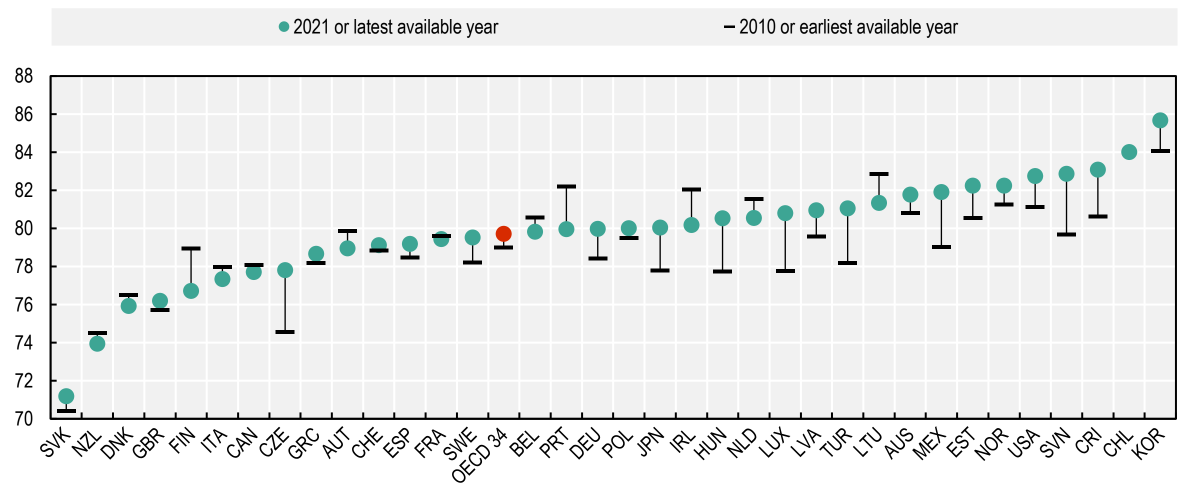
Housing affordability

Ensuring housing affordability is closely intertwined with securing an adequate stock of housing. Affordability is a relative concept, as it depends on the amount of economic resources one has and also on how much housing costs weigh on them. When a high share of disposable income is spent on housing costs, this reduces what households can afford to consume and save to support other aspects of their well-being (OECD, 2020[51]). The housing affordability indicator presented below accounts for housing current expenditures, which include rent (also imputed rentals for housing held by owner-occupiers) and maintenance (expenditure on the repair of the dwelling, including miscellaneous services, water supply, electricity, gas and other fuels, as well as expenditure on furniture, furnishings, household equipment and goods and services for routine home maintenance), but does not include mortgage payments or upfront costs such as a deposit. It should be noted that some concerns have been raised about how well this indicator captures different country contexts. For instance, this indicator does not directly capture the upfront costs (e.g. deposit) or mortgage serviceability costs of housing. In Australia, the time required to save for a 20% deposit worsened since the start of the pandemic (Commonwealth of Australia, 2022[52]).

In 2021 or the latest available year, households in 34 OECD countries had, on average, 80% of their disposable income available after accounting for their housing current expenditures, slightly more than in 2010 (Figure 2.6). This share is the lowest in New Zealand and the Slovak Republic, where it fell below 75%, and the highest in Costa Rica, Chile and Korea, where it exceeded 83%. The average small improvement in the OECD masks diverging trends across member countries: since 2010, the Czech Republic, Luxembourg and Slovenia gained 3 percentage points or more, while Finland and Portugal lost more than 2 percentage points.

Figure 2.6. The average OECD household has 80% of disposable income left after housing costs

Percentage of household gross adjusted disposable income remaining after deductions for housing rent and maintenance



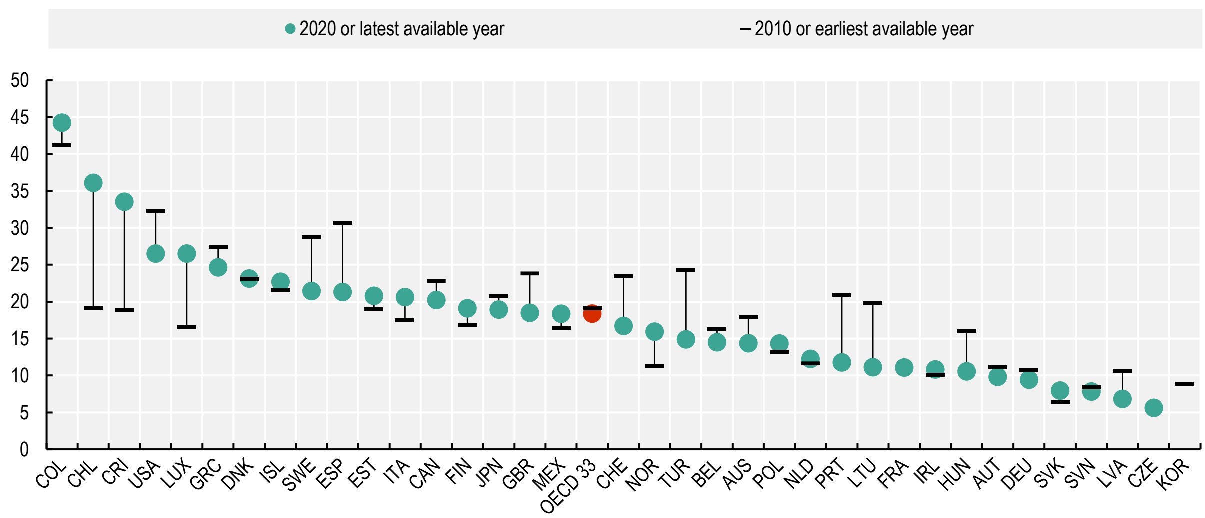
Note: The latest available year is 2020 for Chile, Costa Rica, Japan, Mexico, New Zealand, Switzerland, and 2017 for Türkiye. The OECD average excludes Chile, Colombia, Iceland and Israel due to a lack of data.
Source: OECD calculations based on "5. Final consumption expenditure of households" and "14A. Non-financial accounts by sectors", OECD *National Accounts Statistics* (database), http://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE5 , http://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE14A, as available from the *OECD How's Life? Well-being* (database), https://stats.oecd.org/Index.aspx?DataSetCode=HSL.

StatLink https://stat.link/mi4u8l

When taking into account rent and mortgage costs, lower income households bear the larger burden of housing costs: 18.4% of the households in the bottom 40% of the income distribution spent more than 40% of their disposable income on rent and mortgage costs in 2020 or the latest available year (Figure 2.7). Overburden rates are highest (above 30%) in Colombia, Chile and Costa Rica and lowest in the Czech Republic, Latvia, Slovenia and the Slovak Republic (below 9%).

Figure 2.7. Almost 20% of lower income households in OECD countries spend more than 40% of their income on housing (i.e. rent and mortgage costs)

Percentage of households in the bottom 40% of the income distribution spending more than 40% of their disposable income on total housing costs



Note: The latest available year is 2019 for Germany and Italy, 2018 for Canada and Iceland, and 2017 for Chile. The earliest available year is 2011 for Chile and Costa Rica, 2012 for Belgium, Colombia, Hungary and Korea. The OECD average excludes the Czech Republic, France, Israel, Korea and New Zealand, due to lack of data.
Source: OECD Affordable Housing Database, http://www.oecd.org/social/affordable-housing-database.htm.

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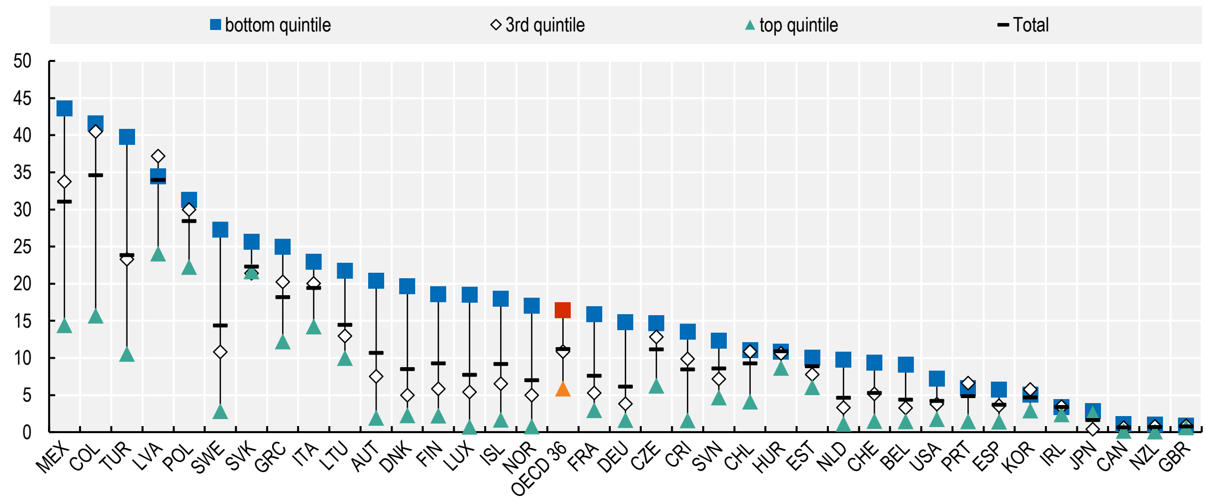
Housing space

The availability of adequate space for each dweller is fundamental in ensuring privacy, personal space, and physical and mental health. While there is no globally agreed standard to define an adequate housing space, the European Union (EU) has set some criteria to measure overcrowding. The EU-agreed definition accounts for different needs for living space according to the age and gender composition of the household (Eurostat, 2023[53]). It defines housing as overcrowded if less than one room is available in each household: for each couple in the household; for each single person aged 18 or more; for each pair of people of the same gender between 12 and 17; for each single person between 12 and 17 not included in the previous category; and for each pair of children under age 12. This report will use this overcrowding measure, included in the OECD Affordable Housing database and in the OECD Well-being Framework.

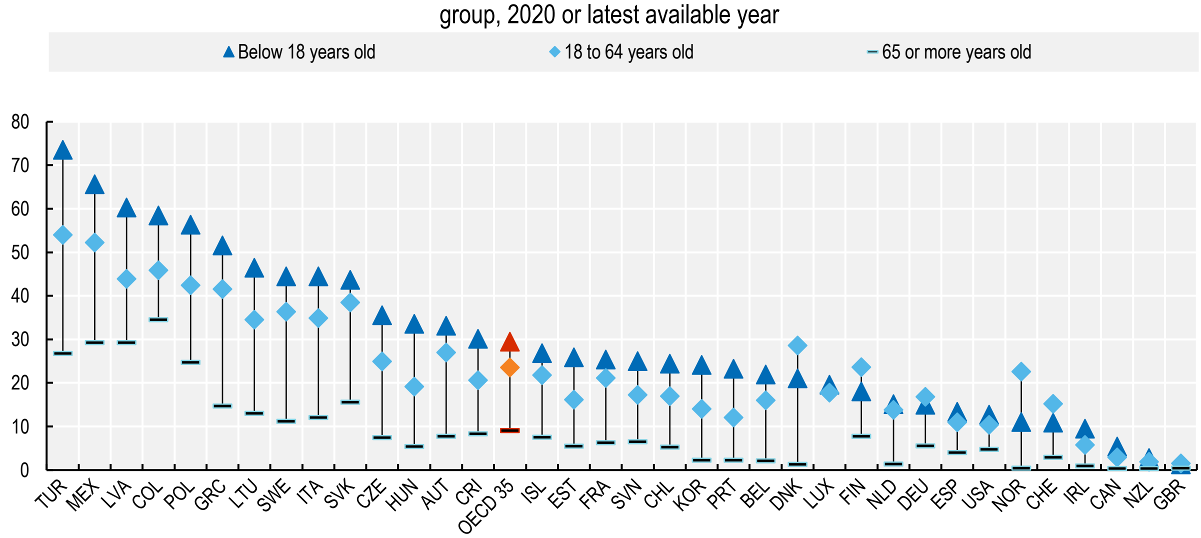
There are large differences across OECD countries in terms of overcrowding rates. The issue of overcrowding was highlighted during the COVID-19 pandemic, associated with people's physical and mental health. In 2020, on average, the overcrowding rate stood at just above 10% in the OECD countries (OECD, n.d.[54]), but was 16% among households in the lowest income quintile (Figure 2.8, Panel A). Age is an important factor that affects people's exposure to housing overcrowding: nearly 30% of children in the poorest households live in overcrowded conditions, more than the working age (24%) and older age populations (9%) (Figure 2.8, Panel B).

Figure 2.8. Overcrowding stands just above 10% on average in the OECD, but is 16% among households in the lowest income quintile, 30% of whom are children

Panel A. Percentage of overcrowded households, by quintiles of the income distribution, 2020 or latest available year



Panel B. Percentage of the population in the bottom quintile of the income distribution living in overcrowded dwellings, by age group, 2020 or latest available year



Note: Low-income households are households in the bottom quintile of the (net) income distribution. Gross income is considered for Chile, Colombia, Mexico, Korea, Türkiye and the United States, due to data limitations. In the United Kingdom, net income is not adjusted for local council taxes and housing benefits, due to data limitations. Data for Canada are adjusted by Statistics Canada based on the assumption of the presence of a kitchen in dwellings where it is expected, and income quintiles are based on adjusted after-tax household income. In Panel A, data refer to the population rather than households for Japan, as data are available only at respondent level. The OECD average excludes Australia, Israel and Japan (Panel B only), due to lack of data.

Source: *OECD Affordable Housing Database*, http://www.oecd.org/social/affordable-housing-database.htm.

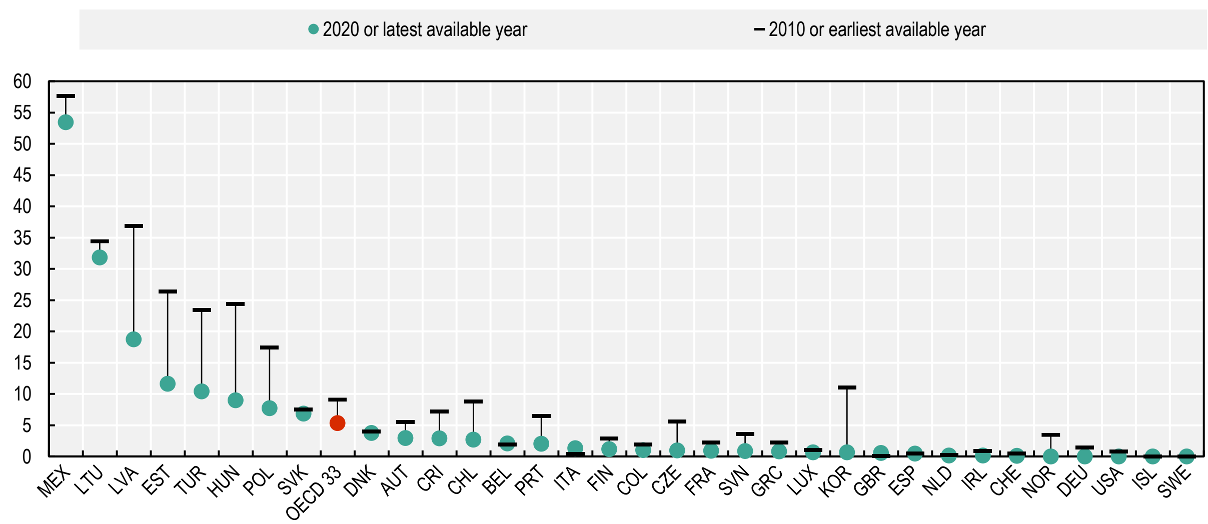
StatLink https://stat.link/hkola3

Housing basic facilities

Certain facilities, such as a toilet, bath or shower, are essential in housing to ensure people's basic needs are met. Although there is almost no lack of housing basic facilities[3] on average across OECD countries, the evidence suggests that more could be done for the poorest households, those with below 50% of median equivalised disposable household income. There is a high correlation between the availability of a toilet and that of a bath or shower, so the evidence on the former was studied. To ensure that not only the availability, but also the quality of the toilet is taken into consideration, data are presented for indoor flushing toilets for the sole use of the household.[4] **The percentage of poor households without an indoor flushing toilet differs widely across OECD countries** (Figure 2.9). The situation improved in the last decade on average, with the percentage of households lacking basic sanitation falling from 9% in 2010 to around 5% in 2020. However, the persistent gap lingers between OECD countries, with 20% or more poor households lacking basic sanitation in countries like Mexico, Lithuania and Latvia, while that percentage stands at 1% or less for half of OECD countries.

Figure 2.9. The percentage of poor households lacking basic sanitation in OECD countries ranges from less than 1% to more than 50%

Percentage of households below 50% of median equivalised disposable household income without indoor flushing toilet



Note: The latest available year is 2019 for Germany and Italy, and 2018 for Iceland. The earliest available year is 2011 for Chile and 2012 for Colombia. The OECD average excludes Australia, Canada, Israel, Japan and New Zealand, due to lack of data.
Source: *OECD Affordable Housing Database*, http://www.oecd.org/social/affordable-housing-database.htm.

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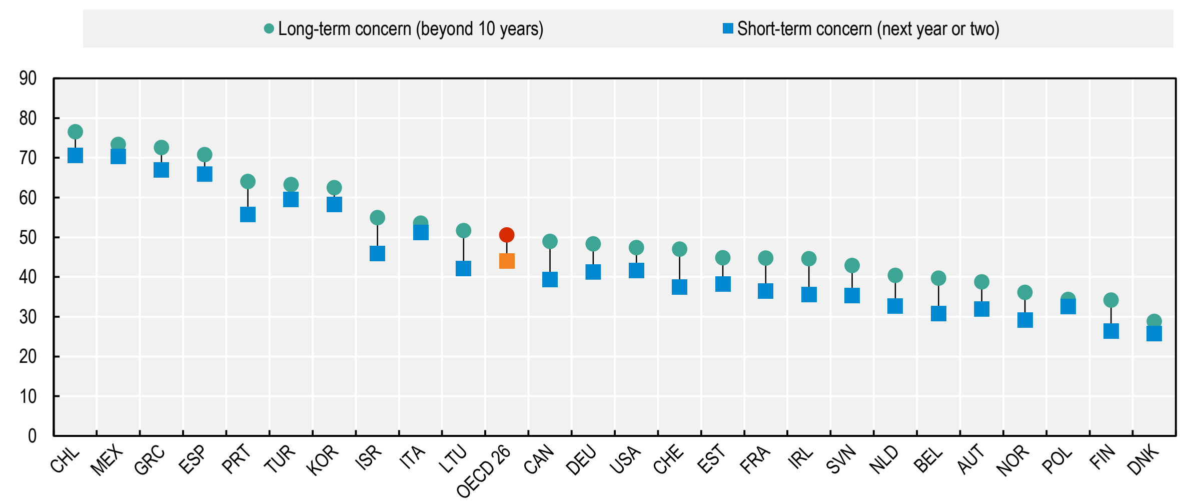
Housing distress

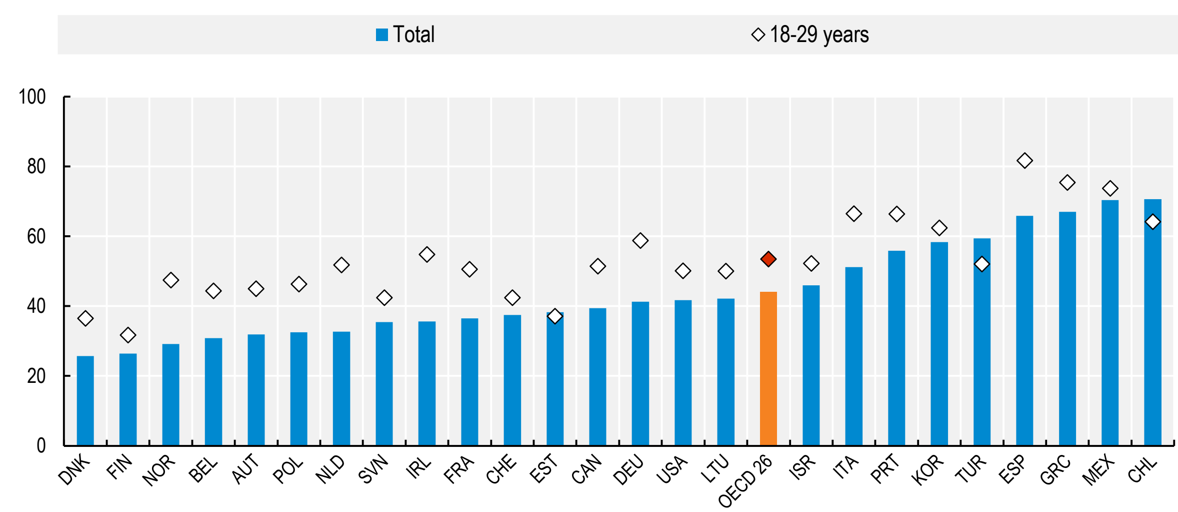
Housing is a major concern for many people in OECD countries. Finding and maintaining adequate housing is both a short and long-term concern, although people are more concerned about housing in the long term than in the short term. According to the *OECD Risks that Matter* survey, more than half of the respondents were somewhat concerned or very concerned for the next 10 years with regards to the availability of adequate housing (Figure 2.10, Panel A). Young people (18-29 years) were more concerned than the older generations about housing, except in Chile, Türkiye and Estonia (Figure 2.10, Panel B).

Figure 2.10. Finding and maintaining adequate housing is a concern in the short and long term, especially among young people

Panel A. Percentage of respondents reporting being either "somewhat concerned" or "very concerned" by not being able to find or maintain adequate housing in the short and long-term, 2020



Panel B. Percentage of respondents reporting being either "somewhat concerned" or "very concerned" by not being able to find/maintain adequate housing in the next year or two, by age group, 2020



Note: The OECD average excludes Australia, Colombia, Costa Rica, the Czech Republic, Hungary, Iceland, Japan, Latvia, Luxembourg, the Slovak Republic, Sweden, Türkiye and the United Kingdom, due to lack of data.

Source: OECD Secretariat estimates based on OECD *Risks That Matter* 2020 survey, http://oe.cd/rtm, as reported in the OECD *Affordable Housing* database, http://www.oecd.org/social/affordable-housing-database.htm.

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2.3. Well-being and the built environment: Transport

2.3.1. The inter-relationship between well-being and transport

Transport enables human activity by connecting people and places. Given this important role, its characteristics and performance can profoundly influence people's well-being and access to opportunities. Transport can also negatively impact well-being: threatening users' safety through traffic accidents and people's health through air pollution; or increasing economic and social inequalities as well as the social exclusion of vulnerable population groups, when planned without accounting for the needs of all population groups. Moreover, transport contributes to climate change, being a significant emitter of global greenhouse gases (GHG) and can cause habitat loss and degradation (OECD, 2019[1]).

Material conditions and economic capital

Consumption

No internationally agreed methodology on transport affordability exists yet. The United Nations, in the *UN SDG Indicator 11.2.1. methodology* on transport accessibility, suggests that it is measured as "the percentage of household income spent on transport of the poorest quintile of the population", indicating that the percentage spent on transport should not exceed 5% of the average net income of households in the poorest quintile (UN, 2021[55]). The European Commission measures transport affordability as the "share of the poorest quartile of the population's household budget required to hold public transport passes (unlimited monthly travel or equivalent) in the urban area of residence" (European Commission, 2021[56]).

Rising fossil fuel prices impact the transport sector in a multidimensional way. As most transport modes rely on the use of petroleum products, a rise in fossil fuel prices impacts several dimensions of the transport system. Possible structural impacts include, for instance, changes in usage levels – users limiting or rationalising their usage, for example by abandoning, postponing or combining their trips. Operators might also reduce service frequency. Modal shifts can occur – part of the traffic can shift to a more energy-efficient mode that suffers less from higher petrol fuel prices, for instance, from road freight transport to rail or inland waterways (Bassot, 2023[57]). While initially passengers (or companies) could simply absorb the higher costs by reducing usage, trimming their profits or cutting their spending in other areas, in a subsequent phase, there could be changes in commuting patterns (like ridesharing or carpooling), attempts to use public transport, rapid adoption of vehicles with high fuel efficiency, and a search for other transport alternatives (Bassot, 2023[57]). Higher transport prices could become an additional burden for households and possibly lead to transport poverty (Kiss, 2022[58]), unless this is compensated at regional or national level. Low-income households that own a car, and rural households spending a higher share of their income on transport fuels, are particularly impacted (Ari et al., 2022[59]).

Work and job quality

Transport broadens people's work opportunities. With the possibility to commute, workers are no longer constrained to work locally and can seek out better employment opportunities further from home. Both the accessibility and affordability of public transport are particularly important for the inclusion of low-income people. Evidence suggests that low-income people suffer more from restricted transport options, have lower quality transport services available to them and travel under worse conditions (safety, security, reliability, comfort). Broad evidence also suggests that the lack of, or poor access to, transport options limits access to jobs, education, health facilities, social networks, etc., which in turn generates a "poverty trap" (ITF-OECD, 2017[60]). People in disadvantaged communities often have less well-maintained infrastructure – notably roads and more limited access to reliable public transport services (OECD, 2018[61]). Lack of public transport connections between minority neighbourhoods and employment centres hinders job opportunities. For example, in a neighbourhood with 1 percentage point higher share of white residents in US cities, a resident could reach 18 more jobs within a 30-minute commute on public transit (OECD, 2018[62]).

There is also a clear link between commuting time, commuting mode and job satisfaction. Findings from the *Commuting & Wellbeing Study* (Chatterjee et al., 2017[63]) indicate that longer commutes lead to decreased job satisfaction (especially for women), reduce leisure time satisfaction (with the impact growing over time), increase strain and reduce mental health. Working from home, walking to work and shorter commute times promote job satisfaction and job retention. Walking and cycling to work increase leisure time satisfaction and walking to work decreases strain. Cycling to work is associated with better self-reported health. Bus commuters feel the negative impacts of longer commute journeys more strongly than users of other transport modes.

The COVID-19 pandemic has changed commuting practices in the short and potentially long term. Prior to the pandemic, commuting to work was a necessary, almost daily activity for most workers. With the pandemic and the necessity, where possible, to work from home, employees and their employers discovered that many work tasks could be performed remotely. High-skilled workers, in particular, benefited more from teleworking opportunities than those in low-skilled occupations. The impacts of the pandemic are further changing work practices in ways that are still unfolding. This has implications for transport: potential benefits, such as reduced traffic congestion, but also challenges for public transport management and maintenance, such as those related to large drops in public transit ridership (Vielkind, 2023[64]).

Economic capital

Transport enables economic development by connecting people, goods and services. Together with housing and other real estate properties, transport equipment, such as vehicles, is an element enhancing both personal economic wealth and countries' economic capital. Moreover, transport infrastructure, such as roads, railways, and airports, is an enabler of economic development. It connects people and places and provides people with access to jobs, other activities and services, firms with access to stakeholders and markets, and cities and regions with access to other cities, to other regions and to the global economy. Building and maintaining transport infrastructure has always been a necessary condition for economic development and remains especially important for economically weaker regions (OECD, 2020[65]).

Quality of life, human capital and natural capital

Environmental quality and natural capital

Road traffic is responsible for air pollution, which is one of the greatest environmental risks to health (WHO, 2022[66]). It is responsible for an average of 25% of ambient (outdoor) PM2.5 in urban areas worldwide. Fine particulate matter (PM2.5) is an air pollutant that can be inhaled and cause serious health problems, including both respiratory and cardiovascular diseases. 62% of people across the OECD are exposed to more than 10 micrograms/m^3 of PM2.5, above the WHO threshold level (OECD, 2023[67]), and more than 373 000 people across the OECD prematurely died of causes related to ambient PM pollution in 2019 (OECD, 2023[68]).

Emissions of particulate matter (PM) from motor vehicles originate from two main sources: exhaust and non-exhaust. One source of transport air pollution is the combustion of fossil fuel, which is emitted via tailpipe exhaust. The other source is non-exhaust processes, including the degradation of vehicle parts and road surfaces and the resuspension of road dust. While PM emissions from exhaust sources are still prevalent, but falling, PM emissions from non-exhaust sources are rising. With stringent controls on tailpipe emissions and increased take-up of electric vehicles, the amount of particulate matter from exhaust sources is continuing to fall, while non-exhaust emissions are expected to comprise the vast majority of particulate matter pollution from road transport as early as 2035 (OECD, 2020[69]). Also, although electric vehicles are estimated to emit slightly less PM10 from non-exhaust sources than conventional vehicles, heavier-weight electric vehicles are estimated to emit more PM2.5 than conventional vehicles (OECD, 2020[69]). Underground railway activity also emits PM from non-exhaust sources and in France, airborne particle concentrations (PM10, PM2.5 in μg/m^3) underground were on average three times higher than in urban outdoor air (ANSES, 2022[70]).

Greenhouse gas (GHG) emissions from transport accounted for around 23% of OECD energy-related emissions in 2020. GHG emissions from passenger transport are correlated with household characteristics and location. Hargreaves et al. (2013[50]) have investigated the differences in emissions from passenger transport (private cars, public transport and international aviation) and have found that passenger transport-related emissions are highly dependent on variables such as income, location and the number of workers in the household. Differentiating policy stringency according to household characteristics with distributional relevance, such as income, geographic location and accessibility, can improve the equity of policy outcomes (Lindsey, Tikoudis and Hassett, 2023[71]).

Finally, transport can damage habitats in three main ways: habitat loss, fragmentation and degradation. The European Commission's *Handbook on the external costs of transport* (European Commission, 2020[72]) identifies three main ways habitats are damaged: habitat loss (i.e. ecosystem loss, which can result from additional land being dedicated to transport, with important impacts on biodiversity); habitat fragmentation (i.e. division of ecosystems due to transport projects, e.g. motorways or railways); and habitat degradation (i.e. negative impacts on ecosystems owing to the release of air pollutants and other toxic substances, e.g. heavy metals). While the document also acknowledges other possible negative impacts (e.g. visual intrusions, light emissions from vehicles), it focuses on the aforementioned three impacts, and estimates the total cost of habitat loss and fragmentation for the EU28 in 2016 at EUR 39.1 billion.

Safety

In 2021, road deaths across the OECD were nearly 5 per 100 000 population (OECD, n.d.[54]). The number of road deaths and casualties is often used as a key indicator of road safety. The latest report by the International Traffic Safety Data and Analysis Group (IRTAD)[5] provides comparable indicators at the national level that reflect the current state and evolution of road safety for different user and age groups, road types and severity of injuries, as well as deaths. In 2021, road deaths were below the long-term trend, with a significant fall in road-crash deaths in most countries and for all users, except for users of powered two-wheelers. The number of pedestrian fatalities also fell in most countries, except the United States and the United Kingdom (ITF, 2022[73]). In particular, pedestrians, cyclists and motorcyclists make up 80% of fatalities in dense urban areas, which is why cities are encouraged to focus on protecting vulnerable road users (ITF, 2018[74]). Transport safety is also a major concern for women. Safety concerns shape the transport behaviour of women more than men across all transport modes, making it their top priority for using public transport. Although women are generally more dependent on public transport than men, surveys show that a large majority of women worldwide feel unsafe in public transport and that many have been victims of physical or verbal harassment when using it or moving in public spaces. Therefore, when possible, women often prefer driving over walking, cycling or public transport due to safety reasons. When driving, women are three times less likely to die in road traffic than men (ITF, 2023[75]).

Improved road safety can unlock a transport modal shift and indirectly support public health and climate change mitigation. The indirect benefits of road safety go beyond the prevention of crashes and the energy and material implications of repairing or scrapping vehicles (OECD, 2019[1]). Safer streets increase confidence to walk, cycle or use public transport (which generally implies longer walking segments on journeys) (Mueller et al., 2018[76]). This improves the health of the population, which is more physically active, and can also reduce the amount of private motor-vehicle traffic and the related GHG emissions and local pollution. Thus, safer roads can support climate change mitigation strategies that focus on a modal shift towards more walking and cycling. Conversely, low levels of road safety may hamper the effectiveness of these strategies, as discouraging people from shifting towards non-motorised modes. Road safety is then a necessary condition for broader policy objectives related to public health, inclusiveness and climate change mitigation (OECD, 2019[1]).

Physical and mental health

Active transport modes (walking and cycling) bring benefits from physical exercise. Physical activity is an important determinant of health. Physiologists distinguish between moderate-intensity physical activity, which includes activities such as gardening, dancing, walking, and higher-intensity activities, such as fast swimming or running. A vast body of epidemiologic literature has associated moderate-intensity physical activity, such as walking, with reducing the risk of a large number of health outcomes, including all-cause mortality, cardiovascular disease, several types of cancer, type 2 diabetes, dementia, depression, excessive weight gain, feelings of anxiety and depression, and sleep difficulties (2018 Physical Activity Guidelines Advisory Committee, 2018[77]). Physical activity has been linked to bone strength, improved cognitive and physical function, and reduced risk of injury associated with falls among the elderly (WHO, 2022[78]), and for school-age academic achievement (Barbosa et al., 2020[79]). Research related to commuters also suggests that active commuting has a positive effect on work performance and reduces sick leave (Ma and Ye, 2019[80]; Hendriksen et al., 2010[81]; Mytton, Panter and Ogilvie, 2016[82]).

Noise from transport is an external cost that causes harm to health. Most community noise in cities comes from road traffic. In addition to annoyance, environmental noise negatively impacts physical and mental health. It increases the risk for ischemic heart disease (IHD) and hypertension, sleep disturbance, hearing impairment tinnitus and cognitive impairment, and there is growing evidence of other health impacts, such as adverse birth outcomes and mental health problems (WHO, 2022[83]; 2018[84]). While improvements in vehicles and roads are expected to reduce noise from transport, growing urbanisation (which increases exposure) and rising traffic volumes are expected to increase the overall negative impacts (European Commission, 2020[72]). The European Environment Agency (EEA) estimates that 1 out of 4 Europeans (i.e. 125 million people) suffer negative impacts from road traffic owing to noise exceeding a 55 decibels (dB) Lden[6] annual average, which is above the threshold for considering noise a nuisance, a level that could also be set at 50 dB Lden (OECD, 2019[1]). According to the European Commission's Handbook on External Costs of Transport, the total cost[7] of noise generated by transport in the EU 28 for 2016 is estimated at EUR 63.6 billion, with 67% of this stemming from passenger transport and 23% from freight road transport (European Commission, 2020[72]).Noise from air transport (airplanes and airports) is increasing and also causing harm. The average noise exposure around major EU 27 and EFTA airports significantly increased during the five years preceding the COVID-19 outbreak with the population exposed to 55 dB Lden and 50 dB Lnight[8] respectively 30% and 50% larger in 2019 than in 2005 (EASA, 2022[85]).

2.3.2. The state of transport in OECD countries

Infrastructure stock

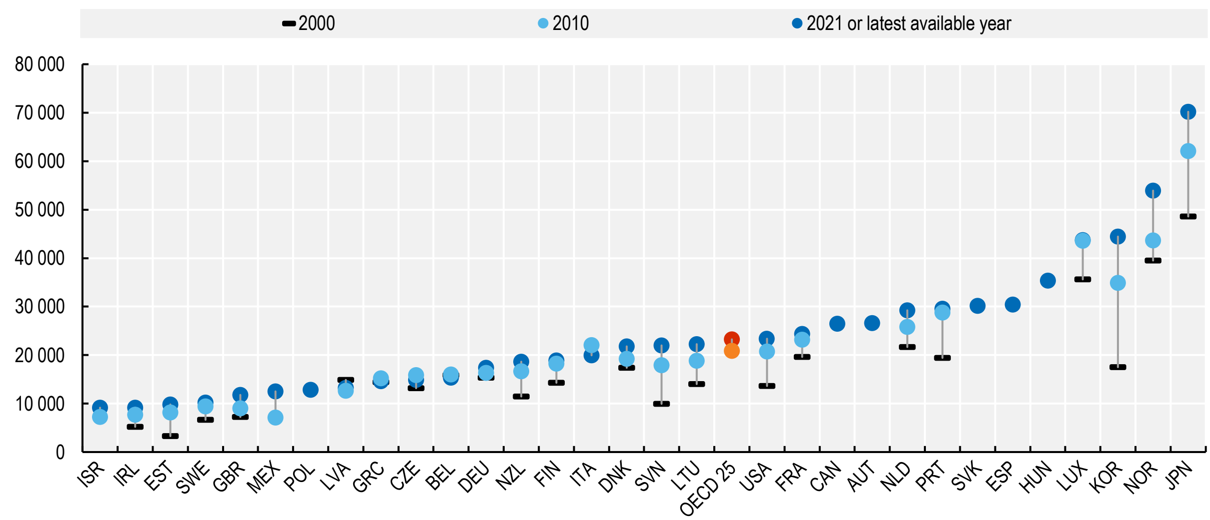
As previously mentioned, it is not possible to disaggregate the information on the monetary market stock value of the different types of infrastructure, as only an aggregate stock measure of the overall infrastructure/civil engineering works that involves the transport sector is available. This section first presents the monetary market stock value of the overall infrastructure and how it has evolved over time, and then it explores the quality of public transport, as available from internationally comparable data. (*For detailed descriptions of the indicators included, please refer to Annex 2.A)*

In 2021, the OECD average real monetary market stock value of infrastructure per person was close to USD 23 000 (Figure 2.11). It is the highest (over USD 50 000) in Japan and Norway, and the lowest (below USD 10 000) in Israel, Ireland and Estonia. As 2000 data are available only for a limited number of countries, the evolution of the real monetary market value of infrastructure is assessed over the period

2010-21. Between 2010 and 2021, the OECD average real monetary market value of infrastructure cumulatively increased by 12%, up from around USD 21 000 per capita in 2010. The largest increases occurred in Mexico, the United Kingdom, Israel and Korea, with a cumulative increase of more than 25% since 2010, and the largest falls occurred in Italy and the Czech Republic (-9% and -6%, respectively).

Figure 2.11. The market value of infrastructure cumulatively increased by 12% on average, between 2010 and 2021 in OECD countries

USD per capita at 2015 PPPs



Note: The latest available year is 2021 for Belgium, the Czech Republic, Denmark, France, Finland, Korea and the United States; 2019 for Estonia, Greece, Latvia, Lithuania, Norway, Poland and Sweden; 2017 for New Zealand; and 2020 for all the other countries. The OECD average excludes Australia, Austria, Canada, Chile, Colombia, Costa Rica, Hungary, Iceland, Poland, the Slovak Republic, Spain, Switzerland and Türkiye, due to lack of data or breaks in the series.
Source: OECD Calculations based on the OECD *National Accounts Statistics* (database): 9B. Balance sheets for non-financial assets, http://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE9B.

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Transport quality

Internationally comparable data on transport quality shed some light on the accessibility and effectiveness of transport, despite some of these data being limited to larger metropolitan areas. Worldwide data on accessibility to public transport are calculated to track progress on SDG indicator 11.2.1 under the coordination of the United Nations Human Settlements Programme (UN-Habitat), using a variety of sources (city administration, transport service providers or, when these are not available, geospatial data such as those from open data sources, such as OpenStreetMap, Google and the General Transit Feed Specification - GTFS feeds), combined with local knowledge (UN, 2021[55]). More granular data on access to and the effectiveness of public transport modes are calculated by the OECD for large metropolitan areas. Internationally comparable data for other transport quality features, such as affordability, comfort, safety, sustainability and inclusiveness, are still lacking or limited to a restricted number of countries.[9] The use of advanced information and communications technology to improve transport users' convenience in their trips, or "smart mobility", can enhance people's well-being and help to close this information gap (Box 2.1).

Box 2.1. Smart Mobility and Well-being: Leveraging advanced traffic information and communications technology to improve people's lives

- ***"Mobility as a service (MaaS)***" is a type of service that, through a joint digital channel, enables users to plan, book and pay for multiple types of mobility services (Mladenović, 2021[86]). MaaS enables travellers to choose mobility solutions based on their travel needs. The movement towards MaaS is being fuelled by a myriad of innovative new mobility service providers, such as carpool and ridesharing companies, bicycle-sharing systems programmes, scooter-sharing systems and carsharing services as well as on-demand "pop-up" bus services. On the other hand, the trend is motivated by the anticipation of self-driving cars, which puts into question the economic benefit of owning a personal car over using on-demand car services, which are widely expected to become significantly more affordable when cars can drive autonomously.
- This shift is being further bolstered by improvements in the integration of multiple modes of transport into seamless trip chains, with bookings and payments managed collectively for all legs of the trip (Kamargianni et al., 2015[87]). Between the multiple modes, trips and payments, data is gathered and used to help people's journeys become more efficient. For governments, the same data informs decision-making when making improvements in regional transit systems, provided that the protection of personal data is ensured. The use of advanced information and communications technology to make transport users' trips more convenient, or ***"smart mobility"***, has the potential to enhance people's well-being. Developing indicators and collecting data on smart mobility can help countries better monitor the safety, sustainability and inclusiveness of these new types of mobility services.

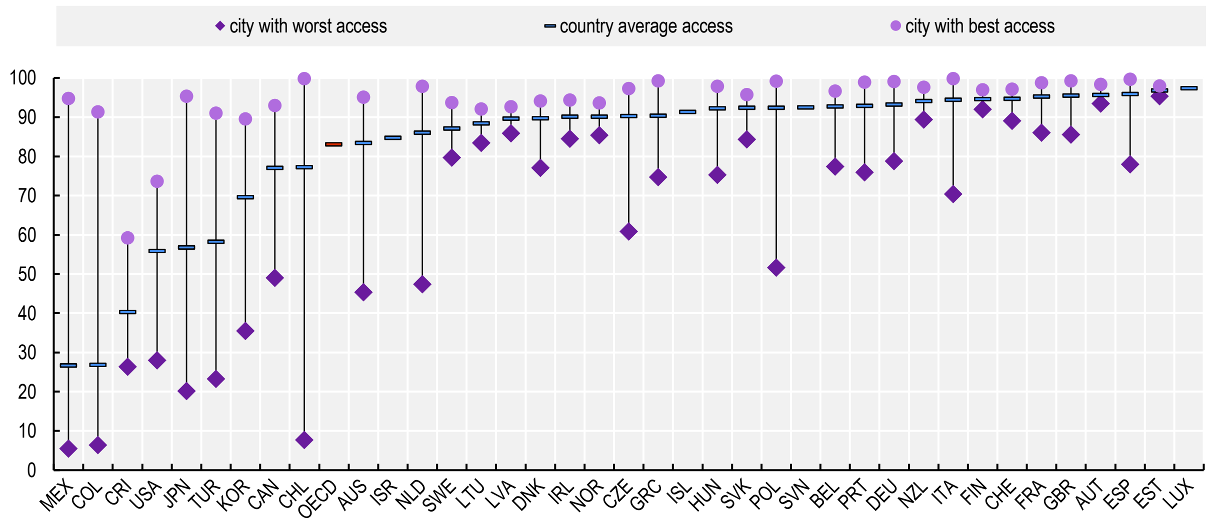
Accessibility of public transport

Accessibility to public transport is a crucial determinant of its usage. SDG indicator 11.2.1 measures the convenience of access to public transport. Access to public transport is considered convenient when a stop is accessible within a walking distance along the street network of 500 m from a reference point such as a home, school, workplace, market, etc., to a low-capacity public transport system (e.g. bus, Bus Rapid Transit) and/or 1 km to a high-capacity system (e.g. rail, metro, ferry). Additional criteria for defining public transport convenience include: 1) public transport that is accessible to all special-needs customers, including those who are physically, visually, and/or hearing-impaired, as well as those with temporary disabilities, the elderly, children and other people in vulnerable situations; 2) public transport with frequent service during peak travel times, and 3) stops present a safe and comfortable station environment (UN, 2021[55]). While the SDG indicator highlights the importance of inclusivity, internationally comparable granular data are available at subnational level for cities (such as in the OECD Programme on a Territorial Approach to the SDGs (OECD, n.d.[88])), but not by people's socio-economic characteristics.

Serious inequalities exist in convenient access to public transport across OECD cities with available data. More than 80% of the population had easy access to public transport in 2020 or the latest available year (Figure 2.12). However, there is a large gap between the cities with the best and the worst access in many countries, most starkly in Mexico, Colombia and Chile, where the gap is above 80 percentage points. Available data cover only the largest metropolitan areas, as defined by the *Degree of Urbanisation* (DEGURBA) (UN Statistical Commission, 2020[89]), but convenient access to public transport is more likely to be lower in smaller urban areas and rural areas, where public transport infrastructure is less developed.

Figure 2.12. More than 80% of the population in OECD large metropolitan areas have convenient access to public transport, but gaps exist between the cities with best and worst access

Percentage of the population that has convenient access to public transport in largest metropolitan areas, maximum, minimum and average country access, 2020 or latest available year



Note: The latest available year for Canada is 2016. The data and information on types of public transport available in each urban area, as well as the location of public transport stops, are obtained from city administration or transport service providers or, when these are not available, from geospatial data such as those from open data sources (e.g. OpenStreetMap, Google and the General Transit Feed Specification - GTFS feeds). The walking distance is calculated on the basis of the street network (as available from city authorities or from open sources such as OpenStreetMap). Data providers, on the basis of their local knowledge, exclude streets that are not walkable. Finally, the Network Analyst tool (in GIS) is used to identify service areas (i.e. regions that encompass all accessible areas via the streets network within a specified impedance/distance) around any location on a network. All individual service areas are merged to create a continuous service area polygon. The estimation of the population within the walkable distance to public transport is performed on the basis of individual dwellings or block level total populations, which is collected by National Statistical Offices through censuses and other surveys (UN, 2021[55]).
Source: *UN Global SDG Indicator Database*, indicator 11.2.1, https://unstats.un.org/sdgs/dataportal.

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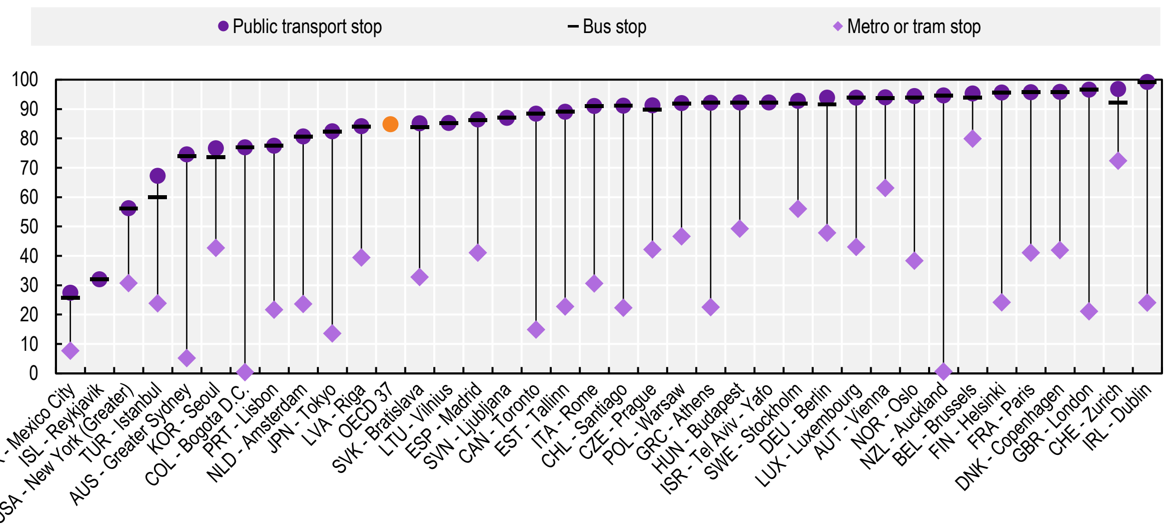
Buses are more accessible than the metro or tram in OECD large functional urban areas (Figure 2.13). The OECD, in cooperation with the European Union, has developed a harmonised definition of functional urban areas (FUAs) for metropolitan areas. FUAs are composed of a city and its commuting zone and encompass the economic and functional extent of cities based on people's daily movements (OECD, 2012[90]). The definition of an FUA aims at providing a functional/economic definition of cities and their area of influence, by maximising international comparability and overcoming the limitation of using purely administrative approaches. At the same time, the concept of an FUA, unlike other approaches, ensures a minimum link to the government level of the city or metropolitan area. Granular data on accessibility to different public transport modes is calculated using geospatial data and is limited to the largest OECD functional urban areas, due to the poor reliability of Open Street Map (OSM)[10] in identifying public transport stops in smaller cities or rural areas. 84% of the population have access to buses within a 10-minute walk, while only 33% to a metro or tram on average in OECD's FUAs with available data. The bus is also more widespread as a public transport mode than the metro or tram.

Figure 2.13. Accessibility to a bus is higher than to a metro or tram, in OECD's largest functional urban areas

Percentage of the population having access to a public transport stop within a 10-minute walk, by mode of transport, 2022



Note: The OECD average excludes Costa Rica, due to lack of data. Public transport accessibility is measured using Open Street Map (OSM) to get public transport stops. Data are limited to large OECD functional urban areas (i.e. above 250 000 inhabitants), due to the poor reliability of Open Street Map (OSM) in identifying public transport stops in smaller cities. The 2022 Mapbox isochrone API is then enabled to compute isochrones from the identified public transport stops to get to all the areas located within 10-minute walking distance. Finally, the Global Human Settlement Population layer 2015 is enabled to get the share of the population in each functional urban area (FUA) who have access to public transport in less than a 10-minute walk (OECD, 2022[11]).
Source: OECD *Regions and Cities, City statistics* (database), https://stats.oecd.org/Index.aspx?datasetcode=FUA_CITY.

StatLink https://stat.link/rh54cf

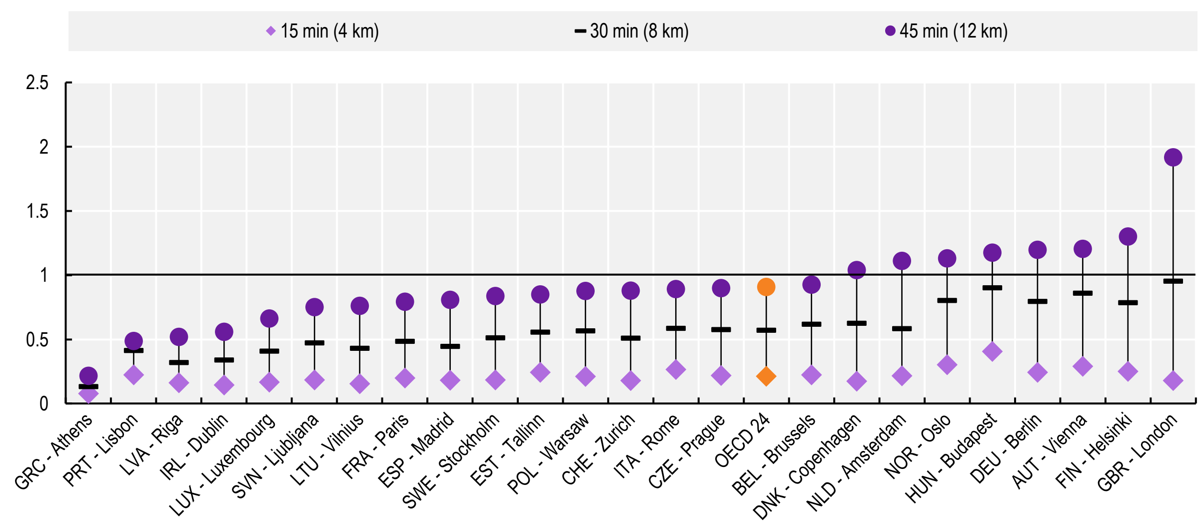
Effectiveness of public transport

Another important quality characteristic of public transport is its effectiveness. Combining geospatial data and modelling, the EC-ITF-OECD Urban access framework[11] (ITF, 2019[91]; OECD, 2020[65]) defines absolute accessibility and proximity, which are then used to compute transport effectiveness. Absolute accessibility is the total number of destinations that can be reached by a transport mode. It captures all the opportunities that are available to a resident, which are determined by the size and density of the city and the neighbourhood where someone lives, as well as by the transport network that connects the area to the rest of the city. Proximity captures the spatial concentration of trip origins and potential destinations. It is defined as the total number of services within a given distance, according to a model that assigns fixed average straight-line speeds to each mode based on typical average speeds in European cities (16 km/h for cars, public transport and cycling, 4 km/h for walking). It measures the number of destinations in "close" proximity to the origin, regardless of the effective travel time required to access them.

There is much room for improvement in public transport effectiveness in European capital cities. Transport effectiveness is computed as the ratio between the absolute accessibility for a given transport mode and proximity to potential destinations. A ratio of one or more means the transport mode performs well, as the number of accessible destinations through the transport mode is higher than those in proximity. A ratio close to zero means that the mode performs poorly, even in providing access to nearby destinations. In the case of public transport, the indicator captures the frequency of services, the in-vehicle speed, the number of transfers and the distance to the nearest bus stop or station, with as its effective performance is compared to a theoretical reference. Transport effectiveness is evaluated over three thresholds and an associated distance: 15 min (4 km), 30 min (8 km), 45 min (12 km) (ITF, 2019[91]). Public transport is effective (i.e. the indicator is higher than one) at a time threshold of 45 mins (12 km) and only in a limited number of European capital cities such as Oslo (Norway), Budapest (Hungary), Berlin (Germany), Vienna (Austria), Helsinki (Finland) and London (the United Kingdom) (Figure 2.14 Although the data presented here refer to the entire metropolitan area (and the effectiveness of the public transport of the respective city's urban centre may be better or worse than the results shown), it shows that overall even for longer time thresholds of 30 and 45 minutes, there is much room for improvement in terms of public transport effectiveness.

Figure 2.14. There is much room for improvement in terms of public transport effectiveness in European capital cities

Average public transport effectiveness in functional urban areas, by time thresholds and associated distance, 2018



Note: OECD 24 is the simple average of the 24 European capital cities included in the chart.
Source: OECD ITF Urban access framework, https://stats.oecd.org/Index.aspx?DataSetCode=ITF_ACCESS.

StatLink https://stat.link/9cuef2

2.4. Well-being and the built environment: Technical infrastructure

2.4.1. The inter-relationship between well-being and technical infrastructure

Infrastructure provides services essential to human life and health, such as drinkable water, power supplies or sewerage networks. Infrastructure should not be considered as a collection of individual assets, but rather as a system of assets that collectively has the potential to foster people's well-being and economic, social, human and environmental sustainability. This potential can be created throughout the entire life cycle of the infrastructure: it generates employment during its conception, construction and maintenance and, once built, it can spur economic activity connecting people to places and giving the possibility to perform human activities before sunrise or after sunset (through lighting) or in difficult weather conditions (through heating or cooling). Infrastructure can also play a key role in conserving natural resources and reducing the impact of climate change. Clean energy generation plants, for example, are critical in reducing dependence on fossil fuels. When it is designed to account for critical consideration of needs (i.e. who needs and gets what from infrastructure), infrastructure can contribute to equity. Finally, as infrastructure should itself be resilient to shocks, it helps to ensure the sustainability and resilience of human activities, as the services infrastructure provides are less vulnerable to extreme events and disruptions.

Water and sanitation

Access to safe water and sanitation is essential to human life and well-being. Water is a natural asset necessary to human life. Its access is a prerequisite to health, which is fundamental to the regular performance of human activities. Its importance has been recognised in Sustainable Development Goal 6, “Ensure access to water and sanitation for all”. **Water is also a precious natural asset, increasingly under stress**. 60% of the global population could face water issues by 2050, with low-income families bearing the brunt of the water crisis (Romano, Lassman and Tardieu, 2022[92]). The UN defines *water stress* as the situation where the ratio of freshwater withdrawn to total renewable freshwater resources is above the 25% threshold (UN, 2022[93]). Annual water use represents more than 20% of internal water resources in close to one-third of OECD countries and some OECD countries, such as Israel, Korea, Spain and Türkiye also experience water stress (OECD, n.d.[94]). On the other hand, establishing protected marine areas can be helpful in preserving water and its biodiversity. In the OECD, the total marine protected areas, as a share of each country’s exclusive economic zone, was almost 22% in 2022, ranging between below 1% in Israel, Iceland and Norway to above 40% in Australia, Chile, Germany and the United Kingdom (OECD, n.d.[95]). Not only the extension, but also the location of the protected areas is critical to the conservation of nature. One example are the marine key biodiversity areas (KBAs), of which more than half (55%), on average, is still not safeguarded (UN, 2022[93]).

Material conditions and economic capital

Measuring the affordability of water and sanitation is challenging. A common view is that tariffs are affordable if they ensure poor households’ ability to afford access to adequate supplies of clean water (Leflaive and Hjort, 2020[96]). However, the amount of *adequate* clean water can vary across demographic characteristics and countries (Howard et al., 2020[97]). Expenditure for investment in infrastructure, such as upfront costs, also needs to be considered. Keeping tariffs artificially low for all customers, including those who can afford the full price of the service, can lead to a vicious cycle of decaying infrastructure and deteriorating services (Leflaive and Hjort, 2020[96]). This in turn hurts the poor the most, because, even where connected to a public service, poor households will need to procure water from private vendors (e.g. bottled water), often at greater cost (OECD, 2010[98]; OECD, 2013[99]).

While the majority of the urban population in OECD countries enjoy good water and sanitation services, further investment is necessary in water infrastructure due to urbanisation, climate change and water pollution. Economic growth and urbanisation are drivers for further investment in water supply systems, especially when these systems have already reached full capacity (e.g. Dublin in Ireland) (Leflaive and Hjort, 2020[96]). Another driver is climate change, as it causes uncertainty about future water demand and availability. Risks of prolonged droughts and heavier rains will translate into new infrastructure needs to store water or manage storm water (OECD, 2020[100]). Contaminants of emerging concern – such as pharmaceutical residues and microplastics – will also drive investment up, in order to adjust treatment capacities. Sludge management potentially adds another layer of costs (OECD, 2020[100]). Any past investment backlog will lead to infrastructure decay (e.g. non-revenue water) and degraded service quality, requiring further investment (Leflaive and Hjort, 2020[96]).

Quality of life, human capital and natural capital

Not only is access to water essential, but also its quality and safety. Safe drinking water is necessary for everyday domestic purposes, including drinking, food preparation and personal hygiene. Drinking unsafe water impairs health through illnesses such as diarrhoea, and untreated excreta contaminate groundwaters and surface waters used for drinking water, irrigation, bathing and household purposes.

Infants and young children, people who are debilitated and the elderly, especially when living in unsanitary conditions, are at greatest risk of waterborne disease. The WHO has defined Guidelines for drinking-water quality (WHO, 2022[101]), which cover a broad range of chemicals that can affect drinking-water quality. Drinking water is safe when it "does not represent any significant risk to health over a lifetime of consumption, including different sensitivities that may occur between life stages".

Microplastics and pharmaceutical residues are increasingly raising concern for water quality, potentially affecting human health and ecosystems. Up to 3 million metric tons (Mt) of microplastics enter the environment every year (OECD, 2021[102]) and over 17 Mt of plastic entered the ocean in 2021 (UN, 2022[93]). Microplastics are one of the most pervasive emerging environmental issues, as tiny plastic fragments, particles and fibres now widely contaminate oceans, freshwaters, soils and air. Humans and aquatic species, from plankton to large mammals, are commonly exposed to microplastics via ingestion and inhalation. Although data gaps hinder reliable risk assessments, concerns are mainly driven by the presence in plastics of toxic chemicals and known or suspected endocrine-disrupting additives, as well as by the potential for microplastics to absorb persisting organic pollutants from the environment (OECD, 2021[102]). Pharmaceutical residues also pose grave concern. Residues of pharmaceuticals, such as hormones, antidepressants and antibiotics, have been detected in surface water and groundwater across the globe (OECD, 2019[103]).

Water should also be available in sufficient quantity. The daily consumption of sufficient safe water is required to replenish body fluids and facilitate physiological processes (Howard et al., 2020[97]). Water is also essential for personal and domestic hygiene and for productive and some recreational activities. The WHO recommended minimum daily quantity of water for drinking is 5.3 litres (L)/person. This is the volume of water that should be accessible to ensure that lactating women engaged in moderate activity at moderately high temperatures – the population group with the highest physiological needs – remain hydrated. People living a sedentary lifestyle in temperate climates may require less, whereas those living in hot climates or engaging in strenuous work may require more.[12]

Undervaluing water is one of the fundamental causes of its mismanagement (Farnault and Leflaive, 2022[104]). The value of water is multifaceted, with sociocultural, economic and religious associations, as established by the Valuing Water Initiative[13] (initiated by the government of the Netherlands). While there is no clear relationship between water's price/cost and its value, the price or cost recorded in economic transactions tend to be confused with its value. Water is priced to recover some of the costs of service provision from consumers, but the price does not cover the full value of water. Almost absent from international conferences a few years ago, the valuing and financing water have begun to appear more recently on the international water agenda (e.g. the annual Stockholm World Water week, the Global Commission on the Economics of Water, UN Water Conference in March 2023, the OECD Roundtable on Financing water, the Valuing Water Initiative).

Energy Infrastructure

Energy is critical for basic services, human activities and development. Electricity is a versatile form of energy that has multiple impacts on human well-being and sustainability. Electricity is used to light and heat buildings, which increases the comfort, health and safety of residents. It supports a broad range of basic services, as well as economic infrastructure and activities. However, electricity generation is a major contributor to global greenhouse gas (GHG) emissions and climate change through the combustion of fossil fuels. Depending on how electricity is generated, it can have negative impacts on current and future well-being, including health, marine and terrestrial biodiversity and, more generally, sustainable development (Pachauri et al., 2014[105]).

Material conditions and economic capital

Access to energy is important but so is its affordability. Even if households have physical access, some may be excluded from electricity consumption because of fuel poverty, which may force households to reduce space heating or cooling to levels that reduce comfort and therefore well-being (OECD, 2019[1]). Looking at the electricity price alone is not sufficient to assess affordability properly, as it is not correlated with some indicators of energy affordability over the long term (Flues and van Dender, 2017[106]). On average in 2021, energy expenditure comprised 14% of households' current expenditures on housing across the OECD (OECD, n.d.[107]).

The affordability of electricity and energy poverty are multidimensional concepts. Focusing on electricity expenditure alone would result in a biased picture, in which households with electrical heating appliances appear to have higher electricity bills, although they may have lower energy bills. The European Union Energy Poverty Observatory has selected primary and secondary indicators to track energy poverty (European Commission, n.d.[108]). In addition to "inability to keep home adequately warm", the other primary indicator is "arrears on utility bills" (i.e. percentage of the population declaring to be unable to pay on time due to financial difficulties for utility bills (heating, electricity, gas, water, etc.) for the main dwelling. The two secondary indicators are "hidden energy poverty" (i.e. percentage of the population whose absolute energy expenditure is below half the national median) and "high share of energy expenditure in income" (i.e. percentage of the population whose share of energy expenditure in income is more than twice the national median share), both based on expenditure values from the Household Budget Surveys. Indicators used to monitor energy poverty and evaluate the impact of specific climate policies and energy-tax reforms on affordability ex ante have been proved to be positively correlated with the subjective indicator "inability to keep the home warm" (Flues and van Dender, 2017[106]).

During the recent global energy crisis, higher gas and coal prices accounted for 90% of the upward pressure on electricity costs around the world (IEA, 2022[109]). In 2022, Russia's cut in its natural gas supply to Europe and European sanctions on imports of oil and coal from Russia severed one of the main arteries of the global energy trade. Price and economic pressures are increasing the number of people without access to modern energy for the first time in a decade. Globally, around 75 million people who recently gained access to electricity are likely to encounter affordability challenges, and 100 million people may revert to the use of traditional biomass for cooking. High energy prices have prompted behavioural and technological changes in some countries to reduce energy use (IEA, 2022[109]).

Renewables have implications for employment opportunities, job quality and local communities. The transition to renewables is likely to create new jobs and initiate changes in job quality. For example, the number of mine workers may decrease as employment in renewables increases. This may create difficulties for some regions and communities, especially for those that rely on coal extraction (OECD, 2017[110]). However, it is difficult to define and therefore quantify the impact on overall employment, as not all jobs can be attributed clearly - in particular, indirect jobs, which refer to work for suppliers who provide services and intermediate goods for the energy sector (Advisory Council on the Environment, 2017[111]). Monitoring indirect job numbers in renewables is particularly challenging, as renewable energy suppliers consist of a relatively large variety of firms, most of which also offer other services besides renewables. Distinguishing between direct jobs (working for the mining or power company) and indirect jobs (suppliers) for fossil-fuel companies is, however, easier (OECD, 2019[1]).

Quality of life, human capital and natural capital

Electricity generation, and generation based on fossil fuel in particular, is associated with air, water and soil pollution. Fossil-fuel power plants – especially coal plants – are major contributors to GHG emissions and climate change. In 2021, the electricity sector emitted 13 gigatonnes of carbon dioxide (Gt CO_2), accounting for over one-third of global energy-related CO_2 emissions (IEA, 2022[112]). Coal accounted for 74% of the total CO_2 emissions from electricity generation. In advanced economies, electricity sector emissions have been declining since 2007, with a temporary rise in 2021 due to the recovery from COVID-19 (IEA, 2022[112]). Despite important progress in reducing air pollution from the power sector in recent years, air pollution remains a serious problem: fossil fuel air pollution is responsible for one in five deaths worldwide (Vohra et al., 2021[113]). Coal power plants are also a major source of mercury emissions (UN Environment Programme, 2023[114]). When airborne mercury enters the water cycle, it interacts with bacteria that convert it into its highly toxic form, methylmercury, which negatively affects aquatic ecosystems and animals, threatening fish-eating birds and mammals, as well as their predators (EPA, 1997[115]). Thermal power plants are also a major source of toxic waste, which can negatively affect the local environment if it is not properly stored (National Research Council, 2010[116]).

Renewable and decentralised solutions are on the way, but these are also bringing some negative impacts on public health, safety and ecosystems. In 2021, across OECD countries, nearly 12% of the total primary energy supply came from renewable sources, up from nearly 8% in 2010 (OECD, n.d.[117]). The share is higher when looking at electricity supply: 30% of the electricity generated in 2021 across the OECD was renewable, up from 18% in 2010 (OECD, n.d.[117]). With distributed energy resources (from small generation units (small hydro, rooftop solar), energy storage, demand response and electric vehicles), consumers can play a more active role self-producing electricity and transforming the traditional power system from a unidirectional, centralised system towards a bidirectional, decentralised system (OECD, 2019[1]). Distributed energy resources coupled with improvements in energy efficiency can lower the energy bill and have positive impacts on ecosystems and finite natural resources (land, materials) (IEA, 2018[118]) Nuclear and renewable energies, however, can also have negative impacts on public health and safety, ecosystems and biodiversity. Unless the negative impacts are addressed by appropriate policy design, low-carbon generation may come at the expense of other well-being goals (Gasparatos et al., 2017[119]). Nuclear energy may generate issues related to safety, health and ecosystems (Pachauri et al., 2014[105]; OECD, 2019[1]; Steinhauser, Brandl and Johnson, 2014[120]), which is affecting public acceptability in some countries. Renewable energies, including solar, hydro, wind and tidal, can have negative impacts on ecosystems and biodiversity through the loss or fragmentation of habitats. Large hydro dams often require displacing communities and interfere with the surrounding ecosystems, causing deforestation and landscape degradation (Winemiller et al., 2016[121]). Furthermore, large-scale bioenergy can put significant pressure not only on ecosystems and biodiversity, but also on available land and food production (OECD, 2019[1]).

2.4.2. The state of technical infrastructure in OECD countries

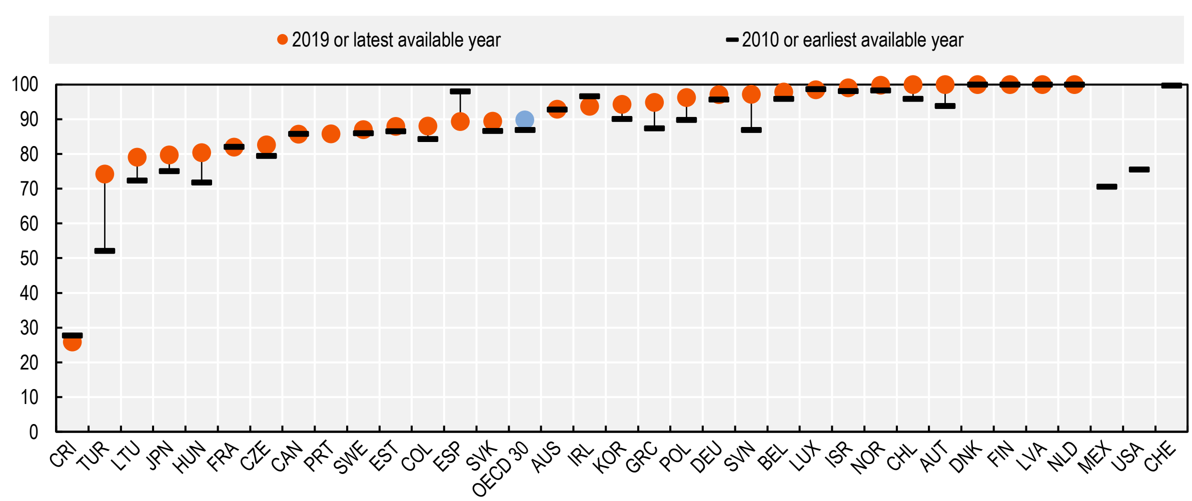
Access to essential services (drinkable water, electricity and public sewerage)

In terms of providing essential services to people, such as drinkable water, electricity and public sewerage, the stock of technical infrastructure in most OECD countries has reached a somewhat sufficient level. Nevertheless, there continues to be inequality between and within countries in terms of the provision of key technical infrastructure, which calls for continued attention from policy makers.

Access to drinkable water and to public sewerage are almost complete. While more than 90% of the population had access to drinkable water on average in the OECD in 2020, access was still below 90% in some OECD Latin American countries: 81% in Costa Rica, 73% in Colombia and 43% in Mexico. Data by urban/rural areas are scattered (i.e. available for only seven OECD countries) and show a slightly lower access to drinkable water in rural areas (between zero and five percentage points lower). The only exception is Colombia, which shows the highest urban-rural gap: only 40% of the rural population had access to drinkable water, compared to 80% in urban areas. Access to electricity is also complete or almost complete in urban and rural areas across OECD countries. Access is complete in all OECD countries, except in Mexico (98%) and in rural areas of other OECD Latin American countries (Chile, Colombia and Costa Rica), where access is almost complete, as 89% of the population or more have access to electricity. In terms of access to public sewerage, in 2019, 90% of the OECD population were connected to public sewerage (Figure 2.15). The percentage of the population connected to public sewerage varies from 26% in Costa Rica and just above 70% in Türkiye to complete coverage in Austria, Chile, Denmark, Finland, Latvia, the Netherlands and Norway.

Figure 2.15. Access to public sewerage in OECD countries varies from 26% and just above 70% to complete coverage

Percentage of the population connected to public sewerage



Note: Percentage of the national resident population connected to an urban wastewater collecting system. “Connected” means physically connected to a wastewater treatment plant through a public sewerage network (incl. primary, secondary, tertiary or other treatment). Individual private treatment facilities such as septic tanks are not covered. The latest available year is 2018 for the Slovak Republic, Spain and Türkiye; 2017 for Canada, Chile, Colombia, Costa Rica, Estonia, France, Germany, Greece, Ireland, Portugal and Sweden; and 2016 for Luxembourg. The OECD average excludes Iceland, Italy, Mexico, New Zealand, Portugal, Switzerland, the United Kingdom and the United States, due to lack of or outdated data.
Source: OECD *Green Growth indicators* (database), https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH.

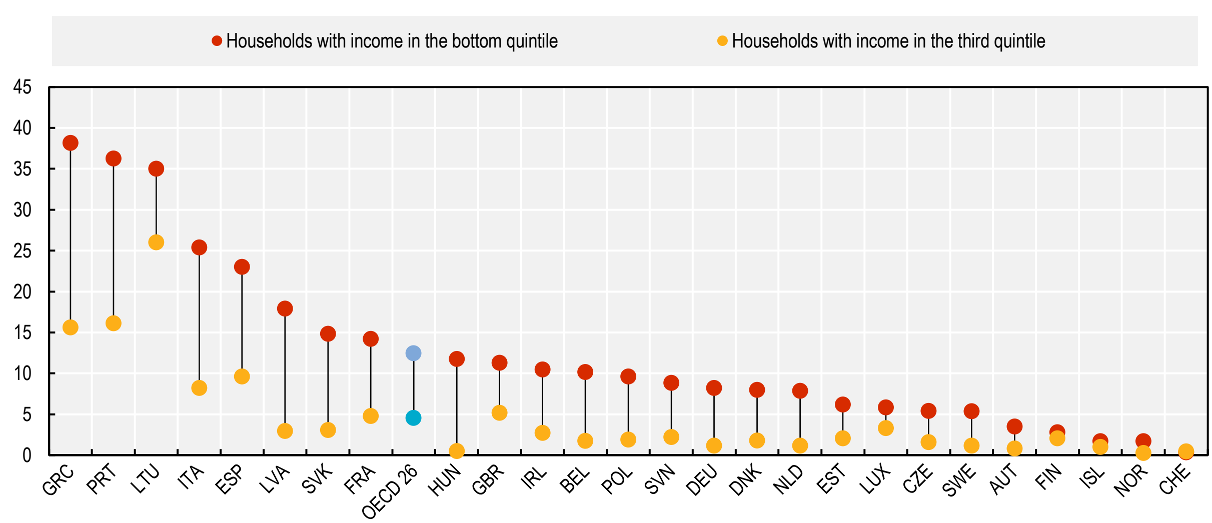
StatLink https://stat.link/9ea5hi

The quality of electricity access and service still matters. The quality of electricity access includes the quality and duration of the supply over the course of the day and the legality and safety of the connection. Hazardous connections in homes, notably in rural areas and slums, can cause major health issues, injuries and deaths (Bhatia and Angelou, 2015[122]). A large set of indicators inform policy makers and regulators about the electricity system's current performance (disruptions of electricity supply, supply shortage to satisfy demand).

While access to electricity is almost complete, one in eight low-income households in Europe cannot afford to keep their dwelling adequately warm (Figure 2.16). This share is almost three times that of those in the third income quintile. The percentage of those that cannot afford to keep the dwelling adequately warm in the bottom quintile ranges from below 2% in Iceland, Norway and Switzerland to above 30% in Greece, Lithuania and Portugal. This indicator is one of the primary indicators identified by the EU Energy Poverty Observatory to measure energy poverty (Thema and Vondung, 2020[123]). There are limitations to this indicator, however. It depicts an outcome of being in energy poverty, but it does not provide information about the reasons behind this inability to keep the home adequately warm, which could be economic (price of energy, lack of resources, etc.), issues with the building (energy efficiency of the home, lack of equipment) or others. Given that it is subjective, the social and cultural characteristics of households strongly influence the declaration of an inability to heat one's home adequately, and the level of adequate temperature can vary from country to country. Finally, there is the "denial of reality bias": energy-poor people might deny seeing themselves as being in an uncomfortable situation and, therefore, do not declare it. To better understand and monitor the drivers of energy poverty, a set of indicators, rather than a single indicator, may need to be considered (EU DG for Energy, 2023[124]).

Figure 2.16. One in eight low-income households cannot afford to keep their dwelling adequately warm

Percentage of households that cannot afford to keep their dwelling adequately warm, bottom and third quintiles of the disposable income distribution, 2020 or latest year available



Note: Data refer to 2019 for Germany and Italy; and 2018 for Iceland and the United Kingdom. The OECD average excludes Australia, Canada, Chile, Colombia, Costa Rica, Israel, Japan, Korea, Mexico, New Zealand, Türkiye and the United States due to lack of data.
Source: OECD calculations based on European Survey on Income and Living Conditions (EU-SILC), as available from the OECD *Affordable Housing* Database, http://www.oecd.org/social/affordable-housing-database.htm.

StatLink https://stat.link/noe3qu

2.5. Well-being and the built environment: Urban design/land use

2.5.1. The inter-relationship between well-being and urban design/land use

Urban design and land use determine access to opportunities (e.g. employment, health and education), neighbourhood characteristics (e.g. the quality of services, public space and infrastructure), and the transport connections between a given dwelling and different areas of a city. All these have impacts on health, safety, the environment, equity and overall well-being. For example, planning housing development as part of more compact and mixed land-use development, integrated with high-quality public and non-motorised transport facilities, can avoid urban sprawl and car dependence, reduce air pollution and GHG emissions, and improve the quality of life (OECD, 2019[1]). Inclusiveness can also be promoted by urban design. Low-income areas are often associated with lower-quality education, less access to good-quality green space, and a lower quality of the dwelling itself (Clarke and Wentworth, 2016[125]). To foster inclusivity, some cities like Vienna (City of Vienna, n.d.[126]) and Barcelona (City of Barcelona, n.d.[127]) have applied a gendered lens to urban planning to account for gender differences in needs and experiences of the city. Some of the urban planning models fostering well-being and sustainability (such as compact cities and superblocks) are further introduced in Box 2.2.

Box 2.2. New urban planning models fostering well-being and sustainability: Compact cities, Superblocks, the 15-minute city

In recent years, new urban planning models such as compact cities, superblocks, the 15-minute city, no-car city and a combination of these have emerged to foster well-being and sustainability.

- **Compact cities** are characterised by a higher residential density, shorter distances and a more diversified land use. One of the key elements is the shift from private motor vehicles towards pedestrians, bicycles and low-emission public transport. Compact cities bring health benefits to citizens, such as reducing diabetes, cardiovascular disease and respiratory disease, when planned to favour green spaces and avoid heat island effects. (Stevenson et al., 2016[128]).
- Another model is **the superblocks model**, planned by the city of Barcelona. With the creation of over 500 so-called "superblocks", the city aims to reduce motor vehicle traffic on some streets and to provide more space for people and green areas. An analysis of the impact of the superblocks implemented in the neighbourhoods of Poblenou, Sant Antoni and Horta by the Barcelona Public Health Agency (ASPB) (Ajuntament de Barcelona, n.d.[129]) concluded that they are generally perceived as better for well-being, tranquillity, sound quality, noise reduction, pollution reduction and social interactions and mobility. These effects, in turn, can help to prevent chronic health problems, such as cardio-vascular or respiratory diseases, diabetes, obesity, cancer, depression and anxiety.
- Finally, **the 15-minute city model** builds on the idea that the city should be a place where work, school, entertainment and other activities can be reached within a quarter of an hour's walk from home. The city of Paris is pursuing this model, which was first conceptualised by the urban planner Carlos Moreno. Moreno's vision is that of a polycentric city, where the population density is made pleasant, where the inhabitants can satisfy six categories of social functions: to live, to work, to supply themselves, to take care of themselves, to learn and to have fun. The model is based on three main ideas: ecology (for a green and sustainable city), proximity (living at a small distance from other activities) and solidarity (to create links between people).

Material conditions and economic capital

Income, consumption and housing

Housing and transportation costs, combined, should be considered in urban planning. Failure to account for the higher transportation costs in remote neighbourhoods could lead to policies, plans and regulations that exacerbate sprawl and locate households far from civic, social and economic amenities and opportunities (Guerra and Kirschen, 2016[130]). Various measures are necessary to bring opportunities to people living in low-income neighbourhoods by favouring mixed land-use to increase the proximity of people and opportunities. Investment to improve the efficiency of the transport system may increase accessibility in a neighbourhood but, without additional measures, may not necessarily translate into greater accessibility for low-income residents. House prices and rents in the less affluent neighbourhoods targeted by investment will rise alongside improvements in accessibility. Complementary policies (such as expanding the housing supply through densification around transport links or dedicated affordable housing) can alleviate these cost pressures (OECD, 2020[65]). In this context, the Center for Neighborhood Technology (CNT) in the United States has developed a methodology incorporating transportation costs into measures of neighbourhood affordability (Guerra and Kirschen, 2016[131]). The resulting *Housing and Transport (H+T©) Affordability Index* was used to develop a national framework that calculates neighbourhood affordability within and across cities in the United States. The CNT defines transport and housing as affordable when their expenditures stand below 15% and below 30% of household income, respectively (OECD, 2019[1]).

In particular, the location of housing matters. Broadening the spatial scale from an individual house to the area where the house is located allows room for examining their interdependencies. It is possible to leverage interdependencies to better consider synergies and trade-offs (OECD, 2019[1]; Turcu, 2010[132]; 2012[133]; Suescún et al., 2005[134]). For example, densifying areas without sufficient levels of transport accessibility can increase congestion (especially in adjacent neighbourhoods), fuel GHG emissions and pollution and reduce the quality of life. Likewise, not ensuring minimum green space in urban areas can undermine the physical and mental health of inhabitants (Clarke and Wentworth, 2016[125]; Power et al., 2009[135]) and miss opportunities for contributing to climate change mitigation and resilience, by reducing urban heat islands through nature-based negative-emission approaches (OECD, 2019[1]). Housing is not an isolated entity, but it is part of a neighbourhood (meso scale), a city (macro scale), a region (regional scale) and finally the wider ecosystems in which urban agglomerations are embedded (OECD, 2019[1]).

This broad approach is consistent with the WHO definition of healthy housing and the UN Habitat New Urban Agenda (NUA) adopted in 2016. The WHO's definition of healthy housing includes both "the presence of a community, and the quality of the neighbourhood and its relation to social interaction, sense of trust and collective efficacy", and "the nature of the immediate housing environment, such as the quality of urban design, including green spaces, services and public transport choices" (WHO, 2018[136]). It is consistent with that of the NUA, which states that adequate housing should be "i) ensuring adequate social functions and standard of living that ensure access to basic services such as drinkable water, public goods, and quality services for food and security; ii) fostering inclusiveness and gender equality; iii) promoting civic engagement; iv) leveraging urbanisation to support the transition to a sustainable and formal economy; v) fostering territorial integration and development; vi) enhancing efficient and sustainable urban mobility, as well as improving accessibility; and (vii) protecting ecosystems and natural habitat, and promoting sustainable consumption and production" (UN Habitat, 2017[137]).

Quality of life, human capital and natural capital

Safety

Urban design and land use drive neighbourhood safety. Land and urban design can influence the speed of travellers and the complexity (e.g. number of road intersections, intersection design, bus stop design) they are exposed to, potentially creating circumstances that increase or reduce the frequency and severity of traffic crash risks (Saha, Dumbaugh and Merlin, 2020[138]). Road characteristics such as the length of roadway segments, the number of lanes, or roads' location in an urbanised area are positively associated with the higher risk of a crash (Chen and Lym, 2021[139]). Greater numbers of parcel deliveries and transit stops are associated with higher risk of crashes involving pedestrians, bicycles and vehicles (Kim, Pant and Yamashita, 2010[140]; Yu and Woo, 2022[141]; Osama and Sayed, 2017[142]). Conversely, single and multi-family residential areas are associated with fewer crashes (Yu and Woo, 2022[141]; Kim, Pant and Yamashita, 2010[140]).

An unkept and blighted built environment can increase the perception that it is unsafe. Empirical studies on the "Broken Windows Theory" (Wilson and Kelling, 1982[143]) suggest that physical environmental disorder increases criminal behaviour and perceived and actual social disorder (Hinkle and Yang, 2014[144]), therefore contributing to lower perceived safety. The presence of trash in the street, vandalised buildings, blighted lots, insufficient nighttime street lighting, low network connections and unkept and insufficiently lit green spaces can increase the perception of crime (Velasquez et al., 2021[145]; Pearson et al., 2021[146]; Kaplan and Chalfin, 2021[147]; Hardley and Richardson, 2021[148]). People with a lower economic status are more likely to live in degraded neighbourhoods and are disproportionately affected by violence (CDC, 2021[149]). For adults with functional limitations, sidewalk quality matters for safety (Velasquez et al., 2021[145]). In 2022, 73% of people declared they felt safe walking alone at night in their neighbourhood in the OECD, up from 65% in 2006. In particular, women feel significantly less safe than men: over the period 2017-22, 80% of men declared feeling safe compared to 65% of women (OECD, n.d.[54]).

Physical and mental health

The built environment can shape people's physical activity behaviours, especially in terms of active transport (e.g. biking, walking) (OECD/WHO, 2023[150]; Cervero et al., 2009[151])**.** People living in more "walkable", safe and attractive environments are more likely to use active transport and have higher levels of physical activity (Mackett and Brown, 2011[152]; Handy et al., 2002[153]). Urban design and the efficiency of municipal transport networks are crucial factors in favouring or hampering active transport, and consequently physical activity. A compact urbanisation that prioritises the needs of pedestrians instead of motor vehicles promotes physical activity (OECD/WHO, 2023[150]).

Safer, less polluted and greener neighbourhoods are associated with improved mental health. Living in unsafe areas with high levels of violent crime and/or vandalism is associated with higher levels of mental ill-health and lower levels of life satisfaction (Guite, Clark and Ackrill, 2006[154]; Fujiwara and HACT, 2013[155]; OECD, 2023[28]). Exposure to air pollution, especially at a young age, can lead to future problems with physical and mental health (OECD, 2023[28]). Air pollution is often worse in lower socio-economic neighbourhoods where residents are more likely to also have worse employment outcomes and housing conditions (Brunekreef, 2021[156]; Kerr, Goldberg and Anenberg, 2021[157]), which contribute to poor mental health. Air pollution can also affect health-related behaviours: people who live in heavily polluted areas are less likely to spend time outside or to engage in physical activity (Bos et al., 2014[158]). Conversely, improved mental health outcomes are associated with greater access to clean air and more time spent in nature (Bratman et al., 2019[159]). Living in neighbourhoods with ample access to green spaces like gardens and parks is associated with better mental health (Guite, Clark and Ackrill, 2006[154]). More exposure to green areas and increasing the number of leisure facilities in the built environment also provide opportunities and venues for physical activity and social interaction for the elderly, thereby promoting their physical and mental health (Yan, Shi and Wang, 2022[160]). As for housing, the quality and aesthetic of a neighbourhood are associated with greater momentary happiness (Seresinhe et al., 2019[161]) and influence positive mental health as a status symbol (Bond et al., 2012[45]). Contemporary architecture – characterised by asymmetry, lack of ornamentation, and industrial appearance – has been found to score lower in environmental perception than traditional architecture (Mouratidis and Hassan, 2020[162]) and could thereby trigger negative emotional responses, since environmental perception may contribute to affective appraisal (Zhang and Lin, 2011[163]).

Environmental quality and natural capital

The nexus between the built environment and the natural environment and capital is complex and intertwined. Buildings and the construction sector are major sources of CO_2 emissions, the consumption of natural resources, waste and pollution, all of which aggravates climate change and threatens biodiversity. However, green urban areas may mitigate some of these negative impacts on the natural environment and provide additional well-being benefits.

Looking at land use and the way it is changing leads to a more comprehensive picture of its impact on the natural environment and its resources. Across the OECD, 75% of land in 2019 was covered by natural or semi-natural vegetation. This share ranges from below 30% in Israel, Denmark and Hungary to above 87% in Norway, Ireland and Australia (OECD, n.d.[164]). Between 2004 and 2019, the total land covered by natural and semi-natural vegetation in OECD countries remained stable. However, it is important to separate losses and gains in natural and semi-natural vegetation, as losses can involve damage to habitats rich in biodiversity (e.g. loss of primary or old-growth forest) that may not be compensated by gains in semi-natural areas that are poor in biodiversity. Land change also matters for economic and environmental efficiency. There are powerful economic incentives to redevelop urban land, such as brownfields, for industrial, residential and commercial uses, leading to additional carbon emissions. Most brownfield sites have some form of “greenish space” in the form of derelict, empty or vacant land, which is being taken over by natural space. These green areas are often suppressed, because bringing nature back to contaminated sites is believed to be relatively expensive. Nonetheless, brownfield sites can provide opportunities to develop green and blue spaces, and their development should be monitored in tandem with the evolution of green and blue spaces (OECD, 2019[1])

Urban green areas mitigate exposure to air pollution, excessive heat and noise and foster pro-environmental behaviours (WHO Regional Office for Europe, 2016[165]; Engemann et al., 2019[166]). A recent study published in the *Lancet* (Iungman et al., 2023[167]) found that of the 6 700 premature deaths linked to higher temperatures in 93 European cities during 2015, one-third could have been prevented by increasing urban tree cover by at least 30% per neighbourhood. High temperatures in urban environments are associated with negative health outcomes, such as cardiorespiratory failure, hospital admission and premature death (Iungman et al., 2023[167]). Strategically integrating green infrastructure into urban planning can promote more sustainable, resilient and healthy urban environments.

Green areas can support climate change mitigation if carefully planned. Such areas, in particular trees, have the potential to sequester carbon and be a nature-based negative emissions solution. Nevertheless, urban green areas entail important costs and do involve emissions linked to their construction and maintenance. Trees in urban areas also pose challenges in terms of mortality rates since dead trees release GHGs as they decompose. A careful and comprehensive life-cycle assessment is key to correctly assessing the potential of urban green areas to mitigate climate change (OECD, 2019[1]). Trees in poor condition have less ability to provide ecosystem services, since poor conditions impede growth, slow carbon sequestration and can also lead to canopy dieback (University of Florida, 2020[168]). Larger trees have a better capacity to store carbon, to reduce atmospheric pollution and to avoid stormwater runoff. The interception of precipitation and air pollutants increases with greater canopy size and total leaf area (i.e. the total area of all leaves), which is associated with greater height (Munson and Paré, 2022[169]).

Also, green space design can contribute to climate change mitigation. Green space design includes the diversity of the tree population and the share and distribution of open space relative to the tree-covered space. This has proven important for increasing the potential of carbon sequestration (Strohbach, Arnold and Haase, 2012[170]; Hutchings, Lawrence and Brunt, 2012[171]; Nero et al., 2017[172]).

Building heights also interact with environmental quality and natural capital. Limiting building heights, with Floor Area Ratio (FAR) limits in particular, may lead to urban sprawl, leading in turn to higher GHG emissions from commuting and higher housing prices (Borck, 2016[173]; Jedwab, Barr and Brueckner, 2020[174]). On the other hand, Resch et al. (2016[175]) found that the energy use of buildings changes profoundly with height, as heat loss per floor decreases as the building reaches higher. The authors argue that there is a range of heights that contribute most to an energy-efficient urban structure, which lies in a broad range of 7 to 26 stories, depending on population size and building lifetimes. The relationship between building heights and the local wind environment has also been receiving greater attention. This is related to the quality of the urban climate, such as heat island intensity and air pollution, which affect well-being in large cities. Urban ventilation is also a key factor influencing pedestrian comfort (Tsichritzis and Nikolopoulou, 2019[176]; Chen et al., 2017[177]; Chen and Mak, 2021[178]).

Box 2.3. Building, the construction sector and sustainability

- Buildings and the construction sector are major emitters of greenhouse gases and impact the natural environment in various ways. These include CO_2 emissions, the generation of construction and demolition waste, (indoor and outdoor) air pollution, and the consumption of energy and natural resources (European Commission, n.d.[179]; OECD, 2004[180]). In 2021, the global buildings sector consumed an estimated 30% of global energy (IEA, 2022[181]). A further 4% of global energy use and 6% of global emissions in 2021 were due to the production of concrete, steel and aluminium and materials used in the construction of buildings (IEA, 2022[181]). The production of glass and bricks could amount to a further 2-4% of global emissions. Combined, CO_2 emissions from the operation of buildings and the materials used in their construction are estimated to account for around 37% of global energy and process-related emissions in 2021 (UNEP, 2022[182]).
- The transition to the decarbonisation and sustainability of the built environment is still "not on track". After construction activity fell briefly during the COVID-19 pandemic, in 2021, it rebounded to pre-pandemic levels in most major economies. The increased use of fossil fuel gases in buildings in emerging economies drove the largest rise in building energy demand in the last 10 years (IEA, 2021[183]). As a consequence, CO_2 emissions from buildings operations have reached an all-time high, up by 5% and 2%, respectively, compared to 2020 and the 2019 previous peak. To be aligned with reaching net zero carbon emissions by 2050, emissions need to fall by over 98% from 2020 levels (IEA, 2021[183]).
- Buildings and infrastructure are also vulnerable to climate change. Every region across the globe is already experiencing weather and climate extremes, such as heatwaves, flooding, precipitation, droughts and cyclones. With global warming, scientists anticipate increases in the frequency and intensity of these extreme events (UN, 2022[93]). Despite the adoption of the Sendai Framework for Disaster Risk Reduction at the UN World Conference on Disaster Risk Reduction in 2015, direct economic losses and damage to critical infrastructure have increased substantially over the past decade (United Nations Office for Disaster Risk Reduction, 2022[184]). The Sendai Framework is a 15-year (2015-2030), voluntary, non-binding agreement, with seven targets and four priorities for action. The 2030 Agenda for Sustainable Development also recognises and reaffirms the urgent need to reduce the risk of disasters, pointing to specific

objectives, such as reducing the exposure and vulnerability of the poor to disasters, as well as building resilient infrastructure.

- Green buildings can contribute to tackling climate change. The construction of energy-positive and negative-emission buildings and infrastructure can reduce the environmental footprint of the built environment, also bringing benefits to people's well-being and sustainability (OECD, 2019[1]). Designing buildings with passive solutions (e.g. orientation, ventilation) can significantly reduce energy needs (through natural daylight, heat loss reductions, etc.), while also improving thermal comfort and health (IEA, 2019[185]). Moreover, buildings can become carbon sinks, even after accounting for their entire life-cycle emissions, and bring wider well-being and environmental benefits, provided that measurement tools and instruments exist to incentivise net-positive carbon performance (Renger, Birkeland and Midmore, 2014[186]).

Community relations and social capital

Spaces become places when they provide setting for social connections. Spaces that bring people together, enabling people to participate in community life, are such places. Some of these places have been designed with the intention to create opportunities for individuals and groups to interact and form social relations. For example, squares, parks and play areas, are places specifically designed for people to meet up in informal settings (O'donnell et al., 2014[187]). There are also places that "host the regular, voluntary, informal, and happily anticipated gatherings of individuals beyond the realms of home and work" (Oldenburg, 1999[188]). These so-called "Third places" can include bars, churches, libraries, shops and markets (Jeffres et al., 2009[189]). "Non-places", such as motorways, stations and shopping malls, which are not often suitable for socialising, can also provide opportunities for sociability through their design and specific interventions (e.g. community events) (Bagnall et al., 2023[190]; Aubert-Gamet and Cova, 1999[191]). On the other hand, there is strong evidence that interventions in green and blue areas (any natural green space: parks, woodland, gardens; or blue space: rivers, canals, coastal areas) can enhance social cohesion and a sense of belonging, in addition to individual well-being benefits, such as increased physical activity (Bagnall et al., 2023[190]) and opportunities for social interactions especially for the elderly (Yan, Shi and Wang, 2022[160]). The picture is more mixed as to whether different types of urban design/land use interventions have positive impacts on social connections. There is evidence that neighbourhood design can improve social networks and have positive impacts on community well-being, particularly civic participation, and reduced crime. Both positive and negative impacts are reported in cases of urban regeneration, however, as urban regeneration projects can either create social relationships or weaken existing social ties between long-term residents and create a divide between longer-term and newer residents (Bagnall et al., 2023[190]).

Walkable and less dense neighbourhoods are associated with higher neighbourhood social cohesion. Walkability and easy access to destinations are associated with greater social cohesion at a neighbourhood level (Mouratidis, 2017[192]; Kwon, Lee and Xiao, 2017[193]; Mazumdar et al., 2017[194]; Talen and Koschinsky, 2014[195]; Wood, Frank and Giles-Corti, 2010[196]). Residents of dense, mixed-use neighbourhoods appear to form more impersonal neighbour ties, resulting in lower neighbourhood social cohesion (Mouratidis, 2021[197]), even after controlling for the time living in the dwelling (Mouratidis and Poortinga, 2020[198]; Brueckner and Largey, 2008[199]; French et al., 2013[200]; Skjaeveland and Garling, 1997[201]). Daily interactions between neighbours in these conditions tend to be more superficial (Simmel, 1903[202]; Tönnies, 2012[203]). According to (Mouratidis and Poortinga, 2020[198]), this is explained by the following factors: 1) Detached houses, duplexes and row houses in low-density areas might be conducive to more frequent and more meaningful social interaction between neighbours compared to apartment blocks found in denser areas. 2) A lower density may provide residents with greater control over whom they meet and socialise with regularly (Baum and Valins, 1977[204]). The lower concentration of residents means people are more likely to frequently meet a limited number of neighbours. This helps create the trust needed for developing social ties. 3) Residents of dense, inner-city neighbourhoods are enabled to create and maintain bonds with residents of other neighbourhoods more easily due to geographical centrality and higher accessibility. Therefore, they might have a decreased need for socialising with neighbours and might be less interested in forming local social connections.

On the other hand, social interactions are more frequent in denser urban areas. Although these areas result in more impersonal social interaction between neighbours and weaker neighbour ties, they enable their residents to socialise more frequently overall with friends and family and facilitate the development and maintenance of larger overall social networks, since they bring a larger number of people into proximity and provide greater access to "third places" (Balducci and Checchi, 2009[205]; Mouratidis, 2018[206]; Jacobs, 2016[207]; Gehl, 2013[208]). Compact-city residents, although they may not even know their neighbours, tend to have a greater number of close relationships, to socialise more often, to receive stronger social support, and to have better chances of making a new friend or meeting a new partner compared to residents of low-density suburbs (Mouratidis, 2018[206]; Melis et al., 2015[209]). There is, however, also literature suggesting that high-rise buildings are less satisfactory than other housing forms for most people, are not optimal for children (restricting children's play), and lead to more impersonal social relations (Gifford, 2007[210]).

Despite less ease of using transport to connect with others, and consequently greater challenges in making social connections, people in rural areas tend to have a strong community culture (UK Department for Digital, Culture, Media and Sport, 2018[211]). People living in the British countryside are no more likely to report feeling lonely than people in cities. Instead, the UK Office for National Statistics (ONS) found that home and neighbourhood matters, as people who rent are more likely to feel lonely, while people satisfied with their neighbourhood are less likely to feel lonely (ONS, 2018[212]).

The built environment can compound or alleviate loneliness. The European Commission Joint Research Centre (JRC) has conducted a study to explore the concept of "lonely places" (Proietti, 2022[213]). They are identified as "a plurality of places that present a vulnerability in terms of lack or insufficient local endowment, accessibility, or connectivity". A lonely place can be digitally or physically disconnected, poorly equipped with urban amenities and disengaged from participation. Lonely places were identified in remote and rural areas, but also in urban areas. The 2023 US National Strategy to Advance Social Connection of the US Department of Health and Human Services (HHS) (US HHS, 2023[214]) recognises that the built environment (the layout of cities, from the usability and reach of public transportation to the design of housing and green spaces) has a direct effect on social connections, and the first of its six pillars highlights the importance of designing a built environment to promote social connection. Neighbourhoods with high building heights and without communal areas can impede social interaction, with both children and stay-at-home mothers feeling more isolated (Evans, Wells and Moch, 2003[215]). According to the report of the Campaign to End Loneliness hosted by the What Works Centre for Wellbeing, the overall pattern of the built environment, rather than individual solutions to elements of it, matters to alleviate loneliness (MacIntyre and Hewings, 2022[216]). This includes walkable, safe, friendly neighbourhoods, where people can get around, have access to a mix of services from the public, private and voluntary sectors, and can interact and connect at different levels, creating "weak ties", and also develop strong relationships, such as friendships, and then go on to create "strong ties".

Stronger evidence is needed to better identify the impact of the built environment on loneliness. Additional evidence is necessary to strengthen the understanding of the connection between specific features of the built environment, aspects of place-based interventions, and reductions in loneliness in order to improve the design of the built environment. One reason is that it can be difficult to separate the impact of the purely physical environment from that of the social activity and experience which takes place and evolves within it (MacIntyre and Hewings, 2022[216]).

2.5.2. The state of urban design and land use in OECD countries

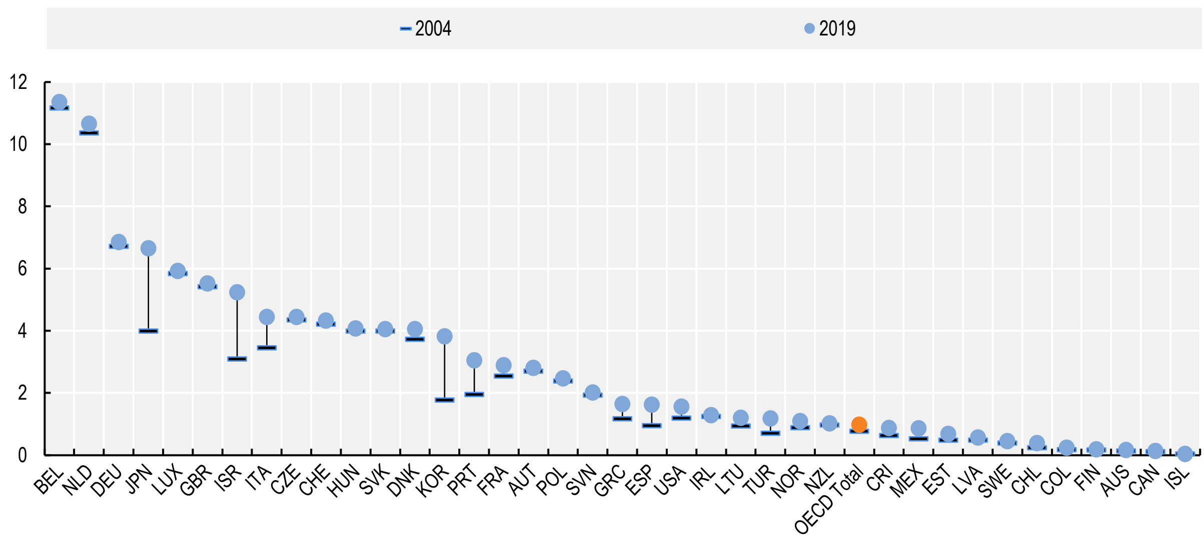
Urban design/land use concerns the organisation of space, making it difficult to quantify as a specific asset. In this section, this is described using indicators related to how the space is organised, first with an overview of the extent and evolution of artificial surfaces, then delving into a number of main categories, such as built-up areas and urban green areas. The quality of urban design/land use is assessed in terms of access or proximity to amenities (urban green areas) and services (hospitals and schools). Internationally comparable data on artificial surfaces are available and presented here at the country level, while more detailed data on the type of artificial surfaces, such as built-up areas and urban green areas, are available for metropolitan functional urban areas. As the number of functional urban areas (FUAs) with available data can vary from country to country, and to facilitate the reading, only information relative to OECD capital cities is presented. *For a detailed description of the indicators included, please refer to Annex 2.A.*

Artificial surfaces

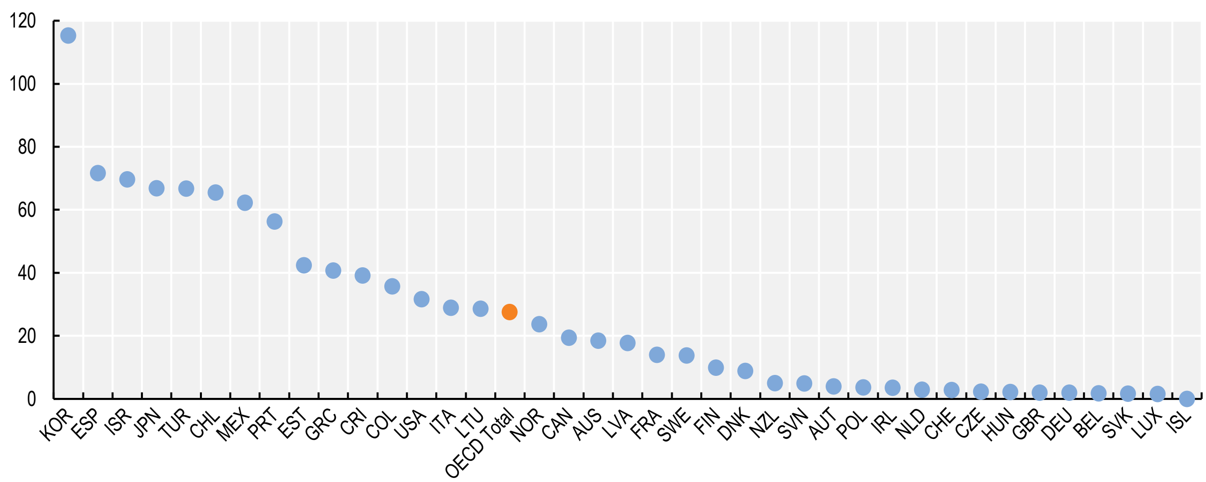
Artificial surfaces cover 1% of the OECD total land surface, on average (Figure 2.17, Panel A). Artificial surfaces are defined by the Central Framework of the System of Environmental- Economic Accounting (SEEA) (United Nations, 2014[217]) as any urban or related feature, including urban parks (developed for leisure and recreational purposes), and industrial areas, waste dump deposits and extraction sites. The stock of artificial surfaces in OECD countries ranges from less than 0.3% of the total land in Australia, Canada, Colombia, Finland and Iceland to more than 10% in Belgium and the Netherlands. The stock of artificial surfaces is highly correlated (0.83) with the country's population density: high-density countries such as Belgium, Germany, Israel, Japan, Luxembourg, the Netherlands and the United Kingdom are covered by a higher share of artificial surfaces, while low-density countries such as Australia, Canada, Finland and Iceland have the lowest share. The correlation is not perfect as, for example, Korea has the highest population density, but not the highest share of artificial surfaces. Compared to 2004, the stock of artificial surfaces has increased by almost 30% (0.2 percentage points) in the OECD area, with the largest increases in Korea (more than 100%), Israel and Spain (around 70%) and Chile, Japan, Mexico and Türkiye (above 60%) (Figure 2.17, Panel B). Iceland is the only OECD country where there has there been no increase in artificial surfaces since 2004, and there are no OECD countries in which artificial surfaces been converted at scale to another type of land use since 2004.

Figure 2.17. The stock of artificial surfaces in OECD countries ranges from less than 0.3% of total land to more than 10% and has increased by almost 30% since 2004

Panel A. Artificial surfaces, as a percentage of total land area



Panel B. Intensity of conversion to artificial surfaces, percentage, 2004-2019



Note: Artificial surfaces are defined by the SEEA Central Framework (United Nations, 2014) as any urban or related feature, including urban parks, and industrial areas, waste dump deposits and extraction sites.
Source: OECD *Land cover in countries and regions* (database), https://stats.oecd.org/Index.aspx?DataSetCode=LAND_COVER (Panel A) and OECD *Land cover change in countries and regions* (database), https://stats.oecd.org/Index.aspx?DataSetCode=LAND_COVER_CHANGE (Panel B).

StatLink https://stat.link/xrlhps

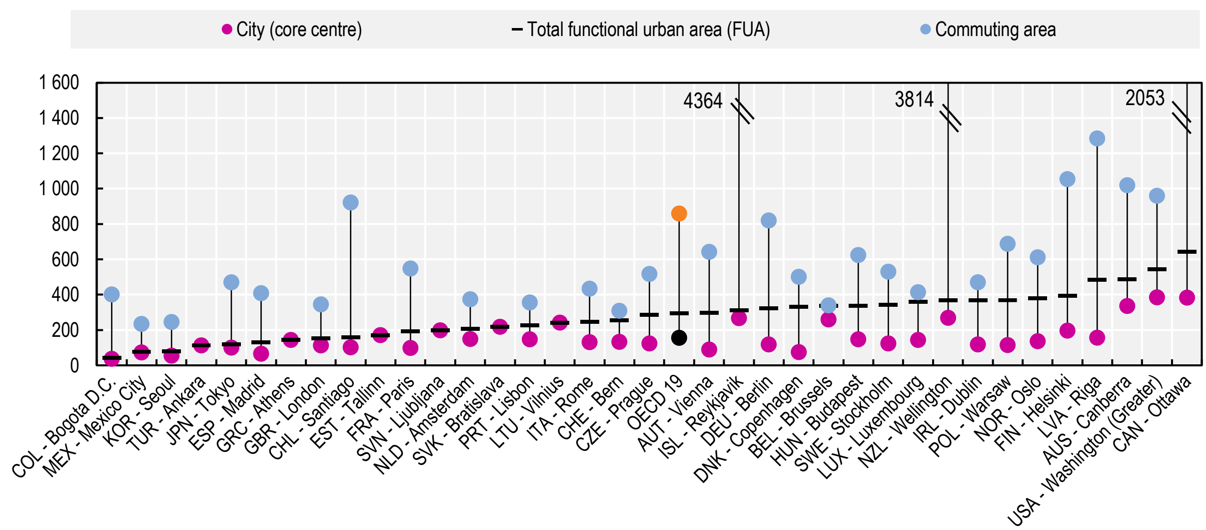
Urban built-up area

Built-up area per capita varies widely among OECD capital cities. The OECD defines "built-up" area as an area with the presence of buildings (roofed structures) (OECD, 2023[218]). This definition largely excludes other parts of urban environments and the human footprint, such as paved surfaces (roads, parking lots), commercial and industrial sites (ports, landfills, quarries, runways) and urban green spaces (parks, gardens). In 2021, there were 292 sqm per capita of built-up area on average in OECD capital cities (Figure 2.18). The surface of built-up area per capita ranged from just above 40 sqm per capita in

Colombia's capital city Bogota to more than ten times higher in Riga (Latvia), Canberra (Australia), Washington (the United States) and Ottawa (Canada). On average in OECD capital cities with available data, nearly 70% of built-up area per capita is residential. In OECD countries, the residential area covers at least 50% of the built-up area per capita, except in Korea's capital city Seoul, where only 35% of the built-up area per capita is residential and more than 60% is commercial (OECD, n.d.[219]). In commuting areas, the built-up area per capita is nearly six times larger than in the core centre, on average. This ratio goes from 1.30 (30% more than in the core centre) in Brussels (Belgium) to more than 16 (16 times higher than in the core centre) in Reykjavik (Iceland).

Figure 2.18. Built-up area per capita in selected OECD capital cities varies from just above 40 sqm to more than 400 sqm

Built-up area, sqm per capita, by functional urban area (FUA) and components (core centre and commuting area), selected OECD capital cities, 2021



Note: OECD 19 is the simple average of the 19 capital cities included in the chart with information available for both the core centre and the commuting areas. Data are not available for Costa Rica nor Israel. Functional urban areas (FUAs), as defined by the OECD and the EU, are composed of a city and its commuting zone. This definition overcomes the purely administrative perimeter to encompass the economic and functional extent of cities based on people's daily movements (OECD, 2022[11]). These indicators were estimated using a deep learning model based on satellite imagery.

Source: OECD *Regions and Cities, City statistics* (database), https://stats.oecd.org/Index.aspx?DataSetCode=FUA_CITY and (Banquet et al., 2022[220]).

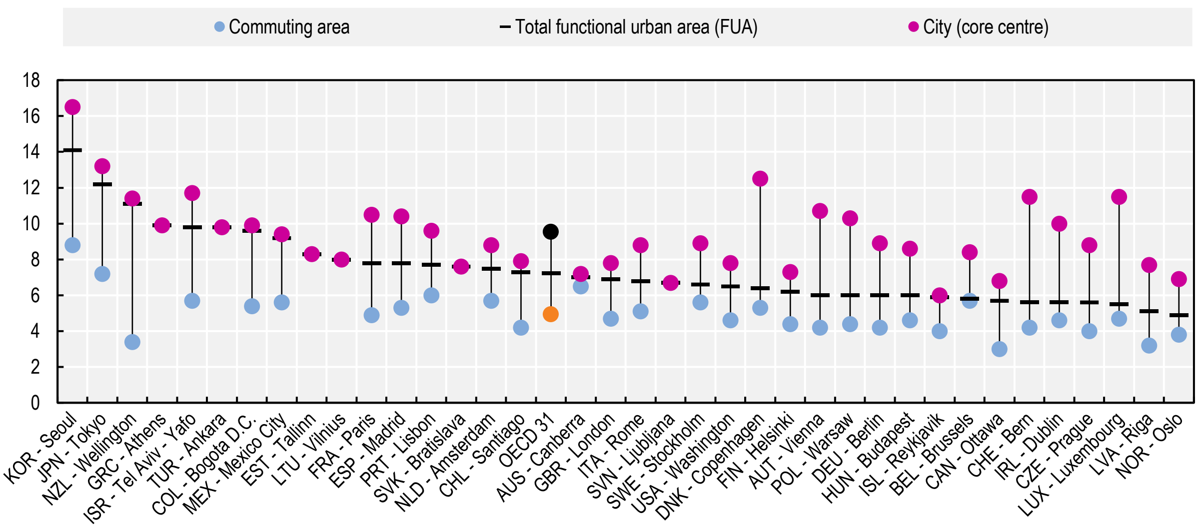
StatLink https://stat.link/6zkbo2

Average urban building height

Built-up area tends to develop horizontally in the commuting area and vertically in the core centre. While built-up area per capita is six times larger in the commuting area, average building height in the core centre is twice that in the commuting areas. The average building height in OECD capital cities is seven metres (Figure 2.19). Buildings in the core centre are twice the height of those in the communing area, on average. The average difference in building height between the core centre and the commuting area varies from 10% in Canberra (Australia's capital city) to almost three-and-a-half times in Wellington (New Zealand).

Figure 2.19. Buildings in the core centre of OECD capital cities are, on average, twice the height of those in the commuting zone

Average building height, metres, by functional urban area (FUA) and components (core centre and commuting area), selected OECD capital cities, 2021



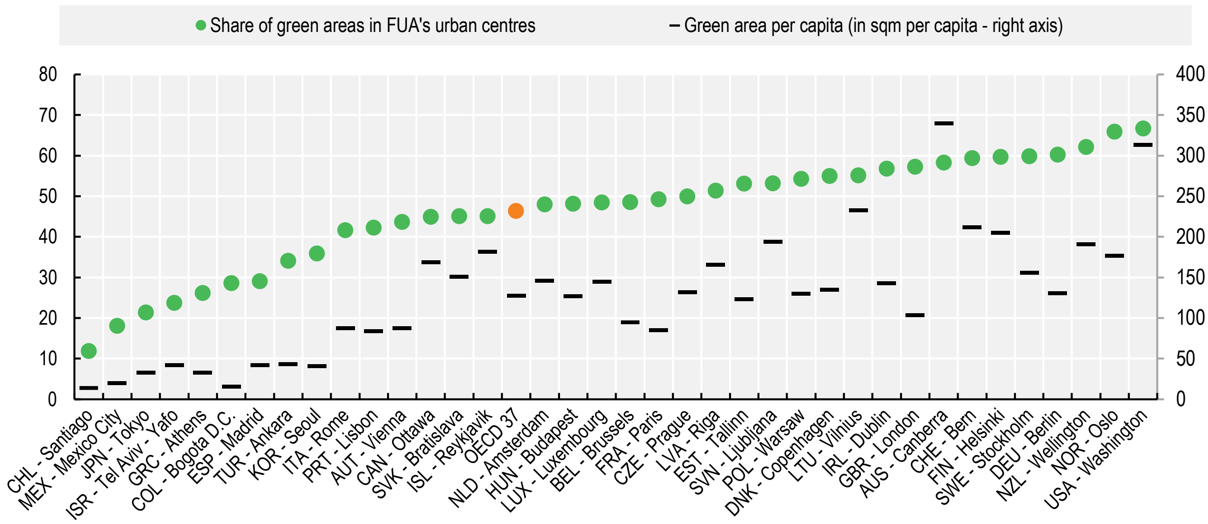
Note: OECD 31 is the simple average of the 31 capital cities included in the chart with information available for both the core centre and the commuting areas. Data are not available for Costa Rica. Data are not available for both core centre and commuting area for Estonia, Greece, Lithuania, the Slovak Republic, Slovenia and Türkiye.
Source: *OECD Regions and Cities, City statistics* (database), https://stats.oecd.org/Index.aspx?DataSetCode=FUA_CITY and European Commission's Global Human Settlement Layer (GHSL), https://ghsl.jrc.ec.europa.eu/.

StatLink https://stat.link/kme17g

Among the OECD capital cities with available data, urban green areas cover 46% of the Functional Urban Areas (FUAs) (Figure 2.20). The share of FUA varies from 12% in Chile's capital city Santiago to 67% in the United States' capital Washington. The correlation between the share of green areas in the FUAs' urban centres and green areas per capita is high (0.80), but not perfect, because it is related to the density of the city: for denser cities the share in FUA is higher than the surface per capita. This definition of urban green areas is broad, as it encompasses all vegetation (trees, shrublands and grasslands) without setting a minimum surface. A stricter definition of green areas referring to areas for recreational use, such as parks, and suburban natural areas that have become and are managed as urban parks, is considered when examining proximity to urban green areas.

Figure 2.20. Green areas as a share of functional urban areas' urban centres in selected OECD capital cities ranges from 12% to 67%

Urban green areas in OECD capital cities, 2020



Note: OECD 37 is the simple average of the 37 capital cities included in the chart for which data are available. Data are not available for Costa Rica. The share of green areas in FUAs is estimated at the urban centre level, using ESA Worldcover data, which provides worldwide land cover data for 2020 at a 10 m resolution. Green areas are vegetation, which includes trees, shrublands and grasslands (OECD, 2022[11]).
Source: OECD *Regions and Cities, City statistics* (database), https://stats.oecd.org/Index.aspx?DataSetCode=FUA_CITY.

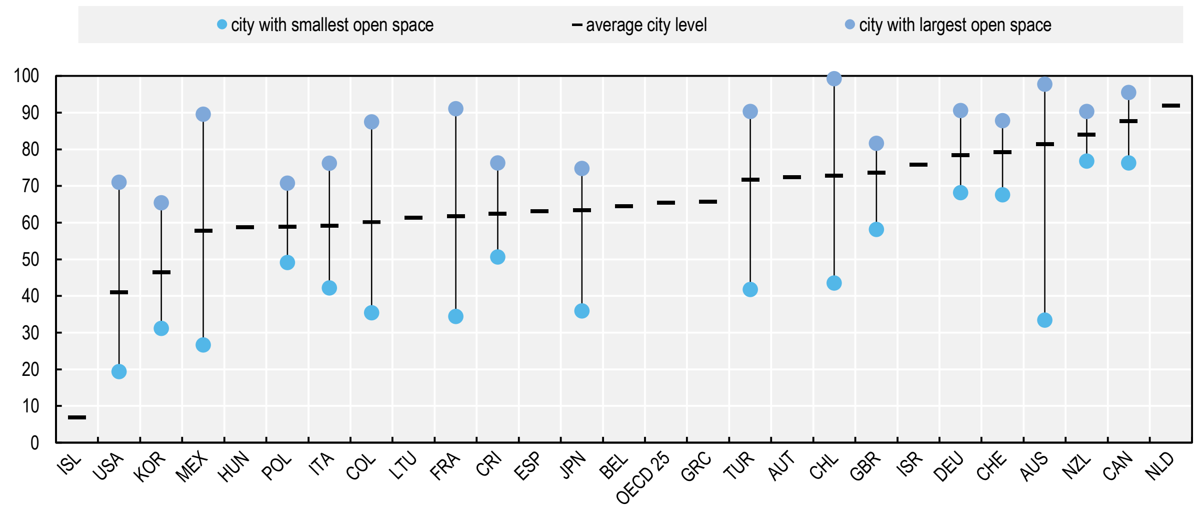
StatLink https://stat.link/gls86c

Open space for public use

On average, 65% of city area was open space for public use in the OECD in 2020. To monitor progress towards the accessibility and inclusiveness of cities and human settlements by 2030, the UN monitors the share of city area that is open space for public use, using SDG indicator 11.7.1. Open public space is any open piece of land that is undeveloped or land without buildings (or other built structures) that is accessible to the public without charge, which provides recreational areas for residents and helps to enhance the beauty and environmental quality of neighbourhoods. The inter-city variability for each OECD country with available data is presented in Figure 2.21. The share of open space ranges from 7% in Iceland to 92% in the Netherlands.

Figure 2.21. 65% of city area is open space for public use on average in the OECD

Percentage of city area that is open space for public use for all, by smallest, largest and average inter-city level, 2020 or latest available year



Note: The latest available year is 2018 for Iceland. The cities with the smallest and largest open space as a percentage of urban area are shown when data for at least two cities in the country are available.
Source: UN *Global SDG Indicator* (database), indicator 11.7.1, https://unstats.un.org/sdgs/dataportal.

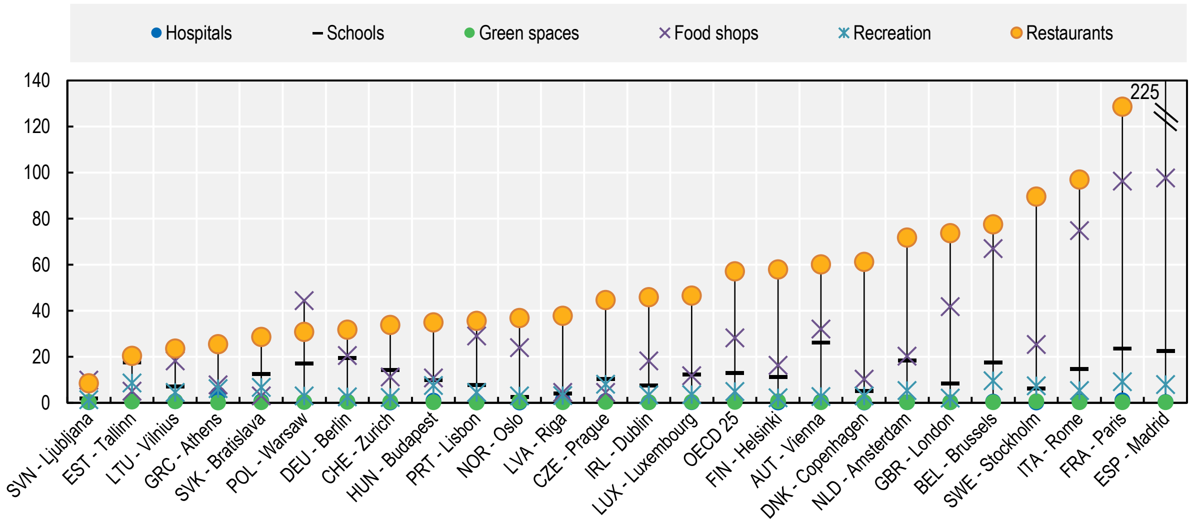
StatLink https://stat.link/7kcrml

Proximity and access to services and amenities

Proximity and access to amenities and services shape the quality of urban design/land use. Access to urban green spaces is available only for selected European cities, as is proximity to services and amenities[14] (here measured as the number of destinations within a selected radius/distance or time). Internationally comparable information on proximity for OECD countries is available with reference to different destinations (hospitals, schools, recreation, food shops, restaurants, green areas) and time thresholds (15 minutes, 30 minutes and 45 minutes). Cities have adopted different thresholds (e.g. "20-Minute Neighbourhoods" for the city of Portland (United States) and Melbourne (Australia), "15-minute city" for Paris (France)). Given the data availability of the three thresholds mentioned above, the 15-minute walking distance and other relevant information referring to European capital cities is presented below. Figure 2.22 shows that the proximity to services and amenities varies widely across European capital cities. In 2018, an average of 57 restaurants, 28 food shops, 13 schools and 5 recreation destinations were reachable within 15 minutes' walking distance, while less than one hospital or one urban green space were reachable. Since 2012, the urban population's access to green areas in cities (with an urban centre of at least 50 000 inhabitants) has been, on average, broadly stable. 69% of people have access to public parks, forests or other recreational green spaces within 10 minutes' walking distance from their home in European urban areas[15] (OECD, n.d.[54]).

Figure 2.22. Proximity to services and amenities varies widely across European capital cities

Number of services and amenities within 15 minutes' walking distance (1 km), by type, European capital cities, 2018



Note: "Hospitals" includes any health care or emergency structure, "Schools" include all pre-university education structures, "Green spaces" include all green urban areas (parks) and forests, as defined by the Copernicus Urban Atlas 2012 land cover/land use database, "Food shops" include any supermarket, bakery, grocery, butcher, specialty store, etc., "Recreation" includes theatres, museums, cinemas, stadiums, tourist and cultural attractions, and "Restaurants" includes any type of restaurant. For further details, please refer to (ITF, 2019[91]). The OECD average includes the 25 European capital cities included in the chart for which data are available. For Switzerland, Zurich instead of Bern is included, as data for Bern are not available.
Source: OECD ITF Urban access framework, https://stats.oecd.org/Index.aspx?DataSetCode=ITF_ACCESS.

StatLink https://stat.link/e07wu3

Two-thirds of residents living in low-income neighbourhoods must rely on cars to get access to opportunities, due to insufficient access via public transport. An OECD study *Transport Bridging Divides* (OECD, 2020[65]) conducted in 32 metropolitan areas found that in half of the metropolitan areas, residents of low-income neighbourhoods have worse access to opportunities compared to residents in high-income neighbourhoods, even when they rely on their cars instead of public transport for getting around the city. Overall differences in accessibility between income groups are also driven by differences in the way high- and low-income households sort across cities. Residents in larger cities tend to be, on average, better educated and have higher income levels than residents of smaller cities (OECD, 2015[221]). As a result, high-income households benefit from better accessibility not only because they live in parts of the metropolitan area where access to opportunities is on average better, but also because many of them live in richer metropolitan areas that enjoy overall better access to opportunities, regardless of the location within the city (OECD, 2020[65]).

Access to opportunities is more limited in rural areas. For example, the aforementioned European Commission Joint Research Centre report on lonely places (Proietti, 2022[213]) concluded that primary school accessibility in European rural areas is lower and people have to travel larger distances to reach a service area. In cities, the EU-wide average distance to the nearest primary school is 2.5 km, while in remote rural areas this average distance is 7.5 km. Of the municipalities examined, 90% of those without a primary school in 2011 were rural.

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Annex 2.A. Definition and measurement of the indicators included in this report

Overall built environment

Built environment stock refers to the value of a country's stock of residential (dwellings) and non-residential buildings (industrial, commercial, educational, health care, public, religious, amusement, sport, recreational and community buildings, non-residential farm buildings, etc.) and civil engineering works (infrastructure, such as highways, streets, roads, railways and airfield runways; bridges, elevated highways, tunnels and subways; waterways, harbours, dams and other waterworks; long-distance pipelines, communication and power lines; local pipelines and cables, ancillary works; constructions for mining and manufacture; and constructions for sport and recreation). It reflects the reduction in their value due to physical deterioration, normal obsolescence or normal accidental damage. Data are expressed in US dollars per capita at 2015 PPPs and are sourced from the *OECD National Accounts Statistics* database.

Investment in the built environment refers to the total (public and private) investment in both buildings (residential and non-residential) and civil engineering works (infrastructure). Data are expressed as percentage growth rates at constant prices and as percentages of Gross Domestic Product (GDP) and are sourced from the *OECD National Accounts Statistics* database.

Housing

Housing (residential buildings) stock refers to the value of a country's stock of residential buildings (dwellings). Data are expressed in US dollars per capita at 2015 PPPs and are sourced from the *OECD National Accounts Statistics* database.

Investment in housing (residential buildings) refers to total (public and private) investment in residential buildings (dwellings). Data are expressed as percentage growth rates at constant prices and are sourced from the *OECD National Accounts Statistics* database.

Housing affordability (current expenditures) refers to the share of household gross adjusted disposable income that is available to the household after deducting current expenditures on housing. Current expenditures on housing include rent (including imputed rentals for housing held by owner-occupiers) and maintenance (expenditure on the repair of the dwelling, including miscellaneous services, water supply, electricity, gas and other fuels, as well as expenditure on furniture, furnishings, household equipment and goods and services for routine home maintenance). Data are sourced from the *OECD National Accounts Statistics* database and refer to both households and non-profit institutions serving households.

Housing cost (rents and mortgage) overburden refers to the share of households in the bottom 40% of the income distribution devoting more than 40% of their disposable income to housing costs, where the 40% threshold is based on the methodology used by Eurostat for EU member countries. Housing costs include actual rents and mortgage costs (both principal repayment and mortgage interest); in contrast to the housing affordability measure sourced from National Accounts, no imputed rentals for owner-occupied homes are included. No data on mortgage principal repayments are available for Denmark. For Chile, Mexico, Korea and the United States, gross income instead of disposable income is used. Data are drawn from the *OECD Affordable Housing* database, which is sourced from household survey data.

The overcrowding rate adopts the EU-agreed definition (Eurostat, 2023[53]), which considers different needs for living space according to the age and gender composition of the household. A household is considered as living in overcrowded conditions if less than one room is available in each household: for each couple in the household; for each single person aged 18 or more; for each pair of people of the same gender between 12 and 17; for each single person between 12 and 17 not included in the previous category; and for each pair of children under age 12 (Eurostat, 2023[53]). Data are sourced from the *OECD Affordable Housing* database, which uses household survey data.

Poor households lacking access to basic sanitary facilities refers to the share of households with equivalised disposable household income below 50% of the national median without an indoor flushing toilet for the sole use of the household. Flushing toilets exclude toilets outside the dwelling but include flushing toilets in a room where there is also a shower unit or a bath. For Chile, Mexico, Korea and the United States, gross income instead of disposable income is used. Data for Korea refer to a flushing toilet regardless of the type of toilet (Asian or European style). Data are drawn from the *OECD Affordable Housing* database, which is sourced from household survey data.

Housing distress captures people's concern in finding or maintaining an adequate house in the short and long term. It is based on the survey questions: "Thinking about the next year or two, how concerned are you about each of the following? Not being able to find/maintain adequate housing" (for the short-term horizon) and "Looking beyond the next ten years, how concerned are you about the following? Not being able to find/maintain adequate housing" (for the long-term horizon). The possible answers are "1. Not at all concerned; 2. Not so concerned; 3. Somewhat concerned; 4. Very concerned; 5. Can't choose". The indicator presents the percentage of respondents reporting either "somewhat concerned" or "very concerned". Data are drawn from the OECD *Affordable Housing* database, based on the OECD *Risks That Matter* survey.

Infrastructure

Infrastructure (civil engineering works) stock refers to the value of a country's stock of civil engineering works (infrastructure). Data are expressed in US dollars per capita at 2015 PPPs and are sourced from the *OECD National Accounts Statistics* database.

Transport (focus on public transport)

Convenient access to public transport refers to the percentage of the population that have convenient access to public transport in large metropolitan areas. Access to public transport is considered convenient when a stop is accessible within a walking distance along the street network of 500 m from a reference point such as a home, school, workplace, market, etc., to a low-capacity public transport system (e.g. bus, Bus Rapid Transit) and/or 1 km to a high-capacity system (e.g. rail, metro, ferry). Additional criteria for defining public transport convenience include: 1) public transport accessible to all special-needs customers, including those who are physically, visually and/or hearing-impaired, as well as those with temporary disabilities, the elderly, children and other people in vulnerable situations; 2) public transport with frequent service during peak travel times and 3) stops present a safe and comfortable station environment (UN, 2021[55]). Data on types of public transport available in each urban area, as well as the location of public transport stops, are obtained from city administration, transport service providers or, when these are not available, from geospatial data such as those from open data sources (e.g. OpenStreetMap, Google and the General Transit Feed Specification – GTFS feeds). The walking distance is calculated on the basis of the street network (as available by city authorities or from open sources such as OpenStreetMap). Data providers, on the basis of their local knowledge, exclude streets that are not walkable. Finally, the Network Analyst tool (in GIS) is used to identify service areas (i.e. regions that encompass all accessible areas via the streets network within a specified impedance/distance) around any location on a network. All individual service areas are merged to create a continuous service area polygon. The estimation of the population within the walkable distance to public transport is estimated on the basis of individual dwelling or block-level total population, which is collected by National Statistical Offices through censuses and other surveys (UN, 2021[55]). Data are available only for the largest metropolitan areas, as defined by the *Degree of Urbanisation* (DEGURBA) (UN Statistical Commission, 2020[89]). This indicator is SDG indicator 11.2.1, and data are sourced from the *UN Global SDG Indicator* database.

Access to various public transport modes refers to the percentage of the population in large urban areas with access to a public transport mode (bus, tram or metro) within a 10-minute walking distance. Public transport stops are identified using Open Street Map (OSM). The 2022 Mapbox isochrone API then enables to compute isochrones from the identified public transport stops to get to all the areas located within a 10-minute walking distance. Finally, the Global Human Settlement Population layer 2015 allows to understand the share of the population in each functional urban area (FUA) who have access to public transport in less than a 10-minute walk. The OECD, in cooperation with the European Union, has developed a harmonised definition of functional urban areas (FUAs) for metropolitan areas. FUAs are composed of a city and its commuting zone and encompass the economic and functional extent of cities based on people's daily movements (OECD, 2012[90]). The definition of FUA aims at providing a functional/economic definition of cities and their area of influence, by maximising international comparability and overcoming the limitation of using purely administrative approaches. At the same time, the concept of FUA, unlike other approaches, ensures a minimum link to the government level of the city or metropolitan area. Data are limited to large OECD functional urban areas (i.e. above 250 000 inhabitants), due to the poor reliability of Open Street Map (OSM) in identifying public transport stops in smaller cities or rural areas, and they are sourced from the *OECD Regions and Cities* database.

The **effectiveness of public transport** is computed as the ratio between the absolute accessibility for a given transport mode (i.e. the number of destinations that can be reached within a fixed amount of time with a given transport mode) and proximity to potential destinations (i.e. the number of destinations within a set radius). A ratio of one or more means the transport mode performs well, as the number of accessible destinations through the transport mode is higher than those in proximity. A ratio close to zero means that the mode performs poorly, even in providing access to nearby destinations. The ratio summarises many aspects of the effectiveness of the mode in providing access to destinations. In the case of public transport, the indicator captures the frequency of services, the in-vehicle speed, the number of transfers and the distance to the nearest bus stop or station, as its effective performance is compared to a theoretical reference. Transport effectiveness is evaluated over three thresholds and an associated distance: 15 min (4 km), 30 min (8 km), 45 min (12 km). Based on the EC-ITF-OECD Urban access framework, data are obtained combining geospatial data and modelling. Data are sourced from the *OECD ITF Urban Access Framework* database.

Technical infrastructure (energy, water, waste management and digital infrastructure)

Access to improved drinking water sources considers the percentage of the population with access to improved drinking water. Access is defined as water being accessible on the premises (i.e. the point of collection is within the dwelling, compound, yard or plot, or water is delivered to the household) and available when needed (i.e. households report having "sufficient" water, or water is available "most of the time" (i.e. at least 12 hours per day or 4 days per week)). Water is defined as drinkable if it meets international standards for microbiological and chemical water quality specified in the WHO Guidelines for Drinking Water Quality. This indicator is SDG Indicator 6.1.1. For the purposes of global monitoring, water is drinkable if free from microbiological contamination of E. coli (or thermotolerant coliforms) and from the priority chemical contaminants (i.e. arsenic and fluoride). Improved drinking water sources include piped supplies, boreholes and tubewells, protected dug wells, protected springs, rainwater, water kiosks, and packaged and delivered water. Data are sourced from the *UN Global SDG Indicator* database, which are mainly collected through censuses for this indicator.

Access to public sewerage refers to the percentage of the population connected to an urban wastewater collecting system. "Connected" means physically connected to a wastewater treatment plant through a public sewerage network (including primary, secondary, tertiary or other treatment). Individual private treatment facilities such as septic tanks are not covered. Data are sourced from the *OECD Green Growth indicators* database, based on the WHO/UNICEF Joint Monitoring Programme and by Eurostat for EU Member states.

Access to electricity refers to the percentage of the population that have access to consistent sources of electricity. This indicator is SDG Indicator 7.1.1. For the purposes of global monitoring, access rates are only considered if the primary source of lighting is the local electricity provider, solar systems, mini-grids and stand-alone systems. Sources such as generators, candles, batteries, etc., are not considered due to their limited working capacities and since they are usually kept as backup sources for lighting. Data are sourced from the *UN Global SDG Indicator* database, which are mainly collected through household surveys and censuses for this indicator.

Ability to keep the dwelling warm considers the percentage of households that cannot afford to keep their dwelling adequately warm. This indicator is one of the primary indicators identified by the EU Energy Poverty Observatory to measure energy poverty (Thema and Vondung, 2020[123]). The indicator presents some limitations. It depicts an outcome of being in energy poverty, but it does not provide information about the reasons behind this inability to keep the home adequately warm that could be economic (price of energy, lack of resources, etc.), issues with the building (energy efficiency of the home, lack of equipment) or others. Given that it is subjective, the social and cultural characteristics of households strongly influence the declaration of an inability to heat one's home adequately, and what the adequate temperature should be can vary from country to country. Finally, there is the "denial of reality bias": energy-poor people might deny seeing themselves as being in an uncomfortable situation and, therefore, do not declare it. To better understand and monitor the drivers of energy poverty, a set of indicators, rather than a single indicator, should be considered (EU DG for Energy, 2023[124]). The indicator is available for EU members only. Data are sourced from the *OECD Affordable Housing* database, based on the European Survey on Income and Living Conditions (EU-SILC).

Urban design/land use

Artificial surfaces is defined as the percentage of total land area covered by artificial surfaces. Artificial surfaces are defined by the SEEA Central Framework (United Nations, 2014[217]) as any urban or related feature, including urban parks (developed for leisure and recreational purposes), and industrial areas, waste dump deposits and extraction sites. **Change in artificial surfaces (to and from)** is the percentage of artificial surfaces converted to (from) any other land cover type (e.g. agricultural, natural and semi-natural). The denominator used is the "stock" of artificial surfaces at the start of the reference period. Land cover types are based on geospatial data from the Copernicus/European Space Agency and Université catholique de Louvain Geomatics Climate Change Initiative – Land Cover (CCI-LC) Annual Maps: https://cds.climate.copernicus.eu/cdsapp#!/dataset/satellite-land-cover. Countries' administrative boundaries are based on the latest OECD Territorial grid geographies, where available, and otherwise the FAO Global Administrative Unit Layers (GAUL 2014). For full details of the methodology, please refer to (Haščič and Mackie, 2018[222]). Data are obtained from the *OECD Land cover change in countries and regions* database.

Urban built-up area. "Built-up" areas include residential (discontinuous and continuous urban fabrics and isolated structures) and industrial and commercial areas (industrial, commercial, public, military, and private units, mineral extraction and dump sites, construction sites, land without current use) as defined by the 2018 Urban Atlas classification of land use. This definition excludes other parts of urban environments and the human footprint such as transport infrastructure (fast transit roads, other roads, railways, port, airports), and open space, including urban green spaces (forests, herbaceous areas, open space without vegetation (beaches, bare land), green urban areas, sports and leisure facilities). Data are based on geospatial information modelled through deep learning (i.e. the U-Net model) that is used to classify land cover and land use in EC-ESA satellite imagery for 2021, as documented in (Banquet et al., 2022[220]). Information is available for metropolitan functional urban areas, as defined by the OECD and the EU, which are composed of a city and its commuting zone. This definition overcomes the purely administrative perimeter to encompass the economic and functional extent of cities based on people's daily movements (OECD, 2012[90]). Data are expressed in sqm per capita and sourced from the *OECD Regions and Cities – City statistics* database.

Average urban building height data are calculated in metres and are based on geospatial data. Data are sourced from the *OECD Regions and Cities* – City *statistics* database, which refers to estimates released by the European Commission (EC) Joint Research Centre (JRC) (European Commission Joint Research Centre, 2022[223]).

Urban green areas data include trees, shrublands and grasslands. The share of green areas in functional urban areas is estimated at the urban centre level, using ESA Worldcover data (Zanaga and al., 2021[224]), which provides worldwide land cover geospatial data for 2020 at a 10 m resolution. Data are also presented in sqm per capita. Information is sourced from the *OECD Regions and Cities* – City *statistics* database.

Open space for public use refers to the share of city area that is open space for public use. Open public space is any open piece of land that is undeveloped or land without buildings (or other built structures) that is accessible to the public without charge, which provides recreational areas for residents and helps to enhance the beauty and environmental quality of neighbourhoods. This indicator is SDG indicator 11.7.1, which has been selected to monitor progress towards the accessibility and inclusiveness of cities and human settlements by 2030. UN-Habitat recognises that different cities have different types of open public spaces, which vary in both size and typology. Based on the size, open public spaces are broadly classified into six categories: national/metropolitan open spaces, regional/larger city open spaces, district/city open spaces, neighbourhood open spaces, local/pocket open spaces and linear open spaces. The classification of open public space by typology is described by the function of the space and can include green public areas, riparian reserves, parks and urban forests, playground, square, plazas, waterfronts, sports field, community gardens, parklets and pocket parks. Information is based on geospatial data, combined with population data from censuses and demographic surveys, and inventories of open public space from legal documents and fieldwork. Data are sourced from the *UN Global SDG Indicator* database.

Access to recreational green space in urban areas refers to the share of the urban population who have access to recreational green space within 5 minutes' walking distance from their home. Urban areas are defined as (greater) cities with an urban centre of at least 50 000 inhabitants, and green space refers to green areas with a minimum mapping unit of 0.25 hectares. They are predominantly areas for recreational use such as gardens, zoos, parks, castle parks and suburban natural areas that have become and are managed as urban parks. Forests at the fringe of cities are also included. The underlying method consists of determining an area of easy walking distance – around 5 minutes' walking time (with an average speed of 5 km per hour) – around an inhabited Urban Atlas polygon. Data are sourced from the *OECD How's Life? Well-being* database and have been calculated by Poelman using geospatial data from the European (Copernicus) Urban Atlas polygons.

Proximity to services and amenities is measured as the number of destinations within a selected radius/distance or time. Internationally comparable information on proximity for OECD countries is available with reference to different destinations (hospitals, schools, recreation, food shops, restaurants, green areas) and time thresholds (15 minutes, 30 minutes and 45 minutes). "Hospitals" includes any health care and emergency structure, “Schools” includes all pre-university education structures, “Green spaces” includes all green urban areas (parks) and forests, as defined by the Copernicus Urban Atlas 2012 land cover/land use database, “Food shops” includes any supermarket, bakery, grocery, butcher, specialty store, etc., “Recreation” includes theatres, museums, cinemas, stadiums, tourist and cultural attractions, and “Restaurants” includes any type of restaurant. Based on the EC-ITF-OECD Urban access framework, data are obtained combining geospatial data and modelling. Data are sourced from the *OECD ITF Urban access framework* database.

Notes

[1] As the value of land underlying buildings (residential and non-residential) and civil engineering works is available only for a very limited number of OECD countries (3-4 countries, depending on the type of building/structure), it has been excluded to ensure cross-country comparability.

[2] There are only few initiatives that disaggregate national GHG inventories at the local level. One example is the European Commission’s EDGAR (Emissions Database for Global Atmospheric Research) which provides independent emission estimates at national level and gridmaps at 0.1 x 0.1 degree resolution at global level, using international statistics and a methodology consistent with the Intergovernmental Panel on Climate Change (IPCC) (European Commission, n.d.[226]).

[3] Internationally comparable information on additional characteristics of the house (such as the presence of a leaking roof, damp walls, floors or foundation, or rot in window frames or floor in the dwelling, the perception of the dwelling as too dark) and more detailed housing affordability measures (such as affordability to replace worn-out furniture) are available only for EU countries participating in the EU-SILC survey. This survey also allows to measure multiple housing material deprivations (e.g. the percentage of the population living in overcrowded conditions and without a flushing toilet connected to a sewage system or septic tank). Given the limited geographical coverage, these have not been presented here.

[4] This is consistent with the approach of the OECD Affordable Housing database and the OECD Well-being framework.

[5] IRTAD is a permanent group dedicated to road safety in the ITF-OECD. With 80 members from 41 countries, the group has the objective of improving knowledge about road safety. It serves as a forum for countries to exchange information on methodologies for data collection and analysis.

[6] L_{den} is the sound pressure level averaged over the year for the day, evening and night-time periods, with a +5 dB penalty for the evening and +10 dB for the night.

[7] Estimations for noise costs and cost factors (per unit of travel) are based on estimations of exposure and increasing prices per decibel (dB), themselves based on estimates by the UK Department for Environment, Food and Rural Affairs and consistent with WHO recommendations. Estimations also use weighting factors for noise for different vehicle types and type of roads, i.e. urban (up to 50 km/h speeds) and other roads (80 km/h or higher speeds).

[8] L_{night} is the sound pressure level averaged over the year for the night-time period only.

[9] Additionally, different users can have different preferences and needs. Hence, transport solutions which work for some, may not work for others. For example, evidence has shown that women’s travel patterns are more complex than men's, with more, mostly short trips, using different services, at differing times of

the day, often involving children. While men tend to make few, direct trips at set times and often alone trips (ITF, n.d.[225]). An inclusive approach to transport would account for these differences.

[10] The 2022 Mapbox isochrone API then enabled to compute isochrones from the identified public transport stops to get to all the areas located within 10-minute walking distance. Finally, the Global Human Settlement Population layer 2015 enabled to get the share of the population in each FUA who has access to public transport in less than a 10-minute walk (OECD, 2022[11]).

[11] The framework relies on a grid system of cells with 500 m squared sides created from the INSPIRE 100 m population grid originally developed by the Joint Research Centre (JRC) of the EC. Each 500 m grid cell represents the sum of the population, services and other amenities that are located within it for a total of approximately 1 580 000 cells in the selected 121 functional urban areas (FUAs), 918 000 of which are populated. The Tom Tom system and the Copernicus Urban Atlas 2012 land cover/land use database (for green areas only) are used to determine the number of destinations of interest in each grid cell and their location. The road network is extracted from OpenStreetMaps (OSM) and the public transport network is recreated using schedule data under General Transit Feed Specification (GTFS) standards. For a given FUA, the grid cells of the zoning system serve both as origins and destinations. Travel time is computed between an origin and a destination cell using a Dijkstra fastest path algorithm (i.e. all possible paths between the two points are examined and the one with the shortest travel time is chosen). The travel time is computed door-to-door. To determine the number of destinations of interest in proximity to each cell the model assigns fixed average straight line speeds to each mode based on typical average speeds in European cities, 16 km/h for cars, public transport and cycling, 4 km/h for walking. Information at cell level is then averaged with population weights to obtain the value for the functional urban area. For more details, please refer to (ITF, 2019[91]).

[12] The empirical evidence to define a minimum quantity of water necessary for cooking, personal hygiene, food hygiene and other forms of domestic hygiene is insufficient. The WHO states that experience and expert opinion (Howard et al., 2020[97]) suggest that 20 L/person/day is often sufficient for drinking, cooking, food hygiene, handwashing and face washing, but not other hygiene practices. However, where demands for water are increased – for example, due to increased hand hygiene in response to outbreaks of disease – 20 L/day is likely to be insufficient, and in many cases running water from a tap will be necessary to support sufficient handwashing. Piped water on premises results in larger volumes of water used and can support improved hygiene. Where water supplies are not continuous or not reliable, households typically use less water. Less water is also used where prices exceed the level that households can afford (Howard et al., 2020[97]).

[13] https://valuingwaterinitiative.org/.

[14] Evidence on proximity to urban green areas here presented is broadly consistent with access to urban green areas as featured in the OECD Well-being database. Both indicators refer to the same definition of urban green areas and are calculated using geospatial data based on the European Copernicus Urban Atlas. Discrepancies are due to slightly different geographical coverage (proximity is presented for functional urban areas of capital cities, while access to urban green areas is calculated for cities with an urban centre of at least 50 000 inhabitants), unit of measurement (number of urban green areas versus the percentage of the urban population with access to them), time distance (15-minute versus 5-minute walk) and implied average speed (4 km/h versus 5 km/h). For more details, please refer to (ITF, 2019[91]) for proximity and to (OECD, n.d.[54]) for access to urban green areas.

3. Next steps: Towards an integrated policy approach

This chapter begins by examining how the built environment is reflected in OECD countries' national well-being frameworks and indicators. The chapter then applies a well-being lens aimed at *refocusing, redesigning, realigning and reconnecting (4Rs)* built environment policies. Well-being evidence can support policy makers in *refocusing* built environment policies towards the outcomes that matter most to people and help *redesign* policy content from a more multidimensional perspective. A well-being lens can also help *realign* the interests of different stakeholders and *reconnect* government with the communities they serve as well as the private sector actors who play a major role in shaping the built environment. Built environment policy examples such as New Zealand's housing and urban policies for well-being and Ireland's sustainable mobility strategy are introduced to highlight how these *4Rs* can be instrumental in promoting an integrated policy approach for the built environment, well-being and sustainability.

3.1. Principles of a well-being policy approach applied to the built environment

This section examines how OECD countries' national well-being frameworks and indicators try to measure and assess the built environment. Countries have selected a variety of indicators to measure the quality of the built environment, and they are increasingly looking at perceptions of whether people are satisfied with their surrounding built environment. Next, the chapter will discuss how the well-being lens of the "four R's" (*refocus, redesign, realign* and *reconnect*) (OECD, 2021[1]) can help *refocus* built environment policies on the topics of well-being and sustainability, *redesign* them with multidimensional well-being evidence, *realign* a wide range of stakeholders' interests and *reconnect* with the people, the private sector in particular, to better implement built environment policies for well-being and sustainability. This will be helpful in showing how to harness the benefits of an integrated approach to well-being and the built environment across multiple policy sectors.

3.1.1. The built environment features in several national well-being frameworks and indicators

OECD countries are increasingly developing well-being metrics and trying to employ them in their policy-making processes. More than two-thirds of OECD countries have developed national frameworks, development plans or surveys with a well-being focus (OECD, 2023[2]). Well-being indicators are also being emphasised in various stages of policy making and implementation. For example, in some cases, well-being indicators are being integrated into budget processes or national planning and performance frameworks; some governments are using legislation to orient specific government processes towards a more well-being and sustainability-based approach, and some are creating new institutions for policy coordination or government posts responsible for well-being (OECD, 2023[2]). These well-being frameworks and indicators are often developed by countries to overcome government silos and to encourage more collaboration across different government agencies.

Using well-being frameworks and indicators allows government officials to explicitly assess the social and environmental impacts of policy decisions in a holistic and integrated way. The benefit of applying a well-being lens to policy decisions is that it makes it possible to consider in a systematic way the various effects of those decisions on people's lives, now and in the future. For example, having well-being indicators in consideration when planning for a long-term infrastructure project will enable policy makers to identify possible social and environmental policy outcomes, and it will be helpful in redirecting the trajectory of built environment policies in a sustainable way.

Many countries have embedded distinct aspects of the built environment in their well-being frameworks or indicators (Table 3.1). Well-being frameworks or initiatives are generally structured so that there are domains or dimensions, which are broad categories of well-being that are of particular interest to the relevant country. Well-being indicators, which are more specific statistics used to measure the state of well-being, are included under each domain. The most frequently covered/measured topics in national well-being frameworks related to the built environment are housing and transport. Countries generally recognise that both the quality and affordability of housing matter for people's well-being. Several indicators measuring housing quality (e.g. *very poor standard of housing* (Austria), *quality of housing* (Iceland, New Zealand), *living space per capita* (Korea)), as well as the affordability and availability of dwellings (e.g. *housing cost* (New Zealand), *home-ownership rate* (Korea), *at risk of poverty rate after rent and mortgage interest* (Ireland), *housing cost overburden* (Austria, Iceland), or r*atio of rental costs to net household income* (Germany)), can be found among countries' well-being indicators. As for transport, a number of countries have included access to essential services (such as education, health and recreational facilities) as a key indicator of mobility (e.g. *timely access to primary care provider* (Canada), *travel time to educational, service and cultural facilities* (Germany), *average distance to everyday services* (Ireland)), in a move away from measuring only the volume of transport. Other areas related to the built environment often covered by well-being frameworks are environment and safety. Examples include people's exposure to air, water or noise pollution in living environments (e.g. *urban exposure to particulate matter* (Netherlands)) as well as access to green space (e.g. *access to the natural environment* (New Zealand)). Several countries have also included traffic safety (e.g. *persons killed or injured on roads* (Ireland), *road casualty rate* (Korea), *road toll* (New Zealand)) and whether people felt safe walking in their neighbourhoods (e.g. *walkability index* (Canada), *feeling safe walking in the neighbourhood after dark* (Iceland, Korea, Netherlands, UK)) in their set of well-being indicators.

Subjective well-being indicators related to the built environment have been incorporated in numerous national well-being frameworks and indicators. Subjective indicators such as people's satisfaction about housing, commuting, neighbourhood safety and access to green space, are often observed, alongside more traditional objective indicators on the built environment. For example, some countries measure people's satisfaction about the living environment (e.g. *satisfaction rates on air and water quality, soil environment and noise level* (Korea*), subjective environmental stress in the living environment* (Austria)). There is also an increasing tendency to take into consideration inequalities embedded in the built environment and try to measure the progress in removing these by providing disaggregated evidence for different population groups. For example, information by gender is presented when considering the indicator *feeling safe when walking alone at night*.

Table 3.1. Examples of built environment-related indicators in national well-being initiatives, selected countries

Detailed descriptions of each initiative can be found in Annex 3.A

Country	Measurement initiative/ indicator set	Leading agency	Key indicators (domains) relevant to the built environment
Australia	Measuring What Matters: Australia's First Wellbeing Framework (2023)	Department of the Treasury	• (Healthy) equitable access to quality health and care services • (Secure) housing serviceability, homelessness, feeling of safety • (Prosperous) digital preparedness • (Sustainable) protected areas, resource use and water generation, climate resilience
Austria	How's Austria 2021	Statistics Austria	• (Quality of life) housing cost overburden, very poor standard of housing, subjective environmental stress in the living environment • (Environment) energy consumption of transport, transport performance of road freight traffic, fuel consumption of private cars, use of public transport, and greenhouse gas emissions from transport
Canada	Measuring What Matters: Toward a Quality of Life Strategy for Canada (2021)	Department of Finance	• (Prosperity) housing needs, homelessness • (Environment) clean drinking water, satisfaction with local environment, walkability index, access to public transit, waste management • (Health, Society and Good Governance) timely access to primary care provider, sense of belonging to local community, accessible environment, perceptions of neighbourhood safety after dark
Germany	Government Report on Well-being in Germany (2017)	Federal Chancellery and the Ministry of Economic Affairs and Energy	• (Our Surroundings) ratio of rental costs to net household income, travel time to educational, service and cultural facilities, broadband access
Iceland	Indicators for Measuring Well-being (2019)	Prime Minister's Committee on Indicators for measuring Well-being	• (Housing) housing cost overburden, quality of housing • (Land Use) progress in land reclamation, protected areas • (Waste and Recycling) quantity of municipal solid waste, recycling rate of municipal solid waste, • (Security) feeling safe after dark
Ireland	Understanding Life in Ireland: The Well-being Framework (2022)	Department of the Taoiseach	• (Housing and the built environment) new dwelling completions, number of domestic dwellings with A or B energy rating, at risk of poverty rate after rent and mortgage interest, average distance to everyday services

Country	Measurement initiative/ indicator set	Leading agency	Key indicators (domains) relevant to the built environment
			• (Safety and Security) persons killed or injured on roads, population who worry they could be a victim of a crime
Korea	National Quality of Life Index (2022)	Statistics Korea (Kostat)	• (Housing) home-ownership rate, rent to income ratio, living space per capita, dwellings without basic facilities (i.e. kitchen, toilet/bathroom), commuting time to workplace, housing environment satisfaction • (Environment) public park size per person in a city, water supply coverage rate of rural area, satisfaction rates on air quality, water quality, soil environment, noise level and green environment • (Safety) feeling safe walking alone at night, road casualty rate, safety accident-induced child death rate
Netherlands	Monitor of Well-being & the Sustainable Development Goals (2020)	Statistics Netherlands (CBS)	• (Well-being trend) time lost due to traffic congestion and delays, housing quality, satisfaction with housing, often feeling unsafe in the neighbourhood, quality of inland bathing waters, urban exposure to particulate matter • (Distribution of well-being) satisfaction with commuter travelling time, quality of housing, satisfaction with housing, feeling unsafe in the neighbourhood, experience pollution in own neighbourhood
New Zealand	Living Standards Framework (LSF) (2022)	New Zealand Treasury	• (Housing) household crowding, housing cost (deposit affordability, mortgage affordability, rent affordability, share of income), housing quality • (Environmental amenity) access to the natural environment, drinking water management • (Safety) feeling safe, road toll • (Financial & physical) total net fixed assets, gross fixed capital formation
United Kingdom	Quality of Life in the UK (2023)	Office for National Statistics (ONS)	• (Where we live) incidence of personal crime, feeling safe after dark, belonging to neighbourhood, digital exclusion, satisfaction with accommodation

Source: Rearranged from relevant agencies' websites (Australia (https://treasury.gov.au/sites/default/files/2023-07/measuring-what-matters-statement020230721_0.pdf), Austria (https://www.statistik.at/fileadmin/publications/Wie_geht__s_OEsterreich__2021.pdf), Canada (https://www.canada.ca/en/department-finance/services/publications/measuring-what-matters-toward-quality-life-strategy-canada.html), Germany (https://www.gut-leben-in-deutschland.de/downloads/Government-Report-on-Wellbeing-in-Germany.pdf), Iceland (https://www.government.is/lisalib/getfile.aspx?itemid=fc981010-da09-11e9-944d-005056bc4d74), Ireland (https://www.gov.ie/pdf/?file=https://assets.gov.ie/226077/8b4c5045-c259-498d-8d03-7feadd128726.pdf#page=null), Korea (https://sri.kostat.go.kr/board.es?mid=a90401000000&bid=11477&list_no=423793&act=view&mainXml=Y), Netherlands (https://longreads.cbs.nl/monitor-of-well-being-and-sdgs-2020/), New Zealand (https://www.treasury.govt.nz/publications/tp/living-standards-framework-dashboard-april-2022#executive-summary), United Kingdom (https://www.ons.gov.uk/peoplepopulationandcommunity/wellbeing/articles/ukmeasuresofnationalwellbeing/dashboard).

Despite the large use of built environment-related well-being indicators, there is still a lack of harmonisation on definitions or measurement across countries. Current measures of the built environment included in national well-being initiatives do share some commonalities, as they often capture elements of housing, neighbourhood, environment and safety. Many of the underlying indicators for these dimensions have often been adapted to national contexts (e.g. timely access to primary care provider (Canada), commuting time to workplace (Korea)). Broadly speaking, however, many of the national well-being indicators on the built environment use different definitions or measurement methods. Many factors can contribute to these variations. Some may arise because well-being dashboards are often developed through a process of extensive consultation with the public and with national experts – which in turn can mean that context-specific and locally developed measures may feature prominently. In other cases, there may be a lack of internationally agreed methods and guidance. Further efforts to internationally harmonise some of the key indicators relevant to the built environment could serve to facilitate benchmarking and developing the evidence base around *what works*, for example in relation to housing and transport accessibility policies.

Well-being indicator dashboards are usually collated by National Statistical Offices, Finance Ministries or Prime Minister's Offices, but all relevant line departments should get involved. Well-being evidence is often used by National Statistical Offices to monitor progress on living conditions, inclusion and sustainability; by the Prime Minister's Office in the context of strategic priority-setting; or by Finance Ministries in charge of economic policies and budgeting decisions. However, line ministries that are directly related to policies concerning the built environment, such as ministries of housing, transport, infrastructure, energy, health and welfare, all need to be involved in the integral processes of designing and maintaining relevant well-being indicators. For example, the New Zealand Treasury states that the Living Standards Framework is not intended to provide the depth of well-being evidence necessary for sector policy analysis and calls for other agencies and stakeholders to develop their own well-being datasets specific to their needs (The Treasury, 2023[3]). Inter-governmental consultations are often already in place, but since the level of understanding on well-being may vary across the government, efforts should be made to ensure that civil servants of different ministries dealing with the built environment fully understand what difference well-being can make in the way their tasks are carried out.

3.1.2. A well-being approach for the built environment: 4Rs (Refocus, Redesign, Realign, Reconnect)

Built environment policies are multidimensional in nature and feature across many policy departments, making a well-being approach particularly relevant. As discussed in the previous chapter and section, the built environment shapes people's well-being in many different ways. In addition, tools and solutions used by governments and private actors to support the built environment span many policy programmes and sectors. In many countries it is often difficult to align and connect a wide range of the stakeholders involved in designing, building, maintaining and ultimately disposing of or recycling the different components of the built environment. Against this backdrop, applying the main principles of well-being policy practices – *refocus, redesign, realign* and *reconnect* (OECD, 2021[1]) (Box 3.1) – to the built environment would be meaningful. The prioritisation of well-being and sustainability at the core of built environment policy objectives will *refocus* the attention of public agencies towards outcomes that matter most to people. Multidimensional well-being evidence can be used to identify policy issues that need to be addressed in the context of the built environment and to *redesign* policies towards well-being objectives. The realignment of government objectives can help overcome government silos and facilitate collaboration between different government agencies responsible for built environment policies. Finally, *reconnecting* the government with the private sector and civil society underpins the common understanding of well-being objectives and policies and lays the ground for effective and collaborative implementation of built environment policies. The rest of this section discusses the application of the 4Rs approach to the built environment in greater detail.

Box 3.1. Using a well-being lens to shape a more comprehensive and balanced approach to policy strategy, design and implementation

- **Refocus** – firmly focusing government action on what matters most to the well-being of people and society, building on evidence about both current and future well-being outcomes, as well as about inequality of opportunity across all dimensions of people's lives
- **Redesign** – designing the content and delivery of policy in a coherent and integrated way that systematically considers potential impacts across multiple well-being objectives, inclusion and sustainability, rather than focusing on a single (or very narrow range of) objective(s) "here and now" independently of others
- **Realign** – aligning the system of government such that it is better able to collaboratively work towards societal priorities, by shifting the focus from narrower outputs of individual departments towards shared outcome-based objectives
- **Reconnect** – strengthening the connections between government, the private sector and civil society based on a joint understanding of what well-being means and how it can be improved.

Source: (OECD, 2021[1]), *COVID-19 and Well-being: Life in the Pandemic*, OECD Publishing, Paris, https://doi.org/10.1787/1e1ecb53-en.

3.1.1. Refocusing the built environment on well-being

Well-being evidence can support policy makers in refocusing built environment policies towards the outcomes that matter most to people. Many dimensions of the well-being framework, especially those related to inclusion and equity, subjective well-being, social connectedness and environmental quality/natural capital, have often been overlooked in the design of the built environment. For example, Kimbur (2020[4]) illustrates how housing policies focused merely on material and utility aspects may miss important aspects of people's well-being, such as inclusion and equity. A housing policy could, for instance, have successfully produced its target number of housing units, with good physical conditions, adjacent green areas, with affordable prices. However, if the system for securing tenants' rights is inadequate, the household may be in an insecure position against the landlord. Some of the statistical evidence presented in the previous chapters also signals that **the built environment is not on a positive trajectory in terms of well-being and sustainability and that the gaps are widening, calling for greater policy attention and *refocusing*.** According to the *OECD Risks that Matter* survey, more than half of respondents in OECD countries report that they are concerned about finding and maintaining adequate housing in the short or long term. Having a well-being lens can also provide insights on how the built environment can catalyse inequalities. For example, over 80% of the population in the OECD's largest cities have convenient access to public transport. However, the fact that access varies widely across and within countries is masked, as in some countries such as Mexico, Colombia and Chile, the gap is above 80 percentage points between the cities with the best access and those with the worst access. Another example is overcrowding: in OECD countries, the overcrowding rate stands just above 10% on average. For households in the lowest income quintile, however, the rate is 16%.

Refocusing policies for the built environment on well-being and sustainability can also contribute to addressing current well-being concerns, promoting equal opportunities and improving well-being outcomes simultaneously (*"triple win channels"*) (OECD, 2021[1]). The creation of sustainable, inclusive and high-quality jobs in the built environment sector illustrates an example of one such channel. Job creation in the built environment can be promoted in traditional sectors, such as the construction industry and property management, but also in sectors that may have increased importance in addressing issues of climate change and social inclusion, such as energy-efficient buildings, green transport and infrastructure, the new mobility sector and social housing. Another example could be fostering child and youth well-being in the built environment, in the context of building healthier and safer educational facilities and neighbourhoods. Finally, Korea's Housing Guarantee program (Box 3.2) demonstrates how refocusing on housing affordability can help well-being of both home buyers and vulnerable renters.

Box 3.2. *Refocusing* on housing affordability: Korea's Housing Guarantee program

- **Amid the rapid economic growth and urbanisation of the 1970-90s, the Korean government had to accelerate the supply of housing to meet the challenges of housing affordability.** The share of urban population in Korea increased from 41.1% in 1970 to 57.2% in 1980, and Seoul's housing prices more than doubled between 1981 to 1990. A five-year plan to construct 2 million units of new housing was carried out from 1988 to 1992, developing new towns adjacent to Seoul. The National Housing Fund was launched to facilitate financing for the housing construction comprehensive plan in 1981, providing financial support for 3 million units of housing from 1980 to 2000, which comprised 36.3% of total housing construction in Korea (Korea Housing & Urban Guarantee Corporation, 2019[5]; Kim, 2022[6]).

- **However, protecting homebuyers became a primary concern while sustaining the housing supply.** The 2008-09 global financial crisis brought many housing projects to a halt, and financial institutions faced substantial losses. Expanding the safety buffer for housing buyers and renters became increasingly important while boosting affordable housing supply. This led to the introduction of the National Housing and Urban Guarantee Fund (NHUF) in 2015 and the establishment of the Korea Housing & Urban Guarantee Corporation (HUG), a dedicated public guarantor managing the NHUF.

- **Korea *refocused* on housing affordability recently, making it one of its top priorities of housing policy.** The Ministry of Land, Infrastructure and Transport (MOLIT) has stated that its key policy objective is providing stable housing for all people, focusing on low-and middle-income households, and that "housing will be affordable for those who wish to have their own, and secure for those who wish to rent" (MOLIT, 2022[7]). Despite the accumulation of significant housing stock in Korea, housing instability for low-income households has continued, with the homeownership rate for high-income households at 73.5% against 47.5% for low-income households in 2017. In this context, the Korean government strives to strengthen the provision of housing guarantees to renters, home buyers as well as housing developers, in addition to continuing to expand the public rental housing supply and extending housing support to the young, the elderly, newly-weds and low-income households. These guarantees include:

    - **Housing guarantees to protect home buyers.** Korea has a "*pre-sale housing system*", which allows developers to use the housing purchase payment made by home buyers, with nearly 80% of the payment made in advance, to fund housing development projects. Homebuyers can buy houses at a lower cost, and constructors can benefit from lower financing costs and reduced risk of unsold stocks after the 2-3 years of construction period (Choi et al., 2020[8]). However, a delay in the housing project or a bankruptcy of the developer could cause a financial blow to the home buyers and abandonment of the project site. With 70-80% of the household assets in Korea being "houses", home buyers can be hit hard by the constructor's defaults. HUG provides guarantees to constructors following a thorough risk assessment, and constructors can only sign-up potential home buyers afterwards. If a guarantee incident incurs due to the insolvency of the constructor, HUG refunds the payments to home buyers (if more than 2/3 of homebuyers ask for refund) or selects a new constructor to complete the construction (if construction is more than 80% complete).

- **Vulnerable renters are also protected from volatility of the housing market.** In particular, tenants can receive guarantees for *Jeonse* deposit return. *Jeonse* (i.e. lump-sum rental deposit) emerged during the period of high interest rates and rising housing prices when the landlord could invest the large upfront deposit to generate a return equivalent to rent, and the tenants did not have to pay monthly rent after making the deposit payment. This asset-based lease has been the dominant rental lease in the Korean housing market (OECD, 2018[9]). However, financial difficulties of the landlord may lead to the failure of the deposit return at the end of lease agreement. Thus, HUG, under some conditions, guarantees the return of the deposit to the renter. HUG also makes investments in rental REITs (Real Estate Investment Trusts), which in turn provide rental housing. HUG-supported rental REITs have a 10-year mandatory rental period, which gives tenure stability to households while renters can choose to leave before the end of the rental period. While the initial rent itself is set at 95% or less of the market price (85% or less for vulnerable households), there is 5% limit per annum on the increase of rent.

Source: (Choi et al., 2020[8]), "2019/20 KSP Policy Consultation Report"; (Korea Housing & Urban Guarantee Corporation, 2019[5]), "Policies to Provide Affordable Houses in Korea: History & Future"; (Kim, 2022[6]), "Urbanization, Quality of Life, and Affordable Housing", https://penniur.upenn.edu/events/kyung-hwan-kim; (MOLIT, 2022[7]), Ministry of Land, Infrastructure and Transport, Minister's Message, https://www.molit.go.kr/english/USR/WPGE0201/m_28266/LST.jsp; (OECD, 2018[9]), *Housing Dynamics in Korea: Building Inclusive and Smart Cities*, OECD Publishing, Paris, https://doi.org/10.1787/9789264298880-en.

Redesigning built environment policies to promote well-being, inclusion and sustainability

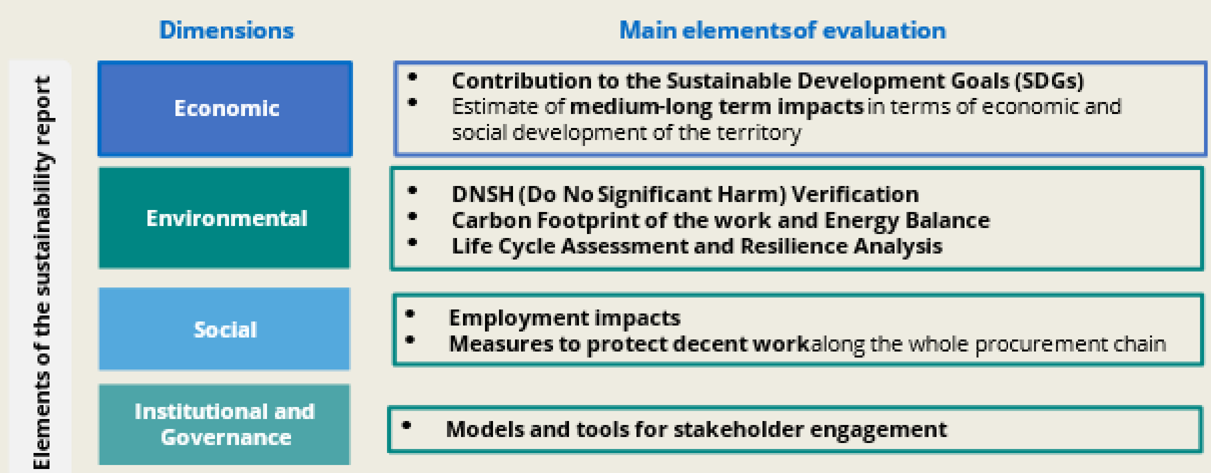
Well-being evidence can also help in redesigning policy content related to the built environment. The drivers of people's well-being during the entire policy cycle for the built environment need to be disentangled in order to redesign built environment policies from a more multidimensional perspective. This implies the development of a well-being evidence base articulating the inter-linkages between the built environment outcomes and both the policy levers and the economic, social and environmental factors that drive them. Planners and policy makers are asked to shape better places for better lives but may often lack systematic knowledge both on what better places are and on how to shape these places, and well-being evidence may shed light on the multiple ways through which the built environment contributes to people's quality of life (Mouratidis, 2021[10]). For example, (OECD, 2021[11]) documented how taxation, spending, and final policy related to housing, as well as rent regulation, building regulation, land use and environmental urban policy have effects that cut across multiple dimensions of affordability, mobility, economic resilience, the local environment and greenhouse gas emissions. Multidimensional well-being evidence can help assess possible synergies, trade-offs and unintended consequences that these different policies related to the built environment may generate. It will also help to address inequalities between population groups and to sustain physical capital for future generations.

Redesigning with well-being evidence can be done during various stages of developing built environment policy. Investments made in the built environment, including infrastructure investments, tend to be large-scale, and extensive sunk costs could be generated if the course is diverted after initial investments have been made. Thus, multidimensional well-being impact assessments for new built environment projects need to be done ex ante, rather than ex post. Italy's case presents an example (Box 3.3) of having an evaluation score that includes economic, environmental, social and institutional dimensions for the feasibility assessment of large-scale public works. Another example is Infrastructure Canada (INFC), which has been incorporating a gender-based analysis plus process (GBA Plus) in many of its infrastructure programmes and policies. Reporting on the employment and/or procurement opportunities for at least three Community Employment Benefits (CBE) groups (e.g. women, persons with disabilities, youth, Indigenous peoples) is required for projects worth over CAD 10-25 million under the Investing in Canada Infrastructure Program (ICIP) (Infrastructure Canada, 2022[12]). However, for the existing stock of the built environment, it is equally important to consider through ex-post assessments how its management or redesigning can be altered to ensure people's well-being and sustainability. For example, urban regeneration projects should address the inter-connected policy challenges revamping projects may generate that impact people's lives, such as gentrification.

Box 3.3. Redesigning with ex-ante assessments of sustainability: The experience of Italy

In July 2021, new ***Guidelines for the Technical and Economic Feasibility Project of Public Works*** were issued by the Italian Ministry for Sustainable Infrastructures and Mobility (Mims), which renewed focus on the design of sustainable and resilient infrastructures and mobility networks. These guidelines include a Sustainability Report of investments as a **new ex-ante analysis document**. This report is based on a Sustainable Infrastructure and Mobility Score (SIMS), comprised of four dimensions of impacts: 1) economic and financial, 2) environmental, 3) social and 4) institutional and governance (Figure 3.1). This report is used during screening as part of a scoring methodology intended to determine the priorities for works to be funded. In addition to the cost-benefit analysis, it enables the assessment of impacts on the environment, accessibility, employment as well as concerning consistency with programme goals and mechanisms for involving stakeholders and citizens.

Figure 3.1. Dimensions for Sustainable Infrastructure and Mobility Score (SIMS)



Source: Ministry for Sustainable Infrastructures and Mobility, Italy (https://www.mit.gov.it/en/comunicazione/news/green-transition-minister-giovannini-oecd-council-italys-strong-commitment-just).

Realigning the policy structures that support the built environment

Policies concerning the built environment often call for input from a wide range of public and private agencies. A well-being lens can help these agencies to overcome traditional government silos and coalesce around a common goal/vision, helping stakeholders to pivot and avoid digressing towards the interests of individual agencies. Horizontal and vertical policy coherence is crucial in ensuring the effectiveness of diverse policies, and a well-being lens can help align the interests of different ministries (OECD, 2021[1]). For example, decarbonising buildings would require horizonal and vertical policy alignment and coordination between multiple policy areas so that a coherent message is sent out to cities and regions; in Japan, three ministries – the Ministry of Land, Infrastructure, Transport and Tourism; the Ministry of the Economy, Trade and Industry; and the Ministry of the Environment – had to develop a common roadmap (OECD, 2022[13]).

A well-being lens can also contribute to realigning resources for the built environment, embedding a long-term focus. Built environment policies and interventions often involve a long time-horizon, often taking 10 to 30 years from planning to full operation, which has implications not just for well-being and inclusion today, but for several generations into the future. When there is a clear mandate to consider people's well-being in the policy-making process, policy agents would be better incentivised to coordinate and negotiate the finite resources for the built environment with a long-term focus, rather than focusing on their immediate tasks and those that they are directly accountable for. For example, Korea's 5th Comprehensive National Territorial Plan (2020-2040), which came into effect in 2020, focuses on setting the strategic policy direction for "sustainable development and people's happy lives as well as building a social consensus" (Cha and Jeong, 2020[14]). Faced with criticism that, despite being the highest national spatial plan, the previous plans lacked guidance for sectoral and sub-regional plans and also for the participation of the central government's different ministries and the local governments, the fifth plan sought to redefine its status as the "indicative policy plan" that leads the direction of the country's land policies with "planning guidelines and indicators" (Cha and Jeong, 2020[14]). In particular, the Ministry of Land, Infrastructure and Transport and the Ministry of the Environment jointly developed a practical model of drawing up an integrated land-environment management strategy, aligning the Comprehensive National Territorial Plan with the Comprehensive National Environment Plan, implementing a joint monitoring system for the execution of both plans (MOLIT, 2019[15]).

Reconnecting the various public, private and civil society actors that shape and make use of the built environment

Across the lifecycle of the built environment – from planning to financing and maintaining it – a well-being approach can be used to support dialogue and engagement among the multitude of actors that create, shape and use the built environment. This includes strengthening citizen and external stakeholder participation in various stages of policy development and decision-making concerning the built environment. A clear well-being vision and statement around the built environment can also stimulate more effective and productive public debate. In Wales, the Well-being of Future Generations (Wales) Act 2015, which outlined seven well-being goals, provided the basis for the construction sector's interest in building a sustainable built environment (Constructing Excellence in Wales, 2023[16]). For example, Constructing Excellence in Wales (CE Wales), an independent body representing each part of the built environment's supply chain, has been championing collaboration and best practices, working with organisations in both the public and private sectors. In 2019, CE Wales organised a conference in partnership with the Future Generation Wales and engaged almost 300 stakeholders and a further 130 organisations to develop ideas for construction well-being objectives that support the seven well-being goals, such as proposals to make designs more people-centric, promoting physical and psychological well-being and serving the broader social needs of the community (Constructing Excellence in Wales, 2023[16]). Furthermore, empowered residents reported more positive attitudes towards their surroundings and housing providers (Baba et al., 2016[17]). This approach will help amass social capital as well as restore trust in institutions surrounding the built environment. In Elk Grove, a city in the United States, city planners created an online simulation for residents to choose different scenarios of projects providing affordable housing units (Adam, 2022[18]). Input from residents helped the planners to build an overall plan of recommended projects, with no less than 65 percent support from all the respondents (Adam, 2022[18]).

Consultations with stakeholders are often required by law for infrastructure development projects, but they usually lack quality discussions on the well-being dimensions of the built environment. Introducing dimensions of well-being can improve the consultation process and make it more relevant to people's lives. For example, there have been efforts to involve citizens in energy sector planning and decision-making in Canada, with deliberative consultations on energy policy in some provincial settings, but there have been reservations about these not leading to policy empowerment or co-production (MacArthur et al., 2020[19]). There is the necessity for an incentive/reward system for the government agencies to actively involve external stakeholders in their processes. Delays in the timeline of infrastructure projects would generate additional costs for the government and the companies. Unless the benefits of involving diverse stakeholders in the dialogue are manifest, it would be difficult for them to prioritise public consultation processes. Moreover, hard-to-reach populations are not always represented in the process. Hence, it is necessary to build civil service capacity and shift cultures of practice within institutions so as to recognise the importance of such dialogue and communication between government and citizens of all layers. In Britain, the National Infrastructure Commission (NIC) established the Young Professionals Panel (YPP) in 2018, which brings together professionals from across industry to provide fresh thinking to the NIC's work (NIC, n.d.[20]). For example, the YPP is using its podcast to inform the NIC's work about the role of infrastructure in levelling up disparities in the economic geography of the United Kingdom (NIC, n.d.[20]).

3.3. Countries' experiences: Well-being and sustainability policies for the built environment

Expanding on the previous section's general discussion of well-being approaches and the built environment, this section will look at country-level cases: New Zealand's housing and urban policies and Ireland's sustainable mobility policy. Some of these cases concern broader national strategies while some are more sectoral policies or specific policy interventions. The strengths and weaknesses of these case studies will be examined with reference to the four R's introduced in the previous section: refocus, redesign, realign and reconnect.

3.3.1. New Zealand's housing and urban policies and well-being

New Zealand has significant experience in applying a well-being lens to the built environment, notably in measuring the well-being impacts of public policy and collecting well-being evidence to monitor progress on the built environment. As discussed earlier, housing is an important determinant of well-being, which is reflected in its inclusion as one of twelve domains under the Treasury's Living Standards Framework. This section will illustrate in more detail how New Zealand's housing as well as urban policies have evolved to consider various dimensions of well-being in the planning, implementation and evaluation of polices, with a particular focus on housing affordability and housing quality.

Refocusing on well-being to anchor housing and urban policies

In the face of rising housing prices, the New Zealand government has taken steps to boost the supply or renovate its housing stock to tackle the issue of housing affordability. Strong demand (with greater access to credit and high immigration) and weak supply responsiveness have been cited as being responsible for a rapid price escalation over the past two decades (Barker, 2019[21]). Housing costs consume more than 40% of disposable income for tenant households in the bottom quintile of the income distribution in New Zealand (OECD, 2023[22]). Despite the rapid pace of housing construction over the last decade, the number of dwellings per inhabitant in New Zealand remains below the average for the OECD (Fitchett and Jacob, 2022[23]). Unaffordable housing has also led to an increase in people experiencing housing distress or homelessness. Against this backdrop, the principles of well-being are increasingly being applied to change the strategic course of housing and urban development policies in New Zealand through national strategic statements, legislation about homes and communities, as well as the establishment of a new public housing and urban development agency:

- Partly due to variations in capabilities and in the application of evidence, New Zealand councils have historically taken approaches to urban planning that have nevertheless tended to result in less dense, car-dependent cities that lack affordable housing. *The National Policy Statement on Urban Development (NPS-UD)*, which came into force in August 2020, is a legal direction to councils to remove restrictions and plan for growth both up and out, and to allow for denser housing in areas where people want to live, and connected to jobs, transport and community facilities (Ministry of Housing and Urban Development, n.d.[24]).
- The *Kāinga Ora – Homes and Communities Act 2019* provides that when preparing or reviewing a *Government Policy Statement on Housing and Urban Development (GPS-HUD),* the Minister must be satisfied that it promotes a housing and urban development system that contributes to the current and future well-being of New Zealanders (New Zealand Legislation, 2019[25]). Based on this, the New Zealand Government has published the GPS-HUD*,* a multi-decade strategy that sets the vision and direction for housing and urban development (Ministry of Housing and Urban Development, 2021[26]). "Wellbeing through housing" is identified as one of its four main outcomes over the next 30 years, based on input from organisations and individuals from communities across the country, which outlined a consensus on the housing and urban outcomes that New Zealanders want to see (Ministry of Housing and Urban Development, 2021[26]). The GPS-HUD acts as an anchor from which aligned and consistent decisions can be made and gives the wider system visibility on how government intends to work and focus its energy and resources (Ministry of Housing and Urban Development, 2021[26]). It also provides the private sector an important context in which they can decide how to shift their own operations to respond to this direction, in partnership with government, with each other, or independently (Ministry of Housing and Urban Development, 2021[26]).
- Housing and Urban Development Indicators track progress towards the long-term goals in the GPS-HUD and *MAIHI Ka Ora*, the National Māori Housing Strategy (Ministry of Housing and Urban Development, n.d.[27]). These indicators include information on homelessness, housing support, transport and urban areas, as well as on housing providers and funding. In addition to being strategic indicators of change in housing well-being, the indicators are selected to measure change in the whole system, rather than measuring specific policies or programmes, and to measure change at a national level, with information for population, geographic and tenure groups where appropriate.
- Cognizant of the importance of gearing support towards vulnerable populations such as low-income households living in rented accommodation, efforts to improve access to and the quality of public housing are also underway. The establishment of *Kāinga Ora* in 2019, a public housing provider and urban development agency, further highlights such a shift. With its Māori name meaning "wellbeing through places and communities" (Kainga Ora, 2023[28]), the objectives of Kāinga Ora are to "provide good quality housing that meet diverse needs; support good access to jobs, amenities and services; and sustain or enhance the overall economic, social, environmental and cultural wellbeing of current and future generations" (Ministry of Housing and Urban Development, 2023[29]).

Redesigning policies with multidimensional well-being evidence

Well-being evidence, generated in collaboration with different stakeholders, is being used to shape the built environment policies in New Zealand and to highlight both the interconnected drivers and impact of built environment policies:

- In addition to direction setting strategies such as the GPS-HUD and *MAIHI Ka Ora*, *Long-term Insights Briefings ("Briefings")* provide the public with information about medium and long-term trends, risks and opportunities affecting Aotearoa New Zealand at least 10 years into the future, together with options for how the country might respond (Ministry of Housing and Urban Development, n.d.[30]). The Briefings are made to Parliament, rather than to Cabinet or ministers, and departments determine the topic, ensuring that any political party, government department, stakeholder or advocacy group can access the high-level advice and incorporate it into their context. This helps bring well-being more coherently to the fore of long-term policies (Ministry of Housing and Urban Development, n.d.[30]).
- Various efforts to identify multidimensional drivers of well-being for the built environment are also underway in New Zealand. For example, *Te Hotonga Hapori* (Connecting Communities) is a research programme aimed at providing information on the well-being effects of urban housing redevelopment, including on mental and physical health and a sense of community and place. Funded by the Ministry of Business, Innovation and Employment (MBIE), this project will determine the impact of urban redevelopment on community well-being as well as personal well-being of Kāinga Ora tenants with well-being indicators such as life satisfaction, social connectedness and cultural identity (AUT, 2021[31]). These well-being evidences will be used to give developers and policy makers information about the multifaceted impact of urban redevelopment on mental and physical health and a sense of community and place so as to give direction to further improvements (AUT, 2021[31]).
- A study funded by the Ministry of Social Development found dampness in a baby's room to be associated with chest infections and with cough lasting more than a week in the first nine months of children's lives (Ministry of Social Development, 2021[32]). Another study, which showed that rental housing in New Zealand is generally older, colder, damper and mouldier than owner-occupied housing (Howden-Chapman et al., 2021[33]), helped provide an evidence base for the 2018 World Health Organization (WHO)'s *Housing and Health Guidelines* (World Health Organization (WHO), 2018[34]). The New Zealand Government has in turn introduced higher standards for rental housing (Howden-Chapman et al., 2021[33]).

Realigning different agencies and partners around a common vision of success

The GPS-HUD and *MAIHI Ka Ora* together set the vision and direction for the housing and urban development systems in New Zealand. Successfully implementing these strategies requires central and local government to partner and collaborate with others to enable a system-wide response. Different parts of the system bring different skillsets and knowledge to the table, which together, can help achieve large-scale and systemic change. Detailed roles of key actors are outlined, such as the Ministry of Housing and Urban Development (HUD) and Kāinga Ora, while also stressing the importance of other agencies such as the Ministry of Business, Innovation and Employment, the Ministry for the Environment, the Ministry of Transport and the Ministry for Pacific Peoples. HUD is also working closely with the Treasury and the Reserve Bank of New Zealand not just to understand what is happening in the housing market, but also to better understand what tools are available to deliver better housing outcomes (Ministry of Housing and Urban Development, 2021[26]). In particular, implementation plans for both the GPS-HUD and *MAIHI Ka Ora* strategies were published in 2022. These provide more information about the actions, roles, and responsibilities across the system for delivering the change required to realise system outcomes. HUD will be reporting on progress against outcome indicators and the government work programme annually, to ensure effective responses to changes in context of what is happening in the system.

Reconnecting with the wider community

The New Zealand government has worked closely in partnership with public stakeholders, including local government and the private sector as well as those whose lives are most directly affected by policies (e.g. Box 3.4), to successfully implement its housing and urban policies:

- HUD recognises the necessity to partner or collaborate with the private sector in order to deliver better housing and urban outcomes, given its significant role in funding, financing, designing, constructing, delivering and maintaining the built environment (Ministry of Housing and Urban Development, 2021[26]). It highlights the role of the private sector as the largest provider of housing in New Zealand, through both owner-occupation and rental provision (Ministry of Housing and Urban Development, 2021[26]). HUD has committed to support the building and construction sector by: supporting innovative building methods that speed up and scale up construction, facilitating investment in skills and training across industries, exploring ways of streamlining building consent, and taking action to ensure efficient supply chains (Ministry of Housing and Urban Development, 2021[26]).
- On the other hand, *The Māori and Iwi Housing Innovation Framework for Action (MAIHI)* seeks to strengthen a Māori-government partnership, with Māori housing partners engaged in informing and designing processes of housing solutions. Recognising the evidence that Māori face disproportionately high levels of homelessness; high rental costs as a share of income; low rates of home ownership; and high rates of intergenerational poverty relative to the total New Zealand population, it stresses the importance of co-design and partnership "that are underpinned by the values and lived experience of Māori" and housing solutions "by Māori, for Māori" are central to both its vision and delivery approach. MAIHI calls for the governments' efforts and investment to be relevant to Māori, considering all dimensions of well-being, including cultural values (Office of the Associate Minister of Housing and Chair, n.d.[35]; Ministry of Housing and Urban Development, n.d.[36]).
- The New Zealand Centre for Sustainable Cities, an interdisciplinary research centre, partners with Māori urban authorities, iwi[1], community and regional councils and territorial local authorities, as well as national policy agencies, to focus on how to maximise well-being through public housing (New Zealand Centre for Sustainable Cities, 2021[37]). Partnering with community-led agencies (e.g. Salvation Army, Dwell), as well as public housing providers (e.g. the Tāmaki regeneration programme, Wellington City Council), the Centre aims to provide evidence on the well-being of tenants and the community, community formation and local urban design, carbon emissions related to energy and transport use, and housing quality, to help improve public housing policies and also support more effective allocation of government funding.

Box 3.4. Reconnecting to deliver: New Zealand's *Healthy Homes Initiative*

- The *Healthy Homes Initiative (HHI)*, led by the Ministry of Health (Te Whatu Ora – Health New Zealand), is an example of an integrated policy approach for well-being and the built environment, to improve housing quality while also reducing health inequalities across ethnic and social groups. Under this initiative, interventions such as ventilation, heating sources, support with power bills and minor repairs are provided for eligible families to ensure better health and social outcomes (Health New Zealand, 2023[38]). The *Healthy Homes Initiative* is funded and overseen by the Ministry of Health, working closely with key government agencies such as Kāinga Ora and the Ministry of Social Development (Health New Zealand, 2023[38]). Specific illustrations include families eligible for the Rheumatic Fever Fast Track being put on the social housing wait-list, and Kāinga Ora tenants being provided with access to key capital interventions such as insulation (Health New Zealand, 2023[39]).

- **Reconnecting with people in need led to successful implementation of HHI interventions**. The evaluation report for the HHI illustrates cases where a prolonged relationship between the recipient of the support and the HHI assessor enabled successful delivery of information and support (Health New Zealand, 2023[39]). For example, a family of four living in a rental property with health and safety issues within the home received support for minor repairs and information on home maintenance as well as the options available regarding the Tenancy Tribunal and advocacy via Community Law, from the HHI Assessor. The HHI Assessor helped the family become aware of their rights as tenants, and the family was subsequently awarded compensation from the landlord and then supported to secure a new private rental home (Health New Zealand, 2023[39]).
- The evaluation report also found "unambiguous evidence of broad improvements in well-being", underlining the rationale for the expansion of the programme (Health New Zealand, 2023[39]), by highlighting inter-linked well-being impacts of the interventions. For example, the HHI intervention had a positive impact on employment (with a 4% increase in employment among adults aged 24 to 64), and the value of social benefits from the initiative led to a return on investment within a year (Health New Zealand, 2023[39]).

Source: (Health New Zealand, 2023[39]), *Healthy Homes Initiative – Te Whatu Ora – Health New Zealand*, https://www.tewhatuora.govt.nz/keeping-well/for-families-and-children/healthy-homes-initiative/#healthy-homes-initiative-three-year-outcomes-evaluation; (Health New Zealand, 2023[39]), *Healthy Homes Initiative: Three year outcomes evaluation*, https://www.tewhatuora.govt.nz/publications/heathy-homes-initiative-three-year-outcomes-evaluation/.

3.3.2. Ireland's transport policies for sustainability and well-being

Ireland's Department of Transport published its *National Sustainable Mobility Policy (SMP)* in April 2022, setting out a strategic framework and specific action plan to support a shift to more sustainable transport modes between now and 2030 (Department of Transport, 2022[40]). Its main objectives are to promote active transport journeys, such as walking and cycling, along with public transport use, while reducing private car journeys. Transport accounts for 18% of the total greenhouse gas emissions in Ireland, with road transport making up 94% of total transport emissions, and the *National Sustainable Mobility Policy* is aimed at helping Ireland meet its carbon emissions target of a 51% reduction by 2030.

Refocusing on sustainable mobility and towards sustainable accessibility

The current transport system in Ireland is car-dependent, with private car use accounting for 74% of all journeys (Department of Transport, 2022[40]). There are geographic variations, as evidenced by the 2016 Census, where 55% of residents of the Greater Dublin Area reported that they travel to work by car, against 70% for those residing outside the metropolitan area (National Transport Authority, 2022[41]). Increasing mobility by enlarging transport volume (i.e. by constructing new roads) or by introducing measures to curb congestion, however, would not necessarily lead to greater well-being. OECD (2022[42]) illustrates an example of how well-being can be undermined when people are forced to travel further to meet their daily needs after local stores close down. Mobility could be seen at a glance as having improved, but it would be a misleading proxy for well-being. Ensuring accessibility via sustainable transport modes, on the other hand, can support both present and future well-being.

Placing well-being at the centre of transport policies could help change the overall trajectory of transport planning, from expanding mobility by road transport towards supporting sustainable accessibility. Transformative policies that change the car-dependent system from its core, can help achieve multiple well-being outcomes, rather than simply addressing negative impacts of the unsustainable transport system (OECD, 2022[42]). Along these lines, the vision of the SMP is to “connect people and places with sustainable mobility”. To nudge people towards more sustainable travel patterns, the Policy aims to “improve and expand walking, cycling and public transport options across the country”. The principles and goals of the Policy (Table 3.2) also show that it incorporates various dimensions of both the government of Ireland’s Well-Being Framework (Government of Ireland, 2022[43]) and the OECD Well-being Framework, such as safety, environmental quality, affordability, accessibility as well as inclusiveness for vulnerable populations. Achieving these goals can provide not just current well-being gains but also resources for people’s future well-being.

Table 3.2. Principles and goals of Ireland’s *Sustainable Mobility Policy*

Principles	Goals
Safe and Green Mobility	1. Improve mobility safety.
	2. Decarbonise public transport.
	3. Expand availability of sustainable mobility in metropolitan areas.
	4. Expand availability of sustainable mobility in regional and rural areas.
	5. Encourage people to choose sustainable mobility over the private car.
People-Focused Mobility	6. Take a whole-of-journey approach to mobility, promoting inclusive access for all.
	7. Design infrastructure according to Universal Design Principles and the Hierarchy of Road Users model.
	8. Promote sustainable mobility through research and citizen engagement.
Better Integrated Mobility	9. Better integrate land use and transport planning at all levels.
	10. Promote smart and integrated mobility through innovative technologies and development of appropriate regulation.

Source: Adapted from (Department of Transport, 2022[40]), National Sustainable Mobility Policy, https://www.gov.ie/en/publication/848df-national-sustainable-mobility-policy/#.

Redesigning the transport system to address multiple dimensions of people’s needs

The SMP deals with multiple dimensions of the Irish Government’s Well-Being Framework, with some dimensions more explicitly illustrated in specific goals. For example:

- The need for mobility to support people’s **safety** is emphasised. Although Ireland had the second-lowest rate of road deaths in the EU in 2019 (Government of Ireland, 2021[44]), challenges remain, especially for those who walk or cycle on roads. Some of the policies included in the SMP to improve the safety of mobility options include provision of a safer walking and cycling infrastructure within communities especially adjacent to schools; ensuring safe interchange between active travel and public transport; promoting the safety of railway network and services; and investing in the maintenance of the existing road network to a safe standard.
- **Environmental quality** is covered extensively, both in terms of its contribution to current well-being (such as cleaner air today) and in terms of laying the foundation for future well-being (such as through more sustainable low-emissions transport modes). Goal 2 of the SMP aims to “reduce emissions by transitioning the bus, rail and small public service vehicle (SPSV) fleet across the country to low/zero emission vehicles”. Transitioning subsidised bus fleets to zero emissions vehicles; increasing the rail network with electrified services; and expanding electric vehicles in the SPSV sector are the key measures included to achieve this goal.
- **Inequality** is addressed in terms of expanding sustainable mobility options for regional and rural areas. Delivery of improved walking and cycling infrastructure in towns and villages; expansion of bus services; as well as improving inter-regional connectivity will help increase connectivity for people in rural areas.

- The **inclusiveness of the transport infrastructure and system** for all people regardless of age, size or disability is highlighted. For example, ensuring that bus and train stations are accessible for people with reduced mobility, as well as introducing a Young Adult Travel card that will provide a 50% discount on all subsidised public transport services, all aim at improving inclusive access for all.

Realigning land use and transport planning

The SMP is accompanied by a concrete action plan to 2025, which will be supported by complementary actions from other relevant national strategies. It is based on the OECD recommendation (OECD, 2022[42]), which called for the adoption of a clear implementation plan with specific targets, budgets and responsibilities across all governmental bodies, while revisiting measurement frameworks and models. In addition, a Leadership Group, chaired by the Department of Transport and including key stakeholders who will lead implementation of the actions under the SMP, will be established to ensure smooth delivery of the Policy, including the mid-term review scheduled to take place in 2025 (Department of Transport, 2022[40]).

Better understanding of the interconnectedness of well-being outcomes can strengthen policy integration and coherence. One example of such a policy area is the integration of land-use and transport planning that aims to support "compact growth and transport-oriented development" (Department of Transport, 2022[40]). Sustainable and well-connected communities with a high quality of life are feasible only under housing development plans that incorporate the installation of a quality public transport system. There is also a mutual reinforcement of compact growth when active transport modes are promoted in limited urban space with a high population density. The SMP details how integration should happen at different levels of the policy hierarchy:

- At the national level, the National Planning Framework (NPF) has the objective of compact growth, and to achieve this objective, a working group has been established to consider transport-oriented development in major urban areas, jointly chaired by the Department of Transport and the Department of Housing, Local Government and Heritage (Department of Transport, 2022[40]).
- At the regional level, as the Regional Spatial and Economic Strategies are reviewed, the National Transport Authority will provide an analysis of "land use development potential based on accessibility to the core public transport network" (Department of Transport, 2022[40]).
- At the metropolitan and local levels, the metropolitan area transport strategies and the local transport plans need to ensure delivery of multi-modal transport infrastructure and the integration of sustainable transport and land-use planning. For example, the concept of "10-Minute Towns", which "seeks to have all community facilities and services accessible within a 10 minute walk or cycle from homes or are accessible by public transport services connecting people to larger scaled settlements" (Southern Regional Assembly, n.d.[45]), is supported by the Southern Regional Assembly (SRA), which is the regional tier of government established under the Local Government Reform Act 2014. The SRA forges links between the EU and national and local levels, and has devised a framework and methodology of 10-Minute Towns for local authorities to use as implementation tools for their key towns (Southern Regional Assembly, n.d.[45]).
- The importance of the "correct sequencing" of spatial and transport planning is also highlighted. For instance, making investments in interurban connectivity could have adverse or unanticipated consequences, such as urban sprawl. For the purpose of better coordination during the development process, the Department of Transport, in consultation with the Department of Housing, Local Government and Heritage, will review ways of strengthening transport appraisal requirements around the assessment of spatial and land-use considerations in its sectoral guidance (Department of Transport, 2022[40]).

Reconnecting through public consultation and stakeholder engagement

Public consultations provided the backbone of the SMP, heavily influencing the development of the Policy framework and action plan (Department of Transport, 2022[40]). According to the Department of Transport, development of the policy began with a roundtable forum in 2018 for diverse stakeholders. An extensive set of background papers was produced, providing the basis for the public consultation process that ran from November 2019 to February 2020. Specific questions about the vision, objectives and targets for sustainable mobility were asked, as well as questions about enhancing the quality, reliability, safety and integration of sustainable mobility services (Government of Ireland, 2019[46]). A broad range of themes, such as active travel (27%), rural transport (15%), accessibility (12%), land-use and transport planning (11%) and regulation (11%), were included in over 250 submissions that were received in the public Department's website, from a variety of public and private stakeholders during the consultation process. In addition to public consultations, other government departments, academics, business groups and disability representatives were consulted on a bilateral basis (Department of Transport, 2022[40]).

Moving forward, OECD (2022[42]) has recommended 1) redefining the goal of the transport system as sustainable accessibility; 2) prioritising the up-scale of transformative policies; 3) redefining the electrification strategy to support the transition towards a sustainable transport system; and 4) embracing a systemic approach to policy decision-making across government departments. Exposing people to the benefits of sustainable transport systems, such as reduced obesity or less air pollution, as well as providing people with opportunities to experience sustainable transport modes, such as bikes, will be instrumental in transforming people's behaviours. These efforts would be helpful in transforming the ingrained mindset that favours private cars over other sustainable transport modes. It is also necessary to recognise the importance of accommodating the needs of the hard-to-reach groups in the implementation stage of the SMP, whose opinions could easily be overlooked in the public consultation processes.

3.4. Conclusion and ways forward

The benefits of generally applying a well-being lens to policy extend to policies on the built environment as well. A well-being lens on policy allows policy makers to consider various dimensions of policy impacts on people's lives in a more systematic way. Many OECD countries have already included domains or indicators related to the built environment in their national well-being initiatives, some more explicitly than others. Dimensions of housing and transport/mobility appear frequently, but indicators under broad domains of environment and safety also often touch upon aspects of the built environment. Subjective well-being indicators and people's perceptions of the built environment are also frequently included, such as people's satisfaction with the living environment or commuting. There have also been calls for more detailed well-being datasets to be developed by agencies, including those more directly dealing with policies concerning the built environment, such as ministries of housing, urban planning, transport or infrastructure, in addition to national well-being frameworks that are often developed by the finance ministry or National Statistical Offices.

This chapter has presented how a well-being lens can be used in *refocusing, redesigning, realigning* and *reconnecting (4Rs)* policies on the built environment. Refocusing is necessary to put the built environment back on a positive trajectory in terms of sustainability and well-being and also to close the widening gap in society. Redesigning built environment policies with well-being evidence can help address possible synergies, trade-offs and unintended consequences that different policies related to the built environment may generate. A well-being lens can also contribute to realigning resources for the built environment with a long-term time horizon. Policies concerning the built environment require input from a wide variety of stakeholders, and a well-being lens can help reconnect the public and the private sector as well as civil society.

Defining, measuring and analysing the built environment through a well-being lens can lay the foundation for embedding well-being evidence in built environment policy-making more broadly. Beyond expanding the scope of cost-benefit analysis in economic terms to include other important social and environmental dimensions, a well-being lens can help policy makers better understand and manage the multifaceted trade-offs and synergies inherent in designing and delivering built environment policies. Given the long lifespan of much of the accompanying infrastructure, built environment policies call for a long-term perspective, and a well-being lens that considers both current and future well-being could be helpful in aligning short-term and long-term policy objectives.

Better assessment of the impact of the built environment on well-being across population groups and countries, as well as within countries, is necessary. Data and evidence gaps remain that need to be addressed in order to advance an integrated policy approach in OECD countries. Internationally comparable data relevant to the built environment is often limited in geographical scope (e.g. only having data on metropolitan areas, missing out on rural areas or urban-rural linkages) or misses out on important population groups (e.g. children or the elderly). Country-specific analysis or detailed country profiles will prove to be useful in considering the different historical, cultural and political contexts of countries and regions for the built environment. Exploring the impact of the built environment on the lives of certain vulnerable population groups could also help improve policies concerning these groups (e.g. built environment policies for the disabled population).

Analysing the inter-relationship between well-being and the built environment underscored many dimensions of the built environment that impact people's lives and societal sustainability and that are oftentimes overlooked in the policy-making process. As more well-being data related to the built environment becomes available, it should be possible to conduct in-depth analysis on the causal relationship between dimensions of well-being and elements of the built environment. Performing multivariate analysis on components of the built environment and well-being dimensions will offer more detailed evidence on how the built environment impacts well-being, or vice-versa (i.e. how people's lives could shape or alter the built environment.)

Considering different elements of the built environment (i.e. housing, transport, urban planning/land use, technical infrastructure) side by side can highlight the balance of performance and relative strengths and weaknesses. However, different components also relate to one another. More work could be done to help understand how interactions between elements of the built environment have a profound impact on people's quality of life (e.g. how transport infrastructure facilitating longer commutes influences urban design and the housing market and their impact on people's well-being). Some features of the built environment will also have mixed impacts on well-being. In many ways, this would highlight the benefit of applying a well-being lens: to bring greater transparency on the wide-ranging impacts and elucidating the trade-offs so that they can be better managed. Further work is needed to better understand precise trade-offs that might be involved across the different components.

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Annex 3.A. The built environment in national well-being frameworks and indicators

- In **Australia**, *Australia's Measuring What Matters: Australia's First Wellbeing Framework* (The Commonwealth of Australia, 2023[47]) was released in July 2023 by the Department of the Treasury and draws on the OECD Well-being Framework as a basis to measure progress and wellbeing. The Framework has 50 indicators on five well-being themes (Healthy, Secure, Sustainable, Cohesive, Prosperous). It also includes cross-cutting dimensions of inclusion, equity and fairness to reflect the need to ensure that wellbeing outcomes are fairly shared amongst the Australian population.
- **Austria** has been publishing an annual report on well-being in terms of material prosperity, quality of life and the environment since 2012, with the latest publication being the *How's Austria 2021* report (Austria, 2021[48]).
  - Under the *Quality of life* domain, housing indicators include housing cost overburden (where housing costs exceed 40% of household income), very poor standard of housing, and subjective environmental stress in the living environment. Among these indicators, the "very poor standard of housing" indicator is defined as when two of the following four conditions are met: 1) no bathroom; 2) no toilet; 3) damp walls or floors, rot in window frames or floors, leaking roof; and 4) dark rooms.
  - Transport and mobility indicators are included under the domain of the *Environment*. Indicators include energy consumption of transport, transport performance of truck traffic (i.e. transport volume linked to the distance travelled by road freight vehicles in Austrian territory), fuel consumption of private cars, use of public transport, and greenhouse gas emissions from transport.
- **Canada**'s *Toward a Qualify of Life Strategy for Canada* (Department of Finance Canada, 2021[49]) includes the five broad domains of quality of life: *Prosperity, Health, Environment, Society and Good Governance*. It applies two cross-cutting lenses, *Fairness and Inclusion* and *Sustainability and Resilience,* to each of these five domains. Each domain is further organised into two or four sub-domains that are associated with each of 83 indicators. Among these, housing needs is included in the set of 20 indicators (Statistics Canada, 2023[50]) that are being used in the context of budget assessments.
  - Under the domain of *Prosperity*, housing needs and homelessness are included, as indicators associated with economic security and deprivation.
  - Under the *Environment* domain, indicators such as clean drinking water, satisfaction with local environment, walkability index, access to public transit and waste management are examined. It is mentioned that the environment can be interpreted broadly to include more than just nature, as access to parks and public transit, walkable communities, lower levels of noise pollution and pleasing aesthetics in one's local environments all contribute to people's well-being. Access to pristine green and blue spaces is pointed out as a source of recreation as well as being important to Canadian identity and central to Indigenous cultures.
  - The *Health, Society* and *Good Governance* domains also have indicators that would enable a multidimensional perspective on the built environment, such as timely access to a primary care provider, a sense of belonging to the local community, an accessible environment, and

perceptions of neighbourhood safety after dark. Among these, an *accessible environment*, measured in the Canadian Survey on Disability (CSD), is the proportion of the population reporting having experienced barriers due to limited access to different areas and activities in daily life (e.g. floorplans inside buildings, lighting or sound levels inside buildings, sidewalks) due to a long-term physical or mental health condition (Statistics Canada, 2022[51]).

- **Germany**'s *Government Report on Well-being in Germany* introduced the national well-being framework, comprised of 12 dimensions and 46 indicators that are updated on a regular basis (Federal Government, 2017[52]). The framework's 12 dimensions are further arranged into three broad groupings: aspects that directly concern people's lives and outcomes at the individual and household level ("Our Lives"); aspects that describe the surroundings in which people live ("Our Surroundings"); and aspects that relate to the national or global context, such as the foundations for social coexistence in Germany and the country's role in the world ("Our Country").
  - Three dimensions of "*Our Surroundings"* ("Standing together in family and society", "At home in urban and rural areas", "Living a life in security and freedom") describe safety, mobility, accommodation and social cohesion. Under "At home in urban and rural areas" are indicators such as the ratio of rental costs to net household income, travel time to educational, service and cultural facilities, and broadband access.[2]
- In **Iceland**, the Prime Minister's Committee on Indicators for measuring Well-being developed *Indicators for Well-being* in 2019 (Government of Iceland Prime Minister's Office, 2019[53]). The Committee proposed 39 indicators under the social, economic and environmental categories. There are a number of indicators directly related to the built environment: housing cost overburden, quality of housing, protected areas, quantity of municipal solid waste and recycling rate of municipal solid waste. The framework also includes elements of people's living conditions that relate, in part, to the built environment, such as feeling safe after dark.
- **Israel** adopted a resolution in 2015 requesting the Central Bureau of Statistics to publish a set of *Well-being, Sustainability, and National resilience indicators'*, with the aim of examining changes in well-being in Israel, and for comparisons between different population groups (Central Bureau of Statistics, 2022[54]). The Central Bureau of Statistics updated the 80 indicators, spanning 11 domains, in 2020. One domain explicitly related to the built environment is *Housing and Infrastructure*. This domain includes the share of households who spent 30% or more of their net income on housing,[3] satisfaction with the dwelling, satisfaction with the area of residence, percentage of the population not connected to a sewage treatment system, population without access to water infrastructure, satisfaction with public transportation, housing density, dissatisfaction with commuting time, and the monthly cost of housing services out of disposable income (updated to 2018, base year 2003).
- **Ireland**'s *First Report on a Well-Being Framework for Ireland* in 2021 set out an overarching vision, conceptual framework and dashboard, with a *Second Report* in 2022 (Government of Ireland, 2022[43]).
  - The well-being framework includes *Housing and the Built environment* as one of its 11 key dimensions. Access to housing is considered in terms of "the ability of a person to access and maintain secure housing", which is related to the affordability and availability of accommodation. The impact of housing quality on healthy living, such as the presence of damp or leaks or the quality of insulation, is also included. The "built environment" captures access to various services (e.g. education, transport and recreational facilities, health care, Internet connections, and utilities such as water and electricity). Indicators under this dimension include new dwelling completions, the number of domestic dwellings with an A or B energy rating,[4] the at risk of poverty rate after rent and mortgage interest, and the average distance to everyday services.

- Another dimension, *Environment, Climate and Biodiversity*, measures human impact, which is intended to capture the level of emissions, land use, waste and biodiversity. Indicators relevant to the built environment include the proportion of waste to landfill, and water bodies assessed as "high" or "good".[5]
- The dimension of *Safety and Security* includes people's perceptions of safety and security, such as how safe a person feels in everyday activities such as walking home at night or on public transport. It also considers the risks and impacts associated with infrastructural hazards. Safety and Security indicators broadly related to the built environment include persons killed or injured on roads and the percentage of the population who worry they could be a victim of a crime.

- In **Korea**, Statistics Korea has been updating its *National Quality of Life Index* since 2014, with the objective of providing information for policies to improve people's well-being (Statistics Research Institute, 2023[55]). It considers 71 different indicators under 11 dimensions. Indicators under the three dimensions of *Housing, Environment* and *Safety* each describe the state of the built environment from different angles. The *Housing* dimension includes indicators such as the home-ownership rate, rent-to-income ratio, living space per capita, dwellings without basic facilities (i.e. kitchen, toilet/bathroom), commuting time to workplace, and housing environment satisfaction. The *Environment* dimension includes indicators such as public park size per person in a city and the water supply coverage rate of a rural area. Several self-reported indicators that address people's perceptions of their living environment are also included: satisfaction rates for air quality, water quality, soil environment, noise level and green environment. As for the *Safety* dimension, indicators such as feeling safe walking alone at night, the road casualty rate, and the accident-induced child death rate are included.
- In the **Netherlands**, Statistics Netherlands (CBS) has published three editions of the *Monitor of Well-being and the Sustainable Development Goals* since 2017, using a structured set of indicators and a description of the trends over time (CBS, 2020[56]). The *Monitor* describes trends in well-being for Dutch people "here and now" by outlining the current level of well-being as well as the well-being "later" for future generations. It also adds a description of the way well-being is distributed over various population groups. To make observations about trends of well-being relevant to the built environment, indicators are used such as time lost due to traffic congestion and delays, housing quality, satisfaction with housing, often feeling unsafe in the neighbourhood, quality of inland bathing waters, urban exposure to small particulate matter air pollution. Examples of indicators for the distribution of well-being relevant to the built environment are satisfaction with commuter travelling time, quality of housing, satisfaction with housing, feeling unsafe in the neighbourhood, and experiencing pollution in one's own neighbourhood.
- **New Zealand's** Treasury published their first official *Living Standards Framework (LSF) Dashboard* in 2018. The LSF is intended as a practical tool both for analysts and for promoting a broader assessment of policy options. The LSF Dashboard (2021 edition (New Zealand Treasury, 2021[57])) spans three levels: 1*) our individual and collective well-being*; 2) *our institutions and governance;* and 3) *the wealth of Aotearoa New Zealand*.
  - Of the 12 domains of well-being under *our individual and collective well-being*, the domains most directly relevant to the built environment are housing and environmental amenity. Housing is defined as "having a place to call home that is healthy, suitable, affordable and stable" and environmental amenity as "having access to and benefiting from a quality natural and built environment, including clean air and water, green space, forests and parks, wild fish and game stocks, recreational facilities and transport networks". Existing indicators under housing are household crowding, housing cost and housing quality, but provisional well-being indicators for the LSF2021 Dashboard for housing have newly introduced the age-standardised home

ownership rate. For the domain of environmental amenity, the indicators linked to the built environment are access to the natural environment, water quality and public transport accessibility.

  - *The wealth of Aotearoa New Zealand* provides indicators for the four aspects of wealth: financial and physical capital, human capability, natural environment and social cohesion. Among these, financial and physical capital specifically includes "tangible, human-made assets, such as buildings, machinery and infrastructure".

- The **United Kingdom**'s Office for National Statistics (ONS) examines the country's progress (*Quality of Life in the UK*) across 10 domains of well-being: personal well-being, relationships, health, what we do, where we live, personal finance, economy, education and skills, governance and the environment (Office for National Statistics, 2023[58]). Indicators that describe the built environment are primarily placed under the domain of *Where we live*, detailing the quality of the local life and the community, and how people feel about it. Indicators include crime, feeling safe, accessed natural environment, belonging to the neighbourhood, access to key services, and satisfaction with accommodation.

Notes

[1] An iwi, or Māori tribe, is one of the largest kinship groupings and is generally made up of several hapū that are all descended from a common ancestor. Hapū are clusters of whānau, where the whānau is usually an extended family grouping consisting of children, parents, often grandparents, and other closely related kin (Stats NZ DataInfo+, n.d.[59]).

[2] The ratio of rental costs to net household income provides information on rental housing exclusively, in particular how much people have to spend on rent and utilities out of their disposable monthly income. Travel time to educational, service and cultural facilities measures the time people need to travel from their homes to the nearest regional or major regional centres with public transport or by car. The indicator of broadband access is the percentage of households and businesses with access to high-speed (more than 50 Mbit/s) broadband connections.

[3] The net money income of a household is divided by the number of standard persons in the household. Household size affects the standard of living that can be maintained on a given income. To provide a basis for comparing the standard of living for households with varying numbers of members, the comparison is usually based on income per standard person. For that purpose, a scale was designed that determines a two-person household as the base unit. The larger the number of household members, the lower the marginal weight of each additional person in the household (size advantage) (Central Bureau of Statistics, 2022[54]).

[4] A Building Energy Rating (BER) is an indication of the energy performance of a dwelling (represented in units of $kWh/m^2/year$). The BER certificate indicates the annual primary energy usage and carbon dioxide emissions associated with the provision of space heating, water heating, ventilation, lighting and associated pumps and fans. In Ireland, a BER certificate and advisory report is compulsory for all homes being sold or offered for rent since 1 January 2009. A BER is also required for new dwellings that apply for planning permission on or after 1 January 2007. A BER certificate is required to avail of the grants for energy-efficiency improvements to the home that are provided under the Better Energy Homes scheme (Central Statistics Office, n.d.[60]).

[5] This classification is based on the EU Water Framework Directive (2000/60/EC). Under the directive, water quality is ranked from best to worst as “high”, “good”, “moderate”, “poor” and “bad”.

Built Environment through a Well-being Lens

The report explores how the built environment (i.e. housing, transport, infrastructure and urban design/land use) interacts with people's lives and affects their well-being and its sustainability. It primarily draws on the OECD's Well-being Framework to highlight the many inter-relationships between the built environment and both material and non-material aspects of people's life, focusing on some key well-being dimensions (e.g. health, safety and social connections). It defines the built environment through a well-being lens and outlines implications for its measurement, leveraging literature, current practice and official data. It then describes the state of the built environment and its components in OECD countries and their inter-relationships with well-being and sustainability. Policy examples of an integrated well-being policy approach in the built environment context are also highlighted. This report is intended to "scope" relevant data and existing research in order to lay ground for further work on this issue.

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