European Bank
for Reconstruction and Development

Effective policy options for green cities

With evidence from case studies

December 2020

Acknowledgements

The completion of this report would not have been possible without generous donor support from the TaiwanBusiness-EBRD Technical Cooperation Fund.

The groundwork for this publication and the digital tool was undertaken by the Arup Group, and much appreciation goes to the team led by Stephen Cook and Dima Zogheib. The report also benefited from contributions and valuable guidance from Sebastian Kriticos (International Growth Centre), Dan Dowling (PricewaterhouseCoopers), İnan İzci (Argüden Governance Academy) and Wolfgang Teubner (ICLEI – Local Governments for Sustainability).

Many departments and individuals across the EBRD contributed to the document and helped shape its content. Among them were Ian Jennings, Roland Ramusch and David Tyler from the Sustainable Infrastructure team as well as Nigel Jollands from the Bank's Energy Efficiency and Climate Change team.

The development of the report and digital tool was coordinated and supervised under the leadership of Kjetil Tvedt, Marcel Schlobach, Jinrui Liu, Russell Bishop and Mara Solomon of the EBRD's Economics, Policy and Governance (EPG) Department. Eva Bernard and Theresa Niederle from the EPG team provided valuable input on the inclusion dimensions of the urban policies discussed. Editorial, multimedia and production guidance was provided by Lidia Creech, Dermot Doorly, Cathy Goudie and Dan Kelly in the Communications Department.

European Bank for Reconstruction and Development

Supported by TaiwanBusiness EBRD Technical Cooperation Fund

ARUP

Contents ↘

Case studies ↘

Policy areas

Policy areas

Policy areas

Foreword ↘

This report presents impactful urban policy options and case studies that can help cities accelerate their green agendas. A digital tool for specific policies and case studies will accompany the final version of this document – see www.ebrdgreencities.com.

Maintaining economic growth while creating sustainable cities for all is the biggest urban challenge that countries face today. More than half of the world's population lives in cities, and that share is projected to reach 68 per cent by 2050. Cities and metropolitan areas are engines of economic growth, contributing about 80 per cent of global GDP. However, they also account for about 60 per cent of global carbon emissions and more than 70 per cent of energy use.[1,2] Today, many cities struggle with environmental degradation, inadequate urban infrastructure and traffic congestion.[3] These challenges will become only more pressing if the pace and pattern of urbanisation continues.

[1] See United Nations (2018).
[2] See United Nations (n.d.)
[3] See United Nations Environment Programme (2019).

"Today, EBRD Green Cities is our largest investment programme, covering 44 cities in 22 countries, with more than €1.5 billion mobilised by the EBRD and multiple donors for investments and technical support."

Against this backdrop, the EBRD launched its Green Cities Framework in 2016 to systematically promote sustainable urban development across the Bank's regions. Today, EBRD Green Cities is our largest investment programme, covering 44 cities in 22 countries, with more than €1.5 billion committed by the EBRD and multiple donors for investments and technical support. Recently, as cities have been at the forefront of the Covid-19 crisis, the programme has become even more important, supporting our partner cities as they "build back better" from the pandemic.

While investments in sustainable infrastructure are crucial, complementary policy reforms also play a vital role in helping to achieve systemic impact. However, through our work with EBRD Green Cities, we have noticed the lack of a cross-sectoral overview of green urban policy options that could guide municipal authorities and relevant stakeholders in the selection, design and implementation of effective policies. This report aims to develop such an overview and contribute to a shared vision of the role and opportunities of city-led policy initiatives and programmes. It seeks to raise awareness of the potentially impactful role of policy initiatives, of how they interact with other urban policies and, in particular, how policies can enhance and complement the environmental benefits of municipal investment programmes.

While this publication was produced in the context of EBRD Green Cities and all policies and case studies have been selected and presented with the EBRD regions in mind, itis highly relevant for any city seeking green solutions, regardless of its location. The policy options and case studies detailed in this document are structured around seven policy areas, with each policy option and case study presented in a brief and hands-on manner. The content aims to be practical and accessible to a wide range of stakeholders, including those with limited technical or policymaking experience.

The process of drafting this report was complex. The main challenge was the integrated nature of urban policies and the multiple benefits (and costs) that one policy may create directly and indirectly for different stakeholders. In this complex landscape of activities and outcomes, it is sometimes difficult to structure and categorise policies and benefits in a simple way without losing too much of the true picture. Fortunately, we are not the first institution to compile a structured overview of urban policies. In drafting this report we benefited greatly from the support and expertise of a wide range of external partners as well as from the knowledge and help of many teams across the EBRD. A detailed list of contributors is available in the acknowledgement section at the front of this report.

As the content of this report, and its accompanying digital tool, will be shared and explored among policymakers, stakeholders and other interested parties, the EBRD expects to collect a rich set of feedback and suggestions that it will incorporate and build on. We hope that this will be reflected in an even richer set of policy options and case studies in future. In addition, we aim to further emphasise aspects of smart, inclusive and resilient urban development – as well as their interaction with green urban policies – in future updates to the digital tool and this report. We look forward to intensifying our work with partners around urban policies and hope that this report serves as an important step in this direction.

Elisabetta Falcetti

Elisabetta Falcetti
Director, Sector Economics and Policy
EBRD

Executive summary ↘

1. Introduction

With the pace of urbanisation accelerating globally, it is almost impossible to discuss the opportunities and challenges of sustainable development without reflecting on the role and impact of cities.

On the one hand, cities are powerhouses of economic growth, generating more than 80 per cent of global GDP. On the other hand, they also account for about 70 per cent of energy use and 60 per cent of greenhouse gas emissions.[4,5]

Given the transformative power of cities – for better or for worse – sustainable urban development has moved to the centre of the global development agenda. This is most prominently reflected in Goal 11 of the United Nations (UN) Sustainable Development Goals (SDGs) which seeks to "make cities and human settlements inclusive, safe, resilient and sustainable" by 2030.[6]

However, not only has more attention been given to cities lately, but the way of looking at cities and urban development has also changed over the years. Whereas the focus was previously on economically efficient cities, often linked to car-based urban planning, today the idea of a green and people-centric urban development dominates.

In this view, residents are seen both as important users of urban spaces and services, and also as important guardians of accountability, ensuring well-governed and inclusive urban development. In addition, there is a growing recognition that cities do not merely provide close proximity between the workforce and fixed places of employment, but also represent dynamic arenas for interaction between the working and resident populations, which are increasingly embedded in a digitalised environment.

Given all of these issues, it is becoming clear that sustainable urban development should be pursued through a systematic and holistic approach. Such an approach must go beyond cross-sectoral planning and coordination, to combine and integrate investment programmes with well-defined policy frameworks and put residents at the centre. An inclusive and participatory approach to sustainable urban development is vital to ensure the participation of residents and guarantee that all interests, including those of marginalised groups, are considered when developing, implementing and maintaining urban solutions.

In response to this awareness, in 2016 the EBRD developed its Green Cities Framework in order to promote sustainable urban development across the Bank's regions in a systematic and holistic manner. EBRD Green Cities is now the largest investment programme of the Bank, with more than €1.5 billion mobilised from the EBRD and external donors for investment and technical support, and more than 40 cities signed up to date. The programme seeks to help cities identify and address their key environmental challenges through evidence-based diagnostics and an inclusive planning process – followed by the preparation and implementation of priority investments and policy initiatives.

2. Content of this report

In light of the importance of well-defined and inclusive policy initiatives as part of any agenda for sustainable urban development, this report presents impactful urban policy options and related case studies relevant to cities pursuing an agenda of this kind.

The report structures these policy options and case studies around seven policy areas – five sector-specific areas (urban transport, land planning, energy efficiency and buildings, water and wastewater, solid waste) and two cross-sectoral or enabling policy areas (governance and financing). Within each policy area, the main five to ten policy options are presented in

[4] See United Nations (n.d.)
[5] See World Bank Group (2020).
[6] See UN (2020).

terms of their resource implications, benefits and risks, necessary conditions, typical implementation challenges or expected opposition, and critical success criteria. The listed policy options are backed by relevant case studies from cities located within and outside the EBRD regions. These case studies have been selected on the basis of a multi-criteria analysis, which ranked them in terms of their characteristics such as replicability, transparency, community buy-in and so on.

This report provides a useful and practical source of references for a wide range of urban stakeholders and interested parties and promotes a shared understanding of the possibilities and likely implications of various policy initiatives. The policy options and case studies are concise.[7] This report does not aim to provide support on how to identify environmental shortcomings in a city. Rather, it assumes that the shortcomings have been identified prior to using this knowledge product. However, readers can use the menu of policy options to guide any form of gap analysis undertaken by cities seeking to accelerate their green agenda.[8]

The report content is oriented towards the cities in the EBRD regions taking part in the Green Cities programme – a practical framework that aims to help cities prioritise and implement investments and urban policies. Hence, for the purposes of this publication, policies are understood as being most non-investment activities that target the 'greening' of cities, that municipal authorities can implement or influence within five years, and that can generate material impact within five to ten years. Consequently, this report does not cover high-level strategic policies or visionary plans more suitable for central governments. Instead, it focuses on tactical and operational policy options that fall within municipal control and influence. Among others, these options include planning, regulation, incentives, funding and financing, skills development, capacity-building and monitoring as well as attitude campaigns, awareness-raising, and information programmes.

3. The main issues in each of the seven policy areas

Urban transport: Cities across the region face high levels of air pollution due to growing car ownership and insufficient vehicle standards, compounded by a lack of attractive public and active modes of transport. Relevant green transport policies include those that aim to restrict car use on the one hand and to promote public and active mobility on the other. Furthermore, cities can promote cleaner vehicles, including through the electrification of urban transport.

Land use and biodiversity: Some cities in the EBRD regions face uncontrolled population growth and urban sprawl. Other cities may be more stagnant while suffering from a legacy of poor availability of recreational and green infrastructure and from limited biodiversity. Potential policies to tackle these challenges include the development of compact cities, the promotion of mixed-use areas and transit-oriented urban development, the promotion of green spaces, and the encouragement of community-based land-use planning.

Energy efficiency and buildings: Many economies in which the EBRD invests share a legacy of buildings characterised by poor energy efficiency and high electricity and heat consumption, commonly linked to fossil fuels. Policies to address these issues cover initiatives that promote energy-efficient buildings, ensure better price signals and more energy-conscious consumption and help decarbonise the provision of heat and electricity.

Water sector: In the EBRD regions, cities experience high levels of "non-revenue" water use, water pollution and the overuse of water resources, as well as significant climatic stresses, which are bound to increase. Policies aimed at the supply side focus on water utilities and include the regulation and contracting of public and private service providers, the reform and strengthening of water utility firms, and the promotion of resource-efficient utilities. Policies that target water users include effective tariff reforms and price signals, as well as awareness campaigns for households and industry.

[7] A digital tool for easy access to specific policies and case studies accompanies this report and is available at www.ebrdgreencities.com.
[8] For guidance on how to identify and map a city's environmental challenges through an evidence-based and holistic process, readers may explore the methodology for a Green City Action Plan as outlined at www.ebrdgreencities.com.

Solid waste sector: Inadequate management of municipal and industrial waste is common among these cities, leading to contamination of land and groundwater as well as failure to support a 'circular economy' model. Policies in this area focus on how cities can ensure more effective governance and buy-in as well as on targeted initiatives to increase recycling and recovery rates. Here, the policy instruments include improved planning, accountability structures, price signals and funding, combined with information strategies for residents and businesses and the formalisation of informal waste-collection services.

Governance: The legacy of poor local governance and low administrative and financial capacity across cities in these regions is detrimental to the implementation of the green urban policies mentioned above. Policies that can be implemented to improve governance among local governments include political and fiscal decentralisation, improved transparency and accountability, enhanced integration and coordination across government bodies, strong stakeholder consultation processes and the building of awareness and engagement among a diversity of interest groups – some of which may face disproportionate barriers to economic opportunities.

Finance: Financial constraints are widespread within cities in the EBRD regions. This is often due to declining populations or a lack of creditworthiness and limited access to financing, which can hinder the delivery of public services. Policies to improve the financial health and autonomy of cities include initiatives to upgrade their financial planning and management, boost revenue collection and enhance accountability and transparency, all of which can help to enhance a city's creditworthiness and financial autonomy.

4. Other key messages

Urbanisation patterns differ significantly across the EBRD regions. The EBRD operates in 38 economies across three continents (see Table 1 for details). Across the EBRD regions, which include economies as far east as Mongolia and as far west as Morocco, population patterns and urban trends differ significantly. Economies in the southern and eastern Mediterranean region, Central Asia and Turkey generally have young and growing populations paired with increasing levels of urbanisation. In contrast, the countries in central, eastern and south-eastern Europe tend to have ageing, stagnating or shrinking populations, with the majority of cities experiencing a decline in population.

The EBRD regions also share a legacy of minimal decentralisation and immature private-sector participation. The centralised top-down structure in many economies has led to inadequate local accountability procedures and hence poor governance. It has also limited capacity and expertise among local authorities and inhibited trust in local administrations and buy-in and engagement among the populace. Among the former socialist economies in the EBRD regions, there is also a legacy of poor price signals and a limited role for commercial solutions, leading to continued resource inefficiencies and an immature involvement of the private sector. As a result, poor operational and environmental performance and a lack of people-centric urban development remains widespread in many of these regions.

Decentralisation is important and should be facilitated by local capacity-building. Cities that want to pursue an ambitious green agenda should be empowered to take initiatives and make their own decisions. Cities must also be able to incorporate feedback from local community representatives and city authorities should be held accountable by the local population. That said, central governments tend to be reluctant to transfer decision-making and financial powers to regional and municipal authorities, in particular where local capacity is weak. Cities should help to encourage and prepare for the decentralisation process by strengthening their procedures, capacity and expertise.

Effective private-sector solutions require mature city administrations. Deeper private-sector involvement can offer innovative solutions, relevant expertise and better contractual arrangements. However, many local authorities in the EBRD regions have limited capacity and experience with effective private sector contracting. Such administrative capacity and experience takes time to acquire. Therefore, in the absence of robust administrative experience, a gradual build-up of capacity is recommended.

Despite their differences, many cities face similar environmental challenges and policy needs. All cities are unique in their economic, social and

political composition and urban policies must be tailored to each case. Nevertheless, cities often face similar environmental challenges and the relevant policy solutions often entail significant similarities. This report appreciates these similarities, while recognising the main differences between the typologies of cities in different regions.

The most successful cities plan a mix of policies and investments. Standalone policies and investments often fail to fully benefit from the synergies of optimal coordination and sequencing of interrelated policies, investments and the involvement of residents. While this may sound obvious, developing a shared vision and a coordinated effort can be difficult in a city where departments work in 'silos'.

Inclusive urban development has numerous critical benefits. The co-development of urban solutions may be difficult where there is a weak culture of active involvement by residents. Nevertheless, (i) many cities have been able to cut costs and improve quality by proactively involving their residents and their varied interest groups – despite the upfront costs linked to such initiatives. This involvement should include marginalised groups and women in particular. Moreover, (ii) inclusive urban development is better at addressing inequality issues experienced by women and marginalised groups and (iii) a broad supporter base for a specific green or inclusive urban agenda makes it more sustainable, as it is harder for new or existing political or administrative authorities to divert from the initial plan.

There are many impactful policy options that have moderate implications for a city budget. However, many of these options, which may include active regulation and pricing of the behaviour of commercial users and residents, can be politically costly and may thus be better introduced as part of a policy mix. Other policy options may not be financially costly but may involve comprehensive private-sector participation and therefore require institutional capacity-building.

Long-term, shared visions are necessary to ensure effective and sustainable urban development. While the policy options presented in this report have a short to medium-term timeframe, a clear long-term political vision, which may seek to pursue gradual change over time, is required as a foundation for sustainable urban development.

01

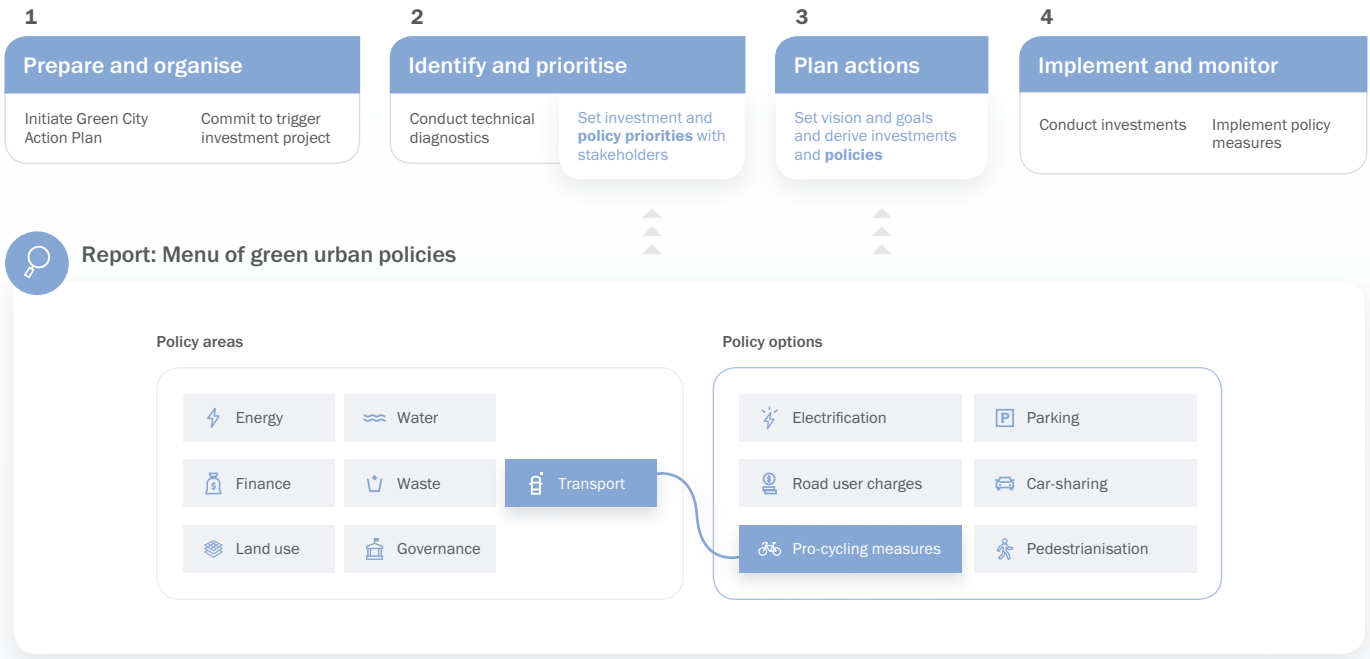
Introduction ↘

Introduction ↘

The European Bank for Reconstruction and Development (the EBRD, or the Bank) has developed a new strategic approach to addressing urban environmental challenges in the economies where it invests: the EBRD Green Cities Framework. With a volume of €1.5 billion, it is one of the Bank's largest investment programmes and a flagship product. EBRD Green Cities seeks to help cities identify and prioritise environmental challenges and address them through targeted investments, services and policy instruments in a strategic and holistic manner. The programme was initiated at the end of 2016 and now covers more than 40 cities in the EBRD regions.

As part of the EBRD Green Cities approach, cities develop a Green City Action Plan (GCAP) – a process initiated by a technical diagnostic study followed by the development and approval of priority investments and policies. The process for preparing a GCAP is defined in further detail in the Green Cities Programme Methodology.[9] The purpose of a GCAP is to apply a systematic, evidence-based approach to prioritising green city projects and to identifying the right enabling framework of policy, regulation and incentives. The initial technical diagnostic is based on a set of indicators to be measured and scored against international standards and benchmarks. These 70 indicators cover: (i) the *quality* of the city's environment, including air quality, pollution levels in water sources, or the quality and stock of other natural resources; (ii) the *sources* of the pollution or other adverse impacts on the environment; and (iii) the *response* indicators – the current municipal activities, institutional arrangements and policy initiatives that set out to improve or protect the environment in the city. Following the technical identification of the city's environmental shortcomings, the relevant stakeholders are consulted and priority investments

Figure 1. Overview of the Green City Action Plan process and the role of this report



Source: EBRD.

[9] See OECD and ICLEI (2016).

and policies are identified and developed to address these challenges.

In order to support the recommendations that emerge from the development of a GCAP and to further strengthen policy discussions in cities participating in the Green Cities programme, the EBRD has developed a knowledge product in the form of this report. It presents policy options and practical case studies that can be effective in mitigating, reducing and addressing the environmental challenges that cities face.

Menu of policy options and case studies

The policy options in this report (see Figure 2) are structured around seven areas – five sector-specific areas (transport, water, solid waste, land use and energy) and two cross-sectoral or 'enabling' areas (governance and finance). Within each policy area, the main five to ten policy options are presented in terms of their resource implications, benefits and risks, and necessary conditions, as well as key implementation challenges and critical success criteria. In line with the market-oriented mandate of the EBRD, the policy descriptions also include ways to unlock or integrate private sector participation. The policy options (or policy instruments) are further backed and illustrated by relevant, practical case studies.[10]

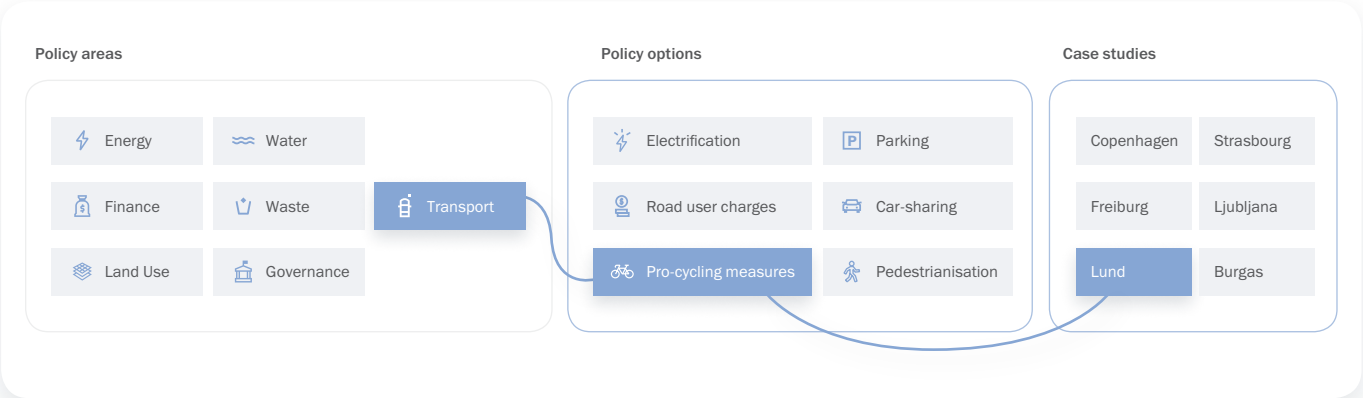
Selection of policy options and case studies: Combining top-down and bottom-up approaches

The policy options and case studies presented in this report were selected through the combination of a bottom-up and a top-down approach. The top-down approach relates to extensive desk research and literature reviews. The structuring of the policy options and case studies derives from the seven policy areas, for each of which the report outlines the most relevant environmental challenges and targets.

The bottom-up approach is based on the development of a long list of potential case studies and the policies they represent. All of the potential case studies were assessed in terms of the kind of policies and cities they covered and through a comprehensive evaluation based on criteria such as impact, effectiveness, political acceptability, transparency or replicability.

To evaluate the relevance of potential policies, necessary metadata about each policy and case study were collected. To enable future users to understand and use them effectively, a number of policy characteristics were drawn up from academic literature and international organisations, for example, from the OECD.[11] Similarly, for the case studies, a list of policy evaluation criteria, such as effectiveness and administrative viability, was developed to assess the

Figure 2. Structure of the policy areas, policy options and case studies



Source: EBRD.

[10] A guided and user-friendly path to the relevant content of this knowledge product is also available through a digital tool at ebrdgreencities.com.
[11] See OECD (n.d.b).

policy delivery, policy outcomes and impacts such that cities can take these examples and apply the policies that have been used most effectively.[12]

This suite of policy options should also relate to the range of characteristics of cities where the EBRD Green Cities programme is being implemented. The assessment of city characteristics provides an insight into whether a city has the right conditions to ensure the success of a specific policy. To some extent, the current GCAP methodology already carries out such an approach through the political framework reports, which include a preliminary review of policy, finance and governance to develop a project-prioritisation matrix.

Objectives and limitations of this report

The objective of this report is to help guide and stimulate the policy discussions taking place in cities – in the EBRD regions and beyond – that are aiming to accelerate their green agenda. The report aims to promote a shared understanding of the possibilities and likely implications of various policy initiatives and provide practical advice on their delivery, in combination with relevant investment programmes. The intention is to create a practical and concise reference point for a wide range of urban stakeholders and interested parties. While this knowledge product does not seek to provide detailed instructions on how to plan and implement specific policies, it aims to offer useful guidance on what to expect and to consider, supported by practical case studies and lessons learned.

The report's content is oriented towards cities in the EBRD regions taking part in the Green Cities programme. As a consequence, the menu of policy options and case studies is limited in the following ways:

- The policy options presented here are primarily relevant to cities and do not cover high-level strategic policies or visionary plans that are more suitable for central governments. Instead, the focus is on tactical and operational policy options that fall within municipal control and influence.
- This report emphasises effective policy options, rather than green investments, to address environmental challenges. It covers options that can be pursued and implemented within a five-year period, in a process that is primarily city-driven. The policy options lead to material impact in the medium term, in other words, five to ten years. For example, a parking policy that may influence the urban transport sector within a few years would be included as a policy option rather than a strategic pursuit of a compact urban design that would take decades to achieve material results.
- This report does not provide support on how to identify environmental shortcomings in a given city. Rather, it assumes that the environmental shortcomings have been identified prior to using this knowledge product. For guidance on how to identify and map a city's environmental challenges through an evidence-based and holistic process, the reader may explore the GCAP methodology outlined at www.ebrdgreencities.com.

Overall, relevant public policies should be understood here as meaning most non-investment activities that target the greening of cities and that municipal authorities can implement or influence and expect to generate impact within three to eight years. Among other activities, these include planning and monitoring, regulation, incentives, funding and financing, skills development and capacity-building, as well as awareness-raising, attitude campaigns and information programmes. This report also presents new technical solutions, but with an emphasis on policies that enable such new solutions to be applied.

[12] Note that quantitative *ex-post* evaluations of individual policies are rarely possible. The causal linking of a policy with an outcome is prevented by the scale and timescale of impact and the presence in a real city of innumerable confounding factors. The exceptions to this occur when a policy of major significance is implemented (for example, the London congestion charge). Nevertheless, policy impact can be judged through a combination of quantitative data, anecdotal information, research across multiple locations, and information from those whom a policy has targeted. This caution should be reflected in the language used to document a policy evaluation.

02

Urban development trends and regional context ↘

Urban development trends and regional context ↘

Policy considerations must recognise the priorities and needs of different types of cities, which can vary considerably in their size, geography and history.

2.1 Transformation in cities

Demographic trends in the EBRD regions

Patterns of population growth and composition differ significantly across the EBRD regions, which include economies as far east as Mongolia and as far west as Morocco (see Table 1 for details). Economies in the southern and eastern Mediterranean region and Central Asia have young and growing populations, while in central, eastern and south-eastern Europe populations are declining.

As documented in the EBRD's *Transition Report 2018-19*, Central Asia, the southern and eastern Mediterranean and Turkey currently find themselves in the early stages of their demographic transition – with large, increasingly young populations.

Table 1. Economies where the EBRD invests

Region	Economies
Central Asia	Kazakhstan, Kyrgyz Republic, Mongolia, Tajikistan, Turkmenistan, Uzbekistan
Central Europe and the Baltic states	Croatia, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic, Slovenia
Eastern Europe and the Caucasus	Armenia, Azerbaijan, Belarus, Georgia, Moldova, Ukraine
South-eastern Europe	Albania, Bosnia and Herzegovina, Bulgaria, Cyprus, Greece, Kosovo, Montenegro, North Macedonia, Romania, Serbia
Southern and eastern Mediterranean	Egypt, Jordan, Lebanon, Morocco, Tunisia, West Bank and Gaza
Other	Russia, Turkey

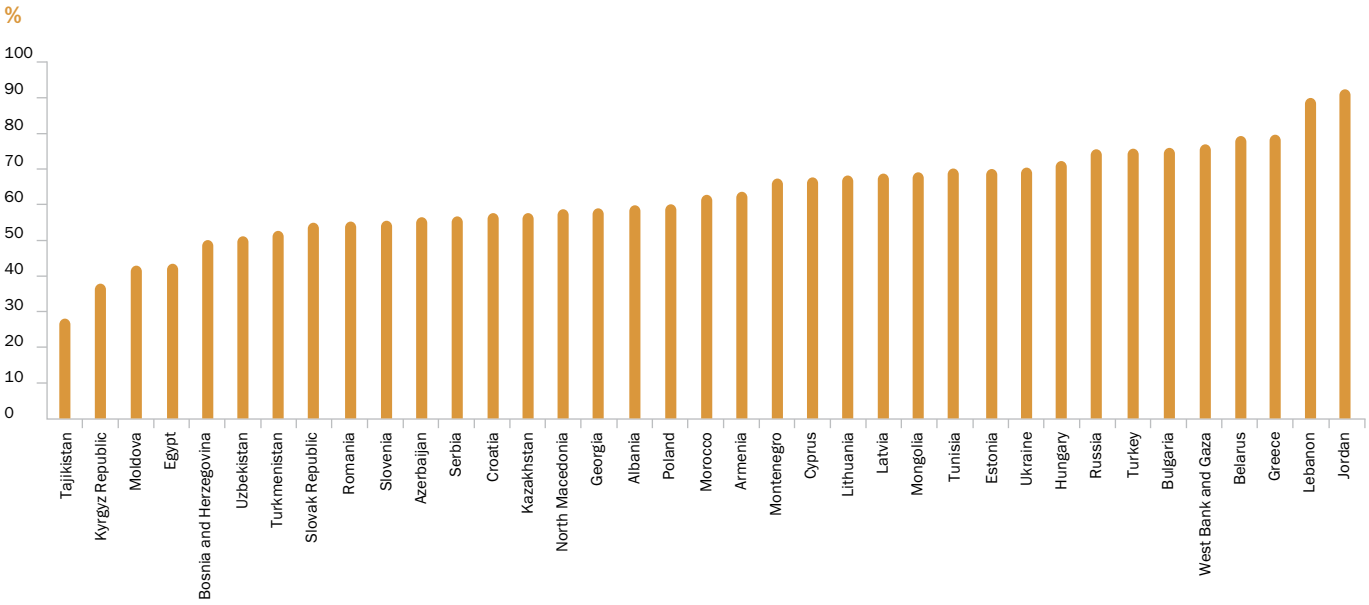
Source: EBRD.

In contrast, the demographic transformation in central, eastern and south-eastern Europe is much more advanced, compared to the emerging markets in Asia, Latin America and parts of the Middle East and Africa. Populations in emerging Europe are growing more slowly, or even shrinking, and ageing at approximately the same rate as the populations of advanced European economies, due to a combination of modest birth rates and continued improvements in life expectancy, often exacerbated by the emigration of young people to other EU countries. For instance, from 1992-2015, the population of eastern Europe shrank by 18 million (around 6 per cent), with the trend accelerating as a number of countries joined the European Union, which gave workers the ability to travel freely to other nations within the bloc.[13] In contrast, southern European countries have observed an increase in emigration, despite high unemployment rates persisting after the 2008 global financial crisis, with net migration up to +0.13 per cent.[14] It is worth noting that this trend of emigration from eastern European countries has slowed in recent years. These countries have experienced the highest levels of return migration in Europe, leading to a stabilisation of net migration at -0.23 per cent of population per year as economic conditions have strengthened.

Urbanisation trends in the EBRD regions

There is a global trend of increasing urbanisation, with 55 per cent of the world's population today living in urban areas and this proportion expected to increase to 68 per cent by 2050.[15] Over the past 25 years, the EBRD regions have experienced on average a steady process of urbanisation, with more than 60 per cent of the population living in urban areas today.[16] However, within the EBRD regions, there are significant variations from country to country, ranging from 27 per cent of the population living in urban areas in Tajikistan to over 90 per cent in Jordan (see Figure 2).

Figure 2. Share of urban population to total population, 2017 (per cent)

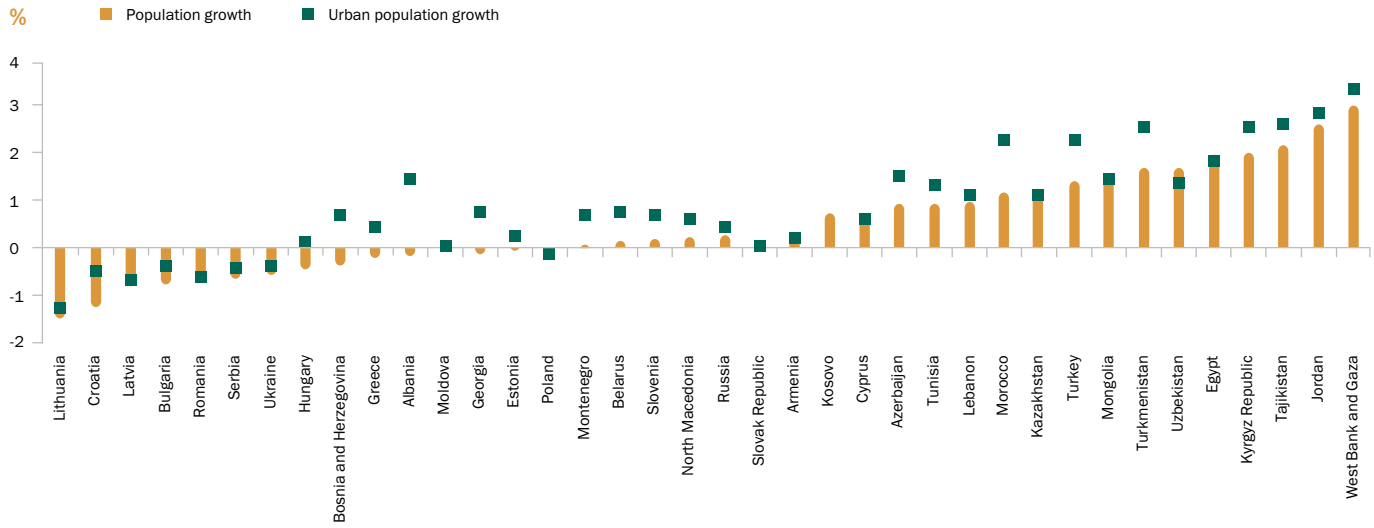


Source: World Development Indicators, urban population (percentage of total population) (https://data.worldbank.org/indicator/sp.urb.totl.in.zs) and EBRD staff calculations, as presented in the report: *Creating Liveable Cities: Regional Perspectives*).[17]

[13] See The Economist (2017).
[14] See Batsaikhan et al. (2018).
[15] See UN (2018a).
[16] Urban areas are often defined as settlements with populations of more than 5,000 inhabitants, although national statistical definitions vary. Other criteria may include population density, type of economic activity, physical characteristics, level of infrastructure or a combination of these and other criteria. See Deuskar (2015).
[17] See AfDB et al. (2019).

Within the EBRD regions there are also significant differences in the levels of urban population growth. The growth pattern of urban populations (urbanisation) follows the demographic trends in which the growing population in Central Asia, the southern and eastern Mediterranean region and Turkey is closely linked to a rapid increase in the urban population while the stagnating, or even declining, population in emerging Europe is matched by a slower process of urbanisation. Figure 3 shows how urban population growth is very slow or even negative in central Europe, the Baltic states, south-eastern and eastern Europe, and the Caucasus, in stark contrast with the patterns observed in most other emerging economies – including those in Central Asia, the southern and eastern Mediterranean, and Turkey, which have seen rapidly growing urban populations. High rates of population growth and urbanisation are particularly strong in Tunis, Cairo, parts of Morocco, the Nile valley and delta and much of Jordan, Lebanon and the West Bank and Gaza.

Figure 3. Population and urban population growth, 2017 (per cent)



Source: World Development Indicators, urban population growth (https://data.worldbank.org/indicator/SP.URB.GROW) and population growth (https://data.worldbank.org/indicator/SP.POP.GROW), and EBRD staff calculations, as presented in the report *Creating Liveable Cities: Regional Perspectives*.[18]

The story of secondary cities in the EBRD region

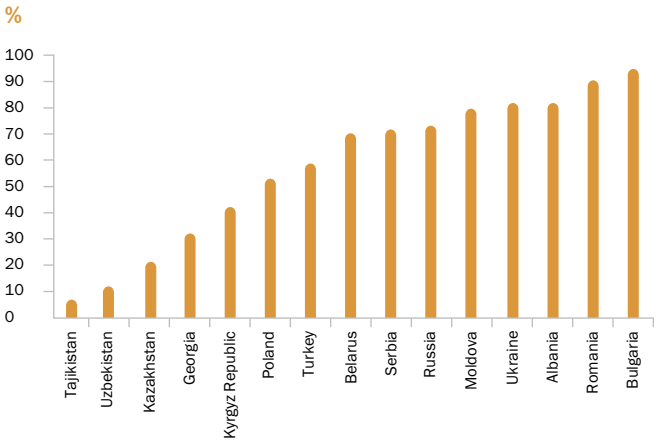
Beyond the general demographic and urban trends in the EBRD regions, there is a noteworthy story about the role and decline of secondary cities in the former centrally planned economies. Populations in the EBRD regions have so far been more concentrated in secondary cities than in large urban agglomerations, as opposed to the pattern seen in many other emerging markets. Within the former socialist economies in the EBRD regions, only Moscow's population exceeds 5 million, which together with Istanbul and Cairo are the only cities with populations above 10 million in all of the EBRD regions.

Historically, secondary cities have played a relatively greater role in the formerly socialist economies, which, under central planning, tended to have high rates of urbanisation relative to their level of development, albeit with more dispersed settlement patterns in secondary cities. Many of these secondary cities were developed around state-owned manufacturing hubs, with little economic diversification and limited alternatives for the local labour force once the manufacturing plants were closed down or relocated as part of the transformation to market-based and more service-oriented economies. As a result, over 80 per cent of cities in some economies of eastern and south-eastern Europe have been

[18] Ibid.

shrinking (see Figure 4). The economic and social consequences of this shift in the urban landscape have been severe. While the growing urban centres benefit from increased productivity and an inflow of capital and skilled labour, the declining secondary cities often experience fiscal constraints due to falling tax revenues, imbalanced and deteriorating infrastructure assets and housing values and a poorly skilled labour force due to selective out-migration. All of this potentially limits the fiscal and administrative capacity of the declining cities to address current and upcoming environmental challenges.

Figure 4. Percentage of cities with falling populations, 2000-12



Source: World Bank City Database and EBRD staff calculations as presented in the report: *Creating Liveable Cities: Regional Perspectives*.[19]

Policy considerations should recognise the priorities and needs of different categories of cities – small, large, growing or declining. For instance, a rapidly growing megacity like Cairo would need significant upgrades of infrastructure services and clear policies to manage an otherwise unregulated urban sprawl associated with poor mobility, economic exclusion, low environmental standards and poor public health. Policymakers in growing cities may also more generally consider the environmental benefits and resource efficiencies of a more compact urban design. However, in shrinking or declining cities, policies should focus on mitigating the negative effects of declining population and capacity, including by helping to diversify the economy, coordinate investments and transfer capacity-building and skills across public, private and academic agencies.

Urbanisation, economic growth and inequality

The shifting landscape of urban centres has created and continues to create 'winners' and 'losers' across different cities. The more productive and dynamic urban centres tend to attract investment, capital and skilled labour and as a result, they represent the majority of the innovation and higher economic growth compared to the rest of their respective countries. In general, gross domestic product (GDP) per capita is significantly higher in large cities than elsewhere in a country and in the EBRD regions such differentials tend to be on a par with or higher than those observed in advanced economies (Figure 5).

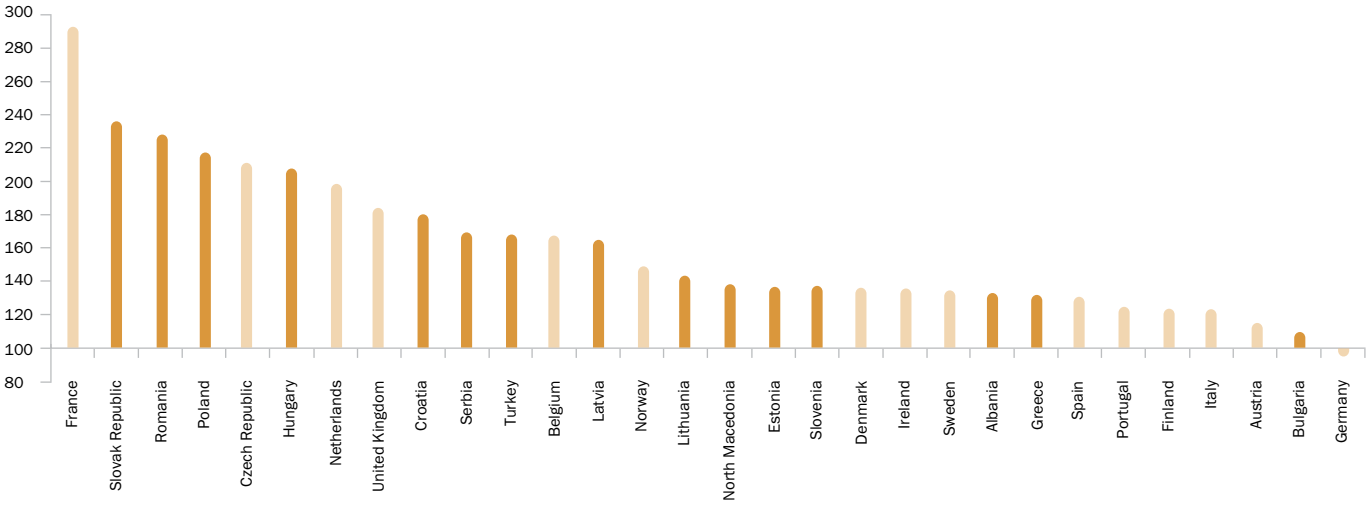
There is also an increasing division between 'winners' and 'losers' within the growing cities as inequality – as measured through the Gini coefficient – is particularly pronounced in fast-growing cites.[20] Policymakers should recognise these patterns and pursue policies that help reallocate wealth and promote equaleconomic opportunities for all, both to help the declining cities and regions left behind and to ensure that growing urban centres are as inclusive as they can be.

Wealth and consumption patterns

In terms of consumption patterns and environmental impact, it is not just absolute population growth that drives consumption, emissions and congestion problems in growing cities. Rather, the interrelationships between wealth and population growth are highly relevant as growing population centres increasingly tend to house wealthier people. Wealthy people consume more and generate more waste. For example, across the EBRD regions, many citizens are craving to spend newly acquired wealth on buying a car and this is reflected in the urban road congestion in the EBRD economies. Road congestion and high pollution levels from traffic are observed in many of the larger cities in the EBRD regions due to a combination of increased car ownership, poor vehicle standards and the absence of pollution control and monitoring.[21] According to the TomTom road congestion

[19] Ibid.
[20] See UN-Habitat (2013).
[21] Poland and Estonia are the countries in the EU with the highest population of cars older than 20 years, making up 33.7 per cent and 27.6 per cent of their car fleets, respectively. See Eurostat (2020)

Figure 5. GDP per capita in the largest city's metropolitan region, 2017 (national average = 100)



Note: Data for Albania, Croatia, France, Ireland, Italy, Latvia, Lithuania, the Netherlands, Norway and North Macedonia are for 2016.
Source: Eurostat, GDP per inhabitant for capital city metropolitan regions (https://ec.europa.eu/eurostat/statistics-explained/index.php/Urban_Europe_%E2%80%94_statistics_on_cities,_towns_and_suburbs_%E2%80%94_the_dominance_of_capital_cities) and EBRD staff calculations as presented in the report *Creating Liveable Cities: Regional Perspectives*.[22]

index for 2019, 16 out of the 18 most congested cities in Europe were located in the EBRD regions.[23] This represents a key challenge for policymakers, who must seek a good balance between regulation, price signals and viable transport alternatives to reduce the need for and attractiveness of private cars.

Decentralisation, governance and regulation in the EBRD regions

The ability of cities to find solutions to economic stagnation, environmental challenges, climate change risks and inequality is highly dependent on the efficiency and effectiveness of their governance structures. For instance, the Urban Governance Survey (developed by LSE Cities, UN-Habitat and United Cities and Local Governments (UCLG)), which interviewed local city government representatives on urban governance, showed that 36 per cent of respondents believed that inflexible bureaucracy and rigid rules were a major factor in reducing the abilities of cities to implement their policies.[24]

Many countries and cities in the EBRD regions have a legacy of poor local governance. The former centrally planned economies do not have a good track record of promoting local capacity and procedures for self-governance or accountability mechanisms and influence through local civil societies. Poor local governance was often exacerbated by inadequately planned and implemented decentralisation processes that followed the collapse of central planning within the EBRD regions.

Empowered local governments have been shown to have a positive impact on the provision of public services and on quality of life.[25] The major benefits of decentralised decisions include (i) a more targeted or tailored supply of public services and infrastructure as a response to local demand, which should lead to (ii) a more cost-efficient use of public expenditures and may lead to (iii) an increase in cost-recovery funding from residents who are more willing to pay for adequate services. Decentralisation can also (iv) promote accountability and reduce corruption, due to a greater proximity to a population that may be more aware of local governments' actions than they are of the actions of central government.

However, if executed poorly, decentralisation may result in inefficiencies and corruption, and further disillusionment with local government. Therefore,

[22] Ibid.
[23] See TomTom (n.d.).
[24] See LSE Cities, UN-Habitat, United Cities and Local Governments (2016).
[25] See Bilbao (2015).

for the abovementioned benefits to materialise, it is important that (a) decisions (and not only operational obligations) are transferred to local authorities; (b) local authorities have sufficient financial and institutional capacity and procedures in place; and (c) the decentralisation promotes engagement and enables residents to hold institutions to account for delivering policies in a transparent manner.

Unfortunately, the decentralisation processes in many of the economies where the EBRD invests are still incomplete, with the capacity, resources, procedures and political autonomy of local authorities remaining inadequate. The process of developing a strong culture and presence of civil society has also proven to be a long and challenging journey in many cities. This, too, has hampered the way local communities are able to influence urban development and hold its local decision-makers accountable.

Conclusion

Urban development and regulation has been reoriented in many parts of the world over the past few decades, from an earlier focus on production and productivity, with less emphasis on environmental and human wellbeing, to a stage where the environment and its residents increasingly take priority. While this reorientation first started among the more advanced OECD economies in the 1970s and 1980s, the centrally planned economies in the EBRD regions began the process later. These economies also had a more rigid approach to management, based on a top-down command structure. As a consequence, many municipalities in the EBRD regions have less experience with rich and complex policy programmes that combine comprehensive stakeholder dialogue processes and the involvement of local community members in urban development. Such programmes encompass effective price signals, economic incentives, strict transparency principles, and information- and trust-building efforts between residents and local authorities.

Taking these observations into account makes it clear that the regions require a combination of green and inclusive urban development. To achieve this, a rich and comprehensive policy mix is needed in many places, where the interdependence of different policies and the synergies between investment programmes and policy initiatives would need to be carefully considered and debated. This report aims to contribute to the debate.

2.2. Beyond green cities: other relevant concepts

Figure 6 captures some of the many terms and concepts being used to refer to programmes and objectives of modern, progressive cities. While this report focuses on green urban policies – targeting environmental and climatic challenges – it touches on these other concepts where relevant.

Smart cities are those that prioritise the development of digital infrastructure connectivity, to facilitate the growth and curation of human capital. The increase in the innovative capacity of smart cities enables them to maintain their industrial competitiveness.[26]

But interconnected digital solutions are not just for the powerhouse cities of the Global North. Santiago's Chilecon Valley, for example, is being heralded as a prime example of an open, smart district in South America.[27] Its growth of digital start-ups can be attributed in part to the country's pro-immigrant policy, designed to welcome innovators from the United States of America. The capital also boasts the most advanced public transit system in South America and is making plans to accommodate rapid growth in the use of electric vehicles charged by the smart grid.[28]

This demonstrates the role that smart cities can also play in driving a green agenda. For instance, data can be used to effectively manage the roll-out of electric vehicles and optimise vehicle-to-grid energy balancing, which can reduce energy consumption as it mitigates against the 'peak-trough' energy-demand profile of cities.

However, these ambitions for technological revolution have not been well received in all cities, with some communities seeing the approach as pandering to outside interests rather than addressing local concerns.[29] For example, international firms that are

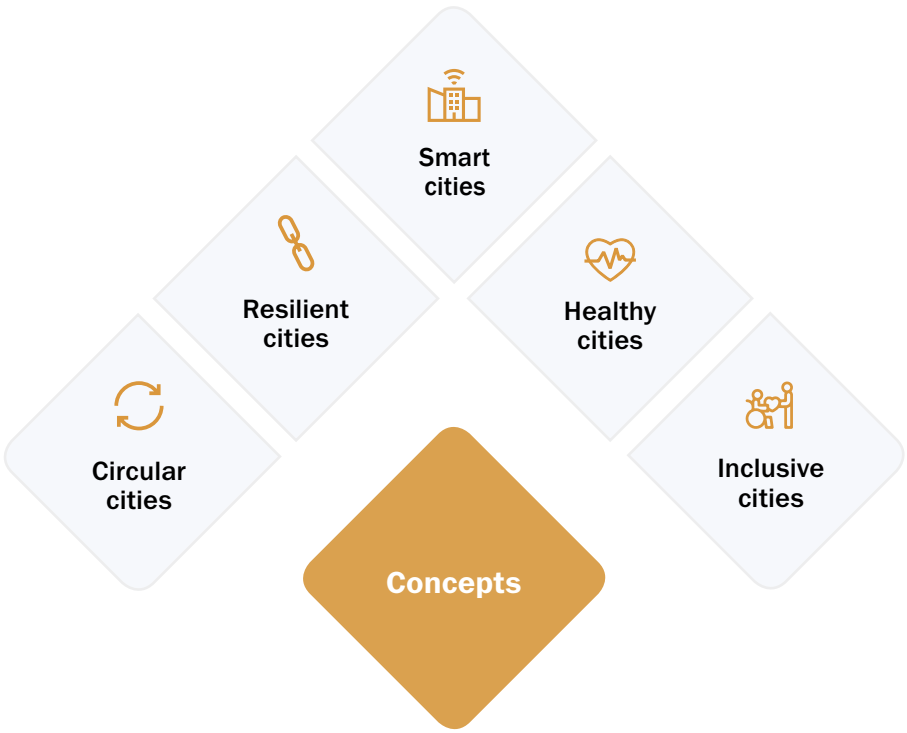
[26] See Trujillo and Parilla (2016).
[27] See The Economist (2012).
[28] See Marshall (2016).
[29] See Wattenbarger (2018).

vocal about the transition to smart cities include the likes of IBM and Siemens. The smart city concept is applied and supported by initiatives such as the Smart Cities Prosperity Fund Programme and the EU's Digital Cities Challenge, and many cities are seeking to pursue a smart urban development agenda.

Circular cities are a relatively new phenomenon based on well-established schools of thought around functional service economies and natural capital. These are cities that seek to harmonise economic development with environmental conservation. Some of the key sectors that are thought to benefit most from this approach include waste and textiles, and transport and food production. The principles of a circular economy can be integrated into planning policy, for example, compact city development, as demonstrated by Curitiba, a city in Brazil, which implemented this development strategy 30 years ago. The strategy entailed mixed-use development and densification along five bus rapid transit (BRT) corridors. This has been reported to help improve land-use issues, increase public transport use and reduce congestion.[30]

Strengthening the resilience of a city is a priority for many governments and their citizens, and circular and smart cities can help in this endeavour. A **resilient city** is one that is able to strengthen its response, recovery and adaptive capacity not just to physical, but also to social and economic shocks and stresses. These may include high unemployment, endemic violence or floods. One such global organisation supporting cities to develop resilience strategies is 100 Resilient Cities, which works to enable cities to structure their approach and pathway to a more resilient future. It has outlined seven key qualities that characterise a resilient city: reflective, resourceful, robust, redundant, flexible, inclusive and integrated.[31]

Figure 6. Other concepts used for city programmes and objectives



Source: Arup Group.

[30] See EMF (2019).
[31] See 100 Resilient Cities (n.d.).

Specific actions that cities are taking to become more resilient include the development of green corridors, as promoted in Atlanta, which has dedicated 400 acres of green space along the BeltLine Westside Trail. This master plan has sought to address the racial inequity in access to green space in the area while also seeking to minimise health issues caused by frequent flooding with sewage-contaminated water.[32,33]

Inclusiveness is a key element of resilient cities, as documented by Jan Gehl in his book *Cities for People*. It is also a focus of work for organisations such as the World Bank and the Asian Development Bank.

The concept of **healthy cities** focuses on promoting health via the political agenda, through institutional change, capacity-building and innovation. Creating healthier urban settings supports the health and wellbeing of the people that use them. The WHO European Healthy Cities Network is a group of European cities that has been working towards this agenda for the past 30 years and forms part of a wider network of 1,400 municipalities.[34] When health is used as a lens through which to examine city sectors it can generate other sustainable urban improvements, for example, shifts towards active mobility that can not only reduce the risk of respiratory disease but also decrease emissions of air pollutants, reduce congestion and injuries and free up green space.[35]

Inclusive cities are those that can provide services, infrastructure and access for all residents, regardless of gender, sexual orientation, race, age or ability.[36] The international community has widely acknowledged the importance of creating inclusive cities to improve people's lives, with Sustainable Development Goal 11 calling for "inclusive, safe, resilient and sustainable" cities.[37] While urbanisation creates the conditions to facilitate opportunities for a better life for residents, for example, through access to larger and more diverse economic markets, the expansion of cities can also increase inequality and exclusion, especially of the poor and vulnerable.[38] Developing inclusive cities is an ongoing and dynamic challenge that requires city governments, businesses and residents to work together. Inclusion encompasses various complex factors, such as economic inclusion, social inclusion and spatial inclusion.[39] Recognising that each of these closely related dimensions need to be addressed will enable cities to break cycles of marginalisation, exclusion and inequality.

"Inclusive cities are those that can provide services, infrastructure and access for all residents, regardless of gender, sexual orientation, race, age or ability."

[32] See Kahn (2017).
[33] See 100 Resilient Cities (2018).
[34] See WHO (n.d.)
[35] See WHO and UN Environment (2017).
[36] See Misra (2016).
[37] See UN (2020).
[38] See Asian Development Bank (2011).
[39] See World Bank (n.d.).

03

Sector-based policy options ↘

Sector-based policy options ↘

Cities can choose from a wide range of policy options to address urban environmental challenges – some options are sector-specific while others cover multiple sectors.

This section discusses the sector-based policy options available to cities to support sustainable urban development and green city investments. It is divided into the sectors of mobility and transport, land use, energy and buildings, water and wastewater, and solid waste.

3.1. Mobility and transport

Transport accounts for a quarter of global carbon dioxide emissions and is responsible for harmful air pollutants that negatively impact the health of city residents. From an environmental perspective, the main policy objective with regard to the transport sector today is to cap or reduce the use of private cars and increase the share of public and active mobility (such as cycling or walking). Policy objectives may further seek to promote cleaner public and private vehicles – ideally with zero emissions. Together with land planning, related policies may also seek to reduce the need for motorised mobility or transport.

Policy measures in the transport sector can be divided roughly into (i) demand-side measures aimed at influencing travel decisions and (ii) supply-side measures seeking to provide a credible alternative to private cars. Among the demand-side measures are policies aimed at making cars – in particular, those that release the most CO_2 and nitrogen monoxide – less attractive (for example, parking policies or road-user charges, but also attitude campaigns and the pedestrianisation of selected streets). Among the supply-side measures are policies and initiatives aimed at providing well-planned, sustainable and attractive public transport services, as well as policies that seek to increase the modal share of active mobility options.

Both demand-side and supply-side measures have been inadequate throughout the EBRD regions partly due to (i) low administrative capacity in cities, (ii) weak enforcement and (iii) a low revenue base. These shortcomings must be addressed as part of an effective policy mix aimed at tackling the main environmental challenges linked to the urban transport sector.

A selection of such urban transport and mobility policies includes the following:

Car-restrictive policies:

1. Parking policies – including pricing, restrictions, information and enforcement
2. Road-user charges – including congestion charges and low emission zones
3. Pedestrian-oriented and car-restrictive policies
4. Car-sharing, car-pooling and ride-sharing

Promotion of public and active mobility:

5. Planning and regulation of public transport services
6. Pro-cycling policies

Promotion of cleaner vehicles:

7. Electrification of urban transport

T1. Parking policies

Summary

The primary environmental objective of parking policies is to make parking, and the use of private cars, less attractive in order to promote a shift towards public and active mobility. Restrictive parking policies cover several types of intervention, including the pricing of parking and the limitation or relocation of available parking spaces. An active use of parking regulation can be an effective deterrent to the use of private cars, with a limited, or even a positive impact on the city budget. Parking policies can also help promote the use of electric or low-emission cars, and effective use of parking facilities may be supported by appropriate information systems. Furthermore, real-estate developers can be obliged to provide off-street parking solutions when needed. However, parking policies only succeed in cities with credible enforcement capacity and good public transport services as a viable alternative to private cars.

Description

Effective parking regulation requires consistent urban coverage, pricing and enforcement. One such approach is the introduction of parking zones, where each zone, often labelled with different colour codes, represents different price levels – from highly priced and often time-limited parking in the centre to cheaper and less restricted parking in zones further from the centre. More sophisticated parking schemes may include parking fees linked to the vehicle emission levels at the time of car registration or dedicated parking and charging facilities for electric cars.

Workplace levies may also be considered as part of a city's parking policies. This measure imposes taxes on companies for each parking space they provide to employees and may also have a significant positive effect on the city's revenue. For example, in Nottingham in the United Kingdom, money raised from the workplace levy has helped fund extensions to the existing tram system and the redevelopment of Nottingham's railway station.

Restrictive parking policies may include the reduction or relocation of available parking spaces, which can be coordinated with other transport solutions. For example, the removal of on-street parking spaces frees up space that can be repurposed for other needs such as dedicated bus lanes, widened pavements or cycle lanes. Hamburg implemented this approach in 1976 and Zürich in 1996.[40] Parking solutions may also be tailored to public transport schemes through parking ('park-and-ride') facilities located next to key transit stations.

Resource implications and key requirements

Introducing regulated parking fees for the first time involves some coordination with land planning and traffic planning. It requires adequate marking of dedicated parking spaces and related signposts. It also requires a reliable and user-friendly payment solution, of the kind that are increasingly based on payments through mobile phones, rather than the more traditional pay-and-display solutions. Operating the system also requires good control and enforcement mechanisms. Lastly, significant legislative changes might be needed in order to regulate private car-parking facilities.

Introducing additional parking fees or time limits on existing parking spaces may require little investment or additional control and enforcement costs for the city. The removal of parking spaces is not financially costly, either. However, the removal of on-street parking may be combined with other arrangements, such as the construction and operation of off-street parking garages or park-and-ride facilities, which may require significant resources and coordination among city designers and planners in relation to other policy areas.

Potential private-sector participation

The private sector can play an effective role in setting up and operating parking payment and control schemes. Here, cities can consider both availability payments (for a system that works) and performance payments (for revenues collected). For example, private contractors can help improve parking control and revenue collection through a well-defined and well-managed parking service contract. At the same time, the private sector can play a constructive role in the financing, construction and operation of off-street parking garages and 'park and ride' facilities.

[40] See Push-Pull Parking (2015).

In addition, real-estate developers can be obliged to provide off-street parking solutions as part of their development permits.

Implementation obstacles and solutions

A radical change to parking fees or parking availability requires a new mindset and acceptance from the public. It also needs adequate control procedures and enforcement capacity. Therefore, recommendations may include the gradual introduction (both in terms of coverage and price levels) of parking fees. This enables a gradual change in people's attitudes and a gradual building of the necessary operational and enforcement capacity. Furthermore, both the pricing and the relocation of parking facilities can play a constructive role in a policy mix together with other 'shift' measures. As car owners see parking fees as a burden, such interventions are more readily accepted when they appear together with improved public transport services as a viable alternative to private cars.

Time-limited parking facilities prevent specific user groups, such as workers or selected residents, from using those facilities. The removal of on-street parking may further upset many potential beneficiaries of such facilities – including business communities, workers and selected residents, and like parking fees, policies that limit parking may face less opposition when combined with improved public transport services or other measures as part of a policy mix.

Parking restrictions that support the general demand for public transport services while also providing carefully planned relocation of parking facilities close to key transit stations (park-and-ride facilities) can have a particularly strong impact on the shift from cars to public urban transport. Removal of parking spaces also provides a great opportunity to reallocate scarce urban space to dedicated bus lanes, bicycle lanes or even trees and green spaces.

Comparison with other policy options

When comparing an active use of parking pricing to road-user charging (see policy option T2), it is worth noting that many of the benefits can be quite similar. Parking policies are often quicker and less complicated to implement and represent lower investment costs compared to the introduction of a new congestion charging solution. Removal of parking facilities may provide good opportunities to reallocate scarce urban space to public and active mobility.

Secondary measures and effects: parking information and guidance

Modern parking facilities equipped with sensors can collect real-time information about parking availability. This information can be communicated to drivers through information boards and mobile apps. It enables drivers to plan and find available parking more easily, reducing search time and traffic and thus minimising congestion and pollution while also helping to enhance the quality of the urban area.

Introducing this parking information, which in a smart city can be combined with pricing, traffic and congestion data in order to propose an optimal parking solution, improves the driver experience rather than promoting a shift away from private cars. It can, however, be viewed as a mitigation of objections by drivers to the relocation of existing on-street parking facilities. Furthermore, these systems can also be economically viable. As an example, within five years the gradual introduction of a Parking Guidance and Information System in Southampton, United Kingdom, proved to have an economic rate of return of 91 per cent, where the cost-benefit calculation took into account the cost of installation and maintenance and the benefits associated with the reduced times spent searching and queuing for parking spaces. Broader benefits included reductions in distance travelled, time spent parking, vehicle operating costs and fuel consumption.[41]

Unintended consequences

Parking policies to deter private cars in urban areas have sometimes accelerated the development of large shopping centres on the outskirts of cities. Such developments should be handled with care, as rather than addressing an urban traffic problem, the parking policies may end up relocating the problem to another part of the city, where public and active transport modal shares are even harder to increase.

T2. Road-user charges

Description

Road-user charging is a transport-demand policy instrument. The primary environmental objective of introducing road-user charges is to discourage the use of certain classes of vehicles, fuel sources or more polluting vehicles.

As an instrument, road pricing can be tailored to specific areas, times, vehicles, emission standards and fuel types. It has the potential to generate substantial revenue, but has high investment and collection costs, for example, in the form of physical road-tolling stations or through an automated charging system that relies on complex information technology (IT) infrastructure and a good vehicle database for effective enforcement procedures. Road charging schemes have often met strong opposition and many plans have been delayed or cancelled due to disapproval from residents.

Urban road-user charging can be arranged in different ways, including through toll booths or through electronic vehicle-recognition infrastructure placed on all entry points to a targeted area of a city. Charging typically requires comprehensive upfront investment, and collection costs are substantial. Road-user charges can be tailored to specific areas of a city and to certain times of the day (for example, more expensive at peak times) and/or vehicle types (for example, fees for heavy goods vehicles). They can

[41] EUROSCOPE (TR1023) (1999).

also be tailored to vehicle emission levels at the time of vehicle registration and are sometimes used to promote low or ultra-low emission zones.

In terms of relevant case studies, Singapore's Electronic Road Pricing scheme was one of the first and most complex. The scheme was launched in 1998 and covers selected expressways, arterial roads and three restricted zones. The toll is applied to all vehicles and varies by time of day and direction of travel.

The London Congestion Charge was introduced in 2003 and works with a flat daily charge for driving a vehicle within the charging zone. The charge helped reduce traffic in London's city centre by 39 per cent between 2002 and 2014. In 2019 the city launched its Ultra-Low Emission Zone, which includes more stringent emissions standards.

Stockholm's congestion charge was introduced in 2006 and is designed as a barrier scheme, in which a payment is required for each entry through the barrier, and is dependent on the time of day. A study of congestion pricing in Stockholm between 2006 and 2010 found that in the absence of congestion pricing, Stockholm's "air would have been five to ten percent more polluted between 2006 and 2010, and young children would have suffered 45 percent more asthma attacks".[42]

Resource implications and key requirements

While there is no clear-cut way of narrowing down the resources needed to introduce a road-pricing measure, it is generally a costly solution that requires strong administrative capacity. It may require complex IT infrastructure, a good vehicle database for enforcement and significant changes to legal and organisational frameworks. For example, in 2015, Transport for London's collection cost was £85 million, representing one-third of total fee collection – with a congestion charge of £11.50 per day.

In cities where no dependable licence plate database exists and there is no legislation enabling congestion charging, this step might be the greatest bottleneck in the entire process. The relationship between the national legislative framework and regional or city legislative structures is also important in that cities or regional areas may be able to enact their own laws, or they may have to rely on national laws being applied in their geographical areas.

Implementation obstacles and solutions

Despite evidence of impact, the public has repeatedly rejected proposed road-user charges. For example, in Manchester and New York in 2008, and Copenhagen in 2012, tolling schemes were rejected by public referendums. Public acceptability requires an incremental introduction of fee levels. It also requires consultation and feedback from the public in designing the policy, and robust awareness campaigns, with evidence of improvement in terms of traffic congestion, public transport and road networks.[43] Furthermore, the vision of the policy should be part of an overall traffic plan, including improvements in public transport funded by the road pricing revenue. In London and Oslo, resistance to congestion and toll charges was partly overcome by transparently linking these fees with public investment.

Comprehensive congestion charging remains suitable for large cities with a congestion problem in their city centres, but is rarely a recommended solution for small to medium-sized cities due to the administrative and financial burden. For small to medium-sized cities, parking measures are much more effective, but may need to be combined with charges for goods vehicles.

Comparison with other policy options

Effective use of restrictive parking policies has many of the same benefits as road-user charges. However, parking policies are often significantly easier to implement and can be introduced in a more gradual fashion.

T3. Pedestrian-friendly policies

Description

Pedestrianising roads or city centres can be seen as a demand-side measure aimed at regulating and influencing travel decisions. When combined with

[42] See Rogers (2017).
[43] See Collier et al. (2019).

good solutions for public and active mobility, it can be an effective policy to reduce traffic and improve local air quality. In addition, car-free roads can promote more vibrant and enjoyable urban spaces. A large number of European towns and cities have made parts of their centres car-free since the early 1960s. This approach is often accompanied by car parking facilities on the edge of the pedestrianised zone and is sometimes combined with park-and-ride schemes or cycle lanes to facilitate public and active transport to the pedestrianised centre. Most pedestrianised zones allow delivery trucks at certain times of the day.

Pedestrian-oriented policies can be more or less restrictive or ambitious in terms of the area, the time and the vehicle classifications that are subject to restricted access. It can involve complete pedestrianisation of a large area or it can be modest in its coverage, or accept motorised vehicles at certain times. There is also the opportunity to exempt certain vehicles from the ban, for example, public transport vehicles or the vehicles of selected residents, business owners or disabled people. The promotion of car-free days is another approach, often aimed at raising awareness as much as regulating travel decisions.

Resource implications and key requirements

Restricting car traffic for a given road has, initially, low financial and administrative implications. However, implementation costs and consequences, with regard to shifts in traffic flow patterns, will need to be considered. Promoting active mobility may also require additional investment, such as better street lighting.

Implementation obstacles and solutions

The main resistance to car restrictions tends to come from local shopkeepers and to some extent from local residents and other businesses. For instance, policymakers should be aware that the pedestrianisation of city centres can cause surrounding property prices to increase significantly. And, while in almost all cases retail businesses also benefit, this can lead to an inexorable rise in commercial rents, too. This means that pedestrianised retail centres risk becoming further homogenised, with only the most high-end independent shops able to operate. The challenge for policymakers, therefore, is to implement pedestrianisation while minimising the negative effects of the gentrification that is likely to accompany it. To this end, the success factors of pedestrianisation schemes include a gradual approach coupled with public consultations. This allows businesses to adapt to and influence the policy. Transparency, regular community engagement, monitoring and evaluation are crucial to measuring the success of the scheme.

The city centre of Nuremberg, Germany, has been gradually pedestrianised since the 1970s, to address the decline in air quality. When heavily congested roads were closed to cars, traffic volumes fell by up to 25 per cent in the historic city centre, while on nearby roads it increased between 4 and 19 per cent. Over the following 10 years, the area was transformed into an attractive pedestrian precinct: buildings were renovated, street furniture upgraded and art works introduced. Public support for the pedestrianisation scheme has proved to be strong. Proposals to reopen the centre to car traffic following a change in political leadership of the city in 1996 were not realised due to public objection.[44]

T4. Planning and regulation of public transport services

Description

The degree of planning and regulation of urban transport services can vary from a liberal approach to a more structured and coordinated approach. A liberal approach, based on largely unregulated private bus and minibus services, requires less administrative and financial capacity within the municipality and is flexible and responsive to most transport demand in cities.

However, a liberal approach tends to face coordination problems. An effective pursuit of environmentally friendly and inclusive mobility requires adequate regulation of transport services on the back of a plan for sustainable urban mobility.

[44] See European Commission (n.d.).

"Effective transport services require professionalism, predictability and accountability. The performance of incumbent operators can be improved by transforming municipal transport operators into separate legal and commercial entities or joint stock companies."

Effective transport services require professionalism, predictability and accountability. Improved performance of incumbent operators can be promoted by transforming municipal transport operators into separate legal and commercial entities or joint stock companies (JSCs). This helps to depoliticise the management of these operators. To further professionalise the relationship between the company management and the city, it is recommended to set up public service contracts (PSCs) between the municipality and the JSC – defining rights, obligations and processes – to ensure predictability and accountability for all. Improved transport services can also be promoted through well-regulated and well-procured private service contracts.

The benefits of a well-planned and regulated transport sector include better resource efficiency through synergies between transport modes, including private cars, bicycles and various public transport services. Better regulation and coordination can further facilitate integrated multi-journey ticketing covering journeys that include a variety of transport modes. It also enables the introduction of an electronic ticketing solution, electronic vehicle monitoring and transport management, which allows for real-time information systems. All this improves user experience and increases the popularity of public transport services.

Resource implications and key requirements

Setting up a strong integrated urban transport regulator takes time. It requires adequate capacity to plan, contract, procure and monitor services. Effective contracting and transparent funding of regulated services also require shifting the control of cash flow from the operators to the transport authority.

Of the different solutions it is worth noting that electronic transport management includes operation of the necessary IT infrastructure and control room. In Moscow, which has a population of 12.3 million, the creation of an intelligent transport system had an overall budget of US$ 1.7 billion from 2012-20.[45] Electronic ticketing and real-time information systems may also require significant investment in ticket machines, validators, information boards and IT infrastructure.

Potential private-sector participation

Increased administrative planning and coordination does not imply a crowding-out of private operators. Regulated bus services can be effectively procured, contracted to private operators and monitored by a dedicated authority. The introduction, operation and maintenance of electronic ticketing systems, electronic vehicle monitoring or real-time information services can also be effectively financed, implemented and operated by private contractors. For example, the city of Belgrade contracted out the supply, financing and operation of an electronic vehicle (bus) monitoring and ticketing solution, including ticket sales and ticket control, in return for 8.3 per cent of the ticket revenues collected. For the city, the outcome was a more than 10 per cent revenue increase in the first year of operation, implying a net rise in municipal revenue, better vehicle monitoring under the PSCs and lower costs of ticket sales, without any material capital expenditure.[46]

Implementation obstacles and solutions

Effective regulation of the urban transport sector may upset public and private operators alike. One challenge is the formalisation of unregulated minibus services, for which moderate adjustments to licencing requirements may be a first step. Effective regulation may involve the unbundling of a transport authority that has in the past provided services and regulated the sector. It may also involve account separation

[45] See Innovative Governance of Large Urban Systems (2017).
[46] See Tica et al. (2012).

and further unbundling of different transport modes or operators to ensure transparency and well-defined service contracts for each mode and operator. A gradual approach may be needed here as both managers and related unions may oppose such moves towards transparency and future competition for related transport markets.

Effective contracting and the transparent funding of regulated services require shifting the control of cash flow from the operators to the transport authority. This implies a change of mindset and may have to be introduced gradually through one transport mode at a time, on the back of a well-defined and well-funded public service contract for the relevant operators.

T5. Electrification of urban transport

Description

Electric vehicles have zero tailpipe emissions and, where renewable electricity generation is on the rise, can be effective in reducing greenhouse gas emissions. Policies promoting the electrification of the transport sector include the introduction of battery-powered electric buses and the promotion of trams and trolleybuses – with or without in-motion charging solutions. This also includes policies promoting individual electric vehicles, including private cars and light commercial vehicles. Key policies promoting private electric vehicles include the use of road-user charges in favour of electric vehicles (see policy option T2), parking policies in favour of electric vehicles (see policy option T1), access to bus lanes for electric vehicles and the roll-out of convenient charging infrastructure.

Resource implications and key requirements

A shift to electric buses brings about fundamental changes to the operating model – and the economics. These changes include significant upfront investment in charging and maintenance facilities and higher costs for the purchase of rolling stock. They also include important negotiations with the energy sector to ensure sufficient capacity on the local grid and optimal electricity prices for overnight or day-time charging. Personnel will also be affected, and many staff will require retraining and redeployment. Drivers will need to adapt to new driving techniques and protocols for recharging and battery management, while the maintenance of buses and charging infrastructure will change to the extent that these may be outsourced as part of supply-operate-maintain contracts.

Overall, lower fuel and maintenance costs are associated with electric buses compared to diesel buses, but as the relevant market segments are less settled the pricing of these activities is subject to some uncertainties. A less radical approach is the expansion of tram or trolleybus networks as this represents less of a change compared to the existing model in operation. Here, one increasingly relevant hybrid solution involves trolleybuses with battery capacity and in-motion charging using existing or new trolley wires for battery charging. This approach, which is mostly relevant for cities with an existing trolleybus service, enables the buses to operate temporarily outside the network of overhead wires, with moderate battery capacity installed.

Policies aimed at the electrification of private vehicles may include revision to a current road-user charge, to parking regulation or the access of electric cars to bus lanes, which may not have huge resource implications. The installation of charging stations at selected parking places, however, represents a significant investment cost. In concrete terms, in 2015 the cost of single-port, non-residential electric-vehicle supply equipment (EVSE) unit ranged from US$ 300-1,500 for Level 1, US$ 400-6,500 for Level 2 and US$ 10,000-40,000 for direct current (DC fast charging, while the installation costs varied greatly from site to site, with a ballpark cost range of US$ 0-3,000 for Level 1, US$ 600-12,700 for Level 2 and US$ 4,000-51,000 for DC fast charging.[47] In light of this, local initiatives aimed at promoting private electric vehicles will only work well when combined with national policies that support the use of electric and low-emission cars.

[47] See Smith and Castellano (2015).

Implementation obstacles and solutions

Electrification of bus services requires considerable investments in fleets, maintenance and charging infrastructure and thus significant capital expenditure. The cost of electric buses can be double the price of their diesel equivalents and charging stations are also expensive – they cost about US$ 50,000 for a standard depot-based version used for overnight charging.[48] Nevertheless, several cities have introduced electrification of bus services on a small scale, on the back of a clear green vision for the relevant city and with some financial support from national or international entities. It has also been suggested that electric buses have lower operating costs in the long term and are easier to maintain. For example, in the case of Stockholm, evidence suggests that lower fuel costs for electric buses can balance the high investment costs incurred in building charging infrastructure, while achieving in the bus fleet a reduction of up to 51 per cent in emissions and up to 34 per cent in energy use.[49] In addition to financial barriers, the current state of technology can be an issue. For instance, during early tests in Belo Horizonte in Brazil, electric buses had trouble getting over steep hills with full passenger loads.[50]

T6. Pro-cycling policies

Description

Cycling generates no emissions or noise, requires less road and parking space compared to cars and is a more economical and healthier form of mobility, compared to motorised transport.[51] Policies to encourage cycling include pro-cycling infrastructure, pro-cycling regulation and pro-cycling subsidies. A modal shift to cycling can be further promoted by awareness and attitude campaigns.

Pro-cycling infrastructure includes the introduction of segregated cycle lanes and the introduction of convenient and theft-preventing parking facilities as well as bike-sharing facilities. Pro-cycling regulation can be seen as an effort to modify road use and traffic patterns in favour of cycling, for example, introducing two-way cycling in one-way streets or introducing advanced-stop boxes in front of cars at traffic lights. Such regulation can also include work towards a reduction or calming of traffic.

Pro-cycling subsidies may fall primarily within the sphere of national policies. However, municipal fiscal measures may include local tax benefits to install cycle-friendly infrastructure, such as bicycle parking at work. Local governments can also demonstrate their support for cycling through cycle-friendly public procurement procedures, which may include purchasing electric bicycles or electric cargo bikes instead of light commercial vehicles for services such as postal deliveries.

Resource implications and key requirements

The design and construction of segregated cycle lanes may be costly, but moderate alterations to existing road infrastructure, such as painted lanes on the side of roads, are more affordable for a city budget. A different issue arises from the potential need to reallocate scarce urban road space to safe cycling infrastructure by removing on-street car parking facilities or by introducing one-way streets. From 2010-14, the city of Copenhagen allocated €80 million to the implementation of its bicycle strategy. The cycling infrastructure in Copenhagen is extensive and includes

[48] See Financial Times (2019).
[49] See Xylia et al. (2017).
[50] See Marshal (2019).
[51] See CIVITAS (2009).

a network of segregated bike paths, bicycle traffic lights, separated coloured bike paths where cars and bikes share road space, and bicycle parking.

Pro-cycling policies can be administratively demanding due to the need to create a cycling code and implement new regulations for non-road infrastructure provision, such as bicycle parking. Policy measures that involve re-regulation of traffic patterns can also be technically demanding and may necessitate new capacities within the local administration. Bike sharing is not cheap, but with good sponsorship arrangements it can represent a minimal burden for the city budget.

Potential private-sector participation

The private sector is involved through the provision and sponsorship of bike-sharing schemes and companies may be further involved in providing bicycle parking facilities and cycling incentives as part of their human resources policies or remuneration policies. Non-governmental organisations (NGOs) can also play an important role in rolling out information about cycling initiatives, such as bike-sharing schemes.

Implementation obstacles and solutions

Reallocation of scarce urban road space away from cars and buses will naturally meet resistance and compromises will have to be made. As in many policy options, a gradual introduction of pilot cases, combined with clear communication and ideas for the city-wide and global benefits of a shift towards active mobility must make up a core part of a pro-cycling strategy. This can include supporting cycling organisations, working with stakeholders, and developing marketing and education programmes – in which NGOs can also play a role.

In many cities, bicycle theft is a growing problem and should be addressed through supportive measures. An important aspect of reducing bicycle theft is to involve multiple actors. Municipalities should make safe parking spaces available and launch campaigns to inform bicycle owners about locks, as well as introduce registration systems for bicycles or more advanced systems, such as chips.

T7. Car-sharing, car-pooling and ride-sharing

Description

Reducing the number of car trips is a way to alleviate traffic, with the aim of reducing pollution and greenhouse gas (GHG) emissions, freeing up space for pedestrians and cyclists, reducing journey times and increasing productivity. Trip reduction may be promoted through several measures, including: (i) car-sharing, which is the practice of renting a car from a prominent service provider and having ownership of the car for a limited time; (ii) car-pooling, in which a group of people travel together using their private vehicles, especially for commuting, taking the trips in turn; and (iii) ride-sharing, a car service in which a person uses a smartphone app to book a ride in a privately owned vehicle.[52] Some cities promote car-sharing services in the form of self-service cars, in a similar form to cycle-sharing schemes (for example, Share Now).

Car-sharing is not a predominantly public-centred policy, but public authority bodies can facilitate or provide incentives for car-sharing programmes, and it can be seen as a phasing policy before the introduction of full congestion charging or pedestrianisation.

Resource implications and key requirements

Car-sharing can have a low administrative and technical burden and, although it could have an associated financial burden if incentives are offered to individuals or companies to operate, there are significant savings to be obtained through reducing the number of cars on the road. Congestion is estimated to cost the EU economy €100 billion annually, with a US study indicating that if car-sharing schemes were widely adopted vehicle numbers could be reduced by one-third in specific scenarios.[53]

Potential private-sector participation

To develop and implement a successful car-sharing programme, local authorities must work with a wide mix of stakeholders, including regional transport authorities, regulatory bodies, businesses and

[52] See Barber (2016).
[53] See Transport and Environment (2017).

multiple local government bodies. Local authorities may have to invest or require businesses to invest in online platforms to facilitate easy connection between users and vehicles. Self-service schemes are normally administrated by the private sector.

Implementation obstacles and solutions

The first barriers to car-sharing are the reluctance of potential users to adopt car-sharing services and a strong desire for car ownership and use. In order to overcome these barriers, it is important to generate awareness and change aspirations from single car ownership to the use of connected transport modes, through robust awareness campaigns and user behaviours.

There is a risk that car-sharing may have a limited impact on reducing car use in a city, and further infrastructure for cars may have to be provided that is specific to self-service sharing schemes. Moreover, the effect of ride-hailing apps on congestion is contested. They could reduce traffic by encouraging people to leave their cars at home, or they could increase the number of vehicles on the road if people switch away from public transport or forms of active mobility.

In the case of sharing schemes, it is also important to provide procedures for checking driving licences and to have appropriate insurance procedures in place to ensure safety, for women in particular.

A further challenge relates to private vehicle restrictions that pose a threat to car-sharing. Exemptions from such policies could be a solution to promote car-sharing.

It is difficult to generate a large user base to reach a certain operational scale for self-service car-sharing schemes and it has been found that competition from taxis that are competitively priced can reduce the use of car-sharing services.[54] Paris is an example of a city with an electric scheme, Autolib, which closed in 2018 and offers some lessons to other cities. The service had to compete with a minicab service, suffered from poor maintenance by users and the vehicles became places of shelter for drug users. Due to decreasing use of the service the operating company went into debt.

In order to be successful, it is important that the operators of car-sharing schemes understand the context and regulation of the cities in which they plan to launch. DriveNow, an alternative car-sharing scheme, has seen significantly more uptake, with one million registered users across multiple cities.[55] However, the firm has had to abandon business in Stockholm due to high congestion charging and parking costs.[56]

Ride-sharing apps such as Uber have encountered resistance from the public due to their employment practices, leading to bans on taxi and ridesharing apps in some countries and cities. Solutions to this issue can include labour law reforms for self-employed workers and the enactment of regulation on installing mandatory meters. Furthermore, such apps require a strong and reliable mobile network, with reasonable cost for data use. Economies in the southern and eastern Mediterranean region have particularly weak data networks, with Jordan, Lebanon, Morocco and Tunisia all in the lowest third of countries globally for overall data speeds.[57]

Elsewhere, the Los Angeles Metro is working alongside car-sharing company Getaround to provide an affordable and “hassle-free” car-sharing service at more than 25 Metro transit park-and-ride lots.[58]

Comparison with other policy options

Car-sharing does not yield the same benefits of transitioning to active or public transport but can still be successful in reducing congestion and air pollution and can lessen the risk of low public acceptability that can be associated with car-free zones or congestion charging. Car-sharing is not intended to replace other traffic management policies but rather to complement them.

[54] See ITDP (2015).
[55] See Holder (2018).
[56] See Rolander (2018).
[57] See Opensignal (2017).
[58] See Metro (2019).

3.2. Land planning, green space and biodiversity

Land planning should sit at the centre of any urban development programme. From an environmental perspective, land planning seeks to protect and promote green and liveable spaces, promote resource efficiency and minimise any conflicts linked to the use of scarce urban space. It also seeks to regulate the development and use of buildings and infrastructure. Effective land planning is a necessity for the development of other infrastructure services in a city. Therefore, one should normally see close coordination between land planning and sector-specific developments – including infrastructure services linked to transport, water, energy and waste.

Over the past decades, urban design and planning have in many places shifted away from a car-enabling development that focused primarily on productivity, to a more people-oriented development with greater emphasis on environmental aspects and the wellbeing of the population. As a consequence, there has also been a shift to a more community-based planning process in which active participation by residents increasingly influences the land-use priorities of a city.

From an environmental and wellbeing perspective, some key strategic principles for land use include the following:

1. Development of compact cities
2. Promotion of mixed-use areas and transit-oriented development
3. Promotion of green spaces and biodiversity
4. Promotion of community-based land-use planning.

These strategic principles or policy options are described in further detail in Sections L1-L4.

L1. Development of compact cities

Description

Compact cities have many environmental benefits when compared to sprawling areas of low density. The benefits include a reduced dependence on cars (hence lowering emissions), a smaller energy consumption due to dense development, better and more cost-efficient public transport services and increased overall accessibility through public and active mobility. Resource efficiency is further promoted through the reuse of infrastructure and previously developed land on the back of regeneration of urban areas.

Policies of urban compaction involve the promotion of urban regeneration, the revitalisation of town

centres, restraint on development in rural areas, and higher-density real-estate development. The promotion of compact cities is further linked to mixed-use development and the concentration of urban development at public transport connection points (see policy option L2).

One way of promoting more compact urban development is to restrain development in rural or peripheral areas of the city. Such development can be controlled through the approval process of planning applications and through effective control and enforcement of any illegal developments.

Other ways of promoting compact urban development include support for urban regeneration and higher-density real-estate development. Urban regeneration would normally involve private developers getting involved in brownfield redevelopment projects. This would normally work best when there is a clear partnership between private developers and the municipal authorities and where the municipality, among others, commits to providing strategic visions, adequate infrastructure and transport services. Private developers tend to welcome higher-density real-estate development, and building permits can include obligations to undertake additional investments linked to the decontamination of brownfield sites or to the construction of green or public spaces for the benefit of the wider area.

Resource implications and key requirements

Building restrictions at the periphery of a city require effective control and enforcement of building permits. In cities where illegal construction activities are widespread, significant resources and effort must be put in place to regulate the informal sector. However, building restrictions offer revenue-generation opportunities for city authorities. For example, Toronto has secured over US$ 350 million through its density-bonusing policies, and in-kind benefits seem likely to have doubled the total value of revenues.[59] Normally, restraining urban sprawl would not require significant capital investments by a city. On the contrary, the containment of urban sprawl should lead to less demand for expanded infrastructure networks and related services.

Urban regeneration and the construction of high-density real estate require massive investment programmes. However, such investments are primarily provided by private developers, and city authorities may only be obliged to finance-related infrastructure upgrades. Nevertheless, the necessary municipal investments may not be trivial and should be carefully considered before embarking on a large-scale urban regeneration programme. City authorities must also be ready to provide comprehensive planning documents and feasibility studies as well as carrying parts of the site preparation costs and development risks linked to issues such as requirements to decontaminate sites prior to their development.

Potential private sector participation

While the city authority may sit in the driving seat in terms of restraining urban sprawl, the private sector will normally be financing and – to a large extent – driving any urban regeneration efforts and real-estate development.

Implementation obstacles and possible solutions

Controlling urban sprawl may meet substantial resistance from developers and local residents. One way to help build a public consensus and clarify the regulation can be to build a greenbelt around the city. This, however, may require the city to acquire land, to relocate people and to manage the landscaping and maintenance of the greenbelt. In Tirana, Albania's capital, the Donate a Tree initiative has surpassed its target and triggered donations by residents, companies and international organisations.[60]

[59] See Institute on Municipal Finance and Governance (2013).
[60] See Sustainable Cities Platform (n.d.).

Urban regeneration projects require substantial buy-in from local residents and private developers, who may have differing interests. For example, the city of Roubaix in France has followed a market-led approach to urban renewal while integrating the issues of social exclusion, housing renewal and economic and cultural development into its regeneration policies.[61] Comprehensive stakeholder engagement is therefore crucial, and to incentivise private-sector participation the municipal authorities must be able to provide strategic visions and comprehensive planning documents. This provision needs to be combined with a clear commitment to providing the necessary transport solutions and perhaps risk-sharing arrangements linked to issues such as requirements to decontaminate sites prior to their development.

L2. Promotion of mixed-use areas and transit-oriented development

Description

Mixed-use development, where housing, jobs, commerce and leisure are in close proximity, is considered to yield significant economic and social benefits, compared to more traditional separately zoned cities, in other words, those in which residential areas sit adrift from commercial areas. First, mixed-use areas require less transport for their inhabitants, who will travel shorter distances between private and public activities. In addition, the shorter transport distances within a mixed-use area may also help promote active mobility rather than motorised transport. As a consequence, significant time-saving and environmental benefits are expected to follow a shift towards mixed-use urban development – time saving that can be used for leisure or for productive work. For example, a doubling of job and living density has been shown to increase economic productivity by 2 to 4 per cent.[62] Economies that are less transport-dependent can also be more inclusive for individuals who otherwise would not be able to afford the transport cost required to access job markets, education or other services.

The environmental benefits can be further enhanced if mixed-use areas are developed in line with transit- oriented urban development, which refers to centres of social and commercial activities that are located at public transport connection points. Such a combination of mixed-use areas and transit-oriented development can accelerate the use of clean transport systems and further rebalance the use of the streets in favour of pedestrianisation and active mobility, where cars are prevented from undermining communal life.

Land-use zoning is a concept used to support transit-oriented and mixed-use development. In this context, zoning policies are those that designate an area to a certain use and are often supported by a regulatory framework to ensure that developers abide by the recommendations, and future developments do not threaten the ambitions set out in the policy. They are particularly successful where there are areas of vacant land, for example, brownfield areas, like old industrial sites, or other areas where the policy is not in direct contradiction to existing developments.

Resource implications and key requirements

Shifting to mixed-use and transit-oriented urban development requires significant resources in terms of planning and regulation, and it has to be pursued in close coordination with various city departments, including the city's transport planners. It takes many years and requires close cooperation with multiple stakeholders and a constructive partnership with private developers. In Clerkenwell in London, mixed-use areas have been developed as a consistent policy for more than 20 years, after the concept of mixed-use development emerged in national planning policy guidance.[63]

Potential private-sector participation

In general, the associated real-estate development will be financed and constructed by private developers. Good planning, coordination and contracting with private developers and businesses is therefore important.

[61] See URBED and the Joseph Rowntree Foundation (2006).
[62] See Bloomberg Citylab (2012b).
[63] See VivaCity2020, Cities Institute, LondonMet (n.d.).

Implementation obstacles and solutions

Like other forms of urban regeneration projects, promoting mixed-use areas on the back of a transit-oriented development will require coordination among several city departments as well as the buy-in of local residents and private developers, who may have differing interests. Such multi-stakeholder complexity may prevent or delay the implementation of mixed-use strategies. Comprehensive stakeholder engagement will be crucial and clear municipal commitments to strategic visions, together with improved infrastructure and public transport services, may be needed.

L3. Promotion of green spaces

Description

A wide range of benefits are associated with the provision of accessible urban green spaces and waterways. First, access to green spaces and waterways has a positive impact on the mental wellbeing of the population. Second, green spaces have direct environmental benefits. They can help improve air quality and even regulate the air temperature of a city. Furthermore, they can reduce flood risks as vegetated surfaces are well equipped to absorb and store water. Lastly, green spaces can help boost biodiversity. In order to promote the benefits of green spaces, policies and initiatives should aim (i) to promote more green space, (ii) to improve the value of the green spaces and (iii) to facilitate better accessibility for all to green spaces, infrastructure and waterways.

It may be necessary to extend the amount of green space through a combination of protective measures for existing green spaces and a proactive conversion or restoration of urban space and building surfaces into new vegetated areas. Protective regulation includes rules, monitoring and enforcement to protect green spaces from being lost to new built structures. For example, in Stuttgart, Germany, green areas are protected by local urban zoning and planning regulations. These are supported by a Climate Atlas created to guide the location of green spaces to facilitate cooling and airing of the city.[64] These protective measures would normally be carried out by municipal authorities although local communities and NGOs may undertake some of the monitoring functions.

Transformation of urban brownfield areas and building surfaces into vegetated land will, however, require close cooperation with private developers and landlords. Opportunities here include ways to integrate green or blue urban space development, such as the obligation to develop pocket parks or to clean up waterways, as part of brownfield redevelopment projects. Other measures aimed at increasing the amount of green space include community-based initiatives to increase the development of pocket parks, gardens and farming activities on available urban land. For example, urban agriculture policies in Amman, Jordan, have initiated the greening of more than 300 rooftops and of around 4,000 school and home gardens.[65]

An increase in the number of green urban spaces can also be achieved through the promotion of green roofs. Green roofs (or walls) have many of the same environmental benefits as traditional parks and gardens, including decreased surface-water run-off preventing flooding during heavy rainfall, improved local air quality, decreased local air temperature and the promotion of local biodiversity. Green roofs can be introduced on public buildings. They can also be introduced on private buildings through subsidies or through planning approvals for new construction or renovation. In addition, green roofs can be promoted through better information and awareness campaigns. For example, Toronto in Canada has introduced an ambitious green roof policy requiring

[64] See European Environment Agency (2014).
[65] See ICLEI (2014).

buildings above a certain height to have a certain percentage of green roofs.[66]

Beyond the amount of vegetated land, the quality and the value of green infrastructure also matter. Green spaces can increase their value through proper landscaping and maintenance. Turning green spaces into multifunctional areas is another way of increasing their value, which again can generate new revenue streams to fund landscaping and maintenance. For example, urban green spaces can be rented out for specific events, and parks can be designed as flood barriers, reducing flood risks or the need to spend resources on alternative flood-protection measures. Examples of this are the jointly funded flood alleviation schemes on parks in London, UK. For example, through joint funding from Southwark Council, the Environment Agency and Thames Water, schemes delivered surface-water flood protection for over 100 homes at risk and brought investment and improvements to several parks and sports grounds.[67]

Improved accessibility is another way to ensure the benefits of green spaces in a city. Therefore, urban planning should always consider how new or amended network infrastructure and built environment can improve current or restored green or blue infrastructure.

"Beyond the amount of vegetated land, the quality and the value of green infrastructure also matter. Green spaces can increase their value through proper landscaping and maintenance. Turning green spaces into multifunctional areas is another way of increasing their value."

Resource implication and key requirements

It requires a significant number of resources to construct, improve and maintain green spaces and urban waterways. For example, in Hamburg, Germany, the estimated costs for the installation of 300 square metres of green roofs is estimated at €9,500 compared to €3,000 for grey roofs.[68] Green roofs have higher maintenance costs, but reduced rainwater fees and a longer roof lifetime led to similar overall costs over 40 years. Therefore, recognising the multifunctional potential and additional revenue streams for urban green spaces can help mobilise significant funds to the sector. With an adequate mix of incentives, regulation and information campaigns, private developers and property owners can be encouraged to contribute to the greening of cities.

Implementation obstacles and solutions

Acquiring resources may be the biggest obstacle to an effective urban green space policy. Therefore, professional management of green and blue assets is important, with visions and skills to mobilise funding and contributions from private sector and voluntary organisations. To address this issue, a number of local authorities in the UK are considering transferring their management of green spaces from the public sector to private and charitable sectors.[69] It has been argued here that one single charitable body at arm's length from the government can present a more compelling case for support to corporate sponsors, private donors and charitable trusts, as well as attracting new volunteers. In terms of the untapped opportunity to benefit from volunteering, a UK survey found that nearly 70 per cent of young people wanted to volunteer to help create better green spaces in their community, but only 7 per cent said they currently do.[70]

L4. Promotion of participatory land-use planning

Description

Community-based land planning and participatory design for public urban spaces refer to a collaborative

[66] See Bloomberg Citylab (2012a).
[67] See Herne Hill (2015).
[68] See Climate ADAPT (2019).
[69] See National Lottery Heritage Fund (2014).
[70] See BBC News (2016).

approach to planning and design between urban planners, government authorities, businesses and the local community. This approach goes beyond traditional stakeholder consultation and instead invites members of the local community to propose solutions and new ideas. It may relate to a specific project, but can also be used for the development and testing of a wider strategic plan. Such approaches are becoming increasingly popular as authorities recognise the diverse natures of the communities they govern, and that traditional fixed standards and design criteria do not take into account the varying needs of residents.[71]

The use of participatory land planning and design is expected to ensure the improved liveability of city areas, and it is likely to improve the public acceptability of development proposals by demonstrating transparency in the design approach, ensuring greater inclusivity and community ownership of the final design.[72]

Resource implications and key requirements

A number of frameworks for public co-design have been developed by academic and research institutions. These can be replicated across cities with a variety of contexts and characteristics. For example, the Adaptive Governance Lab at the School of Architecture at University of Limerick has developed a 'Designing with Communities' framework, which emerged after five years of practice.[73]

The existence of already well-designed approaches can reduce the administrative burden on cities, although participation in design of this nature requires multidisciplinary teams to facilitate the process.[74] Such teams must be appropriately trained in this type of engagement as the use of appropriate language in a specific context and with specific groups is key to successful communication with stakeholders. Therefore, local government authorities may require capacity-building or working alongside external experts. In Barcelona, such a community-based approach to urban planning and design is being pursued to promote "Superblocks", whose overall programme has a budget of US$ 12.4 million from 2014-19. This shows that it is not necessary to invest in large infrastructure solutions to improve the lives of city residents.[75]

Implementation obstacles and solutions

Co-design of urban spaces can be a slower and more time-consuming process than other stakeholder engagement processes, but if considered early on in the design approach, it can be significantly rewarding.

Delivering workshops or interactions with community members that facilitate co-design requires trained professionals who understand the complexities, risks and potential conflicts arising through such intense involvement of local groups who may not have an in-depth knowledge of planning approaches. Using the co-design of urban spaces as a tool for stakeholder engagement can also build up the expectations of stakeholders as to their influence or impact on the project, which can be particularly challenging to manage for groups that have a high level of interest in the project. Therefore, at the beginning of any session or period of engagement, it is important to lay out the expectations and potential outcomes to the groups being engaged. This is where a pre-prepared engagement plan can assist in identifying the opportunities, outcomes and risks ahead of time.

3.3. Energy and buildings

In the EBRD regions, there is a legacy of buildings with poor energy efficiency, and high electricity and heat consumption, as well as widespread use of fossil fuels for electricity and heat generation. For instance, nearly half of the housing stock in central and eastern European countries was constructed between 1960 and 1990. During this time, new housing construction was primarily pre-fabricated, large-scale, multi-family housing blocks built with little or no consideration of energy efficiency.[76] Furthermore, the use of solid fuels

[71] See Inclusive Design Research Centre (n.d.).
[72] See David et al. (2012).
[73] See Webb et al. (2018).
[74] See Aguilar (2015).
[75] See C40 Cities (2018).
[76] See UN-Habitat (2017).

for heating remains common in some cities in the EBRD regions and this has also been a major source of local air pollution.

These environmental challenges are linked to several structural problems and shortcomings. Partly, these challenges are linked to the legacy of low electricity and heat prices and the lack of consumption-based billing, all of which limit incentives to reduce heat consumption or to invest in energy-efficient buildings. They are also partly linked to low administrative and financial capacity in the cities, which hampers the ability to invest in, regulate and promote energy efficiency measures or renewable energy generation at the city level. The financial constraints are often further increased by a lack of creditworthiness and by limited access to financing for local public and private entities in the EBRD regions.

There is an increasing awareness of and a growing effort to achieve an energy-efficient building stock and a decarbonised energy sector following both national and local commitments to the Sustainable Development Goals and the Paris Agreement. Among the policy efforts to reduce GHGs and pollution from urban electricity and heating consumption are (i) ways to encourage investment in energy-efficient buildings, (ii) ways to ensure more energy-conscious consumption patterns, and (iii) ways to decarbonise the provision of heat and electricity. Key policy options can be presented according to the following list.

Policies to encourage energy-efficient buildings:

1. Improved energy performance for public buildings
2. Improved energy codes and labelling for buildings
3. Policies and support for energy performance contracts
4. Financial incentives and access to capital for energy-efficient renovation

Policies to ensure more energy-conscious consumption:

5. Pricing, metering and billing of heat and electricity

Policies to decarbonise heat and electricity provision:

6. Decarbonisation of district heating supply
7. Renewable electricity generation

E1. Improved energy performance for public buildings

Description

Increased energy efficiency of municipal buildings can have a direct and significant effect on the energy consumption and the related emissions and expenditures of a city. It can also have an indirect impact through the demonstration effect and potential for raising awareness of energy efficiency benefits among the wider public.

One way to encourage improved energy performance of municipal buildings is to require higher energy standards for new public buildings. For example, for countries subject to the EU's Energy Efficiency Directive, all new buildings occupied and owned by public authorities must now be "nearly zero-energy buildings".[77] This EU Directive also sets mandatory requirements for municipal purchases and new rental agreements. Public procurement of low-energy buildings, however, can only address some of the problems as long as the main energy efficiency challenges derive from the existing building stock. In such cases, improved energy performance should also be pursued through effective refurbishment of the municipal building stock.

Setting up a municipal energy agency has proven to be a cost-effective way to identify and refurbish public buildings. For example, the Berlin Energy Agency,

[77] See European Commission (2020).

a public-private partnership, was founded in 1992 and has since launched energy efficiency retrofits in more than 1,300 public buildings and 500 private properties.[78] The size of a municipal energy agency can be scaled from a one-officer position to a larger unit with extended expertise. Similarly, the role of an energy agency can be scaled from only assessing and ranking the public buildings with the greatest energy-saving potential, to also cover extensive procurement and implementation support together with training and awareness-raising activities among decision-makers and occupants of public buildings.

Resource implications and key requirements

Public procurement of low-energy buildings will typically imply higher investment costs and lower operating costs and can be economically justified in the long term. For cities with a population larger than 50,000, setting up an energy agency has proven to pay for itself through the energy and cost savings the agency helps to achieve. However, highly subsidised energy prices would not favour energy-efficient constructions or refurbishments and it is important that countries with large energy subsidies seek to reduce them.

Implementation obstacles and solutions

Complacency among city officials and limited financial capacity may prevent an effective pursuit of energy-efficient public buildings. Increased public disclosure of the energy performance of different city departments, combined with the inclusion of energy consumption in key performance indicators (KPIs) for various city managers, may provide good incentives and raise awareness of the benefits of improved energy efficiency. Private-sector involvement through PPP-style energy performance contracts (see policy option E3) has also proven to be an effective way to finance and implement energy efficiency measures. This approach has, for instance, been deployed in Berlin under the Energy Saving Partnerships using energy performance contracting.

E2. Improved energy building codes and labelling

Description

A building code sets out minimum requirements and standards for buildings and covers various aspects of health, safety and welfare – including energy performance. Relevant building energy codes typically consider lighting, walls and roofs, glazing, heating, ventilation and air conditioning. Building energy codes can vary in their degree of ambition and for nearly zero-energy buildings, one would typically incorporate sensors to automatically control lighting and water use, as well as centralised energy control systems to monitor and dynamically minimise energy use.[79] Effective implementation of building codes requires adequate approval and verification procedures, where the construction or major alteration of buildings must

[78] See Berliner Energie Agentur (2006).
[79] See Coins Global (2015).

conform to the code to obtain planning permission, usually from a local council.

Building energy codes are often supplemented with building certification, labelling or information disclosure programmes. An energy certification and labelling process helps to ensure that the energy performance of a building is above a certain threshold and communicated to customers in an effective way. Certifications and labelling can be mandatory or voluntary. Mandatory certification can be used to ensure compliance with building codes and enable better enforcement. Energy certificates can further inform prospective owners and tenants about the performance of specific buildings and systems, and may offer recommendations on how to improve energy performance. Certification further raises awareness about energy efficiency and energy expenditures, with the potential to gradually ensure that a more efficient building stock is being demanded and subsequently supplied. Voluntary certification can be used if sellers or landlords want to distinguish themselves from their competitors. This allows them to inform consumers and help prospective purchasers to anticipate energy costs, and therefore increase the demand for energy-efficient buildings.[80]

While building energy codes may be driven by national authorities, local authorities have significant influence over implementation by means of the planning permission stage. Local authorities can also help promote energy efficiency standards through local requirements for information-sharing and through mandatory energy labelling of private and public buildings. Furthermore, municipal authorities can also facilitate information-sharing platforms and standards for voluntary energy-labelling schemes.

Resource implication and key requirements

As building energy codes become more sophisticated, they require additional expertise and continued efforts to develop and apply them as part of building permitting. Developing or revising a building energy code for local use may not require an excessive amount of resources. National templates can also be developed for more easy application at the local level.

However, effective implementation and enforcement of a building energy code requires city officials or accredited professionals to sign off on plans and the finalisation of building works – and this requires significant resources. The costs of verification and reporting can be passed on to private building sellers and buyers.

Due to the substantial upfront costs, it may be a solution to combine tighter building energy codes with financial incentives, as well as certification and labelling to improve consumer awareness and support enforcement. Tighter building codes may also be combined with expedited review of the permitting process and density or height bonuses if buildings meet particular sustainability criteria. For example, Mexico City's Sustainable Buildings Certification Programme, a voluntary programme reflecting various levels of sustainability performance, offers a number of incentives, including property tax reduction and attractive financial schemes, to cover the cost of building upgrades, as well as expedited processing of construction permitting.[81] And lastly, in countries or cities with a flawed construction permit system and a large informal construction sector, it is important to dedicate resources to effectively manage the construction sector.

Potential private-sector participation

Building-code verification tasks can be carried out by accredited private professionals (who should lose their accreditation in cases of misconduct). They do, however, require careful consideration regarding which bodies can provide accreditation, in order to avoid one or more business associations managing this process in a monopolistic and non-transparent manner.

Local governments can work with commercial banks to provide financial incentives, therefore shifting the financial burden from the public to the private sector. One example is Frederikshavn in Denmark, which developed specific soft loans for the energy renovation of housing to meet its climate change targets. A new product was developed by the municipality in agreement with local banks, featuring a longer maturity period and lower interest rates, relative to typical market conditions.

[80] See Broekhoff et al. (2018).
[81] See C40 Cities (2017).

Implementation obstacles and solutions

A tightened building energy code represents increased investment costs for owners of existing and new property. An extended information disclosure and labelling programme for existing buildings also requires more involvement and buy-in from property owners. Under such scenarios, it is natural that many stakeholders either oppose compliance or fail to contribute to the necessary arrangements. It should also be noted that a large number of stakeholders will need to develop adequate understanding and capacity – including stakeholders such as real-estate developers, architects, engineers, interior designers, regulators, inspectors, subcontractors, manufacturers of building materials and others.

Given these challenges, a gradual introduction of tighter building energy codes is recommended, along with a gradual rollout of extended labelling and information disclosure programmes. These should be combined with effective enforcement. A gradual approach can be pursued through a step-by-step increase in the required standards and required activities – which should be announced years ahead of implementation. A gradual approach can also be pursued by introducing higher energy-performance and reporting standards first as voluntary measures before making them mandatory. Successful implementation of building energy efficiency codes can take many years to achieve.

Denmark was one of the first countries to introduce nationwide energy efficiency standards for buildings. The energy requirements in the Danish Building Regulations for new buildings have been tightened, using a step-by-step approach, preparing the Danish industry for future requirements almost 10 years in advance. Moreover, the new requirements are introduced as voluntary energy classes before they become mandatory.

E3. Policies and support for energy performance contracting

Description

Energy performance contracting (EPC) is a form of packaged financing and capital works, where financial savings from energy conservation measures are used to fund the cost of the measures.[82] EPC involves an energy service company (ESCO) that provides various services, including finances and guaranteed energy savings. The ESCO has a stake in energy savings for the client, which leads to accountable energy and carbon savings. The ESCO may be required to absorb some of the lost savings if savings do not materialise as expected, which commercially incentivises ESCOs to complete optimal investments.[83]

The attraction of EPC is that it enables end-users to secure energy-saving investments without drawing on capital or balance sheet payments. The private ESCO companies provide the financing, and so reduce the debt burden of the municipal authorities. Eurostat confirmed that EPC investments are off balance sheet for public clients and provided a related guide for practitioners.[84] There are some examples of policymakers embracing this opportunity for public-sector energy efficiency investments, having obtained Eurostat's clarification, for example, in the Slovak Republic.[85] There is also evidence that specific investment costs are lower, while energy savings are higher, when applying EPC rather than regular public procurement of projects.[86]

[82] See World Energy Council and Arup (2016).
[83] See Institute for Building Efficiency (2010b).
[84] See Eurostat and EIB (2018).
[85] See Ministry of Finance of the Slovak Republic (n.d.).
[86] See Staničić (2018).

The ESCO is the economic owner of the asset and bears most of the risks and rewards of the investment. The ESCO is also responsible for the proper operation of the installed equipment and bears the maintenance and refurbishment risks.[87] It stays involved in the measurement and verification process for the energy savings during the repayment period. ESCOs and energy performance contracting are mostly found in the public sector and to a lesser extent in the industrial and commercial building sectors.

EPC policy instruments can include (i) the promotion of energy performance contracting through awareness-raising, (ii) the removal of legal barriers to the use of innovative financial instruments, (iii) the preparation of sample contracts and procedures, (iv) the provision of expert support, primarily to the public sector for preparing energy performance and supply projects, contracts and evaluating the projects results and (v) the establishment of a qualified energy services provider scheme.

Resource implications and key requirements

EPC requires sufficient technical capacity and often necessitates capacity-building due to the extent to which it differs from traditional public procurement processes. Additional efforts will be needed in market sounding and preparation of EPC. To enable EPC to take place, it is important that the municipal budget law allows city authorities to sign medium-term to long-term service contracts. Depending on the length of the EPC contract duration, a stable, reliable economic and political system and rule of law are prerequisites. For instance, in Slovenia, contract durations of up to 20 years are common.

Potential private-sector participation

EPC involves the private sector directly through the creation of a market for ESCOs, including a wide range of possible contractors, such as engineering companies, utility firms and equipment providers. Furthermore, ESCO structures are, alongside PPPs, one of the few financial structures that would allow the introduction of more private-sector finance into energy efficiency investments than the mere debt capacity of ESCO clients would allow, thereby helping to bridge the existing finance gap.[88]

Implementation obstacles and solutions

A lack of awareness in both the private and public sectors is often the first barrier to EPC. This can be tackled through capacity-building. A lack of resources to prepare related EPC tenders in the public sector is another barrier. This can be improved through information provision and through providing technical support in procuring EPC projects.

Prohibitive public budget and procurement regulations are another barrier. For example, in many European countries, budgetary restrictions imposing lending limits on local governments leave capital-strapped administrations little room to pay for the upfront costs of performance contracting.[89] Regulatory reforms can be used to treat EPC investments as off-balance-sheet (no new public debt) and the aforementioned Eurostat clarification should give EU member states and accession candidates sufficient confidence. Furthermore, extending the contract duration is required, too, with deep building-retrofit projects in Slovenia, for example, having EPC contract durations of 20 years. Public procurement regulation may also need to be reformed to include lifecycle cost analysis and functional tenders that use energy efficiency criteria as selection criteria in public procurement contracts and leave the technical solutions up to the contractor.

Financing constraints are yet another barrier. Credit markets remain constrained and lending institutions

[87] See Šerić (2017).
[88] See European Commission (2018).
[89] See Institute for Building Efficiency (2010a).

may be unwilling to offer energy performance contract financing despite provisions to guarantee ESCO performance. Smaller ESCOs that are new on the market lack the creditworthiness required by banks. As a response, governments can provide guarantee schemes for energy efficiency loans provided to ESCOs. An alternative solution is to create a project pipeline, which investment banks such as the EBRD can then fund.

However, it is more than the availability of debt that prevents ESCO market development: it is the limited borrowing capacity of ESCOs that limit the capacity to finance many deep-retrofit EPC projects with 20-year contract durations. The solution to this is the sale of receivables of ESCOs to financiers that can understand, price and accept the 20-year limited-recourse finance risk. Supporting the development of such innovative financial (forfeiting) instruments through risk-sharing or other support mechanisms could be part of the policy mix backed by local authorities.

The Czech Republic provides a good example of the development of a market for EPCs. There, facilitating has become an indispensable part of EPC projects in the public sector. In addition, competitive bidding has been developed into a standardised procedure, which increases the quality of EPC projects for clients. The European Code of Conduct for Energy Performance Contracting has been widely used and complies with the actual practice in the country.

E4. Financial incentives and access to capital for energy-efficient renovation

Description

Central and local governments can provide financial incentives, such as green mortgages and tax exemptions, to developers or new building owners in order to encourage energy-efficient design and construction. This can be used in parallel to certification and labelling.

Financial incentives can be provided to encourage 'able to pay' households to retrofit their homes. Some of the measures that governments can deploy include supplier obligations, grants and tax incentives. Energy efficiency programmes can also be designed to leverage private capital, for example, through revolving loan funds or other financing structures, in order to enable and incentivise green renovation of residential and commercial buildings.

For instance, Frederikshavn in Denmark developed specific soft loans for the energy renovation of housing to meet its climate change targets.[90] A new product was created by the municipality in agreement with local banks, featuring a longer maturity period and lower interest rates, relative to typical market conditions. No funds are assigned to the financing schemes by the municipality. Rather, soft loans are provided by the partner banks that bear all the risk. The partner banks run a creditworthiness check of homeowners, decide who gets a loan and under which conditions. In other cases, public funds can be set up to provide favourable funding for energy renovation of private buildings through direct loans or through risk-sharing facilities for private banks.

Resource implications and key requirements

Providing financial incentives will require budgetary commitments and may be administratively demanding for the local government. Significant technical capacity will also be required to identify how incentives should be configured and applied. Incentives can be targeted at lower income brackets of the population to address social equity concerns associated with energy poverty.

Potential private-sector participation

Local governments can work with commercial banks to provide financial incentives, thereby shifting the financial burden from the public to the private sector.

Implementation challenges and possible solutions

The provision of direct financial support is financially demanding on local governments and can be targeted at fuel-poor homes. It is good practice to undertake a comprehensive cost and benefit analysis of retrofitting to zero carbon for all households that are in fuel poverty and to provide targeted funding to

[90] See Energy Cities (2016).

these homes.[91] One of the first programmes to tackle energy poverty was the Warm Front programme in the United Kingdom; 2.3 million households received assistance from the scheme. Grants were on offer for improvements such as loft insulation, cavity wall insulation and heating system improvements.[92]

It is important to address market failures that prevent potentially cost-effective investments in buildings. One such problem is the split incentives between owners and tenants where property owners may be reluctant to invest in energy efficiency if the main beneficiary is a non-contributing tenant. The EURONET 50/50 MAX project is an example of how this challenge can be successfully addressed for public buildings.[93]

The success factors associated with energy efficiency measures include gaining and maintaining consumer trust, an effective communication and marketing strategy, training and qualification schemes to ensure that worker qualifications keep pace with the technical complexity of buildings and the targeting of trigger points, such as household renovations or sales.[94] The provision of financial incentives and favourable financing should only come after energy efficiency building codes have been enacted and adequate enforcement and compliance mechanisms are in place for building construction and retrofits.

E5. Pricing, metering and billing of heat and electricity

Description

The EBRD regions have a legacy of subsidised electricity and heat tariffs, along with normative billing rather than consumption-based billing. Normative billing occurs when, for example, monthly heating bills are based on the size of an apartment rather than on the actual heating consumed. However, correct price signals are necessary to promote prudent energy consumption and to incentivise energy efficiency investments. Today, tariff reforms remain a key challenge in many of the economies where the EBRD invests.

Good price signals depend on decent price-setting as well as good metering and billing mechanisms. Price-setting should reflect all costs, including environmental or climate-related costs. In addition to an adequate price level, it is also important that tariffs are set and adjusted in a predictable manner so that related investments can be undertaken without unnecessary risks of price volatility. To ensure this, the heat and electricity tariffs should be devised using a formula-based methodology and approved by an independent and capable regulator. To this end, the city authorities could help to set up or improve both the relevant methodology and the regulatory authorities. While electricity tariffs often fall outside municipal control, district heating (DH) and cooling tariffs are normally under the control or influence of local authorities.

Effective metering, billing and bill collection are also important to ensure correct price signals for electricity and heat consumption. Electricity metering and billing can have different degrees of sophistication – from plain mechanical readers to digital meters with real-time information on consumption and expenditures combined with differentiated tariffs for day- and night-time consumption. More sophisticated metering and tariff structures can help promote a more prudent and cost-efficient consumption pattern, for example, running washing machines at night when electricity tariffs and grid capacity are more favourable. An even higher degree of 'smartness' includes metering and tariff arrangements that record reversed energy flow back to the grid. This form of smart metering can help promote the installation of renewable energy solutions – such as solar panels on buildings, as surplus energy production can then be sold back to the grid and further reduce the energy bill for the relevant buildings.

District heating metering generally lags behind electricity metering in accuracy and sophistication and normative billing is widespread. The technical challenges associated with DH metering are often largely due to old infrastructure that was not intended for individual metering. However, as new generations of heat allocators can be used as an alternative to heat meters, the opportunity to achieve accurate

[91] See National Assembly for Wales (2018).
[92] See UK Parliament (2013).
[93] See EURONET 50/50 MAX (2020).
[94] See Committee on Climate Change (2016).

consumption-based billing of DH use is there. This will have significant impacts on consumption patterns and incentives to invest in energy-efficient refurbishment of buildings.

Utility sector pricing reforms are needed to accompany the installation of apartment-level metering technologies. Kazakhstan is currently undergoing a smart heat-meter programme,[95] while a number of cities in Europe, such as Tartu, Estonia, and Copenhagen, Denmark, have installed these systems.

Resource implications and key requirements

There are significant investment costs linked to the installation and upgrading of meters. For example, fourth-generation apartment-level heat-cost allocators for metering with remote reading and control, needed to introduce consumption-based heat billing, cost around €40 per allocator. One allocator is needed for each radiator in an apartment.[96] The costs of a smart metering roll-out are largely borne by energy suppliers, predominantly through funding the installation and purchase cost of meters (about €110 per household) and through funding the national smart metering communications infrastructure. Installation of meters in private properties also requires access to the properties. Here, cooperation with the property owners may require significant resources for the relevant implementation agencies. Introducing smart meters that enable bidirectional energy flows would further require the development of a smart grid and necessary capacity within energy distribution companies that are able to implement such net metering arrangements. To encourage the buy-in and cooperation of private companies and property owners, some subsidy schemes may be needed, which again represents additional resource requirements for the city or the authorities promoting this policy.

A cost-benefit analysis by the UK government found that costs related to smart meters are expected to be around £670 million per year, whereas the benefits are calculated at £1.9 billion per year on average. Overall, the UK government estimates that from 2028, the programme will be delivering net benefits of around £1.2 billion per year.[97]

Implementation obstacles and solutions

Increased electricity and heat tariffs often imply affordability constraints for low-income households. It has been argued that this problem can be addressed most effectively through targeted support for the poor rather than by providing universal energy or heat subsidies to the population. Installation of meters in private properties also requires access to the properties and necessary cooperation with the property owners. To support this process, a combination of information campaigns, stakeholder consultation and price incentives to change metering arrangements has proven effective.

E6. Decarbonisation of district heating supply

Description

District heating (DH) systems can reduce their carbon emissions through improving efficiency in the system or by switching to new fuel sources or new heat sources. Efficiency in the DH system may be achieved by rescaling the size of the DH network, as some DH systems are oversized, or by upgrading old boilers and leaking heat pipes. District heating systems can be further decarbonised by switching away from fossil fuels to renewable sources and by capturing new sources of surplus heat.

Whenever DH systems are based on carbon-intensive fuel sources, such as coal or heavy fuel oil, the potential carbon reduction is significant. For example, in Bosnia and Herzegovina, several district heating operators have replaced heavy fuel oil heat boilers with biomass boilers. This has not only reduced carbon emissions, it has also reduced fuel expenditure and helped generate local jobs by developing local markets for the supply of sustainably sourced biomass.[98]

[95] See EBRD (2017).
[96] See EBRD (2018b).
[97] See UK Department for Business, Energy and Industrial Strategy (2019).
[98] See UN Environment Programme (2017).

Actively capturing the heat surplus from other economic activities is another way to decarbonise the district heating sector. Historically, heating systems have often been fuelled by surplus heat or heat waste from industrial processes or from electricity generation. However, as some manufacturing industries close down and new technologies and new industries emerge, new opportunities for potential heat sources may appear. Some of these heat sources may need a 'top-up' to bring the final temperature in line with a commercially required heat supply, but such heat sources may include surplus heat from data centres, shopping malls or wastewater treatment plants.

Resource implications and requirements

All the abovementioned ways to decarbonise the DH supply require significant upfront investment. However, these measures are expected to considerably reduce operating costs and can therefore be economically justified in the long term. For example, the city of Banja Luka in Bosnia and Herzegovina has developed a feasibility study to improve its district heating system, which has attracted interest from the EBRD in providing an investment package of €15 million for new biomass boilers, network upgrades and other efficiency measures. These are expected to reconnect 80 per cent of disconnected users to the district heating network within four years and reduce fuel consumption by 27 per cent, thus reducing emissions by 20,000 tonnes of CO_2 per year and leading to €4.5 million in fuel savings.[99,100]

Potential private-sector participation

Many of the proposed investments and solutions can be provided through PPP-style contracts or energy performance contracts. Under these contracts, private energy servicing companies (ESCOs) make the necessary investments, which they also finance, while being remunerated based on the energy efficiency achieved during a fixed operating period. Energy performance contracts have been demonstrated to be an efficient way of addressing investment needs, providing operational efficiency without adding an additional debt burden to municipal accounts (see policy option E3).

Implementation obstacles and possible solutions

High upfront investment costs and a potential reluctance of some decision-makers to change may hamper support for the proposed decarbonisation measures. One possible solution is the use of private-sector contracting or energy performance contracting where the debt burden and performance risks are allocated to private contractors.

E7. Promotion of renewable electricity generation

Description

Public and private actors can help increase the local production of renewable energy and thus help reduce the carbon footprint of a city. The public sector can lead the way by seeking to install and apply renewable energy solutions wherever economically justified. This can include (i) the introduction of solar/photovoltaic panels for existing and new public buildings or other built structures, (ii) the use of solar panels to fuel public installations such as street lights or ticketing machines, and (iii) an active use of biomass or biogas solutions for energy purposes. For example, this can include gas capture from solid waste or wastewater facilities. The benefits of such installations are not only their reduction of energy consumption and the related carbon emissions and energy expenditure, but also that they raise awareness and underpin other initiatives aimed at encouraging private actors to install renewable energy solutions.

Another possible policy instrument to encourage private actors to install renewable energy solutions is the city's control over planning permits for new buildings and for large building alterations. For example, a city can insist on specific renewable energy components being included as a condition of obtaining building works permits. Alternatively, the city can, as a minimum, require that renewable energy alternatives are analysed when project proposals are being developed. Another measure could be to include solar panel mandates for certain parts of the building stock. For example, Seoul has introduced solar mandates for

[99] See CTCN (2015).
[100] See EBRD (2018a).

new multiple-unit dwellings and commercial buildings to accelerate the deployment of solar panels.[101]

While solar panels can be introduced for self-consumption purposes, this can be further incentivised if it is combined with smart meters or net metering mechanisms. This approach could include further incentives through favourable feed-in tariffs for the energy sold back to the grid by private households or private companies.

Setting up a municipal energy agency has also proven to be a cost-effective way to promote renewable energy in a city. For example, the city of Barcelona has set up the Barcelona Energy Agency to meet its environmental and energy commitments. The agency currently supplies 20,000 users in public and private buildings with renewable energy.[102]

Resource implications and key requirements

Even though the costs of solar technology have been falling rapidly, financing often remains the biggest challenge to implementing a municipal solar plan. Cities have a range of business model options to overcome this barrier, distinguished by who owns the asset: the city itself or a third-party investor.[103] Cities must weigh up these financing and ownership options, taking into account upfront capital costs and expected payback over the lifetime of the installation. National and local regulations, including on whether third-party ownership is permissible at all, will determine the type of possible financing structures. Similarly, there are significant investment costs linked to the installation and upgrading of meters (see policy option E5).

Implementation challenges and possible solutions

As outlined above, significant investment costs are often the biggest barrier to cities embracing solar solutions. To overcome these barriers, cities can either pursue a direct or a third-party ownership strategy with regard to the solar assets. In the direct ownership model, the city purchases the solar system using its own funds, grants from national or regional government, or by borrowing money using municipal bonds. The benefits of such a model are that direct ownership allows the city to have full control over the benefits of solar. However, the city is dependent on the upfront capital being available, or the financial, legal and political ability to issue bonds. In most cases, the city also shoulders the full risk of constructing and operating the solar system. Direct ownership can be a city's only option if the regulatory framework necessary to enable more elaborate business models is not in place.

In the third-party ownership model, the city government enters into a contractual agreement with a private developer, who provides the upfront investment for the solar system. These models can allow the city to install solar power with no upfront capital costs and no impact on their balance sheets. Third-party ownership models are better suited to larger scale projects because the legal and due diligence costs for investors can be high. The two core models of third-party ownership are power purchase agreements or lease arrangements.[104]

Upgrading electricity meters also requires significant investment costs as well as widespread cooperation from private property owners, who may be unwilling to cooperate. Therefore, these policy measures may be most successful when combined with subsidy schemes and favourable price signals such as subsidised feed-in tariffs for electricity, thus channelling electricity back to the grid from private businesses and private property owners. Predictability is very important in order to encourage private actors to invest in renewable energy solutions. Hence, city authorities should consider ways to increase predictability through risk-sharing arrangements or guarantee mechanisms. The city should also clearly define its commitment to the renewable energy agenda as part of its stakeholder consultation process and public awareness campaigns.

[101] See Seoul Metropolitan Government (2017).
[102] See Barcelona Energia (2019).
[103] See C40 Cities (2019).
[104] Ibid.

3.4. Water and wastewater

From an environmental perspective, the main objectives of water sector policies are to prevent pollution and to encourage resource efficiency in the sector. Furthermore, water policies should also enable quality water services to be provided in a sustainable manner. Pollution generated in the water sector primarily derives from untreated wastewater and to some extent from emissions related to energy use in the sector. Resource efficiency can therefore be related to water efficiency, including reuse of wastewater, as well as energy efficiency in the sector.

Water utilities sit at the centre of this, but industries, businesses and residents also play important roles, as do water users and producers of wastewater. Starting with the water utility, the relevant policies are to ensure that the utility firm has enough resources and the capacity to make necessary investments as well as to provide good services in a sustainable manner. It is also important to ensure a predictable institutional framework with clear rules and incentives for the water utilities to make the right decisions. Therefore, policy reforms should aim to ensure that the utility firm is well regulated and controlled on the back of robust institutional capacity and adequate information.

Regarding water users, such as industries, businesses and households, an effective control of water use and wastewater pollution is critical. Policies should also provide price signals, incentives and support for water-efficient behaviour and awareness among the different user groups. Sustainable supply and use of water and wastewater services must be built on the back of a sector plan that carefully assesses future water sources and water needs as well as investment needs. Such a plan should also carefully consider the sequence of reforms and investment programmes. In particular, tariff reforms should be introduced at an early stage to detect any reduced demand and to better scale the necessary investments in water and wastewater treatment capacity.

Potential water policy options relevant for green cities include the following.

Policies targeting water and wastewater utilities:

1. Regulation and contracting of public and private service providers
2. Reform and strengthening of water utilities
3. Promotion of resource-efficient utilities

Policies targeting water users:

4. Effective tariff reforms and price signals
5. Awareness campaigns for households and industry

W1. Regulation and contracting of public and private service providers

Description

While municipal water utilities are subject to national rules and regulation, the governance of the water sector also relies on municipal authorities playing an active role. On the one hand, city authorities are needed to ensure proper supervision and enforcement of national rules – for example, through local monitoring, control and enforcement. On the other hand, city authorities should also play an important role as the owners of the municipal water utilities. This governance function can be supported by a well-defined public service contract (PSC) specifying the rights and obligations of the city and the water utility firm. Furthermore, in the case of extended private-sector involvement, the city should play an important role in procuring and supervising any private-service providers.

A well-defined PSC between the city and the water utility can help ensure clear and transparent governance of that utility when it is owned by a municipality – the utility should have been converted into a separate legal and commercial entity. Such contracts should clearly define the rights and obligations of both the water utility and the respective city authorities. It should also specify procedures and methodologies for business planning and approvals, for budget- and tariff-setting and for performance assessment and reporting. The aim is that

a well-defined service contract will provide predictability and clear accountability for both the water utility and for its municipal owner.

Resource implications and key requirements

Efforts and additional capacity may be needed to design and supervise a well-defined service contract between city authorities and the water operators. Drafting a PSC can sometimes benefit from contract templates or examples from other cities or international institutions. With some external support and technical assistance, a service contract can in many cases be concluded within six to nine months. For example, in Bucharest, the concession contract between the municipality and Vivendi Universal was signed in March 2000 and became effective in November 2000. But effective application of the service contract requires more time as there may be a need for a change of mindset among the city authorities and the utility management.

Potential private-sector participation

Water and wastewater services can be provided through different forms of private-sector participation – from the outsourcing of non-core activities to management contracts or full-scale concession contracts.

Outsourcing contracts may cover a targeted area of activities, such as meter reading and bill collection. More comprehensive private-sector involvement can come in the form of a management contract under which a private contractor works alongside, or fully replaces, the existing utility management. The benefit of a management contract is that a private contractor brings in expertise and may also be less subject to politicised pressure once a contract, with clearly defined objectives and performance-based remuneration, has been signed. Even more comprehensive private-sector involvement could come in the form of a concession contract, often referred to as a PPP contract, which transfers funding, construction and operational obligations to the private contractor. It can also transfer the full operational and revenue collection risks to the private sector.

The preparation and monitoring of a concession contract requires significant resources and administrative capacity within the respective city authorities. It also requires a robust legal framework. A full-scale concession contract for a water utility should thus only be recommended in cities that benefit from good information about current operations and infrastructure assets, and that further benefit from a well-developed legal framework and a strong administrative and procurement capacity.

Implementation obstacles and possible solutions

The introduction of a public service contract implies a more formalised relationship between the city authority or administration and the water utility management. This requires a change of mindset and more transparent processes, which some stakeholders may find unnecessary.

The introduction of deeper private-sector participation, in the form of comprehensive management contracts or a full-scale concession contract, requires significant preparation and institutional capacity within the city administration. Therefore, for cities with limited experience of private-sector contracting, it may be beneficial to pursue a step-by-step approach where smaller and less complex contracts are introduced first, followed gradually by deeper private-sector involvement. For instance, the Armenian water authority has introduced the private sector in a gradual manner over more than 10 years, by first introducing management contracts

and then transferring revenue risks and later investment obligations to the private sector.[105]

W2. Reform and strengthening of water utilities

Description

Converting a municipal water utility from an administrative unit into a separate legal entity with clearly defined objectives and targets can help make the utility and its management focus on its operational and financial deliverables – and thereby help to depoliticise and professionalise the planning and management of the utility. Such corporatisation into a joint stock company (JSC) may also enable better and more transparent governance of the water services following the introduction of an arms-length distance between the utility management and its municipal owner.

The operational and financial performance of a water utility can be further improved through targeted capacity-building and restructuring of their utility. Such efforts typically involve the development and implementation of a corporate development programme (CDP). A CDP would typically start off with a diagnostic, followed by clear recommendations and actions aimed at addressing any identified shortcomings linked to capacity, systems or processes within the utility and its operations.

Resource implications and key requirements

Converting a municipal water utility into a JSC requires a significant legal effort and there is a need for clear political buy-in. However, it is in principle a one-off event and it does not require significant physical investment.

In contrast, building necessary capacity within the city administration and their water utility is a process that can take several years. It requires the utility to develop capacity to manage and plan its assets and future investment needs. This may require the utility to invest in better information management systems and to improve its accounting procedures. External technical assistance may be an effective way to start the process and developing a CDP and a twinning agreement with a more experienced water utility may also be a good starting point.

Implementation obstacles and solutions

Converting a water utility into a separate legal and commercial entity may imply a mayor's loss of control over daily operations at the water utility. Therefore, there may be political resistance to this structure. To provide the city administration with sufficient comfort regarding future control and supervision of the water company, a well-defined PSC can be developed and signed between the water company and its municipal owner.

Building necessary capacity is normally not controversial. However, any company restructuring aimed at improving efficiency that implies labour reforms may lead to opposition from political authorities and from the utility staff. Targeted retraining and relocation of staff, combined with natural attrition as a way to increase labour productivity may be needed to avoid overly severe social impact and political opposition. For example, in Madaba, Jordan, the first phase of the contract was seen as the basis for re-engineering of the business processes and entailed the implementation of the necessary systems as well as staff training.[106]

W3. Promotion of resource-efficient utilities

Description

There is a range of solutions that utilities can explore in order to improve resource efficiency or capture the value of various by-products. As a traditional approach, utilities can reduce water losses or energy consumption through targeted investments and the maintenance of distribution networks and related pumping equipment. To ensure well-targeted investments and timely maintenance, an asset management approach may be recommended. A mature asset management approach is based on having a good inventory and on planning procedures

[105] See Marin et al. (2017).
[106] See Sustainable Water Integrated Management (SWIM) Support Mechanism (2013).

in which investments and maintenance works are planned in a predictable and forward-looking manner. This approach requires good data collection and analysis by the utilities and a long-term commitment and budgeting from the city authorities.

Water utility companies can also be encouraged to explore more innovative solutions. For instance, water efficiency can be pursued through better utilisation of waste streams such as treated wastewater/grey water or better harvesting of water through sustainable urban drainage solutions – solutions that may have to be restructured to better prepare for future risks of flooding. The carbon footprint of water and wastewater services can be further reduced by including forms of energy generation as part of their operation. One way to do this is to exploit the hydropower potential and install a turbine inside the water pipes, transporting water down from a reservoir through gravitation. Energy can also be generated through the capture of biogas at wastewater treatment plants. Lastly, solar and wind power solutions can be located in wastewater treatment plants in order to cover some of the energy needs of the sector.

Another by-product of the wastewater treatment process is sludge. Increased wastewater service provision, for instance to address a sanitation shortfall or to meet higher regulations, will generate more wastewater sludge. The capacity of sanitary landfills to receive such sludge may be limited and the impact of the EU's Landfill Directive is likely to drive further reductions in these types of outlet. As a consequence, alternative solutions for effective management and disposal of wastewater sludge may be increasingly important in a many cities. Sludge re-use for landscaping or agriculture is one option. Other options include co-composting with green waste or using sludge, in combination with other waste or fuel sources, for power generation.

Resource implications and key requirements

Most of the energy and water efficiency solutions presented here require significant investment. Therefore, long and predictable contracts with clear revenue streams may be needed. For example, for renewable energy production to be made sufficiently attractive, any renewable energy subsidies on the energy market should be made available. This may require connections to the electricity grid and bilateral power purchasing agreements may need to be negotiated and signed. Consequently, a water utility firm may need to develop additional capacity and procedures for arrangements in the energy market. Commercial sludge management may also require predictable offtake agreements with relevant stakeholders. There may also be legal limitations on where the utility firm can dispose of wastewater sludge.

The Bangkok Metropolitan Administration has enacted by-laws requiring the installation of a wastewater treatment facility for new housing developments with more than 10 detached houses and for all industries and businesses. Septic sludge is treated in order to be used as fertiliser in the city's public parks, surrounding green areas and farmland. The administration also aims to produce compost with a mix of natural rice straw and the dewatered sludge from the 12 wastewater treatment plants, to be used as manure.[107]

Potential private-sector participation

Many of the necessary investments in resource efficiency can be provided through PPP-style contracts, whereby a private energy servicing company finances, constructs and operates the relevant installation in return for a performance-related remuneration.

In Aqaba, Jordan, the Aqaba Water Company has made large investments in sewers and wastewater treatment. Currently, 90 per cent of the city's wastewater is collected and treated, with 69 per cent of wastewater reused and 100 per cent of energy recovered. The capital investment is paid off by the sale of reclaimed water, under a PPP contract, to hotels and other commercial offtakers.[108]

There is also an important role for the private sector as offtakers of grey water and processed wastewater sludge. For example, selected companies may be interested in reusing treated wastewater for industrial purposes, and farmers or forestry companies may also wish to use wastewater sludge.

[107] See The International Water Association (2018).
[108] Ibid.

Implementation obstacles and possible solutions

Financial risks as well as legal and environmental uncertainties may prevent the pursuit of some of the solutions outlined above. To address such obstacles, it may be helpful to run comprehensive stakeholder engagement sessions. It may also be advisable to run adequate market testing to explore the opportunities for obtaining predictable and long-term offtake agreements with relevant stakeholders.

W4. Effective tariff reforms and price signals

Description

There is a legacy of subsidised water and wastewater tariffs in the EBRD regions – in particular for households. There is also a legacy of fixed monthly billing rather than consumption-based billing. Correct price signals are necessary to promote prudent water consumption – and tariff reforms remain a key challenge in many of the economies where the EBRD invests.

Good price signals require correct price-setting as well as good metering and billing mechanisms. Price-setting should reflect all costs of extracting, treating, transporting and disposing of water and wastewater. In water-scarce areas, water tariffs should go beyond covering production and distribution costs and also reflect the foregone benefits of farmers, for example, whose productivity losses may be higher than the regular water tariff.

In addition to an adequate price level, it is also important that tariffs are set and adjusted in a predictable manner. This is to make sure that related investments, made by businesses and others, can be undertaken without unnecessary risks of price volatility. To this end, the water tariffs should be developed using a formula-based methodology and approved by an independent and capable regulator. In the absence of a national water regulator, the city authorities can help set up or improve both the relevant methodology and a local regulatory authority.

Effective metering, billing and bill collection are also important to ensure true price signals for water use. Therefore, effective tariff reforms should include programmes aimed at installing or upgrading individual water meters whenever this is needed.

Resource implications and key requirements

Setting up the institutional capacity and operating a well-defined water tariff methodology is not too costly, but it may require strong political will to introduce tariff reforms that could be unpopular. What is costly, however, is the installation or upgrading of water meters. Installation of meters in private properties may also require access to the properties, and significant resources and cooperation with property owners will be needed to roll out new or improved water meters.

Implementation obstacles and solutions

Increased water tariffs will generally be unpopular and often difficult for low-income households to afford. The affordability problem should, however, be addressed through targeted support for the poor and not by providing subsidised water to the whole population. Installation of meters in private properties also requires access to the properties and cooperation with the property owners. To support this process, a combination of information campaigns, stakeholder consultation and price incentives to change metering arrangements would be recommended. A gradual adjustment in tariffs over several years may also be needed to obtain acceptance among the wider population.

W5. Awareness campaigns for households and industry

Description

Information campaigns at the household level can trigger behavioural changes in consumption. Different types of information can be communicated to promote water-saving initiatives and activities. This includes information about:

- devices for household appliances to monitor water use, such as for showers or washing machines
- technical advice that offers water-saving tips, for example, spending less time in the shower

- norm-based information communicating practical household experiences, as before-and-after examples, for instance
- benchmarking data, comparing the performance of a household against its neighbours
- informing residents of the potential impacts of localised drought and flooding.

This information can also be conveyed in different ways. Whereas providing information through public advertisement campaigns is one option, information can also be provided in combination with water-saving competitions or similar interactive ways of raising awareness. Attitude campaigns targeting children in schools and pre-schools, who then start 'policing' their parents, have also proven to be effective.

In Spain, the Zaragoza Water Saving City programme ran a broad media campaign, which was extended to schools. Discounts were offered on water-efficient products, and this initiated voluntary commitments by residents and businesses.[109] A "50 Good Practices" guide was also developed that provided businesses with a reference model for identifying effective methods of improving water efficiency.

Resource implications and key requirements

This policy option is a relatively low-cost and proactive approach compared to more reactive network investments. However, it requires substantial efforts to reach the majority of households, in particular, if children are to be convinced, and there should be an administrative commitment to the policy to generate long-term behavioural changes.

Potential private-sector participation

Public or private water utility firms may have an incentive to influence water consumption patterns – in particular, when infrastructure or water sources are stressed. Utility firms often provide awareness campaigns through external non-profit organisations and through school teachers when education campaigns target school children.

Implementation obstacles and solutions

A lack of municipal resources or committed city officials may prevent effective attitude campaigns from taking place. To overcome this problem, one solution may be to team up with local NGOs and schools in order to benefit from their resources and enthusiasm to promote public awareness and attitude campaigns, including for school children. Another ally could be the local water utility company, as it may have an incentive to influence water consumption patterns – in particular, when infrastructure or water sources are stressed.

3.5. Solid waste

The environmental objective of the waste management sector is first of all to ensure pollution control, preventing the diffusion of waste and pollution into soil and water, as well as the emission of GHGs into the atmosphere. This, in turn, protects and improves the environment, human health, nature and public spaces and further mitigates the risks of climate change. Second, the waste management sector also seeks to reduce landfilling while promoting value extraction and resource efficiency.

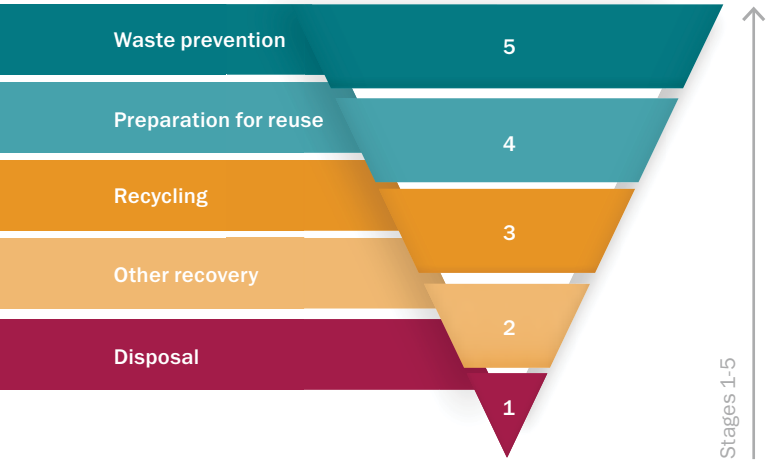
Pollution control (stage 1) can be achieved by ensuring proper collection and delivery of waste, to be disposed of at sanitary landfills, and further by the closure and decontamination of informal and non-compliant dumpsites. The reduction of landfilling and the promotion of value capture or resource efficiency can be realised by moving up the so-called waste hierarchy (see Figure 8), either through energy recovery (stage 2), recycling (3), reuse (4) or the reduction (5) of generated waste.

While the objectives may be clear, the waste sector is complex from a technical perspective, with multiple steps and processes required to take place for different waste streams in a carefully integrated manner. The sector is also complex from a policy perspective. Multiple formal and informal stakeholders and multiple laws seek to regulate, influence and operate within the sector. Regulations include, among

[109] See 2030 Water Resources Group (2013).

others, the application of land, air and water pollution directives as well as the obligations of national, regional and municipal authorities. Other factors include land planning and the obligations and rights of commercial and residential entities. The sector also relies heavily on the behaviour and buy-in of the public.

Figure 8. The waste hierarchy



Source: EBRD.

Poor waste management has been a widespread problem in most of the economies where the EBRD invests. Substandard planning, inadequate funding and limited know-how have led to poor performance and low environmental standards. Not only have poor planning and inadequate funding prevented the necessary investments and services from taking place, inadequate and unpredictable funding has also weakened accountability among the various operators and authorities in the sector. For example, an underpaid waste collection company will 'understandably' cut down on the collection frequency or coverage and thus not provide the agreed service level, making plans and targets less meaningful. Lastly, poor waste management services lead to a poor waste management culture and may hamper buy-in from residents and the relevant public and private institutions.

When seeking to improve the waste management sector, it is important to keep in mind that effective waste management is expensive, often comprising 20-50 per cent of municipal budgets.[110] Overall, it is not a profitable sector even after taking into account revenues from the sale of recyclables, refuse-derived fuels or energy. Therefore, adequate funding for both investments and operations must be in place at all times while improving the performance of the sector. In addition, due to the complexity of the sector, changes should be introduced incrementally, without oversized interventions, in line with the administrative capacity and with public support and willingness to contribute to an improved waste management system.

To help address the pollution challenges and gradually move up the waste hierarchy requires multiple technical and policy-related solutions – including policies that target good planning, adequate funding, effective accountability and effective change in attitudes among residents, businesses and public authorities. Some of the main policy options or building blocks are presented below, covering initiatives (i) to ensure effective governance and buy-in from various stakeholders and (ii) to move up the waste hierarchy.

Ensuring effective governance and buy-in:

1. Establishment of a waste management strategy, action plan and administrative capacity
2. Effective price signals and funding
3. Information strategies for residents and businesses
4. Formalisation of informal services

Moving up the waste hierarchy:

5. Improvement of waste collection
6. Waste sorting and treatment to encourage recycling and energy recovery
7. Promotion of sharing and reuse of products

[110] See World Bank (2019).

SW1. Establishment of a waste management strategy, action plan and administrative capacity

Description

In terms of waste management, an important first step is to develop a waste strategy and an action plan at the city level. If national or international (in other words, EU-level) waste strategy or policy and related institutions exist, this should be taken into account and strategies should be aligned. In the absence of national plans and regulation, local solutions can still be planned at the city level. Given the complexity of the waste sector, it is important that local waste strategies and action plans have holistic views in the pursuit of an integrated waste management structure, covering all the technical and practical steps. This includes the question of how to provide the infrastructure necessary to manage different waste streams, such as mixed municipal waste, recyclables, hazardous waste, construction and demolition waste, organic waste and medical waste. It further includes how to select collection or delivery solutions in terms of 'bring' systems or residential waste (kerbside) collection systems, bin types, volumes, collection frequencies and so on. If seeking to promote separation and collection of recyclables, careful planning is needed to make the process as convenient as possible for residents.

While a waste strategy may set up general objectives, responsibilities and resource implications, an action plan is more detailed and includes practical steps with details, targets and timelines for the implementation of different solutions. A waste plan should also clarify the capacity needed and responsibilities related to the provision of information, awareness campaigns and monitoring systems. Both the waste strategy and the action plan should cover all the formal processes of waste collection, transportation, treatment and final disposal – and may also include ways to better internalise the informal operators when relevant. An action plan should also articulate the roles of the public sector versus any private sector investments or operations. Moreover, as the sector seeks to move up its waste hierarchy, additional and more sophisticated efforts need to be planned, incentivised, coordinated and enforced.

At an early stage, it is important to build adequate capacity and know-how within the city administration in order to plan, operate, contract and monitor waste management activities. Considerable technical expertise is required to design a strategy or an action plan within the national context and based on local needs and conditions. Enforcement and reporting mechanisms are also necessary to ensure continued implementation and compliance. While some regulatory capacity and know-how can be provided by central authorities, the local administration should be expected to plan, secure financing, contract, supervise, monitor and enforce the waste management activities in the city.

Resource implications and key requirements

While the planning itself does not require significant financial or human resources, it needs sufficient know-how, which initially may need to come from the central government or other external knowledge providers. As the planning process evolves and the implementation and the related investments and operations start, the resources needed for a competent management and governance of the sector grow. For example, in Ljubljana in Slovenia, the public waste management company Snaga Ljubljana has been working on planning and administrating the process for 10 years in order to move the sector towards EU compliance – in other words, full collection, disposal in sanitary landfills and the closure of non-compliant dumpsites.[111] In September 2014, Ljubljana became the first European capital to commit to becoming a zero-waste city.[112]

Potential private-sector participation

Planning and regulation should be led by public institutions and relevant authorities. However, where there is a clear lack of know-how, private knowledge providers may be helpful when developing strategies and action plans for a city's waste management sector. To this end, numerous international consultancy firms offer specialist services related to

[111] See Zero Waste Europe (n.d.)
[112] See European Commission (2019).

the development of waste management strategies that comply with international standards.

Implementation obstacles and solutions

The implementation of an ambitious waste management strategy and action plan entails a number of challenges. Significant resistance can be expected from existing and well-connected operators providing suboptimal services. Informal waste management activities may lose out, with political and social implications, and adequate buy-in and commitment from the public may be difficult to achieve. Implementation therefore requires strong political commitment and support, combined with comprehensive awareness campaigns and education. In addition, as a city seeks to move up the waste hierarchy, it requires an ever-wider spectrum of stakeholder engagement. For example, moving up the waste hierarchy may involve stronger commitment to waste-sorting at source by residents, more standardised use of materials by producers or a sector-wide commitment to introducing nationwide deposit schemes for cans and bottles. It may also require changing the awareness and behaviour of citizens and the establishment of permanent communication and education about source-separation of recyclables and various forms of waste reduction. This work creates an understanding of the entire lifecycle of products as well as the feasibility of recycling and the repair of products. While these steps higher up in the waste hierarchy are ambitious measures, one may look at the way Tirana introduced compulsory payments for plastic bags provided by local shops. Alternatively, one can look at cities such as Parma in northern Italy or Ljubljana in Slovenia, where significant improvements have taken place on the back of a mix of policy measures.[113]

SW2. Effective price signals and funding

Description

Adequate pricing of waste-related activities can positively influence behaviour (in other words, lead to a reduction of waste) and ensure more sustainable funding of the sector. Cities have various possible pricing mechanisms and measures at their disposal that are outlined below.

Fist, city authorities can introduce pricing (pay-as-you-throw) on the waste delivered by – or collected from – households, businesses and industry. Pay-as-you-throw schemes can be set up for businesses and households as a charge for waste bags for different waste streams. However, with the exception of the most law-abiding and well-monitored societies, this solution can easily trigger illegal waste dumping and a fixed cost-reflective fee for municipal waste collection is normally a more feasible funding scheme.

Second, the city can normally set tipping fees at the landfill. To help reduce landfilling and to incentivise waste sorting at source, differentiated gate fees for sorted and mixed waste at the landfill can be introduced. This requires weight-based tipping fees and increased control.

Third, cities can introduce pricing requirements and subsidies on certain products, such as disposable and reusable grocery shopping bags, and they can promote the introduction of deposit return schemes for products such as beverage containers. In San Francisco, the checkout bag ordinance that was extended to cover all retail stores in 2012 and all food establishments in 2013 has led to a 72 per cent reduction in plastic bag use since 2010.[114]

Lastly, another pricing mechanism incentivising recycling is the introduction of deposit return schemes for products such as beverage containers. This can be introduced for selected outdoor bars or it can include the setting-up of machine-based schemes where individuals are rewarded for returning beverage containers, for example, in the case of the Veolia-linked pilot in London.[115] Moreover, while not a direct charging mechanism, cities can install and inform their residents about public drinking-water taps as a free alternative to buying new plastic water bottles.

Resource implication and requirement

A pay-as-you-throw scheme requires significant administrative and operational resources as well as substantial monitoring and enforcement efforts.

[113] See Pietzsch et al. (2017).
[114] See SF Environment (2019).
[115] See White (2019).

It also requires a relatively law-abiding culture – otherwise this approach may lead to unmanageable levels of illegal dumping.

Cost-reflective tipping fees do not require excessive investments or operating costs. However, differentiated gate fees for different waste streams will require some additional control and penalty procedures.

The introduction of payment for disposable products, such as grocery plastic bags, does not imply large costs for a city administration, but substantial efforts linked to public communication are likely.

Potential private-sector participation

Introducing payments or deposit return schemes for certain disposable products requires close cooperation with the private sector. For instance, in Scotland, neither the Scottish government nor Zero Waste Scotland will run the scheme. That is the job of the scheme administrator(s), which is expected to be an industry-led, privately owned and not-for-profit private-sector enterprise. Typically, the administrator(s) of the scheme will be responsible for its day-to-day management. In the case of Scotland, the Deposit Return Scheme for bottles and cans creates new obligations for drinks producers and most of them are likely to nominate a scheme administrator to fulfil these on their behalf.[116] The service will be funded partly by small fees paid by producers, with the size of those fees based on the number of drinks containers that producers put on the market. For retailers and hospitality firms, who will collect returned cans and empty bottles, their main contact will be the scheme administrator. For deposits that firms (the `return points') refund, the administrator will provide reimbursement and pay the handling fee.

"Introducing payments or deposit return schemes for certain disposable products requires close cooperation with the private sector."

Implementation obstacles and solutions

Requesting payment and fees for something that used to be free of charge is never popular. However, comprehensive awareness-raising campaigns in cooperation with affected business communities and relevant NGOs can ensure acceptance and buy-in from the relevant population and businesses.

SW3. Information strategies for residents and businesses

Description

Waste prevention depends on a shift in the attitudes and behaviour of residents and businesses. This can be encouraged through various informational measures. Drawing public attention to waste prevention is a fundamental step in nudging behavioural change towards more sustainable consumption and waste management practices. Such informational strategies aim to change consumer behaviour, encouraging informed decisions on reducing waste generation and improved separate collection of different waste streams. This can lead to a number of benefits, including reductions in GHG emissions, environmental pollution and the use of materials. Moreover, waste prevention leads to cost reduction as collection and transport costs, landfill volume and clean-up costs are all lower.

In addition, it is important to inform the public how the current systems work, or how source-separation works, and to communicate the city's plans and achievements. For instance, a new sanitary landfill will lead to tariff increases, but only a few neighbours might see improvements – thus, the city needs to communicate this, too, in order to improve acceptance of increased tariffs.

A number of information strategies can be used, including awareness campaigns, information on waste prevention techniques, training programmes for local authorities and eco-labelling. Effective awareness campaigns often focus on a specific waste stream

[116] See Zero Waste Scotland (2020).

and provide easy-to-follow practical advice on waste-prevention actions. Campaigns may choose to focus on visible actions, such as the use of canvas bags instead of plastic bags, the implementation of home composting, the use of no-junk-mail stickers and the repair and recycling of clothing.[117] Specific methods for information dissemination include online information portals geared towards consumers, online tools facilitating the calculation and tracking of data on waste and the development of waste prevention plans.

Resource implications and key requirements

Education campaigns can be administratively demanding due to the need to provide information on waste prevention techniques for specific users, such as households, businesses and organisations. In addition, the campaigns demand substantial budgetary resources, with leading waste authorities in Europe having invested significant resources into awareness generation, of at least €5 per resident.[118] For this reason, it is important that the financing of campaigns is stable. At the same time, waste prevention also saves a city money – for instance, if food waste is recycled instead of disposed of in a landfill – and awareness campaigns could therefore have a positive effect on a city's budget. Campaigns can be tailor-made for specific waste streams and target groups, using different media.

Potential private-sector participation

Although campaigns are often conducted at the national level, several cities have also been proactive in launching their own campaigns. While the private sector is rarely involved, it is common for awareness campaigns to be provided through external non-profit organisations, and through school teachers when education campaigns target school children. A specific measure for awareness-raising is the establishment of a network of waste advisers. These are volunteers or employees trained in waste prevention and management who support residents in reducing and correctly separating at source the waste generated in households. Leading waste organisations in Europe have put in place one waste adviser per 20,000 residents.

Implementation obstacles and solutions

It is important that messages are tailor-made for well-defined target audiences and delivered consistently through a range of complementary measures. Other success factors include cooperation between the local authority and the stakeholders involved in providing the campaign, such as waste charities, school teachers and waste advisers. The quality of preparation and implementation of the campaign is important and can be based on previous studies and recommendations from stakeholders. Campaign continuity and well-developed materials are equally important for a successful campaign, as well as recognition of the campaign at the national level.[119] It is also crucial to monitor the impact of particular campaigns on key performance indicators.

Successful examples of campaigns in the UK targeted towards consumers include the Love Food Hate Waste campaign, the Recycle Now campaign, the Love Your Clothes campaign and the Real Nappies campaign. Examples in other countries include campaigns for tap water instead of bottled water in Portugal and Italy and the Stop Pub campaign in France. Furthermore, Vienna is promoting lifestyles geared towards services and culture rather than products. Successful examples of informational tools include Eunaofaçolixo.com in Portugal, which suggests waste prevention techniques for different types of household room, the WRAP Waste Prevention toolkit and WasteCap, a non-profit network in the USA.

Comparison with other policy options

Information strategies are a necessary step towards inducing behaviour change and therefore any waste prevention policy will implicitly require information strategies. Awareness campaigns must be delivered in conjunction with the right tools to support organisations in managing their waste, together with an efficient separate waste-collection system and promotional measures for waste reuse and repair.

[117] See European Commission Directorate – General Environment (2012).
[118] See Dri et al. (2018).
[119] See Regions4recycling (2014).

SW4. Formalisation of informal waste collectors

Description

Many economies in the EBRD regions are affected by a number of financial, technical and efficiency-related problems in their waste sector that have caused poor waste management practices and sometimes a lack of any formal practices. This situation has led individuals, groups and micro-enterprises to perform informal collection and recycling, generating income through collection fees and by selling the extracted valuable materials. Informal workers perform their activities under inadequate and uncontrolled conditions, putting themselves at risk of occupational injury and disease.[120] Their work is further characterised by low entry barriers, low organisation levels and irregular income.

The integration of the informal sector into formal solid waste management systems can help reduce overall system costs, support the local industry by providing low-cost materials and create new jobs. Furthermore, it can reduce negative environmental and climate impacts from solid waste management through improved resource recovery and reduced disposal. Lastly, it can help to generate income and improve working conditions for poor populations who often lack other economic opportunities.

Recognising the role of the informal waste sector, several governments have implemented various formalisation measures to address the social problems linked to the sector. There are three main types of approaches to the formal and legal recognition of informal waste collectors:

(i) Formalisation based on organising informal waste workers in associations and cooperatives, which establish contracts or cooperation agreements for performing waste collection and recycling services. The sustainability of such models can be ensured through waste policy and regulation changes proposing a combination of sources of revenue.

(ii) Formalisation based on organising recyclers in community-based organisations or micro and small enterprises. These are mostly covered by waste collection fees paid by users and from selling recycled materials. The role of the municipality is minor in such cases, mostly supporting through awareness-raising and equipment provision.

(iii) Formalisation based on integrating recyclers as workers for the formal waste management sector, by recruiting them to perform collection or recycling at facilities.

Several factors are critical for the successful integration of the informal sector, including deploying a mix of approaches and establishing stable organisational structures. Cooperatives, small enterprises and networks in numerous countries show that these organisations were the first step to get informal workers out of social marginalisation, improving their economic efficiency and thus their position in the economic value chain. They also made partnerships with municipalities and other stakeholders possible.[121]

Resource implications and key requirements

The integration of the informal waste sector demands substantial administrative resources to coordinate their formalisation into a formal sector or through associations and community organisations.

Potential private-sector participation

Partnerships in the private sector, between formal and informal actors, become more and more important. Many private enterprises perceive the opportunities stemming from the use of waste as a (material or energy) resource and recognise that partnerships with the informal sector can improve the value chains related to sourcing materials from waste. The private sector can, for instance, be responsible for providing training and empowerment of waste workers as well as implementing occupational safety practices. Furthermore, it can also help assess and document the waste management system and expand the capital base of the sector. And lastly, the private sector may need to be involved to formally recruit informal waste collectors.

[120] See Wilson et al. (2006).
[121] See GIZ (2012).

Implementation obstacles and solutions

Not all attempts at formalisation have been successful, due to the existence of barriers which have prevented the implementation of such attempts as well as a lack of understanding of these barriers and the measures that may enable formalisation.[122] For instance, formalisation reduces waste pickers' ability to enter and exit the waste management economy, and research shows that waste pickers value that flexibility. Hence, formalisation efforts by government have often been unsuccessful, exposing the limitations of the government's ability to regulate and monitor the actions of those in the sector.[123] Governments should therefore seek to provide economic support through financial incentives, diversification of services and appropriate payment schemes. The formation of partnerships and stakeholder involvement are key and can involve the formation of cooperatives and associations. Funding should also be provided for waste infrastructure to provide adequate sorting and storage spaces. It is also best practice to train and empower informal workers and include them in formalised waste activities.

For instance, the city of Cairo pursued a policy of the privatisation of municipal solid waste collection as part of various World Bank initiatives to improve the conditions in the city. However, this has been seen as threatening the sustainability of garbage collectors' communities as well as new claims on and the commodification of Cairo's waste materials, to the detriment of effective collection.[124]

Integration of informal workers into the formal sector has been successfully used in Austria and Hungary as the preferred option. Recent waste policies and legal frameworks of countries such as Brazil and Peru have included recycling associations and cooperatives in separate collection and recycling programmes. Colombia has introduced a 3R (reduce, reuse, recycle) waste hierarchy and enabled the participation of marginalised groups in a bidding process. Countries such as India and the Philippines have also recognised the need to involve informal waste collectors.

SW5. Improvement of waste collection services

Description

Three components are needed to rectify a poor waste collection system: (i) infrastructure or equipment, (ii) good collection services, and (iii) adequate contribution by waste generators – in other words, households, institutions and businesses. Furthermore, in the economies where the EBRD invests, there is often no full 'collection service coverage rate', meaning that not all households have access to frequent waste collection services. Hence, typically, in addition to replacing worn-out collection infrastructure, cities also seek to extend collection services to the whole city.

Infrastructure investments (in other words, bins, containers, collection points, vehicles and perhaps transfer stations) and related maintenance will have to be well planned and financed, and cover collection systems for different waste streams. For instance, container-based 'bring' systems can be used for construction and demolition waste, whereas residential waste (kerbside) collection systems are feasible for municipal waste with clearly defined bin types, volumes, collection frequencies and so on. Adequate maintenance also includes cleaning, repair and replacement of broken equipment, for which responsibilities must be clearly defined.

A good collection service implies adequate coverage of all locations and adequate frequency and capacity as well as the provision of collection services in a predictable and resource-efficient manner.

Effective waste collection systems rely on sufficient contributions from households, institutions, businesses and industry. Different waste streams must be delivered as planned, placed in the right containers and bins, which must be made easily available and looked after. In order to ensure that residents and other stakeholders are committed and contribute to the collection process, effective information and attitude campaigns may be needed. Such campaigns can be pursued through a combination of different forms, but one effective way is

[122] See Aparcana (2017).
[123] See Linder (2019).
[124] See Fahmi and Sutton (2010).

to educate children through schools and kindergartens, who later 'police' their parents and carers.

Resource implications and key requirements

Waste collection services are costly as they imply capital costs for equipment and vehicles, and significant operating costs for fuel and operating staff.

The logistics and efforts needed to put in place adequate infrastructure can be substantial, depending on how radical the changes to the collection system are. Sometimes, it can mean bins, containers and new or additional collection vehicles only. At other times, it may also include the acquisition or construction of new collection points and transfer stations to streamline some of the processes. For example, Ljubljana invested €421,291 in its door-to-door system to be able to provide bins and vehicles servicing an urban population of 400,000 in the municipality of Ljubljana and 10 bordering municipalities. The annual running costs for the door-to-door system were estimated to be €98.4 per tonne.[125]

Potential private-sector participation

Private collection companies contracted through international competitive tenders can provide useful expertise and cost-efficient waste collection solutions. Private contracts can also help introduce better contractual arrangements and help depoliticise and professionalise the collection services, with clearly defined rights, obligations, processes, performance targets and incentive-based revenues. By requiring private collection companies to undertake awareness and attitude campaigns, incentives are further aligned, given that successful attitude campaigns and increased buy-in from inhabitants will benefit the collection company. Some of the financing for vehicles and other equipment can also be provided by private collection companies, although this does not bring down the overall costs for the waste collection services. There may be benefits to splitting a city into more than one collection area or contract for comparative and competitive reasons. Private collection contracts should cover multiple years (five or more) in order for companies to be considered creditworthy and to benefit from their awareness and attitude campaigns.

Implementation obstacles and solutions

Significant resistance can be expected from existing and well-connected operators providing suboptimal collection services. Informal waste collection activities may also lose out, with political and social implications. There may also be significant objections from residents and businesses, groups that may have to change their efforts and pay a higher waste collection fee in order to make a new collection system work. Therefore, strong political commitment combined with comprehensive awareness campaigns, education and a wide spectrum of stakeholder engagement are necessary. By aligning incentives for private collection companies to also undertake awareness-raising campaigns, the effort required to improve commitment and buy-in from various stakeholders will be increased.

SW6. Waste sorting and treatment to encourage recycling and energy recovery

Description

Important steps to reduce landfilling include sorting and treatment of waste. These are also necessary steps to capture economic value from produced waste. Waste sorting is a prerequisite for specialised disposal of hazardous waste and for recycling. It is also the first step of treatment processes aiming to convert waste into fuel for energy purposes.

Waste can be sorted after its arrival at a landfill, a transfer station or a waste treatment plant. However, waste sorting has proven to be most cost efficient when it is combined with pre-sorting at source by households and businesses – for example, through kerbside collection schemes or recycling yards with multiple bins for recyclables and other waste streams such as paper, glass, metal, garden waste, food waste and residual waste. However, it should be noted that waste sorting, aimed at promoting recycling, is only economically justified when the general waste stream is sufficiently rich in recyclables. As a general rule, the share of recyclables in the general waste stream tends to increase in line with GDP per capita.

[125] See European Commission (2014).

Further treatment of non-recycled waste includes the biological treatment of residual waste or anaerobic digestion of food waste. Both treatment processes require large investments and aim to convert waste into refuse-derived fuel (RDF). As recyclables and RDFs are sold through pre-agreed contracts or through relevant markets, it is important to secure reliable access to such markets and contracts prior to large investments in sorting and treatment solutions.

Resource implications and key requirements

Separation of waste is costly. Pre-sorting of waste at source implies additional costs for equipment and vehicles able to deal with pre-sorted material. It also implies additional capital, energy and staff costs linked to the extra mechanical or manual sorting processes. As a general rule, one can assume that recycling of household segregated waste is almost never a profitable activity despite the revenues from the sale of recyclables. However, recovering recyclables from industry and institutions is easier to operate and less costly and may generate profit for the operators.

Waste treatment facilities are large investments and require predictable waste streams and offtake agreements for many years.

Potential private-sector participation

Experienced private collection companies contracted through international competitive tenders can provide useful expertise and cost-efficient waste sorting and collection solutions. Private contracts can also help introduce better contractual arrangements and depoliticise and professionalise collection services, with clearly defined rights, obligations, processes, performance targets and incentive-based revenues. Requiring private collection companies to undertake awareness and attitude campaigns can be a way to further align the incentives – as successful attitude campaigns and increased buy-in from residents and businesses benefit the collection company. Some of the financing for vehicles and other equipment can also be provided by private collection firms, although this will not bring down the overall costs of waste sorting and collection. Private contracts for the promotion and collection of pre-sorted waste should cover multiple years (five or more) in order for companies to be considered creditworthy and to benefit from their information and attitude campaigns.

The financing, construction and operation of waste treatment plants have proven to be done effectively by private contractors through PPP-style arrangements. However, risk mitigation through long-term agreements covering waste delivery and offtake of refuse-derived fuel plays an important role.

Implementation obstacles and solutions

Formalised waste separation at source may come into conflict with informal waste collection activities and may have political and social implications. Waste sorting may also be met with objections from

residents and businesses, who may have to change their behaviour and potentially encounter higher collection fees. To address this, targeted awareness campaigns, comprehensive stakeholder engagement and strong political commitment are necessary. By incentivising private collection companies to also undertake awareness-raising campaigns one may accelerate the effort needed to improve sorting and the overall buy-in from various stakeholders.

Unintended effects

Waste-to-energy solutions can come into conflict with efforts aimed at recycling or waste minimisation, as large investment in waste treatment facilities requires large volumes of waste, preferably with a high calorific value sometimes found in recyclables. EU directives are increasingly ambitious in terms of recycling and waste minimisation and it is important that waste-to-energy solutions are aligned with these targets for all EU and EU candidate countries.

SW7. Promotion of sharing and reuse of products

Description

The sharing and reuse of products can also cut down the overall use of resources as these are cost-effective ways to reduce waste generation and landfilling. This approach can provide a number of benefits, including reductions in environmental pollution, material consumption and the need for additional landfills. It can also provide employment opportunities in secondary markets and increase societal cohesion through the promotion of a sharing culture. In addition to environmental benefits, sharing can create a sense of community among strangers, thus facilitating trust and social inclusion. It can also supplement supply in periods of peak demand: for instance, a tourist location can benefit from a sharing platform through which multiple owners make accommodation available during peak season, rather than turning to additional construction.[126]

These approaches include both sharing among individuals and communities as well as among city governments. In the former category, the sharing economy has entered nearly all urban spheres and includes solutions related to mobility and transport (for example, Uber and Zipcar), spaces (for example, Airbnb and WeWork), skills and talent (for example, Upwork and Fiverr), financing (for example, Zopa and Kickstarter), health (for example, CrowdMed), utilities (for example, Gridmates and Vandebron), food (for example, VizEat) and learning (for example, Coursera). With regard to the latter category, cities can also leverage the potential of the sharing economy, in municipal goods, municipal spaces, civic assets, municipal services and the skills and talent of city residents. An example related to municipal services is the Intermunicipal Collaboration Framework in Alberta, Canada.[127]

[126] See World Economic Forum (2017).
[127] See Government of Alberta (2020).

Policies supporting these sharing approaches both among individuals and among city administrations include the provision of physical and IT-based infrastructure that is necessary for product sharing and for second-hand markets to take place. Policies also include initiatives aimed at raising awareness and changing people's mindsets. Today, various city governments have institutionalised sharing practices through innovation offices (Seoul and Amsterdam), working groups (Vienna), a task force (Denver) or similar institutions dedicated to advocacy, awareness and furthering the agenda of sharing in cities.

Resource implications and key requirements

Reuse and sharing of products are primarily a result of market-based solutions, which may need only modest provision of interventions or resources by the city authorities. For example, a sharing-based economy is increasingly being promoted in some areas, such as through car and bike-sharing schemes, on the back of increased digitalisation and the development of user-friendly apps where the private sector plays a key role. Moreover, it is possible to further increase the awareness and popularity of second-hand products through the involvement of NGOs, community-based initiatives and the availability of infrastructure-facilitating second-hand markets.

This is also a field of resource efficiency, and waste minimisation and promotional measures can place a substantial administrative burden on the local administration, which would need to engage with various stakeholders to coordinate promotional action. Depending on the nature of the promotional strategies, the measures may also necessitate significant financial and technical resources.

Potential private-sector participation

As outlined above, solutions related to the reuse of products are primarily driven by the private sector or charities. City governments can also take on a combination of roles, depending on the socioeconomic environment in the city. An example is the Sharing City Seoul project, which is being implemented based on cooperation between the private and public sectors, steered by the Sharing Promotion Committee. The initiative has certified 50 sharing projects that provide people with an alternative to owning things they rarely use and has given grants to a number of these projects.

Implementation obstacles and solutions

People's mindset may be the biggest obstacle to the development of an economy based on more sharing and reuse of products. Identity is often linked to the products (for example, cars) a person owns and second-hand products may be viewed as something for the poor. A gradual process, supported by community-based and city-supported awareness campaigns, may be the most effective way forward.

In Belgium, Ghent's Foodsavers platform, operated by the city, brings together food leftovers from the wholesale market and local retailers and redistributes them to food banks, social restaurants and social supermarkets. Another successful initiative is the Restorestje, a local version of a leftover container. It is distributed to restaurants for free in order to encourage them to use it. Campaigns have managed to change people's behaviour and encouraged them to take their leftovers home.[128]

In general, not all aspects of sharing-economy models are positive. Cities have faced challenges in creating policy and regulatory frameworks, protecting consumers, avoiding unfair competition, modernising outdated taxation laws and assuring social equality. For instance, while sharing can bring social and environmental benefits, sharing models can also result in excess supply. One example of this is in China, where companies like MoBike (bike-sharing) have created a surplus of bikes at rental stations, rather than improving the use of existing assets, in the belief that a large inventory will help them to dominate an extremely competitive market.

It is therefore crucial for cities to establish trust and reputation in sharing platforms, ensure the safety and security of data and people and be cautious about social inequalities that can potentially be caused by the sharing economy.

[128] See RUAF Foundation (n.d.).

04

Cross-cutting policy options ↘

Cross-cutting policy options ↘

Strong institutional structures and reliable financial mechanisms are required for cities to pursue their green agendas effectively.

Local governments often struggle to undertake environmental action due to several constraints, including limited political power, low levels of institutional capacity, low levels of stakeholder integration, low levels of multi-level government cooperation, limited fiscal power, poor financial management and lack of access to finance.[129] Cities need strong institutional environments that allow their local governments to function more efficiently, flexibly and competitively to achieve an ambitious green city agenda.

Local governments around the world are also increasingly responsible for providing and coordinating services across the sectors of transport, energy, buildings, waste, water and land use. These require heavy infrastructure investment and may have substantial administrative and budgetary implications. Local governments are also responsible for managing social sectors such as health, education and public safety, which have significant operating costs.[130] It is therefore important for local governments to explore the ways in which they can improve their governance and financial responsibility.

While the policy options presented in this chapter may not target green objectives directly, they are critical for enabling cities to pursue their green agendas in a sustainable and efficient manner. The continuous improvement of the institutional environment of cities can make policy implementation more effective, enabling the transition to prosperous cities in which sustainability is integrated into the different facets of public- and private-sector decision-making. A strong institutional environment comprises aspects such as (i) the devolution of powers to local governments, (ii) sufficient multi-level government coordination, (iii) capacity and expertise of all actors so they can play their roles effectively, (iv) participation of relevant stakeholders, including residents and representatives from various groups (women, young people, the elderly, migrants, people with disabilities, and so on), (v) financial transfers from central government and (vi) accountable management and transparent use of public resources. The enabling environment may be divided into two cross-cutting policy areas, namely governance and finance.

4.1. Governance

Economies and cities in the EBRD regions have a legacy of poor governance, which was further exacerbated after the poorly planned decentralisation that followed the collapse of centrally planned regimes. City governments in these regions tend to lack strong administrative authority, political autonomy, skills, resources, technologies and capacity to play an active role in city planning, management and development. This has led to a limited ability to coordinate public infrastructure and service provision at the local level, as well as to weak procedures,

[129] See Sustainable Development Solutions Network (2016).
[130] See UN-Habitat (2009).

a culture of insufficient observation and the criticism of city governments by the public.

Local governments may explore the following selection of policy options, perhaps in combination with each other as a policy mix:

1. Political and fiscal decentralisation
2. Improved transparency and accountability
3. Enhanced integration across government bodies
4. Effective stakeholder participation
5. Capacity-building.

These can bring a number of benefits beyond environmental improvements, including better social cohesion and inclusion, improved political involvement and a stronger ability to successfully change behaviours, with a long-term view to generating sustainable development.

G1. Political and fiscal decentralisation

Description

Empowered local governments have been shown to have a positive impact on the provision of public services and quality of life.[131] The major benefits of decentralised decisions include (i) a more targeted or tailored supply of public services and infrastructure in response to local demand, which should lead to (ii) a more cost-efficient use of public expenditure and may (iii) increase cost-recovery funding from residents who are more willing to pay for adequate services. Decentralisation can also (iv) promote accountability and reduce corruption due to proximity to the population, which may be more aware of local governments' actions than those of the central government.

However, if poorly implemented, decentralisation may result in inefficiencies and corruption, and further disillusionment with the government. Therefore, for the abovementioned benefits to materialise, it is important that (a) decisions (and not only operational obligations) are transferred to local authorities; (b) local authorities have sufficient financial and institutional capacity and procedures in place; and (c) the decentralisation promotes engagement and enables people to hold institutions to account for delivering policies in a transparent way.

The transfer of political or decision-making powers (point (a) above) would primarily be a central government choice. The same is true for the decision to transfer parts of the central budget or collected taxes to local authorities in order to improve their fiscal capacity (point b). However, ensuring adequate funding is also a task for the local authorities and so is the building of institutional capacity and procedures. These enable good governance to promote the population's ability to engage with and hold institutions to account for delivering policies in a transparent way (point c). For example, in terms of fundraising, decentralised governments may be responsible for raising their own revenue and setting their own taxes. That should further improve accountability and responsibility at a local level. There is also evidence that taxes are easier to collect when people can see that they are being used for local purposes.[132] Beyond setting local business, personal or property taxes, local revenues can also come from increased fees for licences or permits, or from higher tariffs for utility services. These options are discussed further under the policy area for local financing (see Section F1).

Resource implications and key requirements

Key requirements for effective decentralisation include central government support and a meaningful local democracy that can inform the local decision-makers and hold them accountable for delivering policies. It is also instrumental to have adequate capacity and procedures in place before any transfer of political and fiscal powers, in order to minimise uncertainties and confusion during the decentralisation process. Significant resources are needed to ensure adequate institutional capacity and

[131] See Bilbao (2015).
[132] McKinsey & Company (2013).

procedures – and further resources will be needed to ensure people's engagement to further deliver results. For instance, in Poland, the reform of public administration demanded effective legislative and operational work, monitoring of the implementation, evaluation of the effects of the reforms and engagement with civil society and local residents about the reform.[133]

Implementation obstacles and solutions

A decentralisation process may meet opposition at central and local levels. Central authorities may be reluctant to give away powers and may be concerned about the ability of local authorities to assume new responsibilities and powers. Local authorities also may be reluctant to take on responsibilities and powers that they are not familiar with. In both cases, it may be argued that uncertainty and limited capacity are the key sources of the problem. While limited capacity can be addressed through capacity-building programmes, uncertainties for both central and local stakeholders can be mitigated by a gradual transfer of powers, for example, first transferring a prescribed service delivery before greater powers to define and organise service obligations and later giving extended local powers to plan, invest and finance local infrastructure and related services. Uncertainties can also be mitigated through a careful sequencing of capacity-building and the promotion of local stakeholders' understanding of tasks and processes before powers are decentralised. Close cooperation and the transfer of skills between central and local authorities are also important to mitigate uncertainties and risks during the transfer process.

Lastly, while decentralisation can help strengthen accountability and improve performance and decisions by bringing government closer to people, it can also present risks of corruption and poor performance. Local officials may have greater vested interests based on family, friendship and business ties that can influence decision-making, and local institutions designed to hold local public officials to account are not always adequate.

G2. Improved transparency and accountability

Description

When transparency and accountability are put at the heart of local governance systems, the risk of corruption is reduced and incentives to perform well can be strengthened. Central authorities can promote accountability incentives through a top-down approach. However, transparency and accountability should also be promoted through a bottom-up approach where residents can participate in and influence city policy design and implementation, as well as hold local officials to account for their decisions and the performance of local institutions.

Transparency can be promoted through mutually reinforcing strategies that include (i) ensuring access to information, (ii) enhancing ethics, professionalism and integrity, and (iii) conducting regular assessment and monitoring.

A well-organised record management system that contains accurate and easily accessible information about municipal rules, decisions, plans, public spending and financial management can be developed, and it is advisable to disclose documents of general interest through user-friendly reports and online presentations. Information should cover rules and procedures related to the hiring and administration of staff, calls for tenders, procurement and monitoring of contract execution. Further information relates to how the law requires that local governments be subject to regular and independent financial and organisational audits within a specific timeframe. E-government is a commonly used tool for local governments to disseminate information and interact with their citizens.

Moreover, the transparency of a local government is contingent on the strength of its legal infrastructure, which regulates the behaviour of city officials and promotes ethics and integrity. Such legal infrastructure may include laws on conflict of interest, on disclosure of income and assets, and on whistleblower protection and transparent procurement. In addition to legal measures, a municipal code of ethics could be established, thoroughly communicated with city

[133] See Kulesza (n.d.).

officials and effectively implemented. Municipalities should also consider designating an independent agency that has the authority to interpret and enforce the code.

As for assessment and monitoring, the key objective is to inform the public about the activities and performance of the local government and its departments. In order to incentivise good performance, the government should conduct annual public reporting about municipal services. These services should be measured against agreed targets and against the performance levels of previous years. Other useful tools for assessment and monitoring include the Municipal Checklist, the Urban Corruption Survey and Report Cards, developed jointly by Transparency International and UN-Habitat.[134]

In order to further bolster accountability, well-resourced institutions designed to ensure adequate structures for checks and balances should be promoted and civic oversight and control should be encouraged. One way to promote better accountability within municipal operations is to transform municipal services, such as water supply, district heating or public transport into separate legal and commercial companies. Such public companies can then be further governed by a well-defined public service contract to be signed between the municipality and the municipal company. A public service contract refers here to a contract that sets out rights and obligations for both parties, including performance targets, planning processes and procedures for approval of revenues and tariff adjustments. It also sets out the role of the municipality and limits on its ability to interfere in operational decisions. The objective of such contracts is to ensure transparency, predictability and accountability for both sides.

Another institutional innovation to improve accountability is the complaints and ombudsman's office, which allows people to address their grievances and complaints about government bureaucracies. This option is additional to existing channels such as the judiciary or internal complaints procedures. The ombudsman is an independent organisation that receives and investigates allegations of maladministration. The office of the Northern Ireland

Ombudsman, for example, deals with complaints from people who claim injustice due to maladministration. The Ombudsman is entirely independent of the Northern Ireland Assembly and the Northern Ireland Executive. All complaints are treated in confidence and the services are provided to citizens free of charge.

Resource implications and key requirements

The improvement of transparency and accountability requires substantial administrative capacity as well as some financial and technical resources. However, it also enables cities to make efficiency gains once processes are in place. For example, Vienna introduced an information management system as part of the initiative Smart City Wien that was also used for effective public disclosure of performance monitoring. The success of the programme was facilitated by its integration within the city's overall planning framework and by giving the entire municipal authority access to the system.[135] For tools like e-Government to have a meaningful impact, computer literacy should be reasonably widespread and access to the internet for local residents must be ensured.

Implementation obstacles and solutions

People and institutions may oppose significant transparency as it is more comfortable to not be held to account. The publicised data may also be perceived as unreliable, which again may hamper the benefits of a transparency initiative. Part of the problem is

[134] See Transparency International and UN-Habitat (2004).
[135] See Department MA 18 – Urban Development and Planning (2018).

connected to trust. This relates both to trust among the data providers that accurate reporting will not lead to harsh penalties or public outcry and no reward, and trust among the data consumers that the reported information is correct or intended to be correct.

In such cases, it may be necessary to introduce transparent reporting gradually. One example of this is the water sector in a country in south-eastern Europe. Here, the central government initiated compulsory performance reporting and benchmarking for the water utilities. This initiative failed as the water utilities misreported performance levels in fear of being penalised for any reported underperformance. Following this failure, a voluntary performance benchmarking initiative was initiated among the leading water utility firms. Performance data was collected and shared during workshops, but the identity of the utilities reporting their performance levels was hidden behind a number (for example, utility number 1, number 2, number 3). Following some successful workshops, the firms no longer saw the need to hide their identities and were happy to replace the numbers with the real utility names. Later, fear of the central government and the sector regulator also vanished and these institutions were invited to participate in performance benchmarking workshops and to see the accurately reported data that the central government had not been able to obtain in the first attempt.

G3. Enhanced integration across government bodies

Description

The enabling environment for city governments is influenced by multiple levels of governance. Integration in government refers to the coordination between multiple departments or public-sector organisations in providing a public service or programme. Such integration is essential to develop a shared long-term vision for economic development across government bodies and sectors and to ensure effective delivery of public services. Collaboration has a number of benefits, including the provision of more comprehensive services at the local level, promotion of joint cultural and economic development, strengthened relationships between local and national governments, improved local governance through modelling and information exchange, opportunities for integrated planning, increased access to a skills, knowledge and services, better use of available technology and better use of capital and other assets.[136]

An integrated approach to urban planning emphasises the social, economic and environmental dimensions of sustainable development, by:

(i) aligning vertical development priorities across different levels of government

(ii) encouraging horizontal coordination between departments and public-sector institutions

(iii) promoting intermunicipal or territorial coordination.

Working in partnership with higher levels of government is required to improve the governance of local governments. Vertical coordination across different levels of government may be achieved through representative institutions at the central government level working with local governments to offer capacity development and cooperation. Special purpose vehicles – partnerships formed for joint project planning and implementation – can also be used. In addition, central governments may provide vertical funds, which are funds earmarked for programmatic planning. For example, in France, the Agence de l'Environnement et de la Maîtrise de l'Energie, an inter-ministerial agency focused on environmental and energy research and policy, has developed a funding programme to assist municipal areas with the development of a Bilan Carbone emissions inventory.[137]

Horizontal and cross-sectoral coordination between departments and public-sector institutions is a necessary approach to dealing with public problems effectively.[138] This may be achieved through informal cooperation or local government directives. Cross-sectoral departments, such as planning and statistics departments, can be allocated the responsibility of facilitating multi-sectoral cooperation. Lastly, shared

[136] See Institute of Public Administration (2012).
[137] See Corfee-Morlot et al. (2009).
[138] See Howell (2012).

digital platforms, such as GIS-based platforms, should be made accessible to all departments to foster a culture of open data and information sharing.

Intermunicipal or territorial coordination can be facilitated through intermunicipal agencies that provide coordination among municipal organisations, often called strategic alliances. Sectoral governance boards support service delivery across municipal borders to ensure fair cost distribution and service efficiencies. The benefit of this approach is that it achieves the advantages of amalgamation, such as economies of scale, streamlined business processes and improved service delivery, while preserving local democracy. An example of such coordinating bodies can be found in the Romanian water sector, where regional water utilities servicing several municipalities are governed by inter-community development associations representing all the relevant municipalities.

Resource implications and key requirements

Integration among government bodies demands a certain level of administrative, human and IT-related resources. Technical resources may be necessary when a government body needs to integrate functions or processes that they did not previously use. Integration necessitates limited financial resources, although this depends on the specific integration package. It also provides opportunities for cost-sharing among administrations. For example, Alba Iulia, a city of 74,000 people in Romania, introduced a pilot smart city project in 2018 developed jointly with the national government and more than 20 private companies. The open data platform under construction will provide useful data to aid decision-making and foster evidence-based analysis.[139]

Implementation obstacles and solutions

A major barrier to government integration is the tendency to think in a 'silo' approach, which is difficult to break out of.[140] There are several other barriers to cooperation, such as an emphasis on the status quo, processes that bring everyone together but reinforce silos, processes that set similar goals and use the same data, and decision-making driven by quests for funding.[141]

The success of integration depends on high levels of commitment and resource-sharing. Successful cooperation strategies need to be based on an understanding of the collaboration cycle, strong leadership capacities, an understanding of the balances between risks and rewards, a culture of innovation and an emphasis on the desired outcomes and impacts.[142] Collaborating parties should take a design approach to cross-sector collaboration and should adopt flexible structures.[143]

It is important to start change management efforts early in the process of planning and implementation. To this end, during the planning stage, it is advisable to develop a thorough plan for change management. Lastly, a phased approach to government integration can be more manageable than a direct cutover approach.

A practical form of integrated governance framework is illustrated by the Urban Nexus, a concept developed by ICLEI - Local Governments for Sustainability (ICLEI) in cooperation with Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). At a variety of scales, this framework integrates services across systems, sectors, social relations and behaviours. For example, the city of Hanover in Germany used the framework to guide the integrated planning and construction process of the environmentally friendly district Kronsberg, improving the provision of affordable housing and social cohesion in the metropolitan area.[144]

G4. Effective stakeholder participation

Description

Effective stakeholder participation should be an underlying principle for most municipal activities. It can enable different forms of collaborative governance and help improve decision-making, implementation

[139] See Sustainable Cities (2018).
[140] See OECD (n.d.a).
[141] See Norris-Tirrell and Clay (2010).
[142] See Institute of Public Administration (2012).
[143] See Bryson et al. (2015).
[144] See ICLEI and GIZ (2014).

and monitoring at the local level. It can cover a wide range of activities and may involve governmental bodies, the private sector, residents, interest groups, NGOs and more.

For instance, at an early phase of a potential investment project, residents and other interested groups can help inform the city about their needs and concerns even before concrete proposals have been developed. Stakeholders can at a later stage respond to ideas or discuss solutions proposed by the municipality, by developers or by other organisations, such as industries or NGOs. A city administration can also invite its population to provide their own suggestions in response to certain challenges or development goals, for example, through the co-design of public spaces (see policy option L4). Effective monitoring of municipal services and assets can be undertaken by city residents or NGOs, for example, by online reporting on the quality of their local road network. Residents and NGOs can also play an important role as volunteers or implementing agencies for attitude campaigns, for example, by informing school children about the benefits of recycling and waste separation.

A transparent, integrated, and inclusive process to engage a wide range of stakeholders helps align different perspectives, altering traditional political dynamics.[145] It helps strengthen relationships and increases the sense of ownership of city strategies and plans among residents. It can also improve the quality, acceptance, and effectiveness of project implementation and produce better social cohesion and urban planning outcomes.[146] It is thus important to engage a wide range of stakeholders, and particularly groups that are less likely to be able to participate in standard engagement activities, such as women, young people, the elderly, ethnic minorities, migrants, disabled people, LGBTQ+ people, and so on. Cities should ensure the participation of these groups in discussions.

Resource implications and key requirements

Improving the participation and inclusion of stakeholders demands substantial administrative capacities and may necessitate technical capacity-building in public stakeholder engagement. Success factors related to stakeholder participation include a stakeholder engagement strategy for policymaking which understands the needs, priorities and interests and seeks participation from key stakeholders. Cities also need to develop effective communication, keeping stakeholders informed and motivated to participate.

Monitoring of the number of stakeholders involved in decision-making activities, and the presence of mechanisms that encourage community engagement, also support effective stakeholder participation processes. Collaborative governance is therefore closely linked to the development of open governance systems, open platform databases and shared information systems, government resource-sharing, research and development activities and innovation and technology transfer.

As part of a national road connectivity initiative, the city of Tirana in Albania introduced an online app for reporting sections of road that need repair and also offered public information on the time it takes to address the reported need for repair.[147] The setting-up and operation of this system had cost implications, but in return the city achieved road surveillance for ‘free’.

[145] See UCLG and World Bank (2009).
[146] See Global Platform for Sustainable Cities and World Bank (2018).
[147] See World Bank (2018).

Cluj-Napoca in Romania initiated the Innovation and Civic Imagination Centre to support the co-design and co-creation of urban solutions within the local community. In 2019, two major debates were held, one in support of a master plan for a large-scale development area, while the other focused on EU cohesion policy. The organisation of meetings and workshops that take place at the centre costs the municipal budget €10,000-€15,000 per month.[148]

Implementation obstacles and solutions

Active public participation may require a certain culture and an active civil society that may not be present in many cities in the EBRD regions. This form of democratic development can be fostered, however, through the education system and also by introducing feedback loops that do not require the capacity of effective civil society units. Tirana's online app for reporting road defects is an example of a user-friendly feedback system.

Several cities have incorporated civil society into their urban planning and implementation process. Cities including Surabaya (Indonesia) and Ghent (Belgium) have seen improved outcomes. Ouagadougou (Burkina Faso) and Douala (Cameroon) also represent impressive examples of cities that have improved development initiatives through an inclusive and participatory approach. Ongoing advocacy and open dialogues were key to encouraging citizens to engage in a city strategy. Consensus and cooperation in establishing and acting on the strategy contributed to institutional confidence and unlocked financial opportunities.[149]

São Paulo (Brazil) has made a considerable effort to include residents in the development of the municipality's Open Government Partnership local action plan. São Paulo has also made efforts to encourage large-scale public participation in the development of a new master plan for the city, with more than 25,000 people attending 114 public hearings. Between these hearings and the city's online crowdsourcing platform, São Paulo's inhabitants have contributed over 10,000 ideas to improve the city and therefore the environment around them.[150]

G5. Capacity-building

Description

Capacity-building is the process through which individuals and organisations can obtain, strengthen and maintain the capabilities to set and achieve their goals.[151] Capacity-building is important for local governments as they adopt increasingly sophisticated policies, management practices and an integrated planning culture.

There are three broad types of capability that should be recognised: (i) institutional or organisational capacity refers to the policies, structures, process, rules and procedures that allow local governments to operate and provide leadership in their jurisdiction; (ii) human capacity refers to the experience, tools and knowledge mastered by the employees of local governments, which enable them to identify, analyse and respond to people's needs, ensure their implementation and assess their impact; and (iii) societal capacity refers to the empowerment of the community, NGOs and city residents, including those that face disproportionate barriers to economic opportunities, to inform and hold local governments and administrations accountable for the services they offer and the good management of the community.

Human capacity-building focuses on strengthening different types of abilities and skills within local governance. Organisational skills are associated with efficiency in programme and project management, tax collection and procurement processes, and municipal finance management. Technical skills target particular areas of expertise in specific sectors, such as urban planning, water and sanitation engineering, waste management, and transport engineering. Behavioural skills have to do with cultural shifts and changes in attitude among all stakeholders, including residents, such as for encouraging multi-level cooperation or waste prevention.[152] Incorporating digital technologies

[148] See Euro Cities (2019).
[149] See UN-Habitat (2009).
[150] See WRI (2016).
[151] See UNDP (2009).
[152] See Sustainable Development Solutions Network (2016).

can further ease administrative burdens, promote greater cooperation between stakeholders and allow for more oversight and transparency in operations.

A number of potential activities are aimed at promoting well-targeted capacity-building within a public administration. Initial diagnostics should help identify relevant shortcomings in capacity. Legal stipulations can require capacity-development plans and/or budget allocations for all implementation programmes. Regular staff-training programmes or requirements for continued learning can be put in place among public-sector employees. Project partnerships with higher levels of government, public or private organisations, academic institutions and civil society groups can also involve capacity-building. Moreover, external expert consultants from private organisations or academic institutions with sectoral or technical expertise can provide skills that are required for a specified period of time, as opposed to training internal staff.

Resource implications and key requirements

Capacity-building demands substantial administrative, budgetary and technical resources. It is a long-term process and should be represented in annual budgets and administrative commitments.

Implementation obstacles and solutions

Budget constraints may be a key implementation obstacle, but clearly defined needs and plans with well-defined objectives and performance indicators may help mobilise funding and support from central governments, international networks or organisations, or NGOs.

Learning from the experiences and outcomes of initiatives by other cities or local governments, for example, by joining coalitions of cities, is another way to build capacity. A successful example of cooperation among municipalities and regions is the Network of Towns and Cities towards Sustainability created in 1997 by the Barcelona Provincial Council. It allows municipalities to exchange knowledge and pool resources. A particular success has been the working group on the Covenant of Mayors, which, along with other support from the Barcelona Provincial Council, has meant that most municipalities have now drawn up local-level sustainable energy action plans.[153]

4.2. Finance

City governments must harness their financial reserves effectively to deliver the necessary services and infrastructure that meet the needs of their residents. The ability to collect, manage and invest these resources through appropriate financial mechanisms determines a city's fiscal sustainability. Examples of unsustainable approaches include high levels of debt or other liabilities, which can divert funds from policy investments, or corruption and mismanagement of funds. The following policy options or policy objectives are discussed below.

1. Improved revenue and financial autonomy
2. Improved accountability and transparency
3. Improved creditworthiness
4. Financial incentives or financial support schemes for green investments.

This section explores the policies or approaches that city governments can take to address these points and strengthen their financial credentials so that they can finance the necessary projects to become a green and sustainable city.

F1. Improved revenue and financial autonomy

Description

It is generally desirable for local governments to have the opportunity to raise their own revenue and set their own taxes. This is also a good way of achieving accountability and responsibility at a local level.

[153] See European Union (2017).

In addition, there is evidence suggesting that taxes are easier to collect when people can see that they are being used for local purposes. To ensure a degree of political and financial autonomy, it is important that local revenues go beyond the bare minimum needed to cover the municipality's allocated service obligations, so that surplus funds can be used to finance investments or services at the discretion of the city administration. If a city relies too heavily on the national government, the city may be restricted in the way it spends funding, the extent of the spending, and the time it takes to use it. This, in turn, will affect the delivery of policies and programmes. Fundraising instruments or mechanisms that ensure adequate local revenues include (i) taxes and transfers, (ii) administrative or commercial fees and (iii) land-value capture.

Taxes and transfers: The opportunity to raise or receive tax revenues depends on the fiscal decentralisation in the country and primarily falls outside of the control of the local government. Such tax revenues are typically linked to local property, sales and business taxes or local personal taxes. It also includes "sharing" taxes between the nation and the region in the form of budgetary transfers from the national budget to local administrations.

Local administrative or commercial revenues: This represents funding that local authorities can influence to a larger degree, regardless of the country's fiscal decentralisation. This normally happens through the way fees are set and the rigour with which they are collected. Administrative fees could include building permits or licensing for a wide range of activities such as operating certain business premises or motor vehicles. Municipal commercial revenues may include fees or tariffs for municipal services such as water, waste, heating and parking services or revenues from the letting out, or sale of, public land and public real-estate to private entities. Cost-reflective and consumption-based heat and water bills not only provide sustainable funding for the sector, but also promote resource efficiency. Therefore, it may be recommended to move utility services towards proper metering and fully cost-reflective tariffs while providing targeted support for low-income households (see policy option E4).

Local administrative and commercial revenues account for just over one-fifth of revenues in Sofia, Bulgaria, with 16 per cent of the annual budget in 2018 coming from municipal fees and 6 per cent from fines and penalties, income from asset ownership and sale of non-financial assets. Other key sources of revenue include 20 per cent in property and other taxes, 28 per cent in intergovernmental transfers and 21 per cent in EU funding.[154]

Land-value capture: There is a strong link between public investments, for example, in transport, and economic growth and property values, with new transport services such as train and metro stations typically increasing the accessibility, attractiveness and value of their surrounding areas. The benefits of public investment can therefore often be substantially captured by private individuals as an unearned windfall gain. This problem, in combination with public funding constraints, has led to the development of a variety of 'land-value capture' mechanisms in order to transfer some private financial benefits back to the public sector. These mechanisms may include:

1. Direct development: The city transport authority makes direct purchases of land surrounding planned new transit stations and develops the land directly or in partnership with the private sector, making commercial returns through subsequent sale or lease (shops, commercial units, flats and so on). Examples include Network Rail station development programmes such as London's Kings Cross St Pancras, or the Hong Kong Metro. This approach involves little complexity – it can be implemented by the city or transport authority directly – and is less controversial than some other mechanisms that may require imposing taxes on developers and existing businesses and residents. However, it may require significant upfront investment and financial risk for the city.
2. Negotiated payments from developers: The city authority secures payments from local developers to fund infrastructure improvements associated with specific large developments, for example, the agreement between London and the Battersea Power Station developers to partly fund the Northern Line extension. This approach also involves little complexity – it can be

[154] See Sofia Municipality (2018).

implemented through direct negotiation between the city or transport authority and developers seeking planning consent.

3. Zonal or city-wide tax increment: A zonal tax increment is a tax uplift or levy imposed by the transport authority and local government on commercial and/or residential properties set to benefit within a specified area around the site, to capture part of the windfall gains accruing to property owners. This increment could be applied to various taxes, for example, business rates, council tax or stamp duty. This approach is more complex as it is likely to require legal or tax reform and central political support for the increases in tax. Focusing on areas of benefit may reduce objections – but requires difficult decisions over boundaries. A city-wide tax increment avoids the boundary question and has the potential to raise very large sums to support strategic infrastructure investment, but may not provide sufficient targeting of areas that gain the most benefit (see, for example, the Community Infrastructure Levy for Crossrail in London).

Resource implications and key requirements

Setting and raising local tax revenues, whether as part of general taxes or as a form of land-value capture, requires adequate fiscal decentralisation and sufficient administrative capacity. This requires time and the development of significant resources. Increasing and collecting administrative fees for permits or end-user tariffs for utility services is less complex but requires political will and enforcement capacity.

Implementation obstacles and solutions

Fiscal decentralisation may be hampered by a lack of local administrative capacity and processes. Therefore, ensuring adequate local capacity and procedures is often an important first step. While fiscal decentralisation may take a long time to implement, local authorities can improve their financial position by raising funds through increased fees and commercial revenues. This also gives the local authorities the opportunity to experience and demonstrate their capacity to plan, budget and operate municipal infrastructure, and can subsequently help increase confidence among local and central authorities that further fiscal decentralisation is feasible.

"Strong fiscal accountability and transparency are also likely to reduce or prevent corruption, thus leading to more efficient spending of public resources."

F2. Improved financial accountability and transparency

Description

The financial management of a municipality should ensure accountability and transparency. This can improve the confidence of and support from central governments, the international community, civil society and local and international businesses – which in turn can lead to greater receipt of public and private funds. Accurate financial management can also enable better insight into which groups benefit most from the municipal budget, including various marginalised groups. Strong fiscal accountability and transparency are also likely to reduce or prevent corruption, thus leading to more efficient spending of public resources. Robust public financial management can also improve a city's creditworthiness and enable better access to commercial debt and capital markets. Municipalities can take several steps to enhance their financial accountability and transparency, including: (i) ensuring that they apply accrual accounting in order to provide an accurate financial picture, which is then used to make fiscal and budgetary decisions; (ii) ensuring that well-defined systems are in place, with clearly defined auditing and control functions; (iii) publishing municipal financial statements regularly; and (iv) using any financial information combined with data analytics to identify inefficiencies, mismanagement or fraudulent behaviour.

Resource implications and key requirements

Accrual accounting goes beyond reporting on cash coming in and going out. It also looks at assets and liabilities to provide a more complete and accurate picture of the financial position of a municipality. Preparation of accrual accounting requires the identification and valuing of all municipal assets and liabilities. Such inventory requires significant resources. In addition, substantial resources and time

are needed for the development of the necessary IT systems for accounting purposes, data analytics and information management. For example, over the course of five years, together with the World Bank, Rijeka in Croatia planned and transformed its financial management and accounting system to one based on transparent accrual accounting and improved accountability.[155]

Implementation obstacles and solutions

Lack of local technical, administrative or financial capacity may prevent necessary improvements to municipal financial management. There may also be vested interests that do not want increased transparency. These obstacles or challenges may be addressed through adequate capacity-building programmes and well-defined action plans aimed at improving governance structures, with clearly defined auditing and control functions.

Belize has identified a need to address fiscal accountability as one factor that could contribute to improvements in municipal management. Despite beginning the process of decentralisation in the 1990s, there has since been little impact as local authorities do not have the technical, administrative or financial capacity to manage funds and powers effectively. The World Bank worked alongside the Belize government to leverage grant resources from the Public-Private Infrastructure Advisory Facility (PPIAF) to support capacity-building around fiscal management. Key activities included conducting a diagnosis of fiscal conditions, training practitioners in financial management, revenue collection, use of financial management software and designing a new accounting approach that included balance sheets.[156]

This case of Belize demonstrates the absence of basic accounting procedures in many countries and cities, and the importance of supporting policies, for example, information and capacity-building (see policy option G5) to support improvements in fiscal accountability.

In Cape Town, South Africa, despite significant efforts to decentralise powers to local authorities, poor sector budgeting is significantly limiting urban development decisions. Current reporting of spending is ineffective (often done in a highly technical manner), resident participation occurs after decision-making and there is no clear public framework that outlines the process of spending decisions. This in turn leads to a lack of trust in the local authority and further lowers public participation. To address this, the Development Action Group convened a number of civic organisations to discuss a range of issues, but all were centred on the absence of accountability. From this measure, two civic coalitions were created. These held workshops and developed resolutions to improve accountability, while encouraging greater civic participation via their web-based platform. This case in Cape Town demonstrates the importance of stakeholder engagement as well as the value of providing a platform for local people to query and challenge public fiscal spending as well as bridging key knowledge gaps.[157]

F3. Improved creditworthiness

Description

Creditworthiness is essentially an opinion by third parties, mainly lenders, on whether debt service payments will be made fully and on time. A lender that has confidence in the long-term financial strength of the borrower, and in the ability and willingness of the municipality to pay its obligations in full and on time, will regard that municipality as creditworthy.

In order to attract private financing, cities must demonstrate that they are a viable investment proposal, that they are able to effectively manage their own finances and are transparent in this process. Improving the creditworthiness or the credit rating of a city is a gradual process partly limited by factors external to the city, such as the wealth and credit rating of the national authorities. However, there are measures a city can take to strengthen its creditworthiness.

[155] See World Bank Institute (2013).
[156] World Bank (2017).
[157] See Kumar and Fester (2019).

A city seeking to improve its creditworthiness should focus on improving conditions in the following five broad categories:

- economic conditions, for example, municipal income levels and economic diversification
- financial management, including transparency, administrative capacity, professional management of debt and liquidity
- budgetary performance or operating balance
- budgetary flexibility, for example, own-source revenues
- current level of debt, debt servicing requirements and other liabilities.

While some of these dimensions are difficult to change in the short term, a city may develop a creditworthiness action plan as a start. This allows the city to set a current baseline and realistic ambitions and aims, as well as identify problematic and priority areas that need to be addressed. Key areas may include managing expenditure, developing a pipeline of public infrastructure projects to be funded and undertaking its own 'shadow' credit rating assessment.

An official municipal credit rating issued by a well-recognised rating agency has several benefits. Beyond improving access to private financing, it represents and guides a process aimed at improving the financial management of a municipality. This also provides valuable information, to the benefit of central authorities and potential donors. It also further enhances the accountability of the city management as it clearly shows the financial rigour of the municipality.

Resource implications and key requirements

A creditworthiness enhancement programme is not difficult to develop, but is challenging to implement. It is also important to remember that improving the creditworthiness or the credit rating of a city is a gradual process. For example, Zaprešić in Croatia has worked to improve its creditworthiness since the establishment of a local treasury system in 2012. The city was assessed in 2016 as having a low credit risk, with a high level of budget liquidity, and has been placed in the top 5 per cent of exceptionally transparent local budgets in Croatia.[158,159]

In Uganda, Kampala's improvements in municipal revenue can be attributed to the work undertaken by local authorities since 2012 to improve its creditworthiness, delivered through a city-wide strategic plan. Despite the city's growing economy, Kampala has faced significant financial problems, including poor revenue collection, weak governance and reliance on government transfers. This limited the city's ability to invest in improving its local services and implementing infrastructure projects. In light of this situation, a strategic plan was developed to strengthen the governance and service delivery. The plan identified key areas to target, including human resource development, better record management and stronger monitoring processes.

To improve its administrative capacity, the city received assistance from the World Bank and PPIAF, enabling the Kampala authorities to develop more robust accounting approaches. The plan was extremely successful and in one year, Kampala managed to increase its revenues by 86 per cent. However, as identified creditworthiness is a continuum, this requires continuous effort and commitment to financial management.

Implementation obstacles and solutions

Pursuing a credit rating can be an administratively and technically challenging task, as it requires addressing any gaps or weaknesses in financial management. Cities can seek support from the national level or through the capacity-building programmes of international organisations, for example, the C40 Cities Finance Facility. Incorporating a resourcing timeline into a creditworthiness action plan allows cities to effectively manage their staff and budgets for this process.

External factors may include an unstable wider economy and, as the national assessment forms an

[158] See World Bank Group and Government of Austria (2018).
[159] See City of Zaprešić, Finance and Budgeting Department (n.d.).

element of a credit rating, this may impact a city's ability to obtain private finance. Improving these external factors can be beyond the remit of a city. However, active stakeholder engagement with the national government and other surrounding cities or municipalities can enable the sharing of best practice and improvement of wider conditions.

F4. Financial incentives or financial support schemes for green investments

Description

Local governments can help provide financial incentives and funding in support of green investments. Such support schemes can include targeted subsidy schemes like the Seoul solar panel programme. It can further include the setting-up of municipally owned or funded green banks or the setting-up of investment funds (for example, the Melbourne green investment fund) that can provide green loans or dedicated risk-sharing facilities for private banks. Local authorities may also work with local banks in order to facilitate green lending solutions with little or no financial contribution from the city.

One example is Frederikshavn, Denmark, which developed specific soft loans for the energy renovation of housing to meet its climate change targets. A new product was developed by the municipality in agreement with local banks featuring lower interest rates and a longer maturity period relative to typical market conditions. The municipality does not allocate any funds to the financing scheme. Instead, soft loans are provided by the partner banks that bear all the risk. They run a creditworthiness check of homeowners, to decide who gets a loan and under what conditions.

Resource implications and key requirements

Providing financial incentives will require budgetary commitments and may be administratively demanding for the local government. Significant technical capacity will also be required to identify how to configure and apply incentives. Incentives can target lower income brackets of the population to address social equity concerns associated with energy poverty. Both the central and local policy frameworks need to accommodate the setting-up of incentive and funding schemes by local authorities.

Potential private-sector participation

Local governments can work with commercial banks to provide financial incentives, therefore sharing or shifting the financial burden from the public to the private sector.

Implementation obstacles and solutions

The provision of direct financial support is financially demanding for local governments and can target fuel-poor homes. It is good practice to undertake a comprehensive cost and benefit analysis of retrofitting to zero carbon for all households that are in fuel poverty and provide targeted funding for these homes.[160] One of the first programmes to tackle energy poverty was the Warm Front programme in the United Kingdom. A total of 2.3 million households received assistance from the scheme. Grants were offered for improvements such as loft insulation, cavity wall insulation and heating system improvements.[161]

The success factors associated with energy efficiency measures include gaining and maintaining consumer trust, an effective communication and marketing strategy, training and qualification schemes to ensure that worker qualifications keep pace with the technical complexity of buildings and the targeting of trigger points such as household renovations or sales.[162] The provision of financial incentives and favourable financing should only come after energy efficiency building codes have been enacted and adequate enforcement and compliance mechanisms are in place for building construction and retrofits.

[160] See National Assembly for Wales (2018).
[161] See UK Parliament (2013).
[162] See Committee on Climate Change (2016).

05

Case studies ↘

Integrated urban mobility: Burgas, Bulgaria ↘

Burgas has sought to reverse a legacy of car-centric urban transport through a cohesive policy on mobility. A rapid transit bus system, integrated transport management, greater accessibility and lower costs for using public transport are among the measures introduced.

Snapshot

- **Location:** Burgas, Bulgaria
- **Population:** Small – 202,000 (2017)
- **Policy area:** Transport
- **Policy options:** Parking pricing, restrictions, information and enforcement; pedestrian-oriented and car-restrictive policies; pro-cycling policies; planning and regulation of public transport services
- **Financial capacity:** Limited
- **Administrative capacity:** Strengthening

Context and policy overview

Burgas is easily accessible by car and connected by two highways to other cities. Consequently, private vehicles are the most popular form of transport: in 2016, 58 per cent of city residents used a personal car and 37 per cent used public transport).[163] However, the municipality of Burgas recognised the adverse environmental and social impacts of this system and introduced policies to address them, including a Sustainable Urban Mobility Plan (SUMP) for the period 2014-20. The city engaged stakeholders to contribute to the SUMP and considered three scenarios. The chosen approach called for the city to (i) develop a dense network of high-speed bus lanes, (ii) increase the use of public transport and (iii) boost the number of bicycle parking areas and lanes.[164]

Implementation

The municipality introduced a number of measures under its Integrated Urban Transport Project. In 2015, the city began implementing a project to create an intelligent transport system that would improve the safety, efficiency and convenience of the public transport network. The plan included integrated ticketing and video surveillance of the network.[165]

First, in 2018, commuters obtained real-time access to information on buses and trolley buses.

[163] See ICLEI – Local Governments for Sustainability (2016).
[164] See Stoyanova (2014).
[165] See ICLEI – Local Governments for Sustainability (2016).

The electronic boards at bus stops were also made more informative.

Second, the city rolled out modern buses and smart intersections. This included the introduction of 60 new buses running on compressed natural gas (CNG) and diesel to operate over the improved transport infrastructure. The new vehicles replaced the city's oldest buses, greatly improving the service and its reliability, with reduced emissions and maintenance costs and more attractive public transport.[166]

Third, Burgas introduced paid parking charges in central areas of the city. It also restricted the access of cars to the main administrative area and market, converting those parts of the city to a pedestrianised zone. A "ring and ride" service was provided for disabled individuals and for children.[167]

Lastly, the city constructed a complete cycling network, adding 20 km to the scheme already in place, and introduced a public bike-sharing scheme.

To enable the implementation of these measures, Burgas has sought to increase its administrative capacity, including systematic policy planning, targeted funding and the participation of residents. The city set aside €60 million from its municipal budget to implement the programme and obtained funding from international bodies such as the EBRD. In addition, the local public transport company has its own budget and receives contributions from the national government.[168]

Public transport is free for certain groups (for instance, individuals over 65, children, people with disabilities). This measure cost the city €2 million in 2012, and therefore it was imperative to obtain funding from other sources.[169]

Results and lessons learned

The Integrated Urban Transport Project achieved the following outcomes:

- The ring-and-ride support scheme was used more than 20,000 times in its first year.[170]
- The ike-sharing scheme has had more than 5,000 subscription contracts with daily users.[171]
- The city has seem reductions in air pollution and GHG emissions related to the modal shift in the transport sector.

Despite these success stories, Burgas remains a predominantly car-centric city. In 2016, more than half of all journeys were made in private vehicles, while cycling represented just 3 per cent of the modal share.[172] In order to foster a local cycling culture, Burgas is planning campaigns, including the Bike2Work scheme.[173]

Links to similar initiatives

Freiburg: integrated mobility policies

Lund: eco-mobility policies

Strasbourg: integrated multi-modal transport

[166] See Go to Burgas (2020).
[167] See EcoMobility SHIFT (n.d.).
[168] Ibid.
[169] Ibid.
[170] See EcoMobility SHIFT (n.d.).
[171] Ibid.
[172] See ICLEI – Local Governments for Sustainability (2016).
[173] See Braun (2017).

Integrated multi-modal transport: Strasbourg, France ↘

Driven by a longstanding ambition to improve air quality, Strasbourg has been removing private vehicles from the city centre while facilitating the uptake of active and public transport. The city has achieved this through a mix of policy options detailed in its Urban Mobility Plan.

Snapshot

- **Location:** Strasbourg, France
- **Population:** Small – 277,000 (2015)
- **Economy:** Service economy
- **Policy area:** Transport
- **Policy options:** Pedestrian-oriented and car-restrictive policies; pro-cycling policies; planning and regulation of public transport services
- **Financial capacity:** Strong
- **Administrative capacity:** Strong

Context and policy overview

In Strasbourg during the 1980s, the growing use of private vehicles was increasing congestion, air and noise pollution, as well as the number of accidents.[174] In the 1990s, cross-border traffic with Germany was an additional problem, given that Strasbourg sits on the busiest road link between Baden and Alsace. In 1990, approximately 240,000 vehicles per day were present in the city centre. This congestion was exacerbated during the peak holiday seasons when visitors flocked to Strasbourg to see its historic buildings and monuments.[175]

To address these issues, Strasbourg's Urban Mobility Plan, also known as the first *plan de circulation*,[176] laid out initial ambitions for reducing the use of private vehicles. The main aim was to build two new tramlines that would serve the city centre. To facilitate this engineering project, Strasbourg implemented a number of transit-oriented policies. These included:

- a trial-period extension of the traffic-free precinct in Central Strasbourg – which was later made permanent.

[174] See European Commission (n.d.).
[175] Ibid.
[176] See Strasbourg.eu eurometropole (2015)

- limited or altered vehicular access to the city centre, for example by only allowing access through a number of loops rather than through direct connections between one district and another
- increased fees for inner-city parking
- the introduction of cyclist-only or pedestrian-only zones
- the introduction of park-and-ride sites alongside tramway lines to facilitate transit-oriented development and better connectivity.

The main goals of the approach were to:

- invest in transport to encourage economic development and trade in the city
- regenerate Strasbourg to increase the quality of life and protect the environment
- provide equal services to communities, improving social cohesion
- produce a multi-modal and coordinated system which would decrease the number of private cars in the city.

Implementation

The policy approach was guided by the Urban Transportation Planning Document (PDU), which covers Strasbourg's transport policies for 10-15 years, as required by national law, to address air quality issues. The guidance document is seen as a tool for encouraging local authorities to integrate their transport policies into broader city planning policy.

Three private consultancy firms developed the PDU. Its eventual adoption required ratification from all municipalities in Greater Strasbourg (CUS), the CUS Council, the regional and national governments, and civic organisations. The tramway department and the Compagnie des Transports Strasbourgeois were responsible for assessing and reviewing the progress of the plan and its impact.

These institutions acted as major levers for the policy's implementation and financing. CUS had significant governance powers as the organising authority, achieved through devolution from the national level. The state implemented structures to allow local authorities to manage mass transit services. This currently enables CUS to coordinate transit with urban planning processes and service provision.

The main sources of funding for public transport systems are the national government, regional and local authorities. The local authority supplies financing through a transport tax, the *versement de transport*, which places a levy of 1 per cent on private wages paid within the Greater Strasbourg area.[177] Although the tax does not provide full financing for all the projects, it is of benefit. The system cost €97 million, which worked out at a reasonable industry cost. Most parking measures are delivered through public-private partnerships between the city and businesses.

Barriers and critical success factors

The mayoral contest held before the implementation of this plan centred on urban planning changes. The winner, Catherine Trautmann, was strongly motivated to carry out the plan and to recruit a more diverse team of professionals into the public bodies tasked with delivering the programme.

There was strong opposition to the scheme, particularly from businesses operating in the city centre who believed that the policies would result in a loss of income. Moreover, they were concerned that works to install the trams would restrict access even further. These negative sentiments resulted in the creation of an opposition campaign. However, the local authority worked hard to develop an engaging communications strategy that would allay people's fears.

The new mayor brought the political vision required to make the plan acceptable among residents. Her campaign was built on transforming the city's transport system and, despite opposition, she continued to pursue this goal throughout her term.

[177] See The Prince's Foundation for the Built Environment (n.d.)

Due to this opposition, Strasbourg undertook an extensive consultation process with local residents, businesses and associations. There was also an accompanying awareness-raising campaign by the city authorities and transport operator. The campaign sought to shift entrenched travel behaviours and was supported through a communications strategy with a city symbol (Bruno the bear) to add a face to the campaign.

Strasbourg established a phone line to deal with complaints more efficiently and personally. The communications strategy also provided regular updates to residents, keeping the community involved.

Furthermore, the city provided landscaping to improve the quality of the environment along routes through social housing projects. This work helped to gain support for the transport plan.

Results and lessons learned

The overall PDU programme generated 30 jointly developed, managed and funded projects, 15 of which focused exclusively on improved environmental protection.

Following the implementation of policies outlined in the Urban Mobility Plan, by 2000 the number of vehicles in the city centre had fallen by 16 per cent,[178] to a third less than the figure that would have been expected on the basis of population growth. Strasbourg achieved this success despite an overall increase in traffic volumes across the municipality. However, this traffic reduction in the city centre may have resulted in a transfer of traffic to surrounding roads.

Nevertheless, data for the tramlines do indicate that more people shifted to using public transport. During its first year, Tramline A carried 68,000 passengers a day, potentially contributing to a 17 per cent reduction in traffic entering the area.

Furthermore, contrary to initial expectations, pedestrianisation increased property values and trading figures as the quality of life increased. And by 2015, 125 jobs had been created across these projects.

Strasbourg's Urban Mobility Plan offers lessons for other cities that hope to implement similar initiatives. First, building an engaging and relatable communications strategy is key to driving change, particularly if a programme faces fierce opposition. Second, this strategy should involve extensive stakeholder engagement, while tailoring the communications to the chosen audience. In particular, the benefits for each group must be made clear and communicated. Third, any communications strategy must not be a one-off, but rather a continuous dialogue.

Links to similar initiatives

Ljubljana: car-free zone

Seoul: transit-oriented development

[178] See European Commission (n.d.)

Shifting from transport to mobility: Moscow, Russia ↘

The Greater Moscow region has successfully implemented a large-scale programme to increase the efficiency of its transport system. Measures to cut traffic and shift journeys to public transport modes have reduced the number of cars in the region by 25 per cent compared to 2012.

Snapshot

- **Location:** Moscow, Russia
- **Population:** Large – 12.3 million (2017)
- **Policy area:** Transport
- **Policy options:** Planning and regulation of public transport services; road-user charges; parking pricing, restrictions, information and enforcement; car-sharing, car-pooling and ride-sharing
- **Financial capacity:** Strong
- **Administrative capacity:** Strong

Context and policy overview

In 2010, a new Moscow city government was established. At the time, traffic congestion was high during peak hours, public transport was ineffective (with inconvenient routes and low quality of service), and the city lacked space for pedestrians and cyclists. These problems were exacerbated by the fact that many residents commuted to the city centre via the Moscow ring road. To tackle these challenges, the Moscow authorities have been implementing a large-scale programme since 2010 to increase the efficiency of the city's transport system.[179]

A new programme, called the "Development of the Transport System 2012-2016 and Further Prospects for 2020" was launched in 2012 with a budget of US$ 80 billion until 2020.[180] The programme included a number of measures such as development of the metro, traffic improvements, the creation of bicycle and pedestrian spaces, the promotion of car-sharing services and the creation of a smart transport system.

The effect of investment at this scale was tremendous, with 80 new rail and metro stations, a complete renewal of the bus fleet and a significant renewal of the tram and metro fleets.

[179] See Maltcev (2017).
[180] See Moscow Transport (2017).

Implementation

Through the programme, the construction of new metro stations was intensified (18 new stations came into operation between 2010 and 2016). Furthermore, an electronic travel card, the Troika, was introduced. It uses payment methods such as Apple Pay and works on all public transport in Moscow. Some 249 additional kilometres of road lanes were designated for public transport and 75 per cent of the public transport fleet was renewed.

The city government reduced private car use in the centre of Moscow by building parking places near metro stations. Heavy goods vehicles were restricted from entering the city centre between 6am and 10pm, alleviating congestion. Car-sharing businesses were also set up. The city introduced an intelligent transport system (ITS) with a budget of US$ 1.7 billion for the period 2012-20. Digitisation has played a key role in updating Moscow's transport network. Public transport operators use mobile applications to provide route-planning options for passengers, and by 2018, 80 per cent of all taxi bookings were made via smartphones.[181]

Barriers and critical success factors

The city transport department recognised that one of the main challenges with regard to the uptake of public transport is the difficulty of competing with the comfort of private cars. To tackle this issue, the department has been upgrading its own fleet, purchasing more than 8,000 new vehicles and 1,600 new metro train cars (all manufactured domestically). By the end of 2017, 37 per cent of all metro carriages were new, along with 90 per cent of the aboveground transport fleet. Today, public transport is more accessible, with 98 per cent of aboveground vehicles suitable for use by disabled passengers. Electronic ticketing systems, a successful city bike hire system (the volume of journeys made using this system doubled between 2015 and 2017), bus lanes, CCTV to improve passenger safety and regulation of the taxi industry have also played key roles.

The introduction in 2013 of the Troika transport card – which allows seamless transfers between all types of aboveground public transport – has been a further success, with more than 85 per cent of trips being paid for through this system. [182] More recently, the city

[181] See Maltcev (2017).
[182] See Liksutov (2018b).

has also introduced contactless payment through mobile phone payment systems.[183]

Moscow has been using data and technology to provide a better service and to gain more insights from transport customers and other residents. In 2020, the city launched an online portal for capturing feedback to help inform priorities for the next investment cycle.[184]

Overall, political will has been key in enabling Moscow to improve the efficiency of its transport system. Sergey Sobyanin, the mayor appointed in 2010, made upgrading the Moscow transport network one of his key priorities. In addition, the transport programme tackled the issues holistically, seeking to improve parking, road infrastructure, public transport infrastructure and the ITS.[185]

Results and lessons learned

- Commuter traffic in the Greater Moscow region increased by 600 million trips, or 12 per cent, between 2010 and 2016. Over the same period, the city saw a 37 per cent increase in the percentage of economically active residents using public transport.[186]
- Travel time from the ring road to the centre has fallen by 20 minutes over the past 10 years.[187]
- The improvement in traffic speeds benefited non-drivers as well; average dwell times were halved for public transport passengers and reduced by more than a quarter for taxi passengers.[188]
- Moscow became a TomTom Traffic Index Parking award winner in 2016, when the average time spent searching for a parking space had been reduced by 65 per cent. In the 2013 version of the TomTom Traffic Index, Moscow traffic ranked as the worst in the world, but by the 2017 edition it was in sixth place.[27] Based on these achievements, in 2016 Moscow won an International Transport Award from the International Transport Forum, for tackling traffic congestion.[190]

The experience of Moscow offers lessons for other cities seeking to upgrade their transport systems. Above all, the city's experience shows that public transport must be safe, reliable and convenient in order to be a credible alternative to private vehicles.

Links to similar initiatives

Rotterdam: customer-centric public transport

Seoul: demand-side policies for transit-oriented development

Paris: public transport integration

Tallinn: subsidised public transport

[183] See Liksutov (2020).
[184] Ibid.
[185] See Maltcev (2017).
[186] Ibid.
[187] See Liksutov (2020).
[188] See Maltcev (2017).
[189] See TomTom (2020).
[190] See International Transport Forum (2016).

Incentives to use public and active transport: Freiburg, Germany ↘

In a quest to cut traffic congestion and environmental pollution, Freiburg has sought to reduce the city's reliance on cars by better integrating affordable and convenient alternatives such as walking and cycling. Today, more than one-third of residents do not own a car.

Snapshot

- **Location:** Freiburg, Germany
- **Population:** Small – 227,000 (2017)
- **Policy area:** Transport
- **Policy options:** Pedestrian-oriented and car-restrictive policies; pro-cycling policies; planning and regulation of public transport services
- **Financial capacity:** Strong
- **Administrative capacity:** Strong

Context and policy overview

Freiburg is a city in which public transport and bicycles are the prevailing methods of transport.

From the 1950s to the 1970s, Freiburg saw an increase in private transport. However in 1969, with its First Transport Plan, Freiburg switched away from policies focusing on private transport to ones that took a more holistic view of the urban community. In the early 1970s, this change saw the planning of an integrated cycling network and a new car-free pedestrian zone in the centre of the old town.[191] Moreover, faced with traffic congestion, city officials decided to maintain and develop, rather than remove, their tram system.

In the 1980s, Freiburg introduced traffic-calming zones to all residential neighbourhoods to discourage the use of cars in residential areas. For instance, parking schemes were introduced, with limited long-term parking and increased parking fees. Neighbourhood associations backed this policy.

Implementation

The city has ensured that the tram is a convenient mode of transport for residents. The tram system is

[191] See Buchler and Pucher (2011).

constantly being extended, with new lines built and existing ones prolonged as needed. This has resulted in 65 per cent of Freiburg residents having a tram stop within 300 metres of their home.[192] Affordability has been another concern for the city, which chose to combine affordable public transport charges with a mobility card model in the 1980s.

Freiburg has doubled the use of bicycles since the 1980s thanks to a number of pro-cycling policies. The average annual budget for bicycle facilities has been €836,000 since 1976.[193] In 2011, bikes accounted for 27 per cent of all journeys.[194] The city has more than 400 km of well-connected cycle routes, with more than 9,000 cycle parking spaces in the centre of Freiburg and at bike-and-ride locations at bus and tram stops.

The city also recognised the importance of having an integrated mass transit system throughout the urban area. Using planning and design, it created a "city of short distances", enabling high levels of public transport use, cycling and walking. Investment in the transit system and measures to encourage cycle use were coupled with restrictions on car use through road design and traffic and parking management measures.[195]

New developments such as Rieselfeld and Vauban were developed around tram lines and both districts limited car access and parking. All streets were traffic calmed at 30 km per hour or less and were well connected to Freiburg's cycle network and tram system. In Vauban, more than 70 per cent of households do not own a car. Car owners have to purchase a parking space in a multistorey car park on the outskirts of the development costing US$ 25,000 plus a monthly service charge.[196]

Resource implications

Neither of these developments required a contribution from the city budget. Both were designed to be self-financing plans, with costs being covered by income received from selling serviced plots of land to

cooperatives, individuals and small builders. Freiburg also has a betterment levy, which allows the city authorities to access one-third of the increase in value on the sale of open land.[197]

The city was able to realise its ambitions to control car use, partly due to changes in federal government funding reforms in the 1970s. During this period, municipal governments were given greater autonomy to direct transport funding as they wished. The state of Baden-Wuerttemberg also funded the initial trial of Freiburg's flat-rate monthly travel tickets.[198]

[192] Ibid.
[193] See Whitelegg (2014).
[194] See ICLEI (2011).
[195] See World Habitat Awards (2013).
[196] See Buchler and Pucher (2011).
[197] See World Habitat Awards (2013).
[198] See Buchler and Pucher (2011).

Overall, the city's policies have had the effect of shifting the relative costs of car ownership and use compared to those of public and active transport modes.[199]

Barriers and critical success factors

The plan faced initial resistance from many residents, especially those who lived in the suburbs. Developers also had a negative response to Freiburg's approach, demanding fewer restrictions on how they developed the city. These problems were overcome by the city having a clear strategic direction, with good communication and engagement with local communities. Moreover, an increase in service levels and modes of public transport contributed to reducing the percentage of private transport.

Citizen participation has been a critical element of the city's transport planning since the 1970s and was a significant driver in the shaping of Vauban into a car-free neighbourhood. Freiburg developed its land-use plan in collaboration with the community, with 900 participants.

Results and lessons learned

The city successfully reduced the prominence of cars, while increasing the use of sustainable transport modes. More specifically, it achieved the following impacts:[200]

- Freiburg has the lowest car density of any city in Germany (423 per 1,000 people). Annual car trips have hardly increased over the last 15 years, even while the total number of trips of all forms has increased by 30 per cent.
- In the 1990s the use of public transport doubled, with 200,000 residents using the four tram lines and 26 bus lines.
- The total number of cycling trips each year has nearly doubled.

Freiburg is internationally recognised to be a leading green and sustainable city. Its successful transition to sustainable modes of transport offers valuable lessons for other municipalities and cities globally. First, public acceptance of car-restrictive measures is closely linked to the cost and quality of the alternatives provided. Residents are more likely to substitute their car ride for a tram journey if the tram is reliable, clean and affordable. Second, active stakeholder engagement is important in order to overcome (and even prevent) opposition to sustainable transport policies. Residents, businesses and civil society groups must be given a voice and listened to. Third, the availability of national funding – for example to subsidise ticket prices for a limited period of time – can help to introduce new services and limit the costs for city authorities.

Links to similar initiatives

Bologna: eco-mobility policies

Lund: eco-mobility policies

Strasbourg: integrated multi-modal transport

[199] Ibid.
[200] See ICLEI (2011).

Pedestrianisation and car-free zones: Ljubljana, Slovenia ↘

In 2012, Ljubljana adopted a plan to restrict private motorised transport and promote sustainable forms of mobility. By introducing new technology, improving public spaces and upgrading the bus network, the city achieved a significant increase in public transport use and greater uptake of walking and cycling.

Snapshot

- **Country:** Slovenia
- **Population:** Small – 287,000 (2015)
- **Policy area:** Transport
- **Policy options:** Pedestrian-oriented and car-restrictive policies; pro-cycling policies
- **Financial capacity:** Strengthening
- **Administrative capacity:** Strong

Context and policy overview

Between 2002 and 2012, Ljubljana experienced a 52 per cent increase in car use, while also witnessing a 23 per cent decline in the use of public transport.

In 2011, the modal share of public transport stood at just 13 per cent while cars accounted for 67 per cent.

To reverse this trend, Ljubljana adopted a new Sustainable Mobility Plan (SUMP) in 2012. The plan sought to limit personal motor vehicle traffic and instead give greater priority to pedestrians, cyclists and public transport.[201]

When introducing the plan, the city set itself concrete targets: to increase walking by 20 per cent, cycling by 40 per cent and bus journeys by 50 per cent, all the while reducing car journeys by 20 per cent. For 2020, the modal split envisioned was one-third public transport, one-third non-motorised mobility and one-third private vehicles.[202]

To achieve these targets, the SUMP proposed a broad mixture of policy measures that are outlined below.

[201] See European Union (2015).
[202] See Civitas (2013).

Implementation

Ljubljana implemented numerous measures across various policy areas to limit motorised transport and promote sustainable mobility. In terms of pedestrian-oriented and car-restrictive policies, the city:

- set up an eco-friendly zone which closed the old city centre to traffic and restricted deliveries to the mornings
- made Slovenska Street, a traffic artery, more pedestrian friendly by improving accessibility and refurbishing the surrounding area. This entailed planting 63 young ash trees along a 400-metre stretch, which also attracted local wildlife.

Moreover, Ljubljana implemented several supporting policies, such as the establishment of five new park-and-ride facilities, the purchase of 32 new CNG buses and the introduction of an electric tourist train. In order to further promote cycling, the city also manages 220 km of dedicated cycle routes and rolled out a public bike hire scheme (Bicike) which comprises 36 stations and 360 bikes.

In addition, to improve the convenience and efficiency of public transport use, the city introduced real-time arrival displays for the bus network as well as a smart travel card, the Urbana card.

Funding for many of the projects under Ljubljana's SUMP has come from the EU's Cohesion Fund at a national level, but Slovenia plans to switch to its own financing from 2020. This will require changes to national legislation and financing, and the carrying out of engagement and awareness campaigns.[203]

Barriers and critical success factors

Several factors contributed to the success of the SUMP. First, due to continuous awareness-raising campaigns, the city was able to take new policy measures year on year. As part of its communication efforts, Ljubljana also hosted the European Mobility Week in 2003 and 2013. This is Europe's largest mobility campaign, designed to encourage city administrators to introduce sustainable transport policies.

[203] See Jovičić (2019).

Second, the mild climate and the flat topography of the city make it ideal for cycling all year round. This has helped Ljubljana's bike-sharing scheme to succeed.

Third, from a political point of view, mayor Zoran Janković chose to implement the bigger, more controversial changes, such as banning cars from the city centre, within his first year of office. This meant that the inconveniences associated with the implementation of the SUMP would be over early on, and residents and initial critics could experience the benefits of cleaner air, safer streets and quieter public spaces by the time the next election campaign came around.[204] This strategy showed success: Mr. Janković has since been re-elected three times.

Results and lessons learned

Through the implementation of its SUMP, Ljubljana achieved a significant uptake in public transport and active mobility options.

With regard to public transport, the city saw:

- an 18.5 per cent increase in public transport use between 2010 and 2014
- 17 per cent more city bus users since 2011
- a 34 per cent increase in journeys on regional buses between 2013 and 2014.

Moreover, 98 per cent of city residents think that the shared bike scheme is a positive idea, and it has seen close to three million journeys in its first four years of implementation.

Ljubljana has also successfully transformed from a car-friendly to a pedestrian-friendly city, in turn bringing down pollution levels. Through the SUMP:

- pedestrian surfaces were increased by 620 per cent through closing the city centre (100,000 m^2) to all motorised vehicles[205]
- the city centre is now used for cultural, social and sporting events throughout the year. The renovation of Slovenska Street reduced black carbon levels by 70 per cent and PM 2.5 levels by 58 per cent, while the concentrations on surrounding streets have not increased.[206]

In recognition of all the above results, the city received the bronze Access City Award from the European Union in 2015. The award identified Ljubljana as one of Europe's leading cities in terms of accessibility to public spaces and public transport.[207]

These impacts also had a direct positive effect on people's wellbeing. In 2015, the European survey on quality of life (Eurobarometer) found that 92 per cent of Ljubljana residents were very satisfied or satisfied with the quality of life in the city.[208]

The success stories in Ljubljana clearly offer valuable lessons for other cities. First, Ljubljana did not take an isolated approach to combat rising numbers of private vehicles and the associated detrimental environmental effects. Instead, it implemented a balanced mixture of policy measures to achieve a modal shift. Second, it can be beneficial for politicians to implement controversial measures early on, so that the positive impacts of initiatives are visible by the time the next elections are due.

Links to similar initiatives

Copenhagen: active transport policies

Lund: eco-mobility policies

Freiburg: active transport policies

[204] See CityLab (2016).
[205] See Istenič (2016).
[206] See City of Ljubljana (2020).
[207] See ICLEI (n.d.).
[208] Ibid.

Promotion of active transport: Lund, Sweden ↘

Over the last 10 years, Lund has implemented a series of pro-cycling and pedestrian-friendly transport policies, leading to a decrease in car use and a rise in the uptake of active transport options.

Snapshot

- **Location:** Lund, Sweden
- **Population:** Small – 92,000 (2018)
- **Economy:** Service economy
- **Policy area:** Transport
- **Policy options:** Pedestrian-oriented and car-restrictive policies; pro-cycling policies
- **Financial capacity:** Strong
- **Administrative capacity:** Strong
- **Other:** Supportive national policy

Context and policy overview

In 2017, just two years after the Paris Agreement, Sweden committed to becoming carbon neutral by 2045,[209] one of the first countries in the world to commit to such a target. Overall, environmental awareness has grown rapidly in Sweden since the 1970s and this has also been reflected in Lund's environmental policy.

In 1999, the city developed a new Environmental Code, which streamlined all previous environmental acts and included concepts such as the polluter-pays principle.[210] Since the 1970s, the city has been implementing a series of hard and soft measures to improve transport management in particular.

Today, the city has a well-developed transport plan (LundaMaTs), which it has further developed to consider wider environmental, economic and social sustainability (LundaMaTs II). The long-term ambition of this plan is to encourage the use of active transport (walking, cycling and public transport), while also reducing the use of private vehicles.

All measures have been supported by suitable levels of funding as well as a highly engaged, motivated and well-educated population.[211]

[209] See UNFCC (2017).
[210] See Baltic Environment and Energy (2007).
[211] See CiViTAS (2009).

Implementation

The small size of Lund (25.75 km^2) lends itself to active transport and, with significant green space, the city is an attractive environment for pedestrians.[212] The measures taken to facilitate the LundaMaTs transport plan were a broad mixture, including rezoning, the establishment of partnerships, education and awareness campaigns, the redesigning of outdoor spaces, and pro-cycling measures.

Rezoning: The city initially carried out a series of rezoning measures including closing several streets and squares to vehicular traffic and limiting bus traffic to certain times of the day.

Redesigning outdoor spaces: The city recognised that the uptake of walking could be even greater for both disabled groups and non-disabled groups if Lund improved accessibility and made the city's open spaces safer with lighting, through project proposals that could be included in a pedestrian management plan.

Pro-cycling measures: At the start of the programme, cycling was already popular across the city, and Lund is recognised as one of the most popular places to cycle in Europe. The municipality undertook a mixture of policies to further capitalise on this popularity, including:

- improvements to cycling infrastructure
- bicycle traffic safety campaigns
- establishing partnerships with the public and private sectors.

In particular, the infrastructure programme facilitated the construction of 260 km of high-quality bike lanes, more than 5,500 cycle parking spaces and multistorey parking and bike storage facilities with servicing at the central train station.[213]

Partnerships: Partnerships between public and private institutions and transport and traffic companies have been established in Lund.

The city has supported these measures to improve active transport through:

- an online service that allows residents to compare different modes of transport in terms of their cost, time, environmental impact and health benefits. It is an open-source service that enables users to contribute and has therefore become a co-produced map.
- measures to improve the public transit system. The bus system is coordinated across the region and provides frequent local services, connecting 400 bus stops over 11 lines. The train system from neighbouring Denmark is similarly unified under one ticketing system.

[212] See ICLEI (2011).
[213] See CiViTAS (2009).

Lund has had significant municipal and national government funding for the measures, mainly due to the wider national ambitions of Sweden. The level of annual funding for active transport in Lund is difficult to estimate. However, a basic budget equivalent to approximately GBP 300,000 is spent on maintenance. Projects to improve provision are additional costs – for example, the equivalent of GBP 2 million for the creation of tunnels and an investment of more than GBP 7.1 million between 1998 and 2005 as part of the LundaMaTs programme.[214] One source states that funding has varied between GBP 1.5 million and GBP 5 million.[215]

Results and lessons learned

The LundaMaTs programme consisted of a mixture of policies implemented over a decade which allowed the city to adjust to the changes, to spread out the costs and to create long-term behavioural shifts among residents.

In 2011, 43 per cent of all trips in Lund were taken by bicycle, and in the preceding decade, there was no increase in car use. In fact, in 2010 there was a measured drop of 2 per cent in the kilometres travelled annually by car compared with the levels seen in the previous year.[216]

Moreover, improvements in accessible design led to a halving of the number of deaths and injuries from traffic accidents. The city aims to have no deaths and injuries in the future.

Looking ahead, the already well-connected bus network will be further supported by the introduction of a tram network that is due to open in December 2020[217] to facilitate faster public transport, greater capacity and an environmentally cleaner system.

The experience of Lund shows that a balanced and well-thought-out mixture of policies implemented over a longer period can help to facilitate behavioural change among residents and to address funding constraints.

Links to similar initiatives

Amsterdam: mobility plan

European: Commission report on cycling

Copenhagen: cycling strategy

[214] See Warren (2010).
[215] See Transport for London (2014).
[216] See ICLEI (2011).
[217] See Railway Gazette (2020).

Cycling strategy: Copenhagen, Denmark ↘

Copenhagen achieved a shift from being an increasingly car-centric city in the 1970s to one in which cycling is now becoming the norm for most inhabitants. While cycling in Denmark has decreased by 30 per cent since 1998, in Copenhagen it has risen by 30 per cent.

Snapshot

- **Location:** Copenhagen, Denmark
- **Population:** Large – 602,000 (2017)
- **Policy area:** Transport
- **Policy options:** Pedestrian-oriented and car-restrictive policies; pro-cycling policies
- **Financial capacity:** Strong
- **Administrative capacity:** Strong

Context and policy overview

Like many other cities in Europe, Copenhagen experienced a major rise in private car ownership and use from 1945 to 1975. This brought about a corresponding decrease in bicycle use and an increase in levels of traffic and pollution.

However, in the 1970s a number of factors including the oil crisis led the city government to prioritise cycling in Copenhagen.[218,219]

This strategy entailed various planning, infrastructure and financing measures and has helped Copenhagen to attain the status of being one of the world's leading cycling hubs.

Implementation

As part of its plan to be CO_2 neutral by 2025, Copenhagen has set itself the goal of becoming the world's best city for cycling. To achieve this, it has deployed a policy mix of planning, infrastructure and financing measures.

Planning measures: Bicycle planning is now an integrated feature of urban development and urban governance in Copenhagen. The city has developed various policy, planning and strategy documents addressing different aspects of cycling through targets, implementation and funding. The most important documents include:

[218] See Urban Sustainability Exchange (n.d.).
[219] See Ruggieri (2017).

- the Copenhagen Cycle Policy (2002-12)
- the Copenhagen Transport and Environment Plan 2004
- the Copenhagen Bicycle Strategy (2011-25)
- the Copenhagen Cycle Priority Plan (2006-16).

Infrastructure measures: There is a large amount of cycling infrastructure in Copenhagen aimed at improving the safety and convenience of cycling through a network of segregated bike paths, dedicated bicycle traffic lights, separated coloured bike paths where cars and bikes share road space, and parking for bicycles and cargo bikes. Cargo bikes are used for transporting children and shopping and are often an alternative to car ownership.

Financing measures: Copenhagen allocated €80 million to implement its bicycle strategies and infrastructure between 2010 and 2014.[220]

Barriers and critical success factors

The main barrier to establishing Copenhagen as a bicycle-friendly city was the rise of private car use from the 1950s onwards. To improve the situation, the city integrated cycling into its planning and policy, ensuring that there were sufficient resources to support the policies. Copenhagen has also promoted a culture of cycling, which has been central to the success of the strategy.

A critical success factor has been the single Technical and Environmental Administration within the city government, as it enables a "one-stop shop" approach to urban and transport planning. The administration works collaboratively, with an open work culture, reducing conflict between urban and transport planning.

Results and lessons learned

Copenhagen successfully managed an urban transformation process from being a car-centric city in the 1970s to becoming a global role model for bicycle-oriented planning. Through a variety of measures, the city achieved impressive results:[221]

- The number of daily bicycle trips increased from 110,000 in 1970 to 150,000 in 2015 (a 36 per cent modal share). Copenhagen plans to increase this further to 240,000 by 2025.
- Since 1998, the city has seen a 30 per cent increase in total kilometres cycled and a more than 33 per cent rise in cycling's modal share for work or educational trips.
- Bicycles are increasingly used, even for trips with heavy shopping or children, and 17 per cent of households have a cargo bike.
- The bicycle is now the most popular form of transport for Copenhagen's commuters.

Today, cities around the world look to Copenhagen for guidance and inspiration when it comes to designing and implementing pro-cycling policies. The lessons learned from Copenhagen can be summarised under two areas: governance, and political leadership and commitment.

Governance: Copenhagen has successfully reduced and minimised conflicts between urban and transport planning by taking an integrated approach across departments and agencies.

Political leadership and commitment:
In Copenhagen cycling is increasingly the norm for the majority of residents. Promoting a culture of cycling and supporting that with sufficient resourcing and planning commitments has been crucial to this success.

Links to similar initiatives

Muenster: policy to promote cycling

Burgas: cycling measures

Utrecht: cycling city of the Netherlands

[220] See Urban Sustainability Exchange (n.d.).
[221] See The City of Copenhagen Technical and Environmental Administration Traffic Department (2011)

Green ventilation corridors: Stuttgart, Germany ↘

Stuttgart developed a climate atlas that maps temperatures and cool air flows in and around the city. This information helps develop planning and zoning regulations to both protect open spaces and incorporate new ones into dense, urban areas.

Snapshot

- **Location:** Stuttgart, Germany
- **Population:** Large – 628,000 (2016)
- **Economy:** Service economy
- **Policy area:** Land use
- **Policy option:** Promotion of green spaces and biodiversity
- **Financial capacity:** Strong
- **Administrative capacity:** Strong

Context and policy overview

Stuttgart's geography and economic base heavily influence its air quality. A mild local climate, low wind speeds and a valley basin location, combined with industrial activity and high traffic volumes all contribute to poor air quality.[222]

Climate projections for the period 2071-2100 predict a 2ºC increase in mean annual temperatures for the city. And projections for heat waves – defined as temperatures exceeding 30°C – suggest that heat stress will be a significant issue, with more than half of the Greater Stuttgart area experiencing at least 30 days of heat stress by 2100. Low-lying areas could experience more than 60 days, significantly increasing the risk to local people.[223] Moreover, ongoing development of valley slopes surrounding the city hinders air flow, exacerbating poor air quality and the urban heat island effect.

Stuttgart has a decades-long legacy of climate mapping; air-quality data collection and local climate assessment began in the 1930s. As air quality worsened into the 1970s, the city began a more focused campaign to address this problem.[224]

Adapting to climate change and mitigating its effects remains a political priority. The city adopted its first climate change mitigation strategy in 1997 and has since supplemented this with an adaptation strategy adopted in 2012.

The main goal of these strategies is to improve air quality and reduce the urban heat island effect by channelling flows of cool air via ventilation corridors from the hills towards urban areas in the valley basin.

[222] See WWF (2012).
[223] See European Environment Agency (2014).
[224] See WWF (2012).

The climate atlas for the Stuttgart region was initiated in 2008. It provides a spatial overview of the region and includes the assessment of 179 towns and municipalities.[225]

Implementation

The atlas illustrates the movement of cold air and the levels of various air pollutants. It also establishes eight types of local climate typology, with associated planning and zoning recommendations to protect open spaces and to promote the creation of new ones, especially in built-up areas. For example, the climate atlas prohibits construction in cold air ventilation corridors and any other open spaces that have a large effect on the local climate. The Atlas recommends additional greening for developed areas in locations that have a significant effect on the climate. Further planning principles include the following:[226]

- Buildings must be surrounded by open space and there must be a larger, interconnected network of open spaces.
- Valleys, hills and hillsides may not be built on.
- Urban sprawl should be avoided.
- For industrial buildings, air pollutants that would affect the surrounding settlements should be avoided.

Collaboration and public participation underpin the implementation of the climate atlas, which was developed and funded in a partnership between the city, regional authorities and climate experts.[227] To increase the programme's public appeal and participation, the city also provided financial assistance for the private installation of green roofs and encouraged residents to adopt and care for a tree.[228]

Barriers and critical success factors

The following success factors have contributed to the successful improvement of air quality and to mitigation of the urban heat island effect:[229]

- The consolidation by the atlas of critical details of the region's geography, climate and land use has faciliated precise planning for different areas.
- The city's increased internal capacity to conduct climate research has created valuable knowledge of the local environment. This has allowed Stuttgart to act on specific information rather than relying on general principles and has rendered the city's efforts more effective. Furthermore, this concrete knowledge, applied

[225] See City of Stuttgart (n.d.).
[226] See WWF (2012).
[227] See European Environment Agency (2014).
[228] Ibid.
[229] Ibid.

over decades, has enabled Stuttgart to regulate development and land use to intentionally create a region-wide system of air flows.

- The atlas has shown that existing regulations (such as the German building code) can also be used to further promote climate-related planning recommendations.

- The partnership between the Office for Environmental Protection and the City Planning and Renewal team in Stuttgart has meant that the recommended green infrastructure solutions were implemented through spatial planning and development control.

Results and lessons learned

Having initiated subsidies for green roofs since 1986, Stuttgart now mandates them on new developments. As a result, the green roof market has had a significant boost.[230] Stuttgart is now a leader in the field, with more than 300,000 m^2 of green roofs. More than 60 per cent of Stuttgart's land area is green open space. In addition, at 39 per cent of the total land area, the city has the highest percentage of protected land of any city in Germany. These green spaces include 5,000 ha of forested land, 65,000 park trees and 35,000 street trees. Through a concerted strategy in place since the 1970s, the city has integrated green areas into a large green corridor. People can now travel from the royal gardens in the city centre to forests at the edge of Stuttgart exclusively via green spaces.[231]

Recent changes to the climate atlas prohibit development in ventilation corridors and on the hills surrounding the city. Plans set out in the city's 2010 Land Use Plan to develop more than 60 ha of these areas have now been halted in order to protect green spaces.[232]

Using financial support provided by the city, about 60,000 m^2 of green roofs have been installed and nearly 500 trees have been paired with citizens in a tree adoption programme. These volunteers water the trees, report on pest infestations and remove fallen leaves, branches and dog excrement.[233]

The climate atlas concept has been replicated in other cities across Germany and internationally. For example, Berlin has developed an environmental atlas and Kobe, Japan has created an environmental atlas to inform measures that support air circulation from the sea during the day and from the mountains during the night.[234]

Links to similar initiatives

Tirana: green belt policy

Novi Sad: green living concept

Hamburg: green roof strategy

Liverpool: mapping green infrastructure

Antwerp: green tool

[230] See Mees (2014).
[231] See European Environment Agency (2014).
[232] See WWF (2012).
[233] See European Environment Agency (2014).
[234] See WWF (2012).

Urban planning with superblocks: Barcelona, Spain ↘

The municipality of Barcelona, in partnership with the Urban Ecology Agency, developed the innovative "superblocks" project to address local challenges such as air pollution, noise, traffic, road accidents, health issues and a lack of green space.

Snapshot

- **Location:** Barcelona, Spain
- **Population:** Large – 1.6 million (2016)
- **Policy area:** Land use
- **Policy options:** Development of compact cities; promotion of mixed-use areas and transit-oriented development; promotion of green spaces and biodiversity; community-based land planning
- **Financial capacity:** Strong
- **Administrative capacity:** Strong

Context and policy overview

The municipality of Barcelona's "Citizen Commitment to Sustainability 2012-2022 – Compromís 22" agenda promotes engagement and collaboration to create a more liveable and sustainable city. More than 800 local organisations have signed the document.[235] One of the aims of the Commitment is to place the individual at the centre of decision-making in city planning, with an increased focus on small-scale interventions.[236] The "Let's fill the streets with life" programme was initiated to prioritise access to public space for people rather than vehicles. The programme centres around public participation.[237]

Barcelona's Climate Plan 2018-2030 builds on the Commitment's aims, with "superblocks" seen as a means of fulfilling the plan's goal to increase green space and cut GHG emissions.[238]

The city's 2013-18 Barcelona Urban Mobility Plan (UMP) also sought "to promote positive communal relations between people as well as social cohesion, wellbeing and public health" and promoted superblocks.[239] Moreover, the new Urban Mobility Plan 2019-2024 includes plans to significantly expand the superblocks programme across the entire city.[240]

[235] See Ajuntament de Barcelona (n.d.a).
[236] See Energy Cities (2016).
[237] See Ajuntament de Barcelona (n.d.b).
[238] See Ajuntament de Barcelona (n.d.c).
[239] See Ajuntament de Barcelona (n.d.d).
[240] See Ajuntament de Barcelona. (n.d.e).

Implementation

The superblocks programme redefines public space, giving priority to people, greenery and human interaction while minimising the space allocated to roads and vehicles. Superblocks consist of a small grid of blocks and roads (approximately 400 m x 400 m), with cars, vans, scooters and other vehicles restricted to the outer perimeter roads (unless the drivers are residents or delivering to local businesses, in which case their maximum speed should be 10 km/h). The city has expanded cycle lanes and initiated an orthogonal-grid bus network, using main thoroughfares only.[241] Superblocks are intended to function as mini-neighbourhoods, creating opportunities for leisure, sports and social interaction.

The approach was first tested in the neighbourhood of Poblenou in 2015. There, the initiative has transformed public space, with 75 per cent of the area that was once occupied by cars now freed up for cycle lanes, benches and room for residents to interact and children to play.[242] Four new 2,050 m^2 public squares have also been introduced.

So far, Barcelona has completed six superblocks and the Urban Ecology Agency (BCNEcologia), a public consortium within the city council, has set out plans to develop 503 more superblocks across the city.

Barriers and critical success factors

While there have been some criticisms, for instance about the inconvenience to drivers as a result of complicated rerouting, the occupants of superblock areas have tended to welcome the changes.[243]

Following the Poblenou test case, the city learned important lessons that were carried through into the development of later superblocks. For example, a lack of sufficient funding to develop the superblock and an initial failure to engage local stakeholders created some opposition and animosity.[244]

Strong, clear communication between planning authorities and residents is recognised as being essential to increase the acceptability of the projects. Public engagement and participation throughout the planning stages also create a sense of ownership and emotional attachment to the areas for the people who will use the spaces. Participatory processes take both those involved in design and policy as well as the communities on a shared journey that is likely to culminate in a joint and mutually acceptable vison for Barcelona.

Furthermore, during the process of developing and designing the superblock spaces, a willingness to experiment and to learn by doing allows people to evaluate the changes as they engage with the spaces. This enables simple, low-cost, no-regret interventions to bring about rapid changes in behaviour and the environment. These can then lead to investment in more permanent changes to the public realm, a clear demonstration of value creation for the neighbourhood. Superblocks are open projects; since the completion of the Poblenou project, any proposed action undergoes a participatory process involving local residents and organisations to ensure social acceptance. The outcomes of the implementation process are different in each block as each neighbourhood has its own preferred approach, characteristics, economic activity, density and so on.[245]

The superblocks initiative is simple but its effects have been transformative. The project is low-cost and relatively quick to carry out, with no physical changes

[241] See Bausells (2016).
[242] See PublicSpace (2018).
[243] See Bloomberg (2017).
[244] See Serena (2018).
[245] See Bausells (2016).

required and with a strong dialogue between city authorities and residents being the major driver of success.

Results and lessons learned

- Building on the initial experiment in Poblenou, the municipality has now created superblocks in five pilot neighbourhoods, with plans for many more. Through these projects, the city hopes to achieve emission reductions of between 20 per cent and 75 per cent.
- The superblocks initiative is part of the city's Urban Mobility Plan, which aims to decrease traffic by 21 per cent while extending car-free spaces and providing 300 km of bicycle lanes. In the Poblenou superblock, vehicle numbers on the inner streets have fallen by 58 per cent while traffic around the periphery has increased by only 2.6 per cent. More than 300 benches have been installed and 212 new trees planted.
- The project has increased the amount of green space by 1 m^2 per capita, reduced the heat island effect and noise pollution and improved air quality.
- The superblocks provide car-free places that are safer and more enjoyable for children and older people. These areas also foster social interaction, sports and cultural activities and expand opportunities for small businesses.
- Quality of life has improved in the city, making Barcelona a more attractive destination for business and tourism.
- The initiative is scalable and could be applied to new developments as well as to regeneration projects.
- A recent study found that if all 503 of the proposed superblocks were implemented, almost 700 premature deaths could be prevented annually (mainly due to reduced pollution levels) and life expectancy could be increased by almost 200 days per resident. These outcomes could result in economic savings of €1.7 billion a year.

The experience of superblocks in Barcelona has shown that initial opposition to such projects must be expected but can be overcome through strong engagement and communication tailored to the specific circumstances of a neighbourhood.

Links to similar initiatives

Amman 2025: from master plan to strategic initiative

Transformation of Tirana's New Bazaar

Beijing: low-carbon zoning policies

[246] See C40 Cities (2016b).
[247] Ibid.
[248] See Publicspace (2018).
[249] See C40 Cities (2016b).
[250] See Mueller (2020).

Urban regeneration and renewal: Roubaix, France ↘

The city of Roubaix has successfully followed a market-led approach to urban renewal which integrates issues such as social inclusion, housing renewal, and economic and cultural development.

Snapshot

- **Location:** Roubaix, France
- **Population:** Small – 96,000 (2015)
- **Economy:** Service economy
- **Policy area:** Land use
- **Policy options:** Promotion of mixed-used areas and transit-oriented development; promotion of community-based land use planning
- **Financial capacity:** Strong
- **Administrative capacity:** Strong

Context and policy overview

Together with the Lorraine region, Nord-Pas de Calais was a cradle of the industrial revolution in France. While coal mining and steel industries developed in the region, Roubaix – one of the four major cities in Nord-Pas de Calais – built its industrial prosperity on textile manufacturing. However, in the early 1970s, the textile industry fell into crisis and 50,000 jobs were lost in Roubaix and the surrounding areas.[251]

The decline of the city's textile industry created a host of interlinking challenges including unemployment, low skill levels, urban decay, housing market collapse, poverty, inequality, violence and racism.[252] As a way to tackle these issues and attract the middle classes back to the city, Roubaix identified a series of strategic objectives:[253]

- recovery from deindustrialisation by encouraging the growth of new sectors
- revitalisation of the rundown city centre and rebuilding of a retail offer
- addressing the need for better, more affordable housing for residents and attracting new residents, and
- ensuring that investment and economic development benefit existing residents, especially by providing training and new employment opportunities.

[251] See Cadell et al. (2008).
[252] See Rousseau (2009).
[253] See Colomb (2007).

René Vandierendonck was elected mayor of Roubaix in 1994 with a political mandate to revitalise the city centre. The mayor's strategy was implemented in a changing political and economic context. Lille Metropolitan Authority (LMCU) – an intercommunal cooperative body with investment-related responsibilities transferred from its 87 individual member municipalities – started to play a strategic role in developing a vision for economic development and urban regeneration. LMCU also initiated a series of long-term agreements with the mayors of the region's four big cities, which led to the emergence of a consensus and a grouping together of budgets.[254]

The resulting strategy, Ville Renouvelée ("renewed city"), includes a spatial plan for metropolitan Roubaix and aims to reverse urban decline and create value for residents and investors. The concept became one of the key objectives of the 1997 strategic plan for the Lille metropolitan region and also informed French national urban policy.[255]

Implementation

Regeneration of the city centre was planned across five key areas:[256]

- creating secure and successful public spaces which enhance the architectural legacy of Roubaix
- improving the retail offer and establishing the city centre as a commercial destination
- designating zones, including enterprise zones, to channel economic development into strategic areas
- launching a cultural strategy to promote Roubaix as a cultural destination
- renewing the city's housing stock.

Improvements to the public realm were designed to entice investment, businesses and shoppers to the city centre. These actions included (i) regenerating the main central square and its civic buildings; (ii) regenerating public spaces and streets while respecting the local architectural and industrial heritage; (iii) regenerating the Canal de Roubaix; (iv) promoting the painting of façades in bright colours to break up the grey, industrial image of the city and (v) improving safety, for instance through additional policing and CCTV.[257]

To improve the city centre's retail offer, the city council established a small core of commercial opportunities through improvements to the streetscape design; improvements in public transport interchanges for the metro, tram and bus; financial and technical support such as tax exemptions for people interested in opening retail shops, and grant to support the refurbishment of buildings. Two large retail outlet centres were also opened on the outskirts of the city. The designation of Roubaix as a Zone Franche Urbaine (tax-exempt enterprise zone) in 1997 brought tax-break incentives and helped promote business and job creation. These measures helped to spread the benefits of the renewal programme across the city and its communities.[258]

Barriers and critical success factors

Key to the success of Roubaix's regeneration was the strong city-regional relationship in which political cooperation developed in the early 1990s. Beginning in 1994 with the mayoral tenure of René Vandierendonck, collaboration increased between the city and the LMCU. The regeneration benefited from outstanding civic leadership and vision both at the city-regional level and at the level of the city of Roubaix itself. The sharing of budgets between the regions also facilitated more collaborative opportunities. The regeneration process in Roubaix was also heavily influenced by the fact that the various urban, social and economic regeneration elements were carried out in parallel within a concentrated period of change. It was the synergy between these elements that made the process a real success.[259]

[254] See Cadell et al. (2008).
[255] See Colomb (2007).
[256] Ibid.
[257] Ibid.
[258] Ibid.
[259] See Colomb (2007).

Investment in the public realm, housing and communities as well as job creation and business incentives also increased the desirability of the city and attracted people to return there to live and work. The city's cultural policy also helped to enhance Roubaix's image, enabling the celebration of its cultural and social history while creating a dynamic modern environment and attracting younger, wealthier people and even tourists.

Resource implications

Roubaix has been used as an experimental area for all urban policy initiatives taken by successive local governments across the country since the birth of urban policy in the early 1980s. This has created a relatively complex combination of schemes and funding but has also meant that the city has used all possible programmes. While the city had a weak tax base, it was able to tap into substantial funding from the central government and the LMCU. One of the challenges for the Lille city-region has been leveraging funding from many different levels (for instance, EU, national and local levels) to finance a clear and coherent approach to metropolitan regeneration.

Results and lessons learned

The strategy has brought meaningful improvements in the public realm to central Roubaix, from quality infrastructure such as housing, unified paving, street furniture, cleanliness and coloured facades, to jobs, skills and business opportunities. The middle classes have returned to the city, the property market has recovered, and the city's image has been transformed.

Roubaix now has a standardised system to conserve and refurbish industrial buildings that date from the industrial revolution. Alongside the improved public realm, these initiatives have supported the re-emergence of retailing in the town centre.

Today, Roubaix has many important cultural amenities, including La Piscine museum, which saw the city's old public swimming pool converted into an internationally known cultural venue thanks to an innovative regeneration programme.[260]

Local leaders have also crafted a strategy for cultural regeneration against great odds. The Ministry of Culture awarded Roubaix the title of Ville d'Art et d'Histoire, only one of 59 cities to earn the title. Similarly, a range of factors including a better nationwide economic climate, the impact of the tax-exempt zone, and improved links between economic development and local employment, has cut unemployment from 33 per cent in the 1980s to 22 per cent in 2005.[261]

Furthermore, people have moved to Roubaix and invested there. As central Lille became more expensive, Roubaix's improved city centre became more appealing, not least thanks to its proximity – only 20 minutes away by metro train following the completion of a new line. The many renewal strategies featured in the programme have also benefited vulnerable groups, in particular in terms of local employment opportunities.[262]

Links to similar initiatives

Rotterdam: urban regeneration

Gothenburg: urban regeneration

Christchurch: urban regeneration

[260] See Guardian (2008).
[261] See Colomb (2007).
[262] See Cadell et al. (2008).

Density bonusing and development: Toronto, Canada ↘

Toronto has applied density bonusing to secure community benefits in exchange for approval to build taller and denser buildings. Parking improvements, public art, and funds for new daycare facilities and affordable housing are among these benefits.

Snapshot

- **Country:** Toronto, Canada
- **Population:** Large – 2.9 million (2017)
- **Policy area:** Land use
- **Policy option:** Development of compact cities
- **Financial capacity:** Strong
- **Administrative capacity:** Strong

Context and policy overview

A strong development market in Toronto has led to a spate of high-rise construction, especially residential condominiums and office buildings. With the establishment of a protected greenbelt area, rising land values, a buoyant real estate market, and population and employment growth, developers have a strong incentive to build projects that are taller and denser than those preferred by local government and city residents.

To address this issue, bonusing in relation to height and density has become an important tool in Toronto's urban planning over the past twenty years. According to Section 37 of the Ontario Planning Act of 1990, developers are allowed to propose a new building larger than would be permitted by existing land controls, in exchange for the delivery of community benefits.[263]

The provisions of Section 37 usually apply to developments if they have a gross floor area exceeding 10,000 m^2 and if the applicant proposes to exceed the permitted density by 1,500 m^2 or more and/or increase the permitted height of the building.[264]

Implementation

City leaders and planners use density bonuses to entice private developers to create public benefits.

[263] See Pantale (2014).
[264] Ibid.

This has been particularly useful in situations where development will create additional demand on infrastructure or the public realm and where there is a lack of public resources to make improvements. Toronto's regular use of Section 37 has provided funds for open spaces, public art, affordable housing, and childcare facilities.[265]

Developers and city planning staff negotiate Section 37 benefits on a case-by-case basis. Once the planning team has completed its review, the application for development goes for consideration by the community council. This period includes public consultation and the opportunity to formally register comments about the development and related Section 37 benefits. If approved by the community council, the application goes to the city council to render a final decision. Once approved, the Section 37 benefits are "secured" and the city enters into a formal agreement with the applicant.[266]

Given that restrictive frameworks may hinder development and community-building potential in a city, the negotiation process under Section 37 has remained flexible in order to react to changing market demand and community needs.

Developers can provide the Section 37 benefits through in-kind or cash-in-lieu methods. The city has discretion regarding how to spend cash-in-lieu contributions. Toronto secured around 850 Section 37 benefits in the period from 2009 to 2014. Some 55 per cent of these were in-kind contributions and 45 per cent were cash in lieu.

Barriers and critical success factors

In contrast to many other tools of municipal finance, Section 37 benefits bring benefits primarily to the area affected by the development. As a result, the "density for benefit agreements" (DBAs) are heavily concentrated in the parts of Toronto that have had substantial development activity, especially the downtown core. Hence, the number of benefits has been disproportionately high in wards with the most DBAs, which has led to an uneven distribution of policy outcomes.

Since its inception, the bonusing policy has experienced controversy and criticism from various actors in Toronto. Points of criticism have included the allegedly inconsistent application of the policy, disagreement over how funds should be spent, the tendency to engender poor planning decisions, and a negotiation process that has little public oversight.[267] Critics also note that the community benefits that the policy seeks have not been achieved in proportion to the developments created and their associated externalities.[268]

To tackle these points, the city council adopted a protocol for negotiating Section 37 community benefits through which it encouraged consultation with a variety of stakeholders during the assessment of community benefits. Consultations would be held with elected representatives, city council staff and the local community and decisions would be supported by evidence of community needs from previous studies.[269]

Results and lessons learned[270]

- Over a 15-year period, Section 37 agreements generated more than €220 million in benefits for Toronto.
- The range of benefits secured through the Section 37 process varied widely and included community facilities, parks, road improvement schemes, public transport projects and arts and cultural facilities.

Links to similar initiatives

London: density development

Vancouver: density bonusing

New York: inclusionary zoning

[265] See City of Toronto (n.d.).
[266] Ibid.
[267] See Moore (2013).
[268] See Lehrer and Pantalone (2018).
[269] See R.E. Millward & Associates Ltd (2013).
[270] See Moore (2013).

Energy manager obligation and white certificate scheme, Italy ↘

Since 2005, Italy has operated a market-based incentive scheme for energy efficiency interventions. This "white certificate" system has delivered substantial savings in the use of electricity and heat.

Snapshot

- **Location:** Italy (nationwide)
- **Population:** 59.2 million (2019)
- **Policy area:** Energy and buildings
- **Policy options:** Industrial regulations and information to report on energy performance; fiscal incentives for efficiency related to machinery and materials in industries
- **Financial capacity:** Limited
- **Administrative capacity:** Strengthening

Context and policy overview[271]

In the 1990s, the industrial sector was responsible for approximately one-third of Italy's energy consumption. Initially, the government responded by introducing rules requiring certain industrial firms and public sector organisations to nominate an energy manager. For industrial companies, this rule applied if their energy consumption exceeded 10,000 tonnes of oil equivalent (toe) per year and for public sector organisations the threshold was set at more than 1,000 toe per year.

While the new energy managers were effective in raising awareness of potential savings from energy efficiency, industries and public bodies were not required to act in response to this newfound awareness. The situation changed in 2005, when Italy introduced a market mechanism for energy efficiency investment called the Titoli di Efficienza Energetica (TEEs, or "white certificates"). The TEE scheme obliged electricity and gas utilities with more than 50,000 customers to reach specific targets in terms of primary energy savings. The utilities could choose to deliver energy efficiency measures themselves or to purchase white certificates earned by other scheme participants as a result of energy efficiency savings. The pool of scheme participants includes all those organisations that had been required to appoint an energy manager under the earlier scheme as well as other organisations with energy management systems in place. This arrangement created a larger

[271] See Thomas et al. (2014).

pool of certificate "sellers" which the utility firms could access to reduce the overall cost of their compliance. It also ensured that energy managers with the required know-how were in place in every participating organisation.[272]

The scheme involves a 12-month baseline monitoring period prior to the proposal of eligible measures, and a 12-month post-completion monitoring and verification period before a firm or organisation submits an application for a TEE certificate.

Implementation and challenges[273]

At first, the scheme had a price cap of €100 per TEE and more than 80 per cent of the energy efficiency savings were in the residential sector.[274] In 2012, the government introduced a durability coefficient, "tau", that allowed up to 3.36 TEEs to be earned per toe saved. Subsequently, the €100 per TEE cap was removed and the scheme was able to leverage greater investment.[275]

In 2013 Italy introduced a measure that prevented technologies that had previously benefited from other national support mechanisms from receiving support under the TEE scheme. In 2017 the durability coefficient was abolished, as it incentivised projects with a long technical life, and other incentives were introduced. The durability cofficient was replaced by a rule allowing scheme participants to front-load the attributable savings to the first half of the project's useful lifecycle.[276]

In 2018, further modifications were made to increase the supply of certificates and to address concerns about fraud and the complexity of the scheme. These modifications included changes to the assessment of additionality; a two-year increase in the designated useful life of measures;[277] an expansion of the project eligibility criteria; the creation of new, pre-approved standardised solutions; the flexibility to spread compliance across scheme years; and the setting of a new definition of cumulativeness.[278]

Barriers and critical success factors

To increase overall energy efficiency savings and diversify measures away from the residential sector (which dominated the early years of the scheme), incentives were increased for industrial sector investments. These included awarding a higher ratio of certificates to industry and removing the price cap for industrial sector savings which had resulted in higher market prices (€427 per TEE in February 2018, for instance).[279]

[272] Ibid.
[273] See Energy Systems Catapult (2018).
[274] See Di Santo (2018).
[275] See Qualenergia.it (2017).
[276] See Gianni-Origoni & Grippo-Cappelli Partners (2017).
[277] Ibid.
[278] See FIRE Federazione Italiana per l'uso Razionale dell'Energia (2018).
[279] See Energy Systems Catapult (2018).

Industrial sector energy efficiency was also supported by the EU Emissions Trading Scheme (ETS), but under this scheme the carbon price was not sufficient to drive significant investment in the sector. However, the white certificate scheme was able to supplement the EU ETS and achieve higher rates of investment and savings.[280] Regular modifications to the scheme were essential to its continuing reliability and effectiveness, although these have, at times, created uncertainty and complexity.[281]

Extensive data collection by the public Italian energy services operator GSE has helped to create a valuable database for assessment and for comparison with other schemes. Furthermore, strict monitoring and verification procedures have helped to identify and reduce fraud in the system.

Defining the appropriate target that parties are required to meet is essential to the attractiveness and effectiveness of the scheme. The wrong target could create low prices and make the scheme less attractive to voluntary members or create high prices for end-users and the potential for fraud.[282]

Outcomes and impacts

- The scheme has resulted in cumulative additional energy savings of 25.6 million toe and annual savings of around 2 million additional toe and 6 million tonnes of CO_2.[283]
- Certifications under the scheme were initially dominated by the residential sector, which accounted for 70 per cent of certified projects in the period 2011-12. By 2017 the industrial sector represented 54 per cent of projects, due to the increase in industry-focused incentives, while the household sector's share fell to around 14 per cent.[284]
- In total, 5,807,831 TEEs were certified by 2017, with total primary energy savings calculated at 1.92 Mtoe. Most of those savings (55 per cent) came from cuts in primary energy use (natural gas) and a further 26 per cent from reduced electricity consumption.[285]

Additional benefits of the scheme include the creation of around 11,000 full-time equivalent direct and indirect jobs as well as a significant increase in knowledge about good practices in industrial energy efficiency across the energy industry.[286]

Links to similar initiatives

Irish large industry energy network

Tokyo: cap-and-trade programme

White certificates in France

[280] Ibid.
[281] See Di Santo et al. (2018).
[282] Ibid.
[283] See Di Santo et al. (2018).
[284] See Energy Systems Catapult (2018).
[285] Ibid.
[286] See Di Santo et al. (2018).

Energy performance contracting: Berlin, Germany ↘

The Berlin Energy Agency initiated energy saving partnerships in 1996 to implement energy performance contracting and improve energy efficiency in public buildings, using the established German ESCO market.

Snapshot

- **Location:** Berlin, Germany
- **Population:** Large – 3.5 million (2016)
- **Policy area:** Energy
- **Policy options:** Improved energy performance for public buildings; policies and support for energy performance contracts
- **Financial capacity:** Strong
- **Administrative capacity:** Strong

Context and policy overview

In the early 1990s, the Federal State of Berlin faced a tight budget and a lack of financial resources. Energy-related costs were high (approximately €255 million per year) and there was potential for average savings of around 30 per cent.[287]

In 1994, the Berlin Senate's Department for Health, Environment and Consumer Protection set a CO_2 emissions reduction target: by 2010, it aimed to decrease CO_2 emissions across all sectors by 25 per cent relative to the levels seen in 1990. Moreover, the Department introduced an updated Climate Protection Concept which set a CO_2 emissions reduction target of 40 per cent by 2020, relative to the 1990 levels.

In this context, the Berlin Energy Saving Partnership approach was initiated in 1996 by the Berlin Energy Agency (BEA) and the Federal State of Berlin. The approach provides a framework for the project management of retrofits and tender preparation for renovation works, guaranteeing energy consumption reductions that are based on energy performance contracting (EPC).[288]

BEA is a public-private partnership between the government of the federal state of Berlin, the development bank KfW Bankengruppe and private stakeholders. BEA acts as the independent project manager, facilitating and managing the process from baseline to contract negotiation.[289]

[287] See Berliner Energieagentur (2006).
[288] Ibid.
[289] See Citynvest (2015).

Implementation

The necessary investments are made by a private energy service company (ESCO), the contractor, and refinanced by the energy costs saved. The contracting authority may combine a selection of its building stock into a so-called “building pool” which can be comprised of town halls, schools, swimming pools or administrative and service buildings. BEA plays the role of project aggregator, bringing together a number of buildings, from four to as many as 150, which are then classified as a pool via an EPC tender. This consolidation of buildings into packages encourages interest from multiple competent ESCOs and ensures good levels of competition and expertise.

Since 1996, BEA has successfully launched and supervised 26 energy saving partnerships covering more than 1,400 public buildings and more than 500 private properties in Berlin alone. Contractors have so far invested in excess of €50 million in energy retrofits. Energy saving measures have included the renewal and optimisation of building energy and ventilation control systems, the replacement of gas boilers and the installation of combined heat and power systems. The Berlin Energy Agency accompanies energy saving partnerships from the conception of a project to the realisation of the energy performance contract and is also responsible for the monitoring process.[290]

The energy contracting model is well established in Germany. The public sector remains an important client group for EPC, with significant ongoing potential for projects. The overall market size for energy contracting has been estimated at more than €4 billion, with energy performance contracting representing around 15 per cent of this market. The general suitability of public buildings is high due to stable patterns of use, openness to longer contract durations (more than 10 years) and extensive experience of EPC in the German market. At the same time, the percentage of EPC projects in the private sector is growing, with a strong focus on hospitals and healthcare, but also significant activity in the services sector and industry. EPC is less common in the residential sector due to a number of barriers such as the lack of a legislative framework, the complexity of tenure and uncertainty with regard to estimating energy reductions.[291]

Barriers and critical success factors

Germany has enjoyed a high level of political commitment to ESCO and energy efficiency projects. The country has one of the most mature ESCO markets in Europe. However, the general legal framework for energy performance contracting in residential buildings is currently not very supportive.[292]

[290] See Berliner Energieagentur (n.d. b).
[291] See Boza-Kiss et al. (2017).
[292] See Berliner Energieagentur (2019).

Financing for projects is available, including risk mitigation instruments, which are backed by appropriate due diligence procedures and standardised processes. With 50 per cent funding from the Federal State of Berlin, BEA is able to make financially attractive offers to property owners. BEA also helps to raise awareness among customers, ESCOs, energy auditors and so on.

Moreover, the energy saving partnership is not limited to large building complexes. The grouping of smaller projects into pools means that transaction costs are reduced.[293]

Berlin has considered developing an Energy Saving Partnership Plus concept, aiming to extend partnerships to include building renovation and insulation measures such as heat insulation and window replacement. Furthermore, Berlin's Energy Saving Partnership model has been transferred to other local authorities due to its low impact on the public balance sheet and its moderate staffing requirements.[294]

Results and lessons learned

The Energy Saving Partnership has proven to be a successful model for reducing energy consumption and improving efficiency in the city's public buildings. Outcomes include the following:

- Over the first fifteen years of the programme, the average annual investment was €3.5 million, which supported energy efficiency measures in an average of nearly 100 buildings per year.[295]
- The scheme delivered an average of 26 per cent savings in energy costs for building owners, with some individual schemes achieving savings as high as 40 per cent.[296]

The Berlin experience demonstrates the potential of energy performance contracting to delivery substantial energy savings. However, it also highlights the challenges faced by municipalities seeking to deliver energy efficiency investments without additional financial support from a higher-tier authority.

Links to similar initiatives

Stuttgart: ESCO market

Czech Republic: ESCO market

Slovenia: ESCO market

European ESCO market

[293] See GEF and UNDP (2010).
[294] See Berliner Energieagentur (2006)
[295] See Citynvest (2015).
[296] Ibid.

Solar City Seoul: Seoul, South Korea ↘

Seoul's metropolitan government plans to deploy 1 GW of solar photovoltaic power for residential and municipal buildings. By 2022, every public building and one million homes in the city are set to be solar-powered, thanks to the Solar City Seoul project.

Snapshot

- **Location:** Seoul, South Korea
- **Population:** Large – 9.9 million (2018)
- **Policy area:** Energy and buildings
- **Policy options:** Policies promoting renewable electricity generation; improved building energy codes and labelling; financial incentives or financial support schemes for green investments
- **Financial capacity:** Strong
- **Administrative capacity:** Strong

Context and policy overview

Following the Fukushima nuclear disaster of 2011, the Seoul Metropolitan Government (SMG) launched a two-stage "One Less Nuclear Power Plant" initiative in 2012, with the aim of reducing energy consumption and increasing renewable energy production. Through the first phase, which ran from 2012 to 2014, SMG reduced energy demand by 2 million tonnes of oil equivalent (toe), corresponding to the annual generation capacity of one nuclear plant.

The second stage of the initiative targeted the transition of around 4 million toe of energy to renewables. As part of these efforts, in November 2017, SMG developed the 2022 Solar City Seoul plan to accelerate solar installations.

Through this plan, SMG has strived to expand the citywide deployment of solar energy units on public buildings. By 2022, it hopes that solar panels will generate a total of 243 MW across all suitable public buildings and land in Seoul.[297] In addition to the work on municipal buildings, SMG plans to expand the residential solar market by adding 551 MW of solar capacity to one million households, including 540,000 apartment balconies, 90,000 rental homes and 370,000 buildings. Other initiatives such as solar landmarks and smart energy districts are to increase the target to 1 GW.[298]

[297] See The Korea Times (2018).
[298] See Seoul Metropolitan Government (2017).

Implementation

SMG provides a number of incentives to households to facilitate the uptake of solar energy. For instance, it was the first municipality in South Korea to pay a city-level subsidy for small solar power plants with an output of 50 kW or less, since the nationwide feed-in tariff was abolished in 2011 due to the related fiscal burden. Subsidies are in place for the installation of mini-solar panels, reducing the upfront cost by 80 per cent. In addition, SMG launched the Energy Self-reliant Village programme in 2012, attempting to inspire a shared vision of energy self-sufficiency in urban and rurual communities.

Furthermore, in 2015 SMG set up a government-backed fund called the Solar Power Generation Citizens' Fund for solar projects. Residents of Seoul can subscribe to the fund to earn a guaranteed annual return of 4 per cent. Land rental concessions are also available to solar power cooperatives installing photovoltaic (PV) systems in unused spaces that are leased from SMG at low rental rates.[299] In addition, since 2018, newly built public apartments have been required to install a mini PV facility and existing apartments have continued to receive an installation subsidy.

In order to promote the concepts developed for Seoul, SMG plans to create solar energy landmarks and special solar energy districts that it can market as tourist attractions. SMG also plans to transform Magok, a western neighbourhood of the city, into a smart energy district by promoting an urban energy paradigm in cooperation with Korea's major energy firms. Moreover, SMG has launched various information and training campaigns to promote solar energy:

- The Sunshine City Seoul campaign was developed during the first stage of the One Less Nuclear Plant programme.
- The Seoul Solar Map was developed to show the potential capacity for solar power in buildings and houses.
- Seoul organised school campaigns in which students were selected to be leaders in energy-saving and volunteering activities.
- The city established the Seoul Energy Dream Centre that would achieve 100 per cent energy self-sufficiency and serve as a learning centre for students and other residents.
- The Seoul Solar Expo, which took place in August 2018 and was free to attend, invited solar energy companies to exhibit and held a solar design competition along with various hands-on events.[300]

Lastly, in 2018, SMG set up support centres called Seoul Solar Centres which provide one-stop services for installation and maintenance. Free consulting services will be provided, as well as a School for Energy Start-ups which will provide training for people who want to set up a solar energy business.[301]

[299] See LEGCO (2017).
[300] See Seoul Metropolitan Government (2018b).
[301] See Seoul Metropolitan Government (2018a).

Barriers and critical success factors

Various factors have made the solar city plan a success, including the following:

- The topping up and subsequent replacement of national subsidies with alternative sources of finance (such as subsidies and grants, rental concessions for cooperatives) have incentivised the deployment of solar plants in residential buildings.
- The identification of sites suitable for solar plants, such as public landmarks, parking lots, villages and districts, in cooperation with energy companies, has promoted Seoul as a role model for other cities and supported tourism.
- SMG has introduced solar mandates for new multiple-unit dwellings and commercial buildings, helping to accelerate the deployment of solar panels.
- SMG has visibly demonstrated the city's commitment to renewable energy. It has provided information for residents through a range of mechanisms such as school programmes, expos, design competitions, support centres and training for start-ups, all of which have supported residential solar PV installations.

Results and lessons learned

Currently, 127 public buildings in Seoul have a total installed capacity of 3.8 MW, 17 infrastructural facilities have a combined capacity of 3.8 MW, 43 schools have a joint capacity of 1.8 MW and 12 MW of capacity has been installed on public parking lots. In addition, as of September 2018, a total of 161,000 households had installed the PV facilities, thereby generating a total of 210 MW annually.

Including the new supply of 52 MW of solar power installed in 2018 and a total installation capacity of 210 MW, the Solar City Seoul project has generated 237,805 MWh of annual energy. It has also reduced greenhouse gases by 109 tonnes of CO_2 and fine particulate matter by 27.6 tonnes. This means that by the end of 2022 the city's capacity will need to be raised by a further 760 MW approximately in order to meet the project's 1 GW target.

In 2019, Seoul was selected as the winner in the renewable energy category of the annual C40 Cities Bloomberg Philanthropies Awards, in particular due to its efforts to become a global solar city.

Links to similar initiatives

Toronto: coal phase-out

Porto Alegre: local renewables

Bristol: smart energy policy

Carbon reduction reporting programme: Tokyo, Japan ↘

Tokyo's carbon reduction reporting programme mandates the reporting of CO_2 emissions for small and medium-sized facilities, which account for 60 per cent of total CO_2 emissions in the city's industrial and commercial sectors.

Snapshot

- **Location:** Tokyo, Japan
- **Population:** Large – 13.5 million (2015)
- **Economy:** Service economy
- **Policy area:** Energy and buildings
- **Policy option:** Policies and support for energy performance contracts
- **Financial capacity:** Strong
- **Administrative capacity:** Strong

Context and policy overview[302]

Commercial and residential buildings in Tokyo accounted for more than 72 per cent of the city's CO_2 emissions in 2013. This was primarily as a result of the high number of small to medium-sized commercial and industrial facilities (around 660,000) that are concentrated in the city.

The Tokyo Metropolitan Government (TMG) has set an interim GHG emissions reduction target of 30 per cent by 2030, which has subsequently been accelerated in the city's Environmental Masterplan to 38 per cent by 2030.

Against this backdrop, the programme of Carbon Reduction Reporting for Small and Medium Entities (CRR) was launched in 2010 with two core objectives:

- encouraging the owners and tenants of small to medium-sized commercial and industrial facilities to monitor their annual CO_2 emissions
- providing policymakers with data on the building stock and providing this back to building owners and the market.

These goals are pursued by mandating for facility owners the submission of an annual report outlining CO_2 emissions for the previous fiscal year. Additional qualitative information on planned and implemented emissions reduction measures must also be submitted.

[302] See C40 Cities (2017).

There is no single GHG emissions reduction target for the programme. Instead, reporting entities are encouraged to set individual emissions reduction targets. Reports are publicly disclosed on the TMG website.

The CRR contains both a mandatory and a voluntary component. Reporting occurs as a regulatory obligation and as a voluntary measure to monitor CO_2 emissions and allows facility owners to compare their performance to that of their peers.

Implementation

The CRR was launched in 2010. The scheme is based on the Tokyo Carbon Reduction Reporting Programme for existing large facilities which ran from 2002 to 2005. That programme was superseded by the mandatory cap-and-trade system, also launched in 2010. The core metric by which facilities monitor and report their annual CO_2 emissions is carbon intensity ($kgCO_2/m^2$).[303]

The CRR seeks to target owners of the roughly 660,000 facilities in the metropolitan area. For these facilities, the threshold for mandatory reporting has been set at between 30 litres and 1.5 million litres of crude oil equivalent. The reporting requirement also applies to businesses that own or operate multiple facilities with a total consumption exceeding 3,000 million litres of crude oil equivalent. Facilities with a consumption higher than this level are expected to participate in the citywide cap-and-trade programme.[304]

In 2012, a low-carbon benchmark component was added after it became apparent that merely reporting would not be sufficient to motivate facility owners and tenants to reduce their energy consumption. Benchmarks allow owners to determine how their facility currently performs relative to the mean performance of other buildings of the same type. Later, a Carbon Report Card initiative was added to enable prospective tenants to compare the energy and CO_2 emissions performance of buildings.[305]

The CRR provides a variety of incentives to both encourage participation in the programme and spur implementation of retrofitting measures:

- A programme participation certificate – the so-called PR Sheet – has proved to be a major incentive for voluntary participation.
- Small and medium-sized leased buildings that report consistently for more than three years and perform better than the average CO_2 intensity benchmarks can earn the label “Low Carbon Model Building”.
- Advice and training on low-energy strategies is provided through free energy audits, in-company training sessions with expert trainers, and industry-specific courses on energy saving measures.
- Subsidies for energy saving equipment are available, including a green leasing scheme and tax incentives for energy saving initiatives.[306]

Improvements in emission reductions have not been uniformly significant across all building types. For instance, schools, universities and entertainment venues have achieved significantly lower reductions.

The programme has been notable in attracting many voluntary submissions. This has improved the validity of the resulting industry benchmarks. Approximately 93 per cent of CO_2 emissions in reporting facilities are related to electricity use, hence most emission reductions can be attributed to a decrease in electricity consumption. Emission reductions observed over the period 2010-13 are largely attributable to the rationing of electricity caused by the closure of the Fukushima power plant. However, emissions have not rebounded since the full restoration of power supplies. It should be noted that the increase in the carbon intensity of electricity has been largely due to the shift from nuclear to gas and coal.[307]

[303] See Nishida (2013).
[304] See Tokyo Metropolitan Government (2018).
[305] Ibid.
[306] Ibid.
[307] See C40 Cities (2017).

The CRR used multiple strategies to increase the educational value of data collected through annual reports and thus to motivate enterprises to pursue improved energy efficiency:[308]

- The low-carbon benchmarks provide building owners and tenants with an overview of how their facility is performing compared to industry averages.
- The Carbon Report Card aims to encourage facility owners to improve their annual benchmark performance and to use report cards as green building labels.
- A series of tailored energy efficiency handbooks were provided to key industry leaders and aimed at facility supervisors in 27 types of business.

The TMG has created several partnerships with key industry stakeholders to enable the recruitment of reporting institutions. It has also reached out to corporate real estate agencies to secure their cooperation in raising tenants' awareness of CRR.

Data verification is carried out by TMG, including checks on previous energy consumption levels and CO_2 emission reports (to check for anomalies year on year). Reporting organisations are contacted when errors are identified and data problems are rectified. Additional verification is also carried out before the reports are made publicly available.[309]

Barriers and critical success factors

Landlords have faced challenges in obtaining the relevant energy data from tenants to comply with reporting requirements. This was addressed by a rule change allowing the publication of only CO_2 emissions intensity (not of actual consumption) and allowing building owners to provide estimates where actual data was not readily available.

TMG officials were unable to achieve widespread disclosure of energy consumption data due to industry resistance. Public disclosure of energy consumption figures would deliver a more positive and meaningful message than data on CO_2 emissions.

Despite the strategies taken to increase awareness and participation, a 2015 survey of 1,149 small and medium-sized enteprises found very low levels of awareness about some of the additional initiatives related to the CRR. Officials have also encountered challenges in engaging corporate tenants with energy efficiency issues. In addition, many recommendations provided in free energy audits are not implemented due to the splitting of incentives between owners and tenants. TMG officials have collaborated with real estate agencies to conduct tenant seminars on CRR participation and effective energy efficiency measures.[310]

Results and lessons learned[311]

- The number of organisations participating in the voluntary reporting scheme grew by 60 per cent over the five years from 2010 to 2015.
- Over a five-year period, the companies reporting achieved an average CO_2 emissions reduction of 13 per cent and cut energy use by 18 per cent.
- The reports provide a valuable database of energy efficiency measures being taken by SMEs. For example, they identify high penetration levels in terms of low-energy lighting, water saving devices and cooling-loss reduction for refrigerated food displays. Reports cover both physical measures and behaviour change initiatives.

Links to similar initiatives

Tokyo: cap-and-trade programme

Carbon disclosure project

[308] Ibid.
[309] Ibid.
[310] See C40 Cities (2017)
[311] Ibid.

District heating and cooling: Tartu, Estonia ↘

Tartu, Estonia's second-largest city, has managed to upgrade its old district heating network and turn it into a world-class system that uses local renewable energy sources.

Snapshot

- **Location:** Tartu, Estonia
- **Population:** Small – 101,000 (2000)
- **Economy:** Industrial economy
- **Policy area:** Energy and buildings
- **Policy option:** Decarbonisation of district heating supply
- **Financial capacity:** Strong
- **Administrative capacity:** Strong

Context and policy overview

Estonia's energy system is dominated by the use of shale oil for electricity, while heating is provided by a mix of sources including local biomass and imported fossil fuels.[312] Meanwhile, around 45 per cent of heating demand is met through district heating networks.[313]

The country is committed to reducing carbon emissions through its adopted National Energy and Climate Plan 2030. The plan includes a commitment to reduce carbon emissions by 70 per cent by 2030 relative to a 1990 baseline and to ensure that renewables account for 42 per cent of final energy consumption.[314] Meanwhile, the National Development Plan of the Energy Sector sets a target for 80 per cent of heat to be derived from renewable sources by 2030.[315]

The city of Tartu is served by a fity-year old district heating network and a five-year old district cooling network. The privatised network serves around 75,000 customers and is owned and operated by Fortum Tartu. The city and the network operator have carried out multiple innovations to improve energy efficiency, air quality, carbon emissions and customer satisfaction.[316]

Implementation

Tartu's district heating system was established in 1967 and owned first by the state and then by the municipality. Originally powered by gas and oil, the network was converted in 1995 to use biomass

[312] See Große et al. (2015).
[313] See Government of Estonia (2017).
[314] Ibid.
[315] Ibid.
[316] See Raud (2019).

and peat, with financing from the World Bank and the EBRD. In 2000 the system was privatised and then acquired by Fortum Tartu in 2004. The privatisation provided the network with access to much-needed capital to carry out a systemwide renewal and to support network expansion.[317]

The municipal government has supported the district heating network through its planning policies and through securing funding for smart city innovation. The first urban development master plan for Tartu was established in 1999 and focused on sustainable development. It included an integrated district heating zone to improve air quality and customer satisfaction levels. The city council raised awareness in support of the district heating system through public campaigns. The plan mandated that all new and renovated buildings in the designated districted heating zones should connect to the heating network, unless their heat consumption was less than 40 kWh/m^2 per year. Meanwhile, a smart city project financed by Horizon 2020 helped to target investment to retrofit energy-inefficient homes and connect them to the heating network.[318]

Fortum Tartu has implemented a number of business and operational innovations to sustain the performance and financial stability of the company. These include:[319]

- vertical integration and diversification, allowing the firm to become a biomass fuel producer and supplier
- development of a new biomass combined-heat-and-power plant
- growth through the expansion and acquisition of a nearby heating network operator
- development of a low-carbon district cooling network partially supplied from the Emajõgi River which runs through the centre of the city.

Most recently, Fortum Tartu has participated in a low-temperature innovation pilot which has demonstrated the potential to reduce system flow temperatures from a peak of 105°C to as low as 60°C, achieving a significant reduction in losses and creating the potential to capture low-grade heat from industrial and other local sources of waste heat.[320]

Barriers and critical success factors

A number of success factors have enabled Tartu to develop and sustain its district heating and cooling system:[321]

[317] See Galindo Fernandez et al. (2015).
[318] Ibid.
[319] Ibid.
[320] See Raud (2020).
[321] See Galindo Fernandez et al. (2015).

- Privatisation has enabled the city to access investment capital and international know-how to renew and expand its district heating network and diversify operations to include district cooling and a fuel supply business.
- A strong national policy framework for district heating clarifies roles for effective operations, while pricing market regulations enable the operator to maintain a financially sustainable business.
- The local policy framework integrates development planning and energy planning to encourage higher density development and to connect new developments to the heating network.

A culture of partnership and innovation has characterised the relationship with the city, supported by multiple EU investment and research programmes. This culture will be critical to supporting the city's recently announced goal of reducing its carbon emissions by 40 per cent by 2030 relative to 2010 and of becoming carbon neutral by 2050.[322]

Results and lessons learned

- The district heating network supplies around 50 per cent of the city's buildings and 75 per cent of its residents.
- The price of district heating is lower than the national average.
- The network has reduced its carbon footprint to 102g/MWh per year.[323]

Links to similar initiatives

Vancouver: district heating system

Copenhagen: district heating and cooling system

Paris Saclay: smart district heating and cooling system

[322] See ERR.ee (2020).
[323] See Galindo Fernandez et al. (2015).

Sustainable eco-districts: Malmö, Sweden ↘

Malmö has regenerated its urban area by converting disused sites such as former shipyards and other heavy industry zones into sustainable, low-carbon districts.

Snapshot

- **Location:** Malmö, Sweden
- **Population:** Medium-sized – 316,000 (2018)
- **Policy area:** Energy and buildings
- **Policy options:** Improved codes for building energy and better labelling; policies promoting renewable energy generation
- **Financial capacity:** Strong
- **Administrative capacity:** Strong

Context and policy overview

In the late 1980s and early 1990s, Malmö's industrial centre lost one-third of its jobs but today the city is a vibrant and sustainable urban area. The heart of this transformation is Western Harbour, an eco-district and regeneration zone. The area was developed as a testbed in the city's ambitious plans to become climate-neutral by 2020 and to run entirely on renewable energy by 2030. The mayor envisioned using the eco-district concept as a model for future sustainable urban development throughout the city.

And with a blank slate – a restored brownfield site –planners could integrate all aspects of Malmö's sustainability approach into the eco-district.[324]

In Sweden, the energy performance of buildings is regulated at the national level. However, Malmö has developed several policy instruments to meet the city's climate and sustainability goals. One example of these instruments is the "Developer Dialogue" which involves different stakeholders in the planning process. Malmö has also worked with the city of Lund to set sustainability requirements that exceed national regulations for new building developments. It has achieved this through a voluntary programme called MBP South in which developers can choose between three levels of ambition.[325]

Implementation

The objective for the Western Harbour eco-district was to reduce energy consumption to 105 kWh/m^2. This is equivalent to half the energy consumption of Malmö's current housing stock and below the nationally required levels for new construction.

City planners invited a variety of stakeholders including architects, developers and construction companies to submit development plans and hold

[324] See Fitzgerald (2016).
[325] See Smedby (2015).

discussions to establish building sustainability standards for Western Harbour. Building standards were established for energy, materials, systems technology, acoustics and noise, green space and biodiversity, moisture control and the indoor environment.[326]

In the second phase of the project, participatory planning – which goes beyond conventional stakeholder consultation processes – was used to bring parties together to shape the approach to energy efficiency. The process involved a combination of site visits and workshops and cooperative design processes to set standards for new buildings.

Sustainable urban mobility was another key policy objective for the district, with a combination of car restrictions and measures to support walking and cycling. The district boasts a 40 per cent modal share for cycle-based journeys to work.

Following the development of Western Harbour, the eco-district concept was replicated in the planning of further projects through Developer Dialogues. These are held to enhance the sustainability profile of prospective eco-districts. Malmö's city planners applied the eco-district approach to redevelop lower income neighbourhoods such as Rosengård, a social housing area with a history of significant social conflict. This project aimed to demonstrate how a troubled neighbourhood can be redeveloped with a focus on environmental sustainability and increased social and economic integration with the rest of the city.[327]

Barriers and critical success factors

In Malmö, political ambition and leadership is strong and goals are set at a high level. The city departments cooperate with each other as well as with developers, universities and other organisations. Malmö is committed to and has been working towards sustainability for a long time.

Experimentation, supported by cross-departmental collaboration and dialogue with developers, has been key to promoting innovation in planning. For example, project managers from the environment and planning departments meet on a regular basis to discuss the delivery of more integrated projects.

The fact that the city owns most of the land means that it has considerable power to impose standards on developers. Swedish cities also benefit from significant national and EU funding to support climate action.

In terms of programme design, MBP South gives building developers a choice between three different levels of ambition. In contrast, similar sustainability programmes in Sweden set only one level of requirements. Moreover, administration of the

[326] See Kanters and Wall (2018).
[327] See Fitzgerald (2016).

programme has been efficient due to the relatively large size of the municipality and the fact that it developed the programme jointly with another municipality.

Results and lessons learned

Malmö has been successful in reducing energy consumption, cutting GHG emissions and making the urban area more liveable for residents.

- The city lowered energy consumption from 72 kWh/m^2 to 65 kWh/m^2 for a development using MBP South without the Developer Dialogue, and to 56 kWh/m^2 for a development using MBP South with the Developer Dialogue.
- Due to Malmö's action and the decline of the shipbuilding industry, per capita GHG emissions have fallen to 3.4 tonnes per year (compared to 5.6 tonnes in Sweden as a whole and 17.6 tonnes in the United States of America in 2010).
- The eco-districts have contributed to economic growth, social innovation and inclusion in the city, making Malmö an attractive place to live.

While external factors, such as funding opportunities and land ownership by the city, were favourable to Malmö, much of the city's success is thanks to effective urban planning and these lessons can be applied anywhere. The experience in Malmö demonstrates that experimentation is key to innovation in planning. It also shows that the formalisation of learning across departments can ensure that a city addresses obstacles to cooperation and institutionalises good practices.

Links to similar initiatives

Portland: eco-districts

Ulaanbaatar: eco-districts

Private contracting in the water sector: Yerevan, Armenia ↘

Yerevan's water utility signed a five-year, performance-based management contract with private operator Acea. Over the contract period, water supply, collection rates and energy efficiency improved.

Snapshot

- **Location:** Yerevan, Armenia
- **Population:** Large – 1.1 million (2016)
- **Policy area:** Water
- **Policy option:** Regulation and contracting of public and private service providers
- **Financial capacity:** Strengthening
- **Administrative capacity:** Strengthening

Context and policy overview

In recent years Armenia has seen major achievements in relation to water resource management, to which the private sector has made significant contributions. Previously, Armenia had lagged behind European countries in terms of the non-revenue water ratios, water accessibility and supply.[328]

Yerevan, the capital of Armenia, is the largest and most populous city in the country. In the 1990s, Yerevan's water utility company, the Yerevan Water and Sewerage Enterprise (YWSE), struggled financially and had a poor water system which was unable to supply water efficiently to city residents. Fee collections were only around 20 per cent, and revenue did not cover operational and maintenance expenses. The majority of customers (80 per cent) connected to the network could only access tap water for between 2 and 8 hours a day. Meanwhile, approximately 72 per cent of water in the network was lost through identified leakages across the system.[329]

Implementation

In 2000, the government of Armenia sought private input via a competitive tender to improve the provision of water services. Through the tendering process, the government commissioned Acea Spa Utility (Acea), a joint venture led by an Italian water operator, to run the water utility system for five years.[330] The appointment was designed to bring in private sector expertise

[328] See World Bank (2018).
[329] See Energy Sector Management Assistance Program (2011a).
[330] See Eiweida and Tokhmakhyan (2011b).

to handle the water distribution network efficiently. An investment fund was created by the government and the World Bank in order to manage Acea's capital investment for water utility services. With the aim of enhancing the water utility system, Acea created a programme to repair leaks, increased the gravity-fed water supply, fixed pumping stations, introduced meters and stabilised water pressure across the networks of three districts. These developments cost US$ 24 million and strengthened the water network across Yerevan.

There are differing degrees of private-sector participation (PSP) in the water sector. These can include minor outsourcing of non-core activities or private concession contracts where investment obligations and revenue risks are fully transferred to private operators. The performance-based contract introduced in Yerevan represented a moderate first step in terms of increased PSP, with only minor risks transferred to private contractors, which are linked to performance incentives. However, it was a first step that brought sector expertise and well-defined performance incentives into the city's water services. It also helped to build capacity and experience of private contracting for the relevant water authorities. This experience later paved the way for wider and deeper PSP in the Armenian water sector.

Barriers and critical success factors

Political support and commitment by policymakers helped the public-private partnership (PPP) with Acea to succeed. Both the government and the operator demonstrated a willingness to resolve issues and agree on common benefits. PPPs are a way to resolve some water sector challenges, but are not the only tool that policymakers have. In order to benefit from the private sector, policymakers need to create a business environment that facilitates private-sector involvement, with a reasonable legal and regulatory framework.[331]

In Yerevan, several measures were taken to ensure strong results. These included performance targets, incentive mechanisms and an efficient selection process for procuring a contractor. Government and city officials, together with Acea, discussed progress and challenges to ensure that appropriate measures were taken.

A key lesson learned from the project was the importance of obtaining an accurate baseline for system performance before setting contractual performance targets. The project's failure to meet targets for non-revenue water ratios was linked to the use of inaccurate baseline values.[332]

A significant part of the project's success was the joint effort by the government and Acea to gain public acceptance for the work. This entailed early improvements to services before the introduction of tariff increases.

[331] Ibid.
[332] See Eiweida and Tokhmakhyan (2011b).

Results and lessons learned

Yerevan's experience is an example of a well-implemented PPP scheme using performance-based contract incentives. It demonstrates that these delivery models can produce positive outcomes for cities if appropriately structured with an effective statutory framework in place. More specifically, between 2000 and 2004, Yerevan achieved the following improvements:[333]

- a significant increase in access to water, with the availability of water increasing from 6 to 18 hours per day
- an increase in fee collection from 20 to 80 per cent
- a fall in electricity consumption by 30 per cent, exceeding the initial target of 20 per cent
- a stronger focus on sustainability, improving the resilience of the network
- a stronger financial performance due to reductions in energy use and water losses and a dramatic improvement in collection rates
- a 10-year contract between the government and Veolia, a French water company, following the success of the project.

The city's experience also illustrates the importance of transparent and predictable regulation as well as contract implementation by a competent public authority. These are necessary not only to avoid disputes but also to ensure good bidding processes, with strong competition between serious and competent companies that fully understand what they are bidding for and feel comfortable with the regulatory environment.

Lastly, Yerevan's experience with performance-based management contracting demonstrates the need to have realistic expectations about the scale and pace of reforms in the water sector. Sustainable changes to a system require time to take effect.

Links to similar initiatives

Amman: private-sector participation in the waste sector

Iasi: water tariffs and governance improvements

Kirklees: performance contracting in the waste sector

[333] See International Bank for Reconstruction and Development and World Bank (2017).

Micro private-sector participation: Madaba, Jordan ↘

The administration of Madaba implemented a micro approach to private-sector participation to reduce the percentage of non-revenue water. The contract addressed billing, illegal use and the replacement and resealing of water meters. In the seventh quarter, the water system reached break-even.

Snapshot

- **Location:** Madaba, Jordan
- **Population:** Small – 105,000 (2018)
- **Economy:** Service economy
- **Policy area:** Water
- **Policy options:** Regulation and contracting of public and private service providers; reform and strengthening of water utilities; effective tariff reforms and price signals
- **Financial capacity:** Limited
- **Administrative capacity:** Limited

Context and policy overview

High levels of population growth, in combination with climate change and droughts, had a strong impact on Jordan's water supply in the 1990s and early 2000s.[334]

Despite investment in the country's water sector, the reduction in the percentage of non-revenue water (NRW) was disappointing. The Ministry of Water and Irrigation documented national NRW rates as high as 66 per cent, with only a slight improvement over time, from 46 per cent in 2005 to 44 per cent in 2010. This NRW rate was due to both physical and administrative losses. Old water pipelines, pipe bursts, poor service connections, illegal tapping and incorrect water meter readings were just some of the reasons for the losses.[335]

In addition, the Water Authority of Jordan (WAJ) had experienced multiple challenges in service delivery and business administration. Application processes and billing were often found to be incorrect, and overall customer management was inefficient and unsatisfactory.[336]

In 2004, the Ministry of Water and Irrigation proposed a set of policy measures to manage the NRW, including a micro approach to private-sector participation. This option was proposed to achieve

[334] See Al-Karablieh and Salman (2016).
[335] See Baghdali et al. (2013).
[336] Ibid.

service improvements in Jordan across the operation and management of the water network. It was seen as a complementary approach that would prepare for more PSP schemes across the distribution of water services in Jordan.

The WAJ defined its targets around improving financial performance through better management of water and wastewater, stronger collection rates, and improvements to customer service and management.

Implementation

The micro-PSP approach was implemented in Madaba from 2005 to 2011. The ministry chose Madaba as the city had a small customer base, limiting complexity. Households accounted for 94 per cent of this base, while only 6 per cent of customers were industrial consumers. In addition, proximity to Amman would enable easier cooperation with WAJ headquarters and facilitate general transactions and logistics. Moreover, there was strong interest in the micro-PSP approach from local stakeholders.[337]

A bidding process was set up for the micro PSP, to manage billing and revenue collection and thus reduce the NRW ratio. A workshop was arranged to raise awareness and to give bidders as much information as possible. The services that were expected of bidders included: managing billing and revenue collection using a tool based on geographical information systems; implementing a system for customer management; and operating a database for the sewerage network in the region.[338]

The contract specification included details of the required activities and levels of performance, and was divided into two parts. The first part considered the business processes of the company. During this first stage, business processes were to be updated to ensure use of the necessary systems and equipment. The staff would also receive training. The second part of the contract covered performance management. In this stage, the private company would carry out meter readings, billing, collection, and customer service, including inspections.[339]

Under the contract terms, the private company received a portion of the extra revenue collected each year, in order to incentivise performance. The contract also had clearly defined targets and indicators. The Project Management Unit of the WAJ monitored the performance of the winning contractor, Engicon, an engineering consultancy firm.

[337] Rabi (2013).
[338] See Baghdali et al. (2013).
[339] Ibid.

Barriers and critical success factors

The micro-PSP project in Madaba was considered to be a success and it was scaled up and extended for three more years. This enabled smaller, local companies to participate in Madaba's water resource management, bringing cash flow into the sector and saving water across the city. The project has also influenced water and wastewater systems in other regions across the Middle East and the Gulf States. Nevertheless, Madaba experienced some challenges:

- It took more than two and a half years to start the programme.
- There was a reliance on external funding.
- A major concern was the availability of local private companies to take on key tasks outsourced by the WAJ.[340]

Strong long-term results for the project depended on an integrated approach that ensured capacity-building to sustain a competitive local market in water services.

Results and lessons learned

The micro-PSP experience in Madaba yielded several results and key lessons. On a general level, micro-PSP effectively reduced costs and created a local market in which private companies could compete to provide important services across the water sector.

The project brought a significant reduction in NRW through efforts in billing, collection of water fees and the fixing of water meters. By 2011, billed amounts had increased by 175 per cent relative to the level seen in 2005. There were nearly 3,000 reported cases of illegal water use between 2006 and 2011. Over the same period, more than 22,000 water meters were resealed and 14,000 replaced.[341]

In 2008, the total annual additional income achieved reached approximately €2 million (excluding tariff increases or revenues from new customers). This represented a significant increase compared to total revenue of less than €1.2 million in 2005. In fact, cash collections doubled across the period 2005-08. After one year, the additional income from the project exceeded the cost of the investment. This helped to strengthen the overall financial performance of the WAJ.[342]

Compared to large-scale PSP models, the micro-PSP scheme requires less funding and the preparatory phase tends to be shorter (although detailed preparation may be necessary where local capacity is limited). In the case of Madaba, the scheme managed to monitor, control and assess reduction levels through incentives, capacity-building and awareness-raising.[343]

These results and the new customer service arrangements built confidence in the system. This was a crucial step towards gaining public acceptance and trust, which contributed to a fall in the illegal consumption of water.

Links to similar initiatives

Iasi: water tariff and governance improvement
Singapore: water metering and billing
Johannesburg: reduction of water losses

[340] See Baghdali et al. (2013).
[341] Ibid.
[342] Ibid.
[343] See Rabi (2013).

Management of water demand: Drakenstein, South Africa ↘

A programme of water demand management in Drakenstein achieved a two-thirds reduction in the percentage of non-revenue water over two years, boosting municipal revenue.

Snapshot

- **Location:** Drakenstein, South Africa
- **Population:** Small – 224,000 (2015)
- **Economy:** Service economy
- **Policy area:** Water
- **Policy options:** Effective tariff reforms and price signals; awareness campaigns for households and industry; promotion of resource-efficient utilities
- **Financial capacity:** Strengthening
- **Administrative capacity:** Strengthening

Context and policy overview

The Drakenstein municipality in South Africa's Western Cape province had long experienced water shortages. These peaked in 1999 when the water supply could no longer meet demand, which was growing at 3.5 per cent a year. This pressure was predominantly due to the high ratio of non-revenue water (NRW), at 33 per cent of total supply. Approximately 90 per cent of the municipality's water had to be purchased from the city of Cape Town, while Drakenstein derived only 10 per cent from its own sources.[344]

Following the 1999 water crisis, the municipality had to take remedial measures. While Drakenstein faced a great challenge, the crisis was also a major opportunity to strengthen the municipality's water resource management. The remedial measures focused on reducing water imports by cutting consumption and minimising wastage.

A water demand management programme was introduced to address the crisis. The scheme aimed to reduce the high percentage of NRW, reduce the level of daily demand and conserve water.[345]

More specifically, the programme focused on six main targets:

- decreasing the high proportion of non-revenue water
- stabilising water pressure

[344] See Drakenstein Municipality (2013).
[345] See 2030 Water Resources Group (2015).

- managing average daily demand
- strengthening financial performance by boosting fee collection
- improving service to residents and other consumers
- conserving water.

Implementation

The programme included wide-ranging interventions such as:

- improving the master plan for the reticulation network through hydraulic modelling
- metering abstraction points and properties
- supplying water at a low cost while imposing penalties on heavy users through tariffs
- advertising water scarcity to raise public awareness, including the promotion of water-saving devices and plumbing repairs.
- improving leaks and making repairs across the network infrastructure
- developing a pressure management system.

Identifying water leaks across the reticulation network was an important step in reducing water loss. This was complemented by an ambitious policy to repair all leaks within an hour of their identification, resulting in one of South Africa's lowest levels of physical water leakages. Poor-quality pipes were replaced with high-quality equivalents and stainless-steel fittings, reducing the number of pipe bursts.

Works were also carried out on advanced management of pressure. The pressure management installations included work on valves, pipes, chambers and controllers. Seven pressure reduction valves that ranged from 100 mm to 300 mm in diameter were equipped with flow-modulated electronic controllers in order to achieve advanced pressure reduction.

The works totalled around US$ 500,000, but within five months that cost had been covered by the savings achieved.

Barriers and critical success factors

The project gained a high level of support within the community. This was partly due to the creation of local jobs through the use of labour-based construction methods in conjunction with extensive local stakeholder engagement.

Moreover, in order to create a reliable collection and storage system for water, the municipality introduced a water treatment programme. This enabled a steady supply of water in the region regardless of season and rainfall. A feasibility study that examined Drakenstein's water supply management proposed the development of a water treatment plant for the Paarl Mountain dam, because a related network for distribution had already been established. The study also proved that significant savings could be made by creating a water treatment plant instead of buying water from Cape Town.[346]

[346] See AVK International (n.d.).

Results and lessons learned

Drakenstein achieved its targets for water demand management. Overall, the municipality now ranks among the best in South Africa with regard to efficient use of water.[347]

The unacceptably high level of non-revenue water was cut from 33 per cent to just 11 per cent over a period of 12 years, boosting municipal revenue. The combination of a new block tariff structure and reduced spending on water purchases from the city of Cape Town increased the net revenue and outweighed the costs of previous measures taken, despite a decrease in the volume of water sold to consumers.[348]

Water demand decreased from 17,800,000 m^3/year to 11,900,000 m^3/year. This resulted in significant savings on water purchases from suppliers and the fulfilment of targets for water conservation.[349]

Notably, the performance indicator for physical leakage (ILI) had decreased to below two by 2012, making it one of the lowest levels in South Africa and demonstrating the impressive water savings that all of Drakenstein's interventions had achieved. Across the 12-year period of the project, total savings exceeded €70 million. No single intervention resulted in this outcome. Instead, it was the combined effect of many smaller interventions that brought eventual success. This has also been the case in the majority of other municipalities in South Africa.[350]

Links to similar initiatives

Singapore: water metering and billing

Johannesburg: reduction of water losses

Madaba: micro private-sector participation

[347] See Drakenstein Municipality (2013).
[348] See 2030 Water Resources Group (2015).
[349] Ibid.
[350] Ibid.

Water and wastewater recycling: Chennai, India ↘

Rapid population and economic growth have caused increasing water scarcity in Chennai. In response, the city has taken measures to accelerate the reuse of water and wastewater.

Snapshot

- **Location:** Chennai, India
- **Population:** Large – 7 million (2011)
- **Policy area:** Water
- **Policy options:** Regulation and contracting of public and private service providers; reform and strengthening of water utilities; effective tariff reforms and price signal
- **Financial capacity:** Limited
- **Administrative capacity:** Strengthening

Context and policy overview

The city of Chennai in southern India has been experiencing water scarcity due to rapid population growth and a rising demand for energy following higher levels of economic activity. This water crisis presented the Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB) with the challenges of supplying water efficiently to residents, while also ensuring that the local economy and industry were not compromised.[351]

Over several years, city officials passed a set of regulations and bylaws to stabilise and manage water sourcing and use. These aimed to ensure maximum reuse of water and to see that wastewater met the safe quality standards required by the city. The new regulatory framework was complemented by partnerships between the private sector and governmental agencies in order to promote innovation.

The water crisis peaked in June 2019, when Chennai declared "Day Zero", marking the depletion of water across all of the city's four main reservoirs. Water was being tankered (or transported via train) from unregulated sources at high costs and to the detriment of rural farming communities.[352]

Implementation

In order to address the rising scarcity of water, changes to legislation were made over many years leading up to 2019. The CMWSSB implemented a water reuse plan and the Greater Chennai Corporation set up a bylaw covering compulsory recycling of wastewater that applied to all stakeholders, including government authorities, the private sector and citizens. These rules stated that all developers should include wastewater recycling in their designs, that water should go through organic filtration for

[351] See International Water Association (2018).
[352] See Trivedi and Chertock (2019).

groundwater recharge (except water from toilets, which would go through the sewerage network), and that toilet flushing should use recycled water. In 2002, the CMWSSB implemented a rainwater harvesting programme, under which new or renewed water and sewerage connections had to include systems for harvesting rainwater.[353] Chennai is one of the first cities in India to have educated residents on the importance on rainwater harvesting.[354]

Another priority area for the city has been energy efficiency. In 2010, CMWSSB commissioned six sewage treatment plants. The plants capture and use biogas to power most of their electricity demand.[355]

Another priority has been zero discharge. Industries and manufacturers are now under legislation that requires them to achieve zero liquid discharge from their operations. Wastewater should not be discharged and should be treated for reuse. For example, the CMWSSB treats wastewater and sells it to major industries across the city.[356]

Since "Day Zero", the CMWSSB has committed to a variety of further measures to reduce the risk of future water crisis events, including:[357]

- reuse of wastewater, by expanding the number of treatment plants in Chennai
- decentralisation of water sources, with a focus on smaller lakes
- an increase in the number of water supply schemes, reducing reliance on tankers
- the provision of sewer connections to new areas
- the collection of sewage from areas where there is no underground sewerage network
- monitoring of groundwater levels
- GIS mapping of the water supply network
- engaging manual scavengers in other work
- upgrading the CMWSSB quality assurance laboratory.

Results and lessons learned

Integrated water resource management is necessary to achieve long-term resilience, as a single intervention would be too simplistic.[358]

- Through mandatory rainwater harvesting, Chennai has improved its water quality and groundwater levels have increased significantly.[359]
- Chennai has met 15 per cent of its water demand through water recycling, while 8 per cent of treated wastewater is sold to industries. Moreover, some 40 per cent of domestic water demand in newly built houses is met through wastewater reuse.[360]
- Improvements to sewerage networks as a resulting of reduced pressure due to more rainwater harvesting and *in situ* wastewater reuse systems have saved water across the network.
- Electricity imports and GHG emissions have fallen due to the use of biogas for energy production. The public-private partnership scheme has reduced dependence on the electricity grid by approximately 77 per cent.
- Innovation in wastewater treatment has been incentivised as new markets in this area have been created.

Links to similar initiatives

Durban: water recycling

Aqaba: wastewater reuse

Namibia: wastewater reclamation

[353] See International Water Association (2019).
[354] See Raghavan (2019).
[355] See International Water Association (2019).
[356] Ibid.
[357] See Natarajan (2020).
[358] See Alam et al. (2019).
[359] See Raghavan, S (2019).
[360] See International Water Association (2018).

Water-saving programme: Zaragoza, Spain ↘

In 1996, the city of Zaragoza introduced a water efficiency programme to address water scarcity. The programme included awareness-raising campaigns, financial incentives and voluntary commitments by residents and businesses.

Snapshot

- **Location:** Zaragoza, Spain
- **Population:** Large – 663,000 (2016)
- **Policy area:** Water
- **Policy options:** Awareness campaigns for households and industry; effective tariff reforms and price signals
- **Financial capacity:** Strong
- **Administrative capacity:** Strong

Context and policy overview

Zaragoza is located in the north of Spain. It is a semi-dry area with moderate average rainfall (314 mm a year). In the 1990s, a severe drought made the city's water shortages a distinct problem, sparking public concern and political controversy.[361]

In 1996, the NGO Fundación Ecología y Desarollo and the municipality jointly set up the Zaragoza Water Saving City programme to tackle water scarcity.The aim was to change wasteful behaviour and increase efficient use of water. The programme set an ambitious target of reducing domestic water consumption. This included saving one million m^3 of water, a target that the programme successfully achieved within a year.[362]

Water shortages in an urban context can be challenging to overcome. However, this project addressed shortages through financial incentives, educational campaigns and multiple partnerships, which secured funding from a variety of sources.

Implementation

The water-saving project comprised a wide range of measures.

Media campaign: In order to increase public awareness of the project, Zaragoza ran a broad media campaign. It featured advertisements on TV, radio and public transport, in addition to information on leaflets and posters. The campaign achieved a high level of public awareness about the project.

Educational outreach: The programme used education to make people conscious of their own domestic water use and to prompt more efficient use of water and related technologies. This outreach

[361] See 2030 Water Resources Group (2015).
[362] See Kassam (2014).

was later extended to schools to ensure that children understood the principles of efficient water use and why it is important to reduce water wastage. By April 1998, 168 educational establishments, 428 teachers and 70,000 students had participated directly in the campaign's educational programme.[363] The cost of the media campaign and educational outreach was around €2.5 million between 2002 and 2010. The second part of the water saving project included a "50 Good Practices" guide. The guide identified measures for efficient water use by businesses, covering water-related technology and behaviours in the city's green spaces, buildings and industry.[364]

Economic incentives: The regional government gave discounts of 20 to 25 per cent to citizens purchasing water-efficient products. In 2002, the Zaragoza city council also offered economic incentives for households to reduce their water consumption. Residents who reduced their water use by 40 per cent or more in the first year of the scheme were entitled to a 10 per cent discount on their water bill. A 10 per cent reduction in water consumption was also expected in the following years. Water bills were redesigned to show clearly how each household's consumption compared to the levels in previous months.[365]

Partnerships: In order to ensure a range of options for customers, the water-saving project partnered with businesses and companies that sold water-related technologies and products. This allowed consumers to choose water-efficient products for their homes, including for bathrooms and kitchens.

Tariff reform: Water tariffs have the ability to make water consumption fairer and more responsive to demand. Revenues can be used to cover indirect costs in the water cycle and the direct costs of providing services.[366] In this case, the following measures were under taken:

- the establishment of fair costs for consumers that correspond to the resulting benefits and services
- a reasonably priced and accessible provision of water services to maintain affordability for vulnerable households
- incentives for smart and efficient water use, including financial incentives, such as discounts on water bills tied to a reduction in household water consumption, and higher rates for excessive water consumption.

Infrastructure upgrade: The programme also required significant upgrades to the water infrastructure in order to minimise leakages. Approximately 16 per cent of the 1,200 km pipeline network required upgrading. The city also initiated pressure management controls and maintenance of leaking storage tanks in order to limit water loss.[367]

Barriers and critical success factors[368]

The most significant factor contributing to the project's success was the change in consumer behaviour following effective public awareness campaigns and engagement. Instead of promoting generic water-saving messages, specific user groups were targeted with awareness-raising activities directly relevant to their business or lifestyle.

[363] See Edo et al. (1998).
[364] See 2030 Water Resources Group (2015).
[365] Ibid.
[366] See SWITCH (2014).
[367] Ibid.
[368] Ibid.

The establishment of a central coordination unit also contributed to the success of the campaign. The Zaragoza Water Commission ensured that there was a coherent approach to smart and efficient implementation and monitoring.

A network of 50 volunteer "accomplices" was set up and free audits were offered to these non-residential water users to help implement water-saving measures. This group included, for instance, a hospital, a fish supplier and a swimming pool operator. Subsequently, as soon as positive results came in, case studies of their success stories were circulated to other businesses.[369]

Policy commitments and the supportive city council made the city's achievement possible through an increase in the available funding opportunities. This also contributed to civic pride. The authorities led by example, providing a reliable, efficient water and wastewater service.

Results and lessons learned

Overall, the Zaragoza project significantly reduced water use and enabled smart behaviour in relation to water consumption. It achieved the following outcomes:

- The city decreased water use by almost 30 per cent within a 15-year period, despite a 12 per cent increase in population over the same time frame. Daily water consumption per capita fell from around 150 litres in 1997 to 99 litres in 2012.[370]
- The campaign enlisted 140 businesses selling technologies that minimised water consumption in homes. This enabled consumers to purchase products that were more water efficient. For instance, one bathroom retailer reported a 58 per cent rise in sales of automatic taps.[371]
- After the first phase of the project had been completed, 72 per cent of residents were aware of water-saving measures compared to 40 per cent before the project started.
- Water system performance improved, with pipe burst events reduced by more than 50 per cent and losses by more than 40 per cent.

The experience in Zaragoza shows that encouraging public participation and targeting specific sectors are valuable measures when implementing awareness campaigns. Strong political commitment is also important. The municipal strategic plan identified stakeholder engagement and public participation as important to managing the city's water consumption.

Links to similar initiatives

Singapore: water demand management

Beaufort West: water demand management

Nevada: water conservation programme

[369] See Kassam (2014).
[370] Ibid.
[371] See 2030 Water Resources Group (2015).

Public-private partnership agreement: Bucharest, Romania ↘

Bucharest introduced new capital improvements to the water sector through a PPP agreement, which has led to efficiency gains and better operational performance of the city's water distribution network.

Snapshot

- **Location:** Bucharest, Romania
- **Population:** Large – 1.8 million (2011)
- **Policy area:** Water
- **Policy option:** Regulation and contracting of public and private service providers; reform and strengthening of water utilities; effective tariff reforms and price signals
- **Financial capacity:** Strengthening
- **Administrative capacity:** Limited

Context and policy overview

In Bucharest, water losses were very high (around 50 per cent) in the 1990s and the city had low levels of fee collection because the metering system was inadequate. Relative to EU quality standards, improvements were required, and the commercial model and tariff structure in place at the time did not allow EU funds to be made available for capital investment.[372]

In 1996, following World Bank recommendations, Bucharest initated a tender process to privatise the city's water and sanitation system. This resulted in a 25-year concession agreement between Apa Nova, a subsidiary of the French firm Vivendi (now Veolia) and the Bucharest municipality for the management of the system. In 2000, Apa Nova won the tender to manage the Bucharest water concession, including the development of the Crivina plant. The contract included operations and the provision of clean water and sanitation, while ownership of the water system remained with the municipality.

The private-sector participation approach gave control of management and investments to a private company and linked its remuneration to efficiency gains and operational performance. The municipality expected that this would lead to significant improvements in Apa Nova's capital and operating efficiency and a higher standard of service. In addition, the municipality hoped to see expertise from international practices in management and operations transferred to Apa Nova's local staff.[373]

[372] See Water Time (2005).
[373] See Islam (2012).

Implementation

In one of the first PPPs in the local water sector, the private contractor was selected through international competitive tendering organised by the municipality of Bucharest, with the support of the International Finance Corporation (IFC). The agreement provided a 25-year contract for Apa Nova to deliver US$ 1 billion worth of investments in existing and new treatment plants and in network renewal.[374]

The contract included targets for key performance indicators in relation to water quality, completion of new infrastructure and customer service. Although the contractor had operational control over the network and the authority to deploy resources to meet these KPIs, the municipality retained ownership of the infrastructure and the power to veto certain decisions.[375]

The agreement helped create a source of capital to support an upgrade and extension of the Bucharest water system. The partnership agreement required the private partner to provide financial resources to upgrade the system, and part of the project included the upgrading of the Crivina plant. The Crivina project had already started 10 years earlier, but the municipality lacked the financial resources and expertise to complete it. To finance the project, Apa Nova and the city of Bucharest applied for an EBRD loan which offered better terms than other commercial sources of capital.[376]

This PPP model offers a degree of stability and risk- and profit-sharing. In 2000, the PPP environment in Romania was uncertain and the classical nature of the model used in Bucharest may therefore have been beneficial to the city.[377]

Results and lessons learned

The PPP contract was beneficial to both parties. Bucharest was able attract financial resources to upgrade and improve the quality of its water system and accessed the necessary expertise to do this. Meanwhile, Apa Nova also benefited, with profits of €24 million in 2006.[378]

Overall, the project improved the city's water distribution network and saw the completion of the Crivina potable water treatment plant on the outskirts of Bucharest.

Key metrics for the period 2002-06 included:

- a 44 per cent reduction in losses[379]
- a 50 per cent decrease in demand[380]
- a 21 per cent increase in customer satisfaction (from 46 per cent to 67 per cent).[381]

Moreover, the competitive nature of the contract, its 25-year duration and the controlled pricing mean that as a result of this concession, consumers in Bucharest have one of the lowest tariffs for water and sanitation in Europe.[382]

Links to similar initiatives

Singapore: water demand management

Johannesburg: water supply efficiency

Jeddah: leakage reduction

[374] See World Bank (2016).
[375] Ibid.
[376] Ibid.
[377] See Islam (2012).
[378] See World Bank (2014).
[379] See IFC (n.d.).
[380] Ibid.
[381] See World Bank (2014).
[382] Ibid.

Industrial symbiosis programme: Cape Town, South Africa ↘

The Western Cape industrial symbiosis programme connects local companies to facilitate the reuse of resources such as water, energy and materials.[383]

Snapshot

- **Location:** Cape Town, South Africa
- **Population:** Large – 3.7 million (2011)
- **Policy area:** Waste
- **Policy options:** Regulation and information to encourage the reuse of materials and the reformulation of processes; incentives for waste recycling by industries; information strategies for residents and businesses
- **Financial capacity:** Strong
- **Administrative capacity:** Strong

Context and policy overview

Despite its rich and diverse resource base, South Africa relies heavily on fossil fuels, has high rates of landfill use and suffers water scarcity. In Cape Town, the Western Cape industrial symbiosis programme (WISP) seeks to address these issues by providing a free facilitation service that promotes the reuse and recycling of industrial waste. The programme covers materials, water, energy, staffing and expertise, and other assets. Its overarching aim is to contribute to the circular economy.[384, 385]

The sharing of resources enables businesses to reduce costs and boost profits; improve operational efficiency; introduce new revenue streams; learn from one another; operate more sustainably; and divert waste from landfills.

The WISP was inspired by the UK's national industrial symbiosis programme (NISP), which successfully proved that reutilising underused resources across industrial and commercial waste improved the environmental impact of companies.[386]

Implementation

The WISP was set up by the Western Cape government and delivered by the non-profit organisation GreenCape, with technical support from the city

[383] See Western Cape Government (n.d.).
[384] See Global Opportunity Explorer (2018).
[385] See African Circular Cities Alliance (n.d.).
[386] See Western Cape Government (n.d.).

of Cape Town and financial support from other partners.[387] GreenCape seeks widespread adoption of green economy solutions. The WISP helps to engage local businesses, improving their understanding of the content and potential uses of waste streams which in turn helps to identify underutilised resources.[388]

Connections were made between nearly 500 participating companies via workshops led by the city and GreenCape and through the use of an online database, SYNERGie™.[389] When connections are made between firms, the WISP supports the exchange of resources and the communication between the relevant actors. Feedback to the WISP is encouraged in order to improve matching and to ensure strong social, environmental and financial impacts for all parties involved. Emission savings that result from the scheme are calculated using an international standard carbon calculator that has been developed for the purposes of the programme.[390]

By way of example, the WISP successfully matched the marketing company Scan Display with the specialist manufacturing firm Sealand Gear. This helped the former to avoid disposing of single-use conference display stands and banners, instead diverting them to Sealand Gear which used the products to make bags and clothing. The long-term relationship between these two firms helped to avoid two tonnes of landfill waste and delivered financial savings to both companies. Sealand Gear saved ZAR 270,000 (€14,000) per year on raw materials and Scan Display saved ZAR 900 (€50) per year in landfill gate fees.[391]

Barriers and critical success factors

Despite its overall success, the project faced challenges including regulatory issues (the reuse or recycling of waste materials, for instance), the cost of transport and logistics services, a lack of demand for secondary materials and additional capital investments. It also faced a difficult enterprise development process and lack of large-scale solutions for dealing with waste composite materials, bio-waste, textiles and wood.[392]

Factors that helped to overcome these issues and make the project successful include GreenCape's reputation as a reliable and trusted NGO with no hidden agendas, the use of partnerships to tap into

[387] Ibid.
[388] See C40 Cities and Climate KIC (2018).
[389] See C40 Cities (2017).
[390] Ibid.
[391] See GreenCape (2018).
[392] See O'Carroll et al. (2016).

networks and the contribution made by International Synergies, a firm whose experience in industrial symbiosis helped to demonstrate the value of this approach.

Government funding was also instrumental in facilitating the development of the free-to-use WISP service.[393]

Results and lessons learned

The WISP operates across several industries, allowing greater scope for the reuse of materials and delivering a range of benefits such as:

- 27,000 tonnes of waste diverted from landfill, thus saving 45,000 tonnes of greenhouse gas emissions over a five-year period.
- income and savings and private-sector investments totalling ZAR 43 million (€2.8 million equivalent)
- the direct creation of 25 jobs and a further 118 indirect jobs.

The programme has also inspired and influenced other industrial symbiosis programmes across South Africa's provinces, including in KwaZulu Natal and Gauteng. The WISP is seeking further expansion.[394]

Links to similar initiatives

Yokohama: 3R Dream Plan
Malmo: industrial symbiosis
Kristiansand: green business competition

[393] Ibid.
[394] See C40 Cities and Climate-KIC (2018).

Sharing city project: Seoul, South Korea ↘

Seoul declared itself a “sharing city” in 2012 and began applying the concept of the sharing economy to its urban policies. This minimised the waste of resources, while generating economic opportunities and better relationships between city residents.

Snapshot

- **Country:** South Korea
- **Population:** Large – 9.7 million (2017)
- **Policy area:** Waste
- **Policy options:** Establishment of a waste management plan and administrative capacity; promotion of sharing and reuse of products; information strategies for residents and businesses
- **Financial capacity:** Strong
- **Administrative capacity:** Strong

Context and policy overview

Initiated in 2012 and funded by the city, the Sharing City Seoul programme seeks to develop a sharing economy covering infrastructure, business, public resources, data and digital services.[395]

Overpopulation, urbanisation and a high population density in Seoul have exacerbated challenges in relation to housing, transport, air pollution and access to resources. The Sharing City Seoul project was initiated to tackle these challenges and facilitate growth without further exploiting resources or adding pressure to infrastructure and services.

The aims of the project include:[396]

- supporting job creation and increasing prosperity across the city
- reducing waste and excess consumption, and improving sustainability across businesses and organisations, and
- improving community spirit by increasing trust between people.

Implementation

Seoul is seeking to move away from its conventional policy of building primary infrastructure (such as roads, schools, and so on) towards an innovative

[395] See Johnson (2013).
[396] Ibid.

focus on secondary infrastructure (such as spaces, objects, skills and other underutilised resources).[397]

To achieve this ambition, the city is implementing a mix of policy and other mechanisms, including a supportive regulatory framework, public awareness campaigns, and financial and other support for businesses.[398] Some of the key measures include the following.[399]

Promoting sharing enterprises: The city supports approximately 20 business start-ups led by young people, providing them with office space, advisory services and subsidies. In addition, the city subsidises the expenses of 27 sharing enterprises with KRW 460 million (€340,000 equivalent) to either launch or scale up their platforms.[400]

Sharing enterprises chosen for city support include:

- Kozaza and Labo Korea, two platforms for home-sharing
- Woozoo, a platform that provides affordable housing by remodelling old houses into shared accommodation
- Wonderlend and Billi, businesses that promote the sharing and borrowing of goods that are underused
- SoCar, a platform for car-sharing services
- Kiple, a business that promotes the sharing of children's clothes
- The Open Closet, a company that distributes donated suits to young job-seekers
- The Living and Art Creative Center, a space for creative writing and art
- Zipbob, a platform that promotes food-sharing.

Public awareness: Seoul introduced a "stamp of approval" for particular sharing services in order to build trust in the sharing economy. Moreover, Seoul is branding itself as an innovator in sharing and is hosting an international sharing city conference to share best practices.

Seoul established an online platform called the ShareHub in June 2013 to help residents understand the concepts of the sharing city and to initiate a directory of sharing services.[401]

Governance: The sharing city project was based on cooperation between the private and public sectors, steered by a committee that the city established in February 2013 to promote sharing. The committee is made up of representatives working in areas such as the media, law, IT, corporate social responsibility, welfare and social innovation. In 2013, mayor Park set up the Seoul Innovation Bureau. The Bureau encourages people's engagement in all aspects of city life, from identifying challenges to providing policy ideas and participating in the sharing economy.[402]

[397] See Urban Sustainability Exchange (n.d.).
[398] Ibid.
[399] See Johnson (2013).
[400] See Johnson (2014).
[401] Ibid.
[402] See Centre for Public Impact (2017).

Other measures: Seoul established a car-sharing service with a fleet of around 500 cars, and a selection of parking lots and municipal buildings were opened to the public during off-peak times. To tackle the growing need for housing, the city created a system to connect older people who had spare rooms with students in need of accommodation. Shared bookshelves and "libraries" of tools were also set up in communities across Seoul.[403]

The city works closely with private companies to develop public-private partnerships and finance the programme.

Barriers and critical success factors

The Seoul metropolitan government is the driving force behind the city's circular economy. The mayor's Seoul Innovation Bureau facilitates the sharing model by means of financial and other support for businesses, start-ups and communities. It is well resourced and funded, with 58 staff members and an annual budget of €5.5 million.[404]

Stakeholder engagement is at the heart of the sharing economy. Strong communication and alignment between the Bureau, the mayor, private sector partners and communities is an important success factor. The mayor's office has arranged more than 6,000 workshops, resulting in input from 600,000 residents, with many of these insights since developed into policies and projects. For example, following a popular suggestion on Twitter, the city used mobile phone data to modify the night-bus timetable to meet passenger demand.[405]

In addition to top-down support from the metropolitan government and the mayor, the programme's success can also be attributed to the city's encouragement and support for a grassroots, resident-driven approach to sharing opportunities. Official support is available for tech start-ups and other organisations focused on enabling more sharing. However, the city acts as a partner and facilitator for these emerging initiatives rather than dictating how they should function.[406]

[403] See Johnson (2013).
[404] See Centre for Public Impact (2017).
[405] Ibid.
[406] See Johnson (2014).

The city also records the growth of sharing initiatives and the number of residents attending events and contributing to sharing policies and ideas both online and offline.[407]

While some people were initially sceptical about this new sharing process, presentation meetings organised by the city have helped residents to better understand the logic and potential benefits of the approach.

Public assurance from the metropolitan government in terms of laws and systems to promote sharing has also been key in helping to generate an ecosystem of start-up companies. Taxation in particular has been a sensitive matter, and the insurance system for the sharing economy is not yet complete. Regulation and laws that stand in the way of sharing activities are continuously reviewed by the city so that amendments can be made by the relevant departments.

Results and lessons learned

- By 2016 the initiative had certified 50 sharing projects and given grants to a number of these. Certified projects range from local car-sharing company SoCar to websites like Billiji that help people share things with their neighbours. One of the best results of the project is the increasing participation of residents.
- Some individual successes illustrate the scale of the project's impact: the car-sharing enterprises Green Car and SoCar have more than 400,000 members; the Moducompany platform has shared 2,000 parking spaces that are underused during the daytime; and children's clothing company Kiple has shared eight million items of clothing.[408]
- Moreover, Seoul has opened up almost 800 public buildings for public meetings and events when they are not in use. ShareHub has organised a sizeable campaign of public engagement and education, with conferences, seminars, reports and a book.
- The metropolitan government has concluded that these sharing policies have had a positive effect on the economy equivalent to around KRW 4.8 billion (€3.6 million equivalent).[409]
- The city government plans to expand the programme and estimates that this could save city residents a total of KRW 12 billion (€9 million) a year and the city administration KRW 1.18 trillion (€900 million), with more than 1,200 new jobs and CO_2 savings of 30,000 tonnes over the course of the expanded programme.[410]

The sharing city project in Seoul has influenced other South Korean cities such as Gwangju and Busan which have implemented sharing activities based on the success of the initiative.[411] They have taken particular inspiration from Seoul's distinct approach which combines top-down and bottom-up measures.

Links to similar initiatives

San Francisco: zero waste city

Berlin: circular city

Oslo: integrated waste-management strategy

[407] See Centre for Public Impact (2017).
[408] See Park (2016).
[409] Ibid.
[410] Ibid.
[411] See Johnson (2013).

Reduce, reuse, recycle: Yokohama, Japan ↘

Yokohama's 3R Dream Plan encourages behavioural change and facilitates coordination between residents, businesses and the city government to increase recycling and reduce waste.

Snapshot

- **Location:** Yokohama, Japan
- **Population:** Large – 3.7 million (2015)
- **Policy area:** Waste
- **Policy options:** Regulation and information to encourage the reuse of materials and the reformulation of processes; incentives for industries to recycle waste; information strategies for residents and businesses
- **Financial capacity:** Strong
- **Administrative capacity:** Strong

Context and policy overview

In the late 1990s, Yokohama faced a significant challenge, with waste generation exceeding the city's waste treatment capacity. In response, it proposed a long-term plan in January 2003 called the Yokohama G30 Plan, which aimed to facilitate recycling and curb waste production. Specifically, the plan sought to reduce waste by 30 per cent by 2010, relative to a baseline of 1.6 million tonnes of waste in 2001.[412]

Building on the success of this plan, a subsequent project was developed in 2010. The 3R Dream Plan aimed to "reduce garbage while continuing the separation and recycling of garbage, to deal with global warming and to reduce CO_2 emissions; [and] to realise [a] comfortable and liveable city where garbage is controlled by pursuing safe, secure, and stable garbage processing". [413]

The Yokohama 3R Dream Plan also demonstrated how manufacturers can produce items using recycled and recyclable materials and encourages the sale of eco-products and services to help avoid and reduce the import, use and waste of resources. It supported participation by residents through briefings, and through campaigns at the many waste collection points and train stations.[414]

[412] See Tokyo Development Learning Centre (2017).
[413] See C40 Cities (2016a).
[414] See C40 Cities (2016b).

Implementation

The G30 plan gave residents considerable responsibility for separating waste at source and bringing it to designated collection points. The city expanded the system to require separation into 10 different categories of waste, each to be placed in clear plastic bags for easy identification by waste operatives.[415] The new plan was supported by extensive education campaigns to raise public awareness of waste management. The campaign included more than 1,000 seminars for residents on waste reduction and segregation, along with numerous events at railway stations and local waste collection sites. Citizen volunteers – so-called "garbage guardians" – were appointed to promote sorting measures.[416]

The 3R Dream Plan promoted better waste management by ensuring secure and efficient processing and disposal of waste. It also sought to encourage collaboration between government agencies, businesses and residents in order to achieve Yokohama's vision of becoming a sustainable city. For instance, the city worked with producers to design products that create less waste and to implement "take back" schemes for the refurbishment or recycling of products that have reached the end of their lifecycle.[417]

Barriers and critical success factors

The scheme aimed to reduce waste while supporting the city's economic development. Its success was heavily influenced by the participatory environment created between government, industry, businesses and consumers.[418]

The involvement of residents and companies was critical in Yokohama for the establishment of effective waste management, even without the deployment of new technology or investment. Education also played an important role, ensuring that residents became involved in waste management activities.

Results and lessons learned

Yokohama achieved the following outcomes through its implementation of the G30 plan and the 3R Dream Plan:

- Yokohama saved approximately €900 million in capital expenditure by avoiding the construction of two new incineration plants, and €25 million in avoided operational expenditure. The new system of recycling was expected to cost approximately €20 million a year, resulting in significant savings for the city. [419]

[415] See Tokyo Development Learning Centre (2017).
[416] Ibid.
[417] Ibid.
[418] See C40 Cities (2016b).
[419] See Tokyo Development Learning Centre (2017).

- By 2015, Yokohama had reduced waste by 45 per cent from a peak of 1.61 million tonnes in 2001, achieving this success while the city's population grew by 170,000 people over the same period. Another marker of success is that by 2005, the G30 plan had already reduced waste by 30 per cent, reaching its target five years ahead of schedule.[420]
- The city experienced a significant reduction in GHG emissions from waste disposal. Between 2003 and 2013, waste-related emissions fell by 10 per cent, which equates to more than 29,000 tonnes of CO_2 saved per year.[421]
- The 3R Dream Plan set a target of reducing waste-related GHG emissions by 59 per cent by 2025 relative to a 2009 baseline.[422]
- Yokohama aims to cut more than 141,000 tonnes of CO_2 emissions by 2025 relative to the level in 2009. [423]

Links to similar initiatives

Cape Town: industrial symbiosis

Malmo: industrial symbiosis

Kristiansand: green business competition

In terms of lessons learned, the experience of Yokohama is appealing because it did not require large investment or new technologies to reduce waste. In fact, the efforts produced new business opportunities in the recycling industry. The Yokohama example also shows that the involvement of residents and companies is critical for effective waste management.

As landfill capacities fall and environmental regulations tighten, many cities are aiming to reduce and avoid waste. The experience in Yokohama thus reminds policymakers of the importance of engaging businesses and communities in the increasing drive towards a circular economy.

[420] See C40 Cities (2015).
[421] Ibid.
[422] Ibid.
[423] See C40 Cities (2016a).

Zero-waste strategy: Ljubljana, Slovenia ↘

In 2004, nearly all of Ljubljana's municipal waste was sent to landfill. However, over the last decade, the city has seen a tenfold increase in separate collection of reusable and recyclable materials, almost eliminating waste disposal to landfill.

Snapshot

- **Location:** Ljubljana, Slovenia
- **Population:** Small – 279,000 (2016)
- **Economy:** Service economy
- **Policy area:** Waste
- **Policy options:** Establishment of a waste management plan and administrative capacity; effective price signals and funding; information strategies and funding; improvement in waste collection; waste sorting and treatment to encourage recycling and energy recovery
- **Financial capacity:** Strong
- **Administrative capacity:** Strong
- **Other:** Supportive national policy

Context and policy overview

Slovenia is well recognised as a country that promotes sustainability and green growth. In 2016 it became the first to receive a Green Destinations award, while Ljubljana was honoured as the European Green Capital.[424] Waste management played an important role in these awards. Indeed, Ljubljana has been a leader in its approach to managing urban waste and developing a local circular economy.

In September 2014, Ljubljana became the first European capital to commit to zero waste.[425] The zero-waste strategy encompassed various pillars:[426]

- expanding separate collection of waste streams at household level
- collecting residual waste less frequently while maintaining the collection frequency of separate waste categories
- encouraging residents and businesses to generate less waste.

[424] See Ford (2017).
[425] See European Commission (2019).
[426] See Oblak (2019).

The strategy had ambitious targets to achieve 78 per cent separate collection by 2025 (from 60 per cent in 2014) and to reduce the generation of residual waste to 60 kg per capita by 2025 (from 150 kg per capita in 2014).[427]

The zero-waste scheme is fully operated by Snaga Ljubljana, the largest Slovenian municipal waste management company. The firm manages waste for Ljubljana's 400,000 residents, in addition to the inhabitants of 10 neighbouring municipalities.[428]

Under the scheme, fees for waste management services are based on the pay-as-you-throw (PAYT) principle in which households pay according to the amount of waste they generate. The charges are linked to container sizes and the frequency of collection. The average monthly cost per household is €8, which is among the lowest in Slovenia and the wider region.[429]

Implementation

In 2002, the city introduced the collection of glass, paper and packaging, in separate container stands. In 2006, it began household collection of biodegradable waste, some 17 years ahead of the implementation deadline set by the EU Waste Framework Directive (2008/98/EC) for separate collection of bio-waste.[430] In 2012, Snaga replaced neighbourhood and roadside containers for paper and packaging with a door-to-door collection system.[431]

While door-to-door collection of separated recyclable and biodegradable waste was being increased, the city's waste operator began reducing the frequency with which it collected residual waste. For single-household dwellings, collection of residual waste was reduced to once every three weeks. In multi-apartment buildings, the collection was weekly, while other streams were collected more frequently.[432]

In spite of a significant communication effort by Snaga, the public and media initially resisted the changes. Rates of separation were low, leading to overflowing containers of residual waste. However, Snaga stuck to the policy and ramped up its communications, including arranging a field trip to demonstrate how much of the residual waste in the bins could actually be placed into the more frequently collected waste streams. Behaviour gradually changed in response to the new system and by late 2013 the rate of separate waste collection had reached 55 per cent.[433] A survey

[427] Ibid.
[428] See LGB (n.d.).
[429] See Snaga Ljubljana (2018).
[430] See Dakskobler (2019).
[431] See Oblak (2019).
[432] Ibid.
[433] Ibid.

in 2016 indicated high satisfaction rates with the city's waste system among residents and businesses alike (albeit the results were based on a very small sample size).[434]

Snaga uses multiple channels to communicate with residents about costs and performance, including through its website and social media accounts. Users can also set up a free SMS reminder to notify them when waste will be collected.

In addition to its household collection system, the city operates a reuse centre and two household waste recycling centres for other reusable or recyclable materials. These are well used. They contribute to overall waste reduction and heighten awareness of waste, with a survey reporting that some 70 per cent of residents think about how to ensure the reuse of goods that they no longer need.[435] Building on this success, Snaga plans to construct 10 smaller centres in denser areas.[436]

For its treatment solution, the city opted to pursue a mechanical and biological treatment approach instead of the mass incineration of residual waste. The Regional Centre for Waste Management (RCERO Ljubljana) opened in 2016 and currently processes almost a quarter of Slovenia's waste. The facility produces its own heat and electricity through biogas derived from the processing. The facility achieves reuse, recycling or energy recovery for nearly all the materials it receives, with less than 5 per cent going to landfill.[437]

Barriers and critical success factors

The key to Ljubljana's success proved to be political support, good management and communication, and a commitment to constantly increasing zero-waste goals.

The introduction of door-to-door collection contributed most to the increase in recycling rates. Snaga's communication strategy was also critical in helping to overcome initial opposition to the zero-waste strategy, through media outreach and stakeholder engagement. The example of Ljubljana also shows how important it is to adjust communication strategies and messages as circumstances change.

Results and lessons learned

Ljubljana had previously lagged behind the rest of Europe in terms of the recycling and reuse of municipal solid waste. Over a 10-year period, the city boosted recycling rates from 29 per cent to 68 per cent and cut waste generation to around 358 kg per capita (compared with an EU average of 486 kg per capita). Among EU capital cities, Ljubljana managed to achieve the highest share of separately collected waste while keeping waste management costs to a minimum.[438]

Ljubljana became the European Green Capital in 2016, an award based on its environmental record. Among the five finalists, Ljubljana was the only city without a waste incineration plant or plans to build one. Instead, it focused on alternative solutions, including a comprehensive waste management plan working towards the development of a zero-waste society.

Links to similar initiatives

San Francisco: zero waste by 2020

Flanders: waste management

Vancouver: zero waste by 2040

[434] See Petek (2016).
[435] See Oblack (2019).
[436] See Dakskobler (2019).
[437] See Oblak (2019).
[438] Ibid.

Zero-waste strategy: Parma, Italy ↘

Parma dramatically increased the collection of biodegradable and recyclable material in only four years after launching its zero-waste policy in 2012. This success was due to strong political will, effective communication and a pricing strategy to set the right incentives.

Snapshot

- **Location:** Parma, Italy
- **Population:** Small – 194,000 (2017)
- **Economy:** Service economy
- **Policy area:** Waste
- **Policy options:** Establishment of a waste management plan and administrative capacity; effective price signals and funding; information strategies and funding; improvement of waste collection; waste sorting and treatment to encourage recycling and energy recovery
- **Financial capacity:** Strong
- **Administrative capacity:** Strong

Context and policy overview

Parma is a relatively small city located in northern Italy's Emilia-Romagna region. In 2014, the city occupied a dubious position as the country's most waste-producing city, with 636 kg of municipal waste produced per person (compared with an EU average of around 480 kg per capita).[439] Around 50 per cent of municipal waste was collected separately for reuse and recycling and the other half was incinerated or landfilled. Door-to-door collection of separate waste streams was very limited, with most recycling taking place through collection containers.[440]

Waste became a major point of debate in the 2012 municipal elections. Responding to public pressure and to leadership within the city council, the city began a series of changes to its collection regime. The new system made it easier for residents to separate out their recyclable waste from residual waste and created financial incentives to reduce waste and increase recycling. Public engagement and consultation were also integral to the process.

Implementation

The first step was to replace collection containers with door-to-door collection of separate waste streams. Parma started this programme in the historical centre and extended door-to-door collection across the city,

[439] See Zero Waste Europe (2016).
[440] See Heinrich (2018).

district by district. Within 18 months, door-to-door collection had been extended to all districts for food waste, paper, packaging and residual waste. Collection frequency varies by material, with bio-waste collected more than once per week and residual waste collected weekly (or less frequently in some areas).

The new system was scheduled according to location and population density. Waste collection in the city centre occurrs during the night (to avoid blocking streets and causing a nuisance to the night-time economy) while collection in residential areas took place during the mornings. Roadside containers were installed for the collection of garden waste and glass.

Parma faced a high cost of disposal (€170 per tonne for its new incinerator) and so the city used a pricing approach to reduce its residual waste stream and lower the overall costs of the system. The city's pay-as-you-throw scheme has a two-part fee structure based on the waste that each household generates. The first part is a fixed cost based on the size of the property and household. Additional allowances are available for households with children younger than 30 months, to account for the additional waste from nappies. The fixed cost covers a minimum number of collections per household and also the costs of management and enforcement. Additional removals of residual waste beyond the fixed number incur a cost per bag or bin.[441]

Households can earn additional 'eco-points' for sorting and disposing of electronic, hazardous and medical waste in the appropriate way. Eco-points are worth a discount of €0.15 on the following year's waste bill, up to a maximum discount of €20.[442] Households also receive a 12 per cent discount on their bill for home composting.[443]

Parma also introduced 'eco-stations' and 'eco-wagons' to complement the door-to-door collection system and provide flexibility. Eco-stations are small kiosks open 24 hours a day where people can recycle their waste outside of the main door-to-door collection hours. Recyclables are free to deposit, while residual waste incurs a fee. Kiosks have eight windows where

recyclables and residual waste can be left, accessible with a user card, which is also used to collect eco-points for depositing recyclables. Eco-wagons are located in the city centre and support the other waste collection services. The system operates like a bus service, with routes and stations to enable people to bring out their waste at the appropriate time.

Barriers and critical success factors

A communication campaign targeting local residents was essential to the success of the new waste system in Parma. This included awareness-raising in public squares, information sent to people's homes, a specially created hotline, and a competition between schools to reduce waste.

Residents were concerned that waste collection would not be frequent enough, so the eco-stations gave them the option of bringing their extra waste for disposal.[444] The flexibility of the system increased its acceptability and people's willingness to support the new approach.[445]

Illegal dumping and fraud were also concerns ahead of the transition. Residents are protected through the use of RFID tags in each bag, so they are only charged for their own waste. The city also installed CCTV

[441] Ibid.
[442] See 2020 Collectors Project (2020).
[443] See Zero Waste Europe (2016).
[444] See Heinrich (2018).
[445] See 2020 Collectors Project (2020).

cameras at eco-stations and created an app for residents to report illegal dumping. Overall, rates of illegal dumping were low, at around 500 g per capita per year.[446]

Results and lessons learned

The new system dramatically reduced residual waste and increased the collection of recyclable and biodegradable materials. As of 2018, Parma had achieved the following capture rates:[447]

- paper: 81 per cent
- plastic: 69 per cent
- metal: 33 per cent
- glass: 93 per cent
- composite material: 36 per cent

Meanwhile, kerbside collection of bio-waste collection nearly doubled, from 50 kg to 100 kg per capita per year between 2011 and 2015, while the fraction of impurities fell from 8 per cent to 3 per cent.[448]

Typical costs for households rose in the early years as investments were made in both capital and operations. However, as the system settled in and savings were captured by reducing disposal costs, the cost for customers began to fall. After a peak in 2013, typical costs in 2016 were at a similar level to those seen in 2010 before the new system was implemented (around €250 a year for a three-person household). In effect, the city is delivering much better outcomes for the same cost as the old system.[449]

The success in Parma helped the adoption of targets in Emilia-Romagna which exceed national and EU requirements, including a 25 per cent reduction of total waste, 73 per cent separate collection and 70 per cent effective recycling. This system incentivised cities to achieve the best performance, while penalising those lagging behind. Through this regional system of incentives, Parma has received €710,000 for its reduction of residual waste.[450]

Links to similar initiatives

Ljubljana: zero-waste city

San Francisco: zero waste by 2020

Flanders: waste management

[446] See Heinrich (2018).
[447] See 2020 Collectors Project (2020).
[448] See Ricci (2020).
[449] See Heinrich (2018).
[450] See Zero Waste Europe (2016).

Formalisation of informal waste pickers: Belo Horizonte, Brazil ↘

Belo Horizonte, Brazil's third-largest city, began to address its waste management issues in the 1970s with a new sanitary landfill. However, it took a new, formalised relationship with *catadores* – informal waste pickers – to deliver a truly integrated solid waste management system.

Snapshot

- **Location:** Belo Horizonte, Brazil
- **Population:** Large – 2.5 million (2015)
- **Policy area:** Waste
- **Policy options:** Formalisation of informal services; improvement of waste collection
- **Financial capacity:** Limited
- **Administrative capacity:** Strengthening

Context and policy overview[451]

Belo Horizonte is a large middle-income city in the Brazilian state of Minas Gerais. The city's population has grown rapidly from around 3.5 million in 1990 to around 6 million today.

Waste management has been a key challenge for Belo Horizonte as the city has grown. In the mid-20th century, much of its waste went to an open dumpsite which was scavenged for valuable materials by *catadores*, waste pickers living on the margins of society. The city stopped this practice when the dumpsite was closed and replaced with a sanitary landfill in the early 1970s. The waste pickers continued to operate but were marginalised and persecuted by the authorities responsible for urban sanitation. In response, the *catadores* made use of 1988 legislation to form a workers' cooperative called the Association of Collectors of Paper, Cardboard and Recyclable Material (ASMARE).[452]

In the 1990s the city developed a flexible and integrated system of solid waste management which incorporated the waste pickers into a formalised relationship with the city's waste authority, SLU, and the wider waste and recycling ecosystem. According to Aurora Pederzoli, SLU Chief of Special Programmes, "Our solid waste management model is based on

[451] See Centre for Public Impact (2016)
[452] See Magni and Günther (2014).

a concept of social inclusion and income and job generation."[453]

Implementation

The city's adversarial relationship with waste pickers began to change when the *Pastoral de Rua* of the Archdiocese of Belo Horizonte engaged with the cooperative to understand their needs and aims. The *Pastoral* mediated negotiations with the city to develop a plan for the waste management system which had the support of all participants – the city, the waste authority, ASMARE and other waste businesses.[454]

Belo Horizonte's environmental plan for recovery and recycling of civil construction waste was initiated in 1993 to provide a mixed system of waste collection and drop-off sites, with selective waste-sorting carried out by the waste pickers.[455] The city introduced weekly kerbside collection of paper, metal, glass and plastic, and established collection sites for households not served by kerbside collection. Waste from both streams was sent to the cooperative warehouses for the sorting and recovery of recyclable materials.[456]

In 2003, the city set up a citizen's forum to facilitate greater dialogue on waste issues. The purpose of the forum was both to review progress and to expand the system to include other workers' cooperatives.[457]

In 2011, the state government introduced a 'recycling bonus', a financial incentive for the waste pickers. Payments are made on the basis of the quality and value of the recyclable raw materials. The payment provides an additional source of income for these workers but also provides an incentive to the cooperatives to innovate to improve the quality of recyclates and to improve business management practices.[458]

Barriers and critical success factors

The city's successful approach was preceded by a long period of dispute and acrimony with waste pickers.

Intensive communication and sustained political support for the new integrated system were therefore essential to overcome the legacy of mistrust between different actors in the city's waste system. Belo Horizonte used creative communication approaches including carnival parades, theatre, dance and music to change public attitudes to the waste pickers and their positive contributions to the city's environmental quality.

The legal framework limited the city's ability to reform the waste system. These issues were addressed over time, including through a change at city level to assign the rights to cooperatives to collect and sell recyclable raw materials. At the federal level, in 2001 waste collecting was classified as a professional occupation.[459]

[453] See LSE Cities, ICLEI and GGGI (2013).
[454] See Magni and Günther (2014).
[455] See Sabatino (2017).
[456] See Centre for Public Impact (2016).
[457] See Sabatino (2017).
[458] See Dias (2016).
[459] See Sabatino (2017).

Results and lessons learned

The achievements and positive change in Belo Horizonte's waste management have proved to be a model for other Brazilian cities. Key outcomes included the following:

- By 2012, the city's formal waste management system was serving 95 per cent of the urban population and at least 70 per cent of favelas, with 93 per cent of residual waste being disposed of in sanitary landfills.[460]
- Some 3,000 waste workers are supported by the system and together with the municipal waste management system they had collectively recycled up to 20,000 tonnes by 2012.
- Working conditions for waste collectors improved significantly with the introduction of a monthly minimum wage of €270.[461] The cooperatives provide the workers with a degree of security.[462]
- Skills development and training were delivered through a Municipal Waste and Citizenship Forum, which was supported by municipal funding and additional support of €125,000 from Caixa Bank.[463]
- Recycling outcomes were relatively low, with recycling rates remaining below 10 per cent as of 2008.[464]

Links to similar initiatives

Bangalore: informal waste pickers

Four strategies to integrate waste pickers

Waste pickers and cities

[460] See Centre for Public Impact (2016).
[461] Ibid.
[462] See Colombijn and Morbidini (2017).
[463] See Centre for Public Impact (2016).
[464] See LSE Cities, ICLEI and GGGI (2013).

Political and fiscal decentralisation: Poland ↘

Decentralisation in Poland has been successful, leading to increased local revenue and improved service delivery. Most interaction between citizens and public administration now occurs at the level of local governments, the most trusted institutions in the country.

Snapshot

- **Location:** Poland
- **Population:** 37.8 million countrywide (2019)
- **Policy area:** Governance
- **Policy option:** Political and fiscal decentralisation
- **Financial capacity:** Strengthening
- **Administrative capacity:** Strengthening

Context and policy overview

Decentralisation in Poland began soon after the collapse of the Soviet Union. The early reforms devolved various central government functions, including some revenue-raising authority, to existing municipalities. In 1999, the country implemented structural reforms of provincial and local government which saw further devolution of powers to counties and municipalities, bringing public services closer to people and making local government in Poland more accountable to its electorate.[465]

Most of the interaction between citizens and public services occurs at the local level, and in Poland local governments have a good reputation.[466] This success was achieved through reforms to administration and by strengthening the capacities of cities and regions.[467] To implement reform, changes were made to legislation and the operation of public administration. The implementation process was monitored and evaluated and the public were kept informed.[468]

Implementation

Fundamental changes were required to the structure of central and local systems, including to legislation, staffing and organisation. It was also necessary to address issues regarding the ownership of public infrastructure and services.

Initially the state established new institutions, including new offices for the different levels of public

[465] See World Bank Group (2017).
[466] See Laszek and Trzeciakowski (2018).
[467] See European Association for Local Democracy (2016).
[468] See Kulesza (n.d.).

administration, followed by a sharing of assets and staff between these institutions. Next, a list of public institutions was created and passed to territorial self-governments to allow them to take over the running of these assets.

In terms of sequencing, Poland's series of political and fiscal reforms since 1990 have been delivered through at least three different approaches.[469] Between 1989 and 1991, the "shock-therapy" technique was used to create rapid change in the economic system. In 1997, a "big bang" approach was employed to implement four major structural reforms within a year. More recently, the preferred approach has been incremental, making important decisions in separate stages. Of these three approaches, the 1997 reforms in particular, towards a three-tier system of local and regional self-government, enabled local communities and society as a whole to take a greater stake in the country's development. Delegating responsiblity for public tasks led to stronger local government.[470] Municipalities therefore have a high level of autonomy within the Polish system, although they must act within the law.

Barriers and critical success factors

Poland used a gradual programme of reform to increase transparency and accountability, allowing the changes to become effective and the country to absorb large EU funds efficiently.[471] Initially, reforms focused on institutions that did not fit with the new market economy context. These efforts were followed by steady action to enable the institutions that had been retained to evolve in response to the growing sophistication of Poland's market economy. The shared goal of EU accession also spurred political support for the reform of institutions.[472]

While public expenditure has been decentralised, local government has limited control over taxes.[473] Control over expenditure and revenue alike is important for local government to succeed.[474]

There can be friction between local and national tiers of government when the degree of autonomy is not established in advance. It is clear that detailed and well-communicated legislation is key to success.

Results and lessons learned

- Local government has been effective, without large regional disparities.
- Service delivery improved because local governments were able to implement centrally designed policies and they had greater accountability.
- Increased accountability allowed local governments to boost their revenue, while also benefiting from dependable intergovernmental transfers and large amounts of EU funds.
- Poland has become more resilient to economic downturns.
- In a recent survey, local governments ranked as the most trusted public institutions in Poland.[475]

Links to similar initiatives

United Kingdom: decentralisation

Colombia: decentralisation

Finland: decentralisation

[469] See demosEuropa – Centre for European Strategy (2015).
[470] See Szescilo and Kulesza (2012).
[471] See World Bank Group (2017)
[472] See Schiffbauer and Varela (2019).
[473] See Szescilo (n.d.).
[474] See Laszek and Trzeciakowski (2018).
[475] Ibid.

Smart city performance monitoring: Austria, Vienna ↘

Vienna has developed a comprehensive programme to monitor the impact and key objectives of its Smart City Wien Framework Strategy. These include resource conservation, innovation and improvements in quality of life.

Snapshot

- **Location:** Vienna, Austria
- **Population:** Large – 1.9 million (2019)
- **Economy:** Service economy
- **Policy area:** Governance
- **Policy option:** Improving transparency and accountability
- **Financial capacity:** Strong
- **Administrative capacity:** Strong

Context and policy overview

Vienna is regularly ranked as the city that offers the world's best quality of life.[476] It also has a tradition of strong governance and engagement with residents in constructive, participatory dialogue.

While Vienna's employment rates and average incomes are high, the region and the city face environmental challenges, including pollution of the Danube River due to unsustainable development along its banks and increasing air pollution due to private transport.[477]

Against this background, in June 2014 Vienna's city council adopted the Smart City Wien Framework Strategy (SCWFS), a comprehensive scaffold for developing effective responses to climate change, including radical conservation of resources and productive use of new technology. Projects that have emerged from the strategy include, for instance, an initiative for e-car-sharing.[478] The strategy was updated in 2019 to incorporate the UN Sustainable Development Goals and to reflect the increased urgency of addressing climate change.[479]

There was concern that such a complex, long-term framework would develop actions that would be left by the wayside among the daily pressing agendas of local government. Therefore, the city council required the municipal administration to undertake a periodic monitoring programme and to verify at regular intervals that the framework's objectives were being met.[480] This monitoring was intended to serve as a performance management tool for policymakers

[476] See Mercer (2015).
[477] See WWF (n.d.).
[478] Ibid.
[479] See Brandl and Zielinska (2020).
[480] See Municipal Department MA 18 – Urban Development and Planning (2018).

and to support the city in implementing and updating the strategy.

Vienna recognised that to back this monitoring process and make the strategy more transparent, the city would need to establish a central data platform. This had to cover the entirety of the municipal administration and ensure access for residents and the exchange of information. In this way, it would involve all of the main stakeholders in the implementation of the SCWFS.

Two principles were defined for the monitoring approach. First, there would be extensive cooperation across city departments and associated organisations to maximise support and ownership. The second key principle was to minimise the data collection workload for participants and to focus on analysing the existing data pool and reporting structure.

Implementation

Vienna created the SCWFS in 2013, following two years of stakeholder engagement and the City Council Resolution of 2014 which first stipulated the need for a monitoring process.

The initial step was to conduct an extensive exploratory project to establish a methodology for monitoring that would reflect the objectives of the SCWFS. The first monitoring process took place in 2017 as part of an EU-funded project and consisted of:

- monitoring objectives by evaluating them individually based on an extensive set of indicators
- carrying out overall monitoring of the Framework's results.

One-third of the objectives could be measured quantitatively. However, the remaining objectives posed greater challenges as their measurement required extensive qualitative descriptions. In these cases, individual indicators were grouped together, making it possible to assess a subject area in more general terms.

Some of the indicators used by the city were found to require greater precision before they could provide a more comprehensive picture, although Vienna recognises that evaluation of indicators should be an ongoing process.

The monitoring is a resource-heavy and time-consuming process, exacerbated by the absence of a central overview of the city's data. Indeed, centralised access to the Vienna's data pools has been identified as an area for future improvement. This could be achieved through further improvement to the online reporting tool already in place and by providing access for the entire municipal authority.

An additional evaluation is expected to take place in order to make the process more routine.

The monitoring programme's key success factor was its integration of evaluation with the strategic performance management cycle for the overall framework. This ensured that the findings could be fed back in more effectively.

The division of tasks across a multitude of stakeholders according to their areas of expertise (data provision, for instance) was supported by academic institutions. This approach ensured ownership and reduced the administrative burden on local government.

Results and lessons learned

The city's monitoring process involved particpants from across the municipality and stakeholder organisations. These organisations took different roles in the process, from reporting on goals to providing objective evaluation and data. This illustrates the methodology's effective approach of engaging a multitude of stakeholders, thus creating ownership of the framework.[481]

One feature of Vienna's implementation framework is the Smart City Agency, which is responsible for coordinating activities under the framework.[482] An agency of this kind is a key ingredient in the successful implementation of smart city strategies.[483]

[481] See Municipal Department MA 18 – Urban Development and Planning (2018).
[482] See Urban Innovation Vienna (2020).
[483] See SmartCities World (2019).

The monitoring provided evidence-based findings on progress against individual objectives and showed where the city needed to make further progress. For example, the assessment identified that Vienna's CO_2 reduction target for 2030 had almost been achieved just one year after the framework was launched. Although this was a positive finding, the monitoring also identified persistent social disadvantages in access to green space. Some measured outcomes of the SCWFS as detailed in the 2017 monitoring report include:

- a reduction in per capita GHG emissions of 33 per cent in 2014 relative to a 1990 baseline (this is a headline goal, with the reduction of GHG emissions being the strategy's prime objective)
- a fall in per capita energy consumption since 2005, of around 14 per cent
- growth in the share of renewable energy, from 12.1 per cent in 2010 to 19.5 per cent in 2015.

Using the monitoring framework to not only report achievements, but to put these in the context of progress against an eventual target, ensures a long-term view and identifies the scale of further actions required. For example, the 2017 monitoring report identified successes and good progress against some targets, but also areas of stagnation or poor performance, for instance:

- levels of car traffic have stagnated since 2013, and Vienna is not on track to meet its objectives to shift to other modes of transport
- similar stagnation or fluctuation in the trends for environmental indicators in buildings and in the water and waste sectors suggests that efforts are required to remain on track, or get back on track.

The accountability offered by a monitoring process has been shown to have a tangible impact on the fulfilment of a city's strategy. Moreover, in Vienna, the data collection necessary to complete the monitoring and evaluation in a smart way was built on existing databases and enabled the creation of a new online reporting tool.

Links to similar initiatives

Alba Iulia: smart city

City of York: performance management

Utrecht and the UN SDGs

Co-designing and co-creating urban solutions: Cluj-Napoca, Romania ↘

Cluj-Napoca established a centre for civic innovation and imagination to encourage debate and collaboration among community representatives and city stakeholders about urban projects.

Snapshot

- **Location:** Cluj-Napoca, Romania
- **Population:** Medium-sized – 303,000 (2012)
- **Policy area:** Governance
- **Policy option:** Effective stakeholder participation
- **Financial capacity:** Strengthening

Context and policy overview[484]

Over the last decade, Cluj-Napoca has been the only growing city in Romania. Its evolving cultural life has transformed Cluj-Napoca into a vibrant European city, with a multicultural environment that attracts tourists and businesses. The city received the European Youth Capital title in 2015, a year in which it organised a range of cultural events. Cluj-Napoca is home to the Paintbrush Factory, an industrial facility that was converted into a cultural space and is one of the country's most notable artistic projects.[485] In short, the city has gained its place as a centre of culture and innovation.

In 2017, Cluj-Napoca established the Civic Imagination and Innovation Centre (CIIC), offering residents the opportunity to take part in shaping their city and community. The inauguration of the CIIC was marked with a debate to identify solutions for the regeneration of a local park. Local government representatives, residents, specialists and academics meet at the CIIC to collaborate on transforming the city.

The CIIC is led by public administration. It has no permanent location and functions by collaborating with the community. The centre is funded by the municipal budget, costing the city €10,000-€15,000 n month.[486]

[484] See ROCK (2019).
[485] See ASEF CULTURE360 (2011).
[486] See Innovation and Civic Imagination Centre – CIIC (2019).

Implementation

The CIIC has revamped the city's method for designing and developing large-scale urban intervention projects. Debates focus on an array of themes such as urban and public spaces and museums.

In 2018, the centre hosted the third Romanian national workshop on the "Attractive Danube". The worshop's overall objective was to identify at a national level measurable indicators of the attractiveness of a region (for the purposes of investment in tourism and business). However, the workshop held in Cluj focused specifically on bringing the discussion towards local problems and solutions.[487] Attendance was broad, ranging from various levels of government to interest groups, academics and businesses. The Territorial Attractiveness Monitoring Platform (TAMP), an open online platform that maximises accessibility, was introduced at the event and received good feedback. This workshop, alongside other national workshops in the series, yielded recommendations from a diverse range of 35 organisations to include 86 draft Territorial Attractiveness indicators within the TAMP tool.[488]

Early 2019 saw two further debates: one on an urban plan for a large-scale development area (Sopor) and a citizen panel focused on EU Cohesion Policy.

Barriers and critical success factors

Having clear objectives for meetings and communications was important in Cluj-Napoca to ensure that people understood the purpose of these events. It was also important to assign a manager who would be in charge of analysing the information collected.

Using a multidisciplinary approach, CIIC events elicited a number of viewpoints, which allowed a story to be told and engaged the community. Where there were socio-cultural differences, the CIIC used facilitators to resolve clashes and address the local dynamics. Local communities had the opportunity to learn about the process of urban development and planning.

In addition, communication about government intentions and an inclusive dialogue that accommodated differing points of view were important for promoting public participation. Furthermore, the centre offered capacity-building for stakeholder engagement to local communities, helping them to understand the planning and urban development process step by step.

Results and lessons learned

The centre has enabled the creation of levers, such as public debates oriented towards addressing urban problems and bridging the gap between three key groups: the city administration, experts and residents.

Two years after CIIC's inauguration, residents are more aware of the opportunities they have to participate and feel empowered to take part in the urban planning and development. The move has enabled more innovation and new ideas, allowing the community to become involved and to have more interaction with the changes to their city.

The success of the CIIC shows that active engagement of residents in urban planning does not need to come at a very high cost. Moreover, the experience in Cluj-Napoca demonstrates the importance of setting clear objectives and expectations with regard to facilitating debates between residents and policymakers.

Links to similar initiatives

Skopje: innovation lab

Bologna: civic collaboration

Lyon: citizen participation

São Paulo: civic participation

[487] See UrbaSofia (2018).
[488] See Interreg Danube Transnational Programme (2018).

Land-value capture: Bogotá, Colombia ↘

Bogotá has applied a form of "betterment levy" to finance road and other infrastructure upgrade projects around the whole city.

Snapshot

- **Location:** Bogotá, Colombia
- **Population:** Large – 7.1 million (2018)
- **Policy area:** Finance
- **Policy option:** Improved revenue and financial autonomy
- **Financial capacity:** Strengthening
- **Administrative capacity:** Strengthening

Context and policy overview

Legislation authorising the use of a betterment levy known as the *contribución de valorización* is common in Latin American countries. This form of levy is often opposed because it can be complex and resource intensive. However, in Colombia, the betterment levy has been used regularly to raise revenue to fund public works.[489, 490]

Implementation

The amount of the betterment levy is set to the lowest value among the following three factors:

- the cost of the project
- the value that the project creates
- the affordability of the levy (whether property owners can afford to pay the levy).

Bogotá has been innovative in its use of the levy. For example, the city applied it across a package of road projects and other infrastructure upgrades.[491]

The Urban Development Institute (Instituto de Desarrollo Urbano, or IDU) is responsible for administering the betterment levy in Bogotá. The IDU also selects the infrastructure upgrades that the levy will finance. All affected properties are subject to the levy, which is calculated by multiplying different benefit factors.

The IDU defines the "areas of influence" that will benefit from the levy. This definition is based on a property's proximity and access to a project and hence to benefits (such as an increase in land value). The IDU endeavours to maximise the number of properties within this area in order to lower the average burden of the levy on individual properties. The benefits for an area could include, for instance:

- better road layouts, leading to increased mobility and transit speeds, shorter transit

[489] See World Bank (2009).
[490] See Borrero Ochoa (2011).
[491] Ibid.

times, lower operating costs and a better quality of life

- better public spaces
- stimulation of new commercial activity
- increased real estate value
- better integration of the area into the city structure
- regeneration.

In Bogotá, the betterment levies are no longer tied specifically to incremental changes in land value.[492]

Barriers and critical success factors

Initial criticism emerged in relation to the cost of implementing the levy system for infrastructure projects (particularly the cost of administration) and in relation to the calculation of land value gains, which were not measured directly and were therefore found to be inaccurate. To address the criticism and reduce the burden on those paying the levy, city authorities had an incentive to underestimate the cost of infrastructure projects, which led to underfunding of infrastructure. The authorities also focused schemes in wealthier areas where landowners could pay more easily. As a result, infrastructure improvements were unequally distributed across Bogotá.[493]

Creating trust is an essential component of the success of betterment levies. This trust must be built largely on affordability, the equitable distribution of benefits, the promotion of social value, and participation by city residents in the process and its implementation.[494]

In Bogotá, public resistance to the betterment levy has since been tempered by spreading public works improvements across the entire urban area. In addition, the city has given residents the option to pay the levy over five years, minimising the financial impact on each property owner. This has enabled Bogotá to use *valorización* payments to repay the short-term debt used to fund construction.

Results and lessons learned

- In the period 1997-2007, Bogotá financed 217 public works projects through the *contribución de valorización*. These projects were located throughout the city and primarily consisted of bridge and road projects and improvements to drainage.[495]
- Over the same period, the city used the levy to finance more than US$ 1 billion of municipal public works.[496]

Links to similar initiatives

China and India: value capture via land sale
São Paulo: sale of development rights
Istanbul: municipal and state land sales

[492] Ibid.
[493] See World Bank (2009).
[494] See Borrero Ochoa (2011).
[495] See World Bank (2009).
[496] See Blanco et al. (2017).

Diagnosis framework for municipal finance: Rijeka, Croatia ↘

Rijeka has successfully implemented the World Bank's Municipal Finance Self-Assessment framework to evaluate the city's financial health and identify specific actions that will improve its public spending and mobilisation of funding.

Snapshot

- **Location:** Rijeka, Croatia
- **Population:** Small – 128,000 (2011)
- **Policy area:** Finance
- **Policy option:** Improved accountability and transparency
- **Financial capacity:** Strengthening
- **Administrative capacity:** Strong

Context and policy overview

Rijeka is a port city in Croatia comprised of 34 municipal entities and a population of 130,000.[497] It is one of the smallest and most densely populated cities in Croatia. In recent decades Rijeka has grown steadily, intensifying environmental challenges such as transport pollution, light pollution and wastewater treatment.[498]

The city undertook several investments in the early 2000s to address these challenges, including funding 13 buses and 8 minibuses that run on CNG and establishing Croatia's first CNG filling station. However, in order to facilitate these investments, Rijeka needed to assess its financial position and improve the financial management of the municipality.[499]

The strategic objectives of the city were:

- to attract global investment through the development of the Rijeka Gateway project
- to develop a competitive economy based on knowledge and new technology, and
- to strengthen social inclusion through the implementation of capital investment projects.

[497] See Croatian Bureau of Statistics (2012).
[498] See World Bank Institute (2013).
[499] See Environmental Local Authorities InterBalkan Network (n.d.).

In 2012, Rijeka used the World Bank's Municipal Finance Self-Assessment (MFSA) tool to strategically assess its finances and develop a long-term action plan for financial management and investment decisions.[500]

Implementation

The work of applying the MFSA began in 2012. The framework provides a common methodology and internationally accepted indicators which can aid cities in accessing external funding and in more efficiently tracking local resources and spending over time. The key steps of the framework are as follows:[501]

1. Transform core databases of municipal financial data into the MFSA format.
2. Carry out analysis of historic trends and balances and assess the level of services provided.
3. Calculate financial ratios and set benchmarks.
4. Use growth trends to identify financial needs and the implications of future policy decisions.
5. Assess the quality of financial management using performance indicators, identifying strengths and weaknesses in the current system.

The MFSA framework is intended to improve the transparency of municipal financial management and help cities make more prudent investment decisions.

As a self-assessment, this approach can require significant administrative resources to review the current spending and finances of a city. However, the task can be outsourced to external auditors so that the local government are not direct owners of the process, but instead analyse and interpret the results to develop a long-term action plan.

Rijeka prides itself on its strong digital credentials and sought to incorporate its smart city infrastructure into this self-assessment to make its municipal finance more transparent and encourage residents to become involved.[502] In 2011, Rijeka launched an interactive game, Proračun(ajme) (Budget me), on its municipal open data portal. The game allowed residents to create their own budget for the city, based on existing funds. This educated people about details of the current budget and allowed them to simulate juggling the city finances.[503]

The strategic long-term financial plan was published in 2014. Subsequent developments in relation to the transparency of municipal finance included the development of a public finance portal created in 2016.

[500] See World Bank Institute (2013).
[501] Ibid.
[502] See Filipovic (2019).
[503] Proračun Grada Rijeke (2018).

The self-assessment revealed that between 2008 and 2012 Rijeka's average annual decrease in revenue was 2.9 per cent and the debt burden increased significantly. These findings, along with the financial ratio analysis, indicated that the city's fiscal autonomy was weak. These trends reflected the economic crisis of 2008 and falling GDP at the national level.[504]

This assessment enabled the city to identify its need to finance capital expenditure through the national government or private financing, which it could achieve by strengthening municipal financial transparency and accountability. The procedures and benchmarking established by the MFSA assist in this process.

The framework has a number of unique features that differentiate it from normal practices. It can promote accountability in local administration by focusing on self-assessment by municipal staff which also enables them to more effectively identify the most realistic actions to place in their improvement plan.[505]

City officials are also actively encouraged to share their findings with other cities to promote learning and visibility in the use of public funds. An example of this approach was the UPP Technical Workshop on Municipal Finance and Urban Audit held in 2018 with 40 participants from cities in Albanian and North Macedonia.[506]

Results and lessons learned

By using the MFSA approach, Rijeka developed an action plan to improve its finances. The main objectives of this multi-year planning and capital investment programme were:[507]

- to provide a stronger revenue foundation for the city, with more robust local tax collection
- to increase the autonomy and flexibility of financial operations
- to improve financial management and build capacity and financial literacy within the city council.

The MFSA tool not only helped Rijeka to identify these key objectives but also enabled the city to meet these goals in the future by providing a key framework for tracking spending through the use of financial ratio analysis, which creates municipal finance benchmarks for internal purposes.

Links to similar initiatives

Zaprešić: creditworthiness

Kolkata: creditworthiness

Istanbul: land asset management

[504] See World Bank Institute (2013).
[505] See Farvacque-Vitkovic and Sinet (2014).
[506] See SEE Cities (2018).
[507] See World Bank (2013).

Climate Fund: Melbourne, Australia ↘

The Sustainable Melbourne Fund allows both tenants and property owners of small and medium-sized enterprises to obtain 100 per cent finance for renewable-energy and energy-efficiency projects, with repayments made through council rates.

Snapshot

- **Country:** Melbourne, Australia
- **Population:** Large – 4.8 million (2017)
- **Policy area:** Finance
- **Policy option:** Municipal funding support for green investments
- **Financial capacity:** Strong
- **Administrative capacity:** Strong

Context and policy overview

In 2003 the city of Melbourne set out a roadmap to achieve net zero emissions by 2020.[508] The Sustainable Melbourne Fund (SMF) was established concurrently with the roadmap preparation in order to provide financial support to businesses implementing projects that have an environmental benefit. These projects include everything from solar, waste and water solutions to more innovative and complex measures such as waste to energy projects.[509]

The SMF furthers the city council's sustainability goals, ensuring that the activities it funds create financial, social and environmental benefits.

In 2016, the fund was valued at AUD 15.6 million, including an initial investment of AUD 5 million in equity and a further AUD 10 million debt facility.[510] This success led to national expansion of the programme. In 2019, the fund was recapitalised and expanded across Australia with increased investment, becoming the Sustainable Australia Fund.[511]

The fund allows both tenants and property owners of small and medium-sized enterprises (SMEs) to obtain up to 100 per cent finance, with repayments made through the local council (often through property rates). This enables a business to get an immediate boost to its profits through a reduction in energy bills, while property owners benefit from capital growth to their building. Loans of up to AUD 500,000 are provided for individual projects that deliver environmental and economic benefits.[512]

[508] See City of Melbourne (2008).
[509] See City of Melbourne (n.d.).
[510] See C40 Cities (2016).
[511] See Sustainable Australia Fund (2020).
[512] See City of Melbourne (2020).

Implementation

A key component of the SMF programme involves financing packages that are designed to overcome the hurdle of owners lacking credit. The Environmental Upgrade Finance (EUF), for instance, is a flagship product developed for the programme and administered by the SMF.

The EUF is an agreement between parties – the owner of the building, a financial institution and the city of Melbourne. The financial institution lends money to the building owner, and the city uses rates and/or taxes to collect the loan repayments and return these funds to the lender. The loans are specially designed to include fixed interest rates and repayment periods of up to 20 years. Importantly, the charge is fixed to the building and can be passed on to the next owner if the building is sold.[513]

As a further option, retrofitting costs (in other words, the loan) can be shared between the owner and the tenant as a way of overcoming the split-incentive dilemma, whereby the owner pays for an upgrade and the tenants benefit from lower energy expenses.[514] The SMF also developed a simple application process for SMEs that does not require consent or approval from the existing financiers of the properties.

Barriers and critical success factors

Developing new products and services of this type requires a sound understanding of where market gaps exist. The SMF studied the market, produced novel revenue models, went beyond the simpler goal of stimulating economic activity in the sustainability sector and created scalable products and services.

When a city operates a climate fund it can require substantial resources. Frequently, the city will also depend on partner organisations to help in particular technical or specialist areas such as creating communications and sales strategies. For example, the SMF partnered with ClimateWorks Australia to create the Better Building Finance website.[515]

Communications and public relations are also critical in the creation of climate funds. It is also vital to sell as much of the financial package as possible.[516]

Results and lessons learned

- The SMF has directly invested more than AUD 16.9 million (US$ 12.5 million equivalent) in building retrofits, district or neighbourhood innovations, renewable energy systems, software technology and lighting solutions.[517]
- Cumulatively, these investments have led to GHG reductions that exceed 245,000 tonnes. The SMF reinvests the returns and co-finances projects with other banks. Altogether, this work has resulted in more than AUD 26 million (US$ 19.2 million) of projects in energy efficiency and renewable energy.[518]

Councils can play a key role as facilitators between tenants, property owners and financial institutions. Melbourne has demonstrated a role for councils in developing new financial products and services that meet the needs of disparate groups. The council found that the SMF's administrator role in environmental upgrade agreements was cost effective and aligned with the preferences of the industry's key actors.

Links to similar initiatives

Melbourne: renewable energy aggregated power purchase agreement

San Francisco: investment grant

Mexico City: green bond

[513] See Sustainable Australia Fund (2020).
[514] See C40 Cities (2016).
[515] See Better Building Finance (n.d.).
[516] See C40 Cities (2016).
[517] Ibid.
[518] Ibid.

References

AfDB, ADB, EBRD and IDB (2019), Creating Liveable Cities: Regional Perspectives, ADB, Manila. Available at: https://www.adb.org/sites/default/files/publication/531126/livable-cities-main-report.pdf (last accessed 18 August 2020).

M. F. Alam, S. S. Guntoju and A. Sikka (2019), "Chennai: Water crisis: a wake-up call for Indian cities", Down to Earth. Available at: https://www.downtoearth.org.in/blog/water/chennai-water-crisis-a-wake-up-call-for-indian-cities-66024 (last accessed on 29 September 2020).

E. Al-Karablieh and A. Salman (2016), "Water Resources, Use and Management in Jordan – a Focus on Groundwater", IWMI Project Report, 11. Available at: https://gw-mena.iwmi.org/wp-content/uploads/sites/3/2017/04/Rep.11-Water-resources-use-and-management-in-Jordan-a-focus-on-groundwater.pdf (last accessed on 29 September 2020).

African Circular Cities Alliance (n.d.), "South Africa. Case Studies", ACCA. Available at: https://africca.org/case-studies/#SouthAfrica (last accessed on 24 September 2020).

M. P. G. Aguilar (2015), "Participatory Design for Public Urban Spaces", Global Compact Cities Programme website. Available at: https://citiesprogramme.org/wp-content/uploads/2019/10/participatory_design-report_web.pdf (last accessed 18 August 2020).

Ajuntament de Barcelona (n.d.a), "Citizen Commitment to Sustainability – a More Sustainable Barcelona". Available at: https://ajuntament.barcelona.cat/ecologiaurbana/en/what-we-do-and-why/public-commitment/citizen-engagement-network (last accessed on 29 September 2020).

Ajuntament de Barcelona (n.d.b), "Superblocks - 'Let's fill the streets with life'". Available at: https://ajuntament.barcelona.cat/ecologiaurbana/en/bodies-involved/citizen-participation/superblocks (last accessed on 29 September 2020).

Ajuntament de Barcelona (n.d.c), "A road map to combat climate change". Available at: https://www.barcelona.cat/barcelona-pel-clima/en/noticia/a-road-map-to-combat-climate-change_646065 (last accessed on 29 September 2020).

Ajuntament de Barcelona (n.d.d), "Urban Mobility Plan (2013-2018)". Available at: https://ajuntament.barcelona.cat/ecologiaurbana/en/what-we-do-and-why/active-and-sustainable-mobility/urban-mobility-plan (last accessed on 29 September 2020).

Ajuntament de Barcelona (n.d.e), "New Urban Mobility Plan for 2019-2024". Available at: https://www.barcelona.cat/mobilitat/en/news-and-documents/new-urban-mobility-plan-2019-2024 (last accessed on 29 September 2020).

S. Aparcana (2017), "Approaches to formalization of the informal waste sector into municipal solid waste management systems in low- and middle-income countries: Review of barriers and success factors", Waste Management, Vol. 61, pp. 593-607.

ASEF CULTURE360 (2011), "The Paintbrush Factory". Available at: https://culture360.asef.org/resources/paintbrush-factory/ (last accessed on 6 August 2019).

Asian Development Bank (2011), Inclusive Cities, Urban Development Series, Manila. Available at: https://www.adb.org/publications/inclusivecities (last accessed 18 August 2020).

AVK International (n.d.), "Excessive leakage reduction in Drakenstein". Available at: https://www.avkvalves.eu/en/cases/water-cases/leakage-reduction-drakenstein (last accessed on 5 August 2019).

R. L. Baghdali, T. Yino, M. Nasereddin and L. Nadifi (2013), "Documentation of best practices in non-revenue water management in selected Mediterranean countries". Available at: http://www.swim-sm.eu/files/Best_Practices_in_non-revenue_water_EN_Final.pdf (last accessed on 29 September 2020).

Baltic Environment and Energy (2007), "Swedish Environmental Policies: History and present regulations". Available at: http://www.ubcwheel.eu/download.php/attachments/articles/607/Swedish%20environmental%20policy.pdf (last accessed on 20 October 2020).

L. Barber (2016), "Carsharing, carpooling, ridesharing…what's the difference?", 12 May 2016, Liftshare website. Available at: http://blog.liftshare.com/liftshare/carsharing-carpooling-ridesharing-whats-thedifference (last accessed 18 August 2020).

Barcelona Energia (2019), "Nuestra Actividad", Barcelona Energia web page. Available at: https://www.barcelonaenergia.cat/es/nuestraactividad/ (last accessed 18 August 2020).

U. Batsaikhan, Z. Darvas and I. Goncalves Raposo (2018), People on the move: migration and mobility in the European Union, Blueprint Series 28, Bruegel, Brussels. Available at: http://bruegel.org/wp-content/uploads/2018/01/People_on_the_move_ONLINE.pdf (last accessed 18 August 2020).

M. Bausells (2016), "Superblocks to the rescue: Barcelona's plan to give streets back to residents", The Guardian, 17 May 2016. Available at: https://www.theguardian.com/cities/2016/may/17/superblocks-rescue-barcelona-spain-plan-give-streets-back-residents (last accessed on 29 September 2020).

BBC (2009), "The city where bicycles dominate". Available at: http://news.bbc.co.uk/1/hi/england/8393475.stm (last accessed on 20 October 2020).

BBC News (2016), "Young people urged for park-life views", M. Kinver, September 2016, BBC website. Available at https://www.bbc.co.uk/news/science-environment-37505850 (last accessed 18 August 2020).

Berliner Energieagentur (n.d.a), "Energy Saving Partnership: A Berlin Success Model". Available at: https://ec.europa.eu/energy/intelligent/projects/sites/iee-projects/files/projects/documents/eesi_good_practices_from_berlin_en.pdf (last accessed 8 October 2020).

Berliner Energieagentur (n.d.b.), "Berliner Energiesparpartnerschaften", Berliner-e-agentur.de. Available at: https://www.berliner-e-agentur.de/en/node/154 (last accessed 8 October 2020).

Berliner Energieagentur (2006), "Performance Contracting: A Berlin Success Model", Berlin Senate Department of Urban Development. Available at https://www.berliner-e-agentur.de/sites/default/files/2018-09/broschuereenergiesparpartnerschaften.pdf (last accessed 12 July 2019).

Berliner Energieagentur (2019), "Market Report on the German EPC Market". Available at: https://guarantee-project.eu/de/wp-content/uploads/sites/2/2016/12/guarantEE_Market_Report_Germany.pdf (last accessed 11 October 2020)

Better Building Finance (n.d.), website. Available at: https://betterbuildingfinance.com.au/ (last accessed on 8 October 2020).

J. R. Bilbao (2015), "What is the Territorial Approach to Local Development?", Capacity4Dev knowledge sharing platform. Available at: https://europa.eu/capacity4dev/article/what-territorial-approach-localdevelopment (last accessed 18 August 2020).

A. G. Blanco, M. Nancy Moreno, D. M. Vetter and M. F. Vetter for Inter-American Development Bank (2017), "The Potential of Land Value Capture for financing urban projects: methodological considerations and case studies". Available at: https://publications.iadb.org/publications/english/document/The-Potential-of-Land-Value-Capture-for-Financing-Urban-Projects-Methodological-Considerations-and-Case-Studies.pdf (last accessed on 8 October 2020).

Bloomberg (2017), “Barcelona’s Car-Taming ‘Superblocks’ Meet Resistance”. Available at: https://www.bloomberg.com/news/articles/2017-01-20/barcelona-s-superblocks-expand-but-face-protests (last accessed on 29 September 2020).

Bloomberg Citylab (2012a), “What Cities Can Learn From Toronto’s Green Roof Policy”. Available at: https://www.citylab.com/design/2012/04/what-cities-can-learn-torontos-green-roof-policy/1846 (last accessed 18 August 2020).

Bloomberg Citylab (2012b), “Why Denser Cities Are Smarter and More Productive”, 10 December 2012, R.Florida. Available at: https://www.bloomberg.com/news/articles/2012-12-10/why-denser-citiesare-smarter-and-more-productive#targetText=Specifically%2C%20doubling%20density%,20productivity.of%20two%20to%20four%20percent.&targetText=It%20thus%20goes%20well%20beyond,performance%20of%20individual%20industrial%20sectors (last accessed 18 August 2020).

O. Borrero Ochoa (2011), “Betterment Levy in Colombia. Relevance, Procedures, and Social Acceptability”. Available at: https://www.lincolninst.edu/sites/default/files/pubfiles/1899_1213_LLA110404.pdf (last accessed on 6 August 2019).

A. Bortoleto, A and K. Hanaki (2006), “Analysis of Waste Prevention Policies Applied at the Solid Waste Management in Belo Horizonte, Brazil.” Available at: https://www.iswa.org/uploads/tx_iswaknowledgebase/543801_Paper.pdf (last accessed on 25 October 2020).

B. Boza-Kiss, P. Bertoldi and M. Economidou (2017), Energy Service Companies in the EU: Status review and recommendations for further market development with a focus on Energy Performance Contracting, European Commission Joint Research Centre. Available at https://publications.jrc.ec.europa.eu/repository/bitstream/JRC106624/kjna28716enn.pdf (last accessed 11 October 2020).

J. Brandl and I. Zielinska (2020), “Reviewing the Smart City Vienna Framework Strategy’s Potential as an Eco-Social Policy in the Context of Quality of Work and Socio-Ecological Transformation,” Sustainability 2020, Vol. 12 (3), 859. Available at: https://doi.org/10.3390/su12030859 (last accessed 24 September 2020).

M. Braun (2017), “Bike Sharing System in Burgas (Bulgaria)” Available at: https://www.eltis.org/discover/case-studies/bike-sharing-system-burgas-bulgaria (last accessed on 20 October 2020).

D. Broekhoff, G. Piggott and P. Erickson (2018), Building Thriving, Low-Carbon Cities: An Overview of Policy Options for National Governments”, Coalition for Urban Transitions, London and Washington, D.C. Available at: https://urbantransitions.global/en/publication/building-thriving-lowcarbon-cities-an-overview-of-policy-options-for-national-governments/ (last accessed 18 August 2020).

J. M. Bryson, B. C. Crosby and M. Middleton Stone (2015), “Designing and Implementing Cross-Sector Collaborations: Needed and Challenging”, Public Administration Review, Vol. 75 (5), pp. 647-663. Available at: https://www.hhh.umn.edu/sites/hhh.umn.edu/files/designing_and_implementing_cross-sector_collaborations_needed_and_challenging.pdf_0.pdf (last accessed 18 August 2020).

R. Buchler and J. Pucher (2011), “Sustainable Transport in Freiburg: Lessons from Germany’s Environmental Capital”. Available at: https://www.tandfonline.com/doi/abs/10.1080/15568311003650531 (last accessed on 20 October 2020).

C. Cadell, N. Falk, and F. King (2008), “Regeneration in European cities: making connections”, Joseph Rowntree Foundation, 7 April 2008. Available at: https://www.jrf.org.uk/report/regeneration-european-cities-making-connections (last accessed on 29 September 2020).

Centre for Public Impact (2016), “Integrated solid waste management in Belo Horizonte, Brazil”. Available at: https://www.centreforpublicimpact.org/case-study/integrated-waste-management-brazil/ (last accessed on 3 July 2019).

Centre for Public Impact (2017), “The Seoul Innovation Bureau and its “Sharing City” initiative”. Available at: https://www.centreforpublicimpact.org/case-study/seoul-innovation-bureau/ (last accessed on 30 September 2020).

C40 Cities (2015), “Yokohama - Yokohama 3R Dream Plan”. Available at: https://www.c40.org/awards/2015-awards/profiles/59 (last accessed on 1 October 2020).

C40 Cities (2016a), “Case Study C40 Good Practice Guides: Yokohama - 3R Dream Plan”. Available at: https://www.c40.org/case_studies/c40-good-practice-guides-yokohama-3r-dream-plan (last accessed on 1 October 2020).

C40 Cities (2016b), “C40 Good Practice Guides: Melbourne – Sustainable Melbourne Fund”. Available at: https://www.c40.org/case_studies/c40-good-practice-guides-melbourne-sustainable-melbourne-fund (last accessed on 8 October 2020).

C40 Cities (2016c), “Cities 100: Barcelona - Redefining City Blocks to Tackle Traffic-Related Emissions”. Available at: https://www.c40.org/case_studies/cities100-barcelona-redefining-city-blocks-to-tackle-traffic-related-emissions (last accessed on 29 September 2020).

C40 Cities (2016d), “Cities 100: City Solutions for an Urbanizing World”. Available at: https://issuu.com/sustainia/docs/cities100_2016_final_small (last accessed on 29 September 2020).

C40 Cities (2016e), “Good Practice Guide. Waste to Resources”. Available at: http://c40-production-images.s3.amazonaws.com/other_uploads/images/554_W2R_UPDATED_EC_15316.original.pdf?1458040149. (last accessed on 1 October 2020).

C40 Cities (2017a), “Case Study. Cities 100: Cape Town - Industrial Resource Exchanges Reduce CO2”. Available at: https://www.c40.org/case_studies/cities100-cape-town-industrial-resource-exchanges-reduce-co2 (last accessed on 30 September 2020).

C40 Cities (2017b), “Urban Efficiency II: Mexico City – Sustainable Buildings Certification Program”, case study, February 2017. Available at: https://www.c40.org/case_studies/urban-efficiency-2-sustainable-buildingscertification-program (last accessed 18 August 2020).

C40 Cities (2017c), “Urban Efficiency II: Seven Innovative City Programmes for Existing Building Energy Efficiency.” Available at: https://issuu.com/c40cities/docs/urbanefficiencyii_final_hi_res__1_ (last accessed 8 October 2020)

C40 Cities (2018), “The implementation of the Superblocks programme in Barcelona: Filling our streets with life”, March 2018, C40 Cities website. Available at: https://www.c40.org/case_studies/barcelona-superblocks (last accessed 18 August 2020).

C40 Cities (2019), “How to install solar panels on city-owned property and lead by example”. Available at: https://www.c40knowledgehub.org/s/article/How-to-install-solar-panels-on-city-owned-property-and-lead-byexample?language=en_US (last accessed 18 August 2020).

C40 Cities and Climate-KIC (2018), “Municipality-led circular economy case studies”. Available at: https://www.c40.org/researches/municipality-led-circular-economy (last accessed on 12 October 2020).

CityLab (2016), “How Ljubljana Turned Itself Into Europe's ‘Green Capital’.” Available at: https://www.citylab.com/design/2016/02/how-ljubljana-turned-itself-into-europes-green-capital/458934/ (last accessed on 19 July 2019).

Citynvest (2015), “Berlin Energy Saving Partnerships”. Available at: http://citynvest.eu/sites/default/files/library-documents/Model%202_Berlin%20Energy%20Saving%20Partnerships_final.pdf (last accessed 11 October 2020).

City of Copenhagen Technical and Environmental Administration Traffic Department (2011), “The City of Copenhagen’s Bicycle Strategy 2011-2025”. Available at: https://www.eltis.org/sites/default/files/case-studies/documents/copenhagens_cycling_strategy.pdf (last accessed on 16 July 2019).

City of Zaprešić, Finance and Budgeting Department (2018), “The City of Zaprešić Experience in the Application of MFSA – Action Plan”. Available at: http://www.seecities.eu/seecities.eu/Portals/0/Images/Upload/Documents/City%20to%20City%20dialogue,%20Skopje%202017/City%20of%20%20Zapresic.pdf?ver=2018-01-10-084851-633 (last accessed 18 August 2020).

City of Ljubljana (2020), “Transport and mobility,” in Ljubljana.si. Available at: https://www.ljubljana.si/en/ljubljana-for-you/transport-in-ljubljana/ (last accessed 20 October 2020).

City of Melbourne (n.d.), “Sustainable Melbourne Fund”. Available at: http://www.melbourne.vic.gov.au/business/sustainable-business/Pages/sustainable-melbourne-fund.aspx (last accessed on 8 October 2020).

City of Melbourne (2008), “Zero Net Emissions by 2020: Update 2008”. Available at: https://www.melbourne.vic.gov.au/SiteCollectionDocuments/zero-net-emissions-2008.pdf

City of Stuttgart, Office for Environmental Protection (n.d.), “Climate Atlas of the Region of Stuttgart (2008)”. Available at: https://www.stadtklima-stuttgart.de/index.php?climate_climate_atlas_2008 (last accessed on 20 October 2020).

City of Toronto (n.d.), “Section 37: An Essential Tool for Building Healthier Neighbourhoods”. Available at: https://www.toronto.ca/city-government/planning-development/official-plan-guidelines/section-37-benefits/ (last accessed on 29 September 2020).

CIVITAS (2009a), “Lund”. Available at: https://civitas.eu/content/lund (last accessed on 20 October 2020).

CIVITAS (2009b), “Smart choices for cities: Cycling in the City”, CIVITAS WIKI Policy Analysis Series. Available at https://civitas.eu/sites/default/files/civ_pol-09_m_web.pdf (last accessed 18 August 2020).

CIVITAS (2013), “Update of the sustainable urban transport plan”, in Civitas.eu. Available at: https://civitas.eu/measure/update-sustainable-urban-transport-plan (last accessed 20 October 2020).

Climate ADAPT (2019), “Four pillars to Hamburg’s Green Roof Strategy: financial incentive, dialogue, regulation and science (2016)”. Available at: https://climate-adapt.eea.europa.eu/metadata/case-studies/four-pillarsto-hamburg2019s-green-roof-strategy-financial-incentive-dialogueregulation-and-science/#cost_benefit_anchor (last accessed 18 August 2020).

Coins Global (2015), “Net Zero Energy Buildings (NZEBs): Building the Future”, February 2015. Available at https://www.coins-global.com/storage/documents/Emerging-Technologies-for-the-Built-Environmen-Net-Zero-Energy-Buildings.pdf (last accessed 18 August 2020).

P. Collier, E. Glaser, A. Venables, M. Blake and P. Manwaring (2019), “Access to opportunity: policy decisions for enhancing urban mobility”, IGC Cities that Work Policy Framing Paper. Available at: https://www.theigc.org/wp-content/uploads/2018/05/access-to-opportunity-3-march1.pdf (last accessed 18 August 2020).

C. Colomb (2007), Making Connections: Transforming People and Places in Europe. Case Study of Roubaix, Lille, URBED and the Joseph Rowntree Foundation, 29 June 2006, updated December 2007. Available at: http://urbed.coop/sites/default/files/Case%20Study%20of%20Roubaix%20Lille.pdf (last accessed on 29 September 2020).

F. Colombijn and M. Morbidini (2017), “Pros and cons of the formation of waste-pickers’ cooperatives: a comparison between Brazil and Indonesia”, from Decision 44, 91–101. Available at: https://link.springer.com/article/10.1007/s40622-017-0149-5 (last accessed on 2 October 2020).

Committee on Climate Change (2016), “Next Steps for UK Heat Policy”. Available at https://www.theccc.org.uk/publication/next-steps-for-ukheat-policy/ (last accessed 18 August 2020).

Copenhagen Resource Institute and Bipro (2014), “Capital factsheet on separate collection.” Available at: https://www.municipalwasteeurope.eu/sites/default/files/SI%20Ljubljana%20Capital%20factsheet.pdf (last accessed on 9 July 2019).

J. Corfee-Morlot, L. Khamal Chaoui, M.G. Donovan, I. Cochran, A. Robert and P.J. Teasdale (2009), “Cities, Climate Change and Multilevel Governance”, OECD Environmental Working Papers No. 14, OECD. Available at https://www.oecd.org/env/cc/44242293.pdf (last accessed 18 August 2020).

Croatian Bureau of Statistics (2012), Population by Ethnicity by Towns/Municipalities, 2011 Census: County of Primorje-Gorski kotar. Available at: https://www.dzs.hr/Eng/censuses/census2011/results/htm/E01_01_04/e01_01_04_zup08.html (last accessed on 8 October 2020).

CTCN (2015), “Rehabilitation and Modernization of the district heating (DH) system in the City of Banja Luka”, Climate Technology Centre and Network, August 2015. Available at: https://www.ctc-n.org/technical-assistance/projects/rehabilitation-and-modernization-district-heating-dh-systemcity-banja (last accessed 18 August 2020).

L. Dakskobler (2019), “From no recycling to zero waste: how Ljubljana rethought its rubbish”, The Guardian, May 2019. Available at: https://www.theguardian.com/cities/2019/may/23/zero-recycling-to-zero-waste-how-ljubljana-rethought-its-rubbish (last accessed 25 September 2020).

S. David, A.G. Sabiescu and L. Cantoni (2013), “Co-design with communities. A reflection on the literature”, November 2013, Conference paper, IDIA 2013, Bangkok. Available at: https://www.researchgate.net/publication/257998124_Co-design_with_communities_A_reflection_on_the_literature (last accessed 18 August 2020).

demosEuropa – Centre for European Strategy (2015), “Poland as a Global Development Partner: Towards Poland’s Global Engagement”, World Bank, Washington, D.C. Available at: http://pubdocs.worldbank.org/en/228061435014173462/Poland-Global-engagement.pdf (last accessed 15 October 2020).

Department MA 18 – Urban Development and Planning (2018), “Monitoring Report 2017: Smart City Wien Framework Strategy”, City of Vienna, Urban Development and Planning. Available at: https://www.wien.gv.at/stadtentwicklung/studien/pdf/b008520.pdf (last accessed 18 August 2020).

C. Deuskar (2015), “What does “urban” mean?”, World Bank Blog, June 2015. Available at: https://blogs.worldbank.org/sustainablecities/whatdoes-urban-mean (last accessed 18 August 2020).

S. M. Dias (2016), “Waste pickers and cities. Environment & Urbanisation”, from Environment and Urbanization Vol. 28, No. 2 October 2016. Available at: https://journals.sagepub.com/doi/pdf/10.1177/0956247816657302 (last accessed on 3 July 2019).

D. Di Santo (2018), “White certificates in Italy: what happened, what to expect”, Bolzano, 4 October 2018. Available at: http://blog.fire-italia.org/wp-content/uploads/2018/11/2018-10-white-certificate.pdf (last accessed 11 October 2020).

D. Di Santo, L. De Chicchis and E. Biele (2018), “White certificates in Italy: lessons learnt over 12 years of evaluation,” from 2018 International Energy Policy and Programme Evaluation Conference, Vienna, Austria. Available at: https://www.dariodisanto.com/wp-content/uploads/2018/07/2018-DiSanto_paper_vienna-IEPPEC.pdf (last accessed 28 September 2020).

Drakenstein Municipality (2013), “Drakenstein Water Demand Management Programme – A resounding success.” Available at: https://showme.co.za/paarl/news/drakenstein-water-demand-management-programme-a-resounding-success/ (last accessed on 29 September 2020).

M. Dri, P. Canfora, I. Antonopoulos and P. Gaudillat (2018), Best environmental management practice for the waste management sector, JRC Science Policy Report, Publications Office of the European Union. Available at: https://ec.europa.eu/jrc/en/publication/eur-scientific-andtechnical-research-reports/best-environmental-management-practicewaste-management-sector (last accessed 18 August 2020).

EBRD (2017), “EBRD to fund installation of heat meters in Kazakhstan”, S. Pyrkalo, EBRD website, February 2017. Available at: https://www.ebrd.com/news/2017/ebrd-to-fund-installation-of-heat-meters-in-kazakhstan-.html (last accessed 18 August 2020).

EBRD (2018a), “Green Cities Framework – Banja Luka District Heating”, project summary document. Available at: https://www.ebrd.com/work-with-us/projects/psd/grcf-banja-luka-district-heating.html (last accessed 18 August 2020).

EBRD (2018b), “Making district heating happen: empowering users through fair metering”, policy paper. Available at: https://www.ebrd.com/documents/admin/making-district-heating-happen-empowering-usersthrough-fair-metering.pdf (last accessed 18 August 2020).

EBRD (2019), "Fast-growing EBRD Green Cities", news page. Available at: https://www.ebrd.com/news/2019/fastgrowing-ebrd-green-cities-signsup-its-25th-city-.html (last accessed 18 August 2020).

EcoMobility SHIFT (n.d.), "Burgas". Available at: https://ec.europa.eu/energy/intelligent/projects/sites/iee-projects/files/projects/documents/ecomobility_shift_ecomobility_shift_case_study_burgas_bg_en.pdf (last accessed on 20 October 2020).

The Economist (2012), "The lure of Chilecon Valley", The Economist website. Available at: https://www.economist.com/business/2012/10/13/the-lure-of-chilecon-valley (last accessed 18 August 2020).

The Economist (2017), "Eastern Europe's wave of emigration may have crested", The Economist website. Available at: https://www.economist.com/europe/2017/08/26/eastern-europes-wave-of-emigration-mayhave-crested (last accessed 18 August 2020).

V. Edo, J. Barrio, M. Allende and M. Garcia Nart (1998), "Zaragoza, Saving Water City (Spain)". Available at: http://habitat.aq.upm.es/bpes/onu98/bp439.en.html (last accessed on 23 October 2020).

E. Eiweida and Z. Tokhmakhyan (2011b), "Public-Private Partnerships Enhances Water Utility's Performance in Armenia", Knowledge Brief, issue no. 44. Available at: http://documents.worldbank.org/curated/en/920781468029671050/Public-private-partnership-enhances-water-utilitys-performance-in-Armenia (last accessed on 28 September 2020).

EMF (2019), "Planning for Compact, Connected Cities", Ellen MacArthur Foundation. Available at: https://www.ellenmacarthurfoundation.org/assets/downloads/1_Buildings_Planning_Mar19.pdf (last accessed 18 August 2020).

Energy Cities (2016a), "Frederikshavn, Denmark: Mobilising savings sleeping on citizens bank accounts", the European association of cities in energy transition, January 2016. Available at: https://energy-cities.eu/frederikshavn-denmark-mobilising-savings-sleeping-on-citizens-bankaccounts/ (last accessed 18 August 2020).

Energy Cities (2016b), ""Superblocks" free up to 92% of public space in Barcelona". Available at: http://energy-cities.eu/best-practice/superblocks-free-up-to-92-of-public-space-in-barcelona/ (last accessed on 29 September 2020).

Energy Sector Management Assistance Program (ESMAP) (2011a), "Good practices in city energy efficiency. Yerevan, Armenia – Water and Sewerage Management Contract", Energy Efficient Cities Initiative. Available at: https://www.esmap.org/sites/default/files/esmap-files/Armenia_Yerevan_Water_Case_Study.pdf (last accessed on 28 September 2020).

Environmental Local Authorities InterBalkan Network (n.d.), "The municipality of Rijeka, Croatia". Available at: https://elain.eu/partners/rijeka-croatia (last accessed on 22 May 2019).

ERR.ee (2020), "City of Tartu seeking to reduce CO2 emissions by 40 percent by 2030", ERR.ee News, 1 September 2020. Available at: https://news.err.ee/1129902/city-of-tartu-seeking-to-reduce-co2-emissions-by-40-percent-by-2030 (last accessed 12 October 2020).

Energy Systems Catapult (2018), "Italian Energy Efficiency White Certificate Scheme." Available at: https://es.catapult.org.uk/wp-content/uploads/2018/10/Italy-White-Certificate-Scheme-Case-Study-FINAL.pdf (last accessed 28 September 2020).

Euro Cities (2019), "Cluj-Napoca, Romania – Imagine the future of the city! Innovation and Civic Imagination Centre – CIIC". Available at: http://nws.eurocities.eu/MediaShell/media/2019_ROCK_CaseStudiesBooklet_Cluj.pdf (last accessed 18 August 2020).

EURONET 50/50 MAX (n.d.), EURONET 50/50 MAX website. Available at: http://www.euronet50-50max.eu/en/ (last accessed 18 August 2020).

European Association for Local Democracy (2016), "Decentralised cooperation: an added value for Eastern Partnership Countries". Available at: https://europeanmovement.eu/wp-content/uploads/2016/02/139-Paper_EaP_IssueNo1_AV.pdf (last accessed 15 October 2020).

European Commission (n.d.a), "Ljubljana becomes the first EU capital to adopt Zero Waste Goal", news page. Available at: http://ec.europa.eu/environment/europeangreencapital/ljubljana-zero-waste-goal/ (last accessed 18 August 2020).

European Commission (n.d.b), "Reclaiming city streets for people: Chaos or quality of life?", EC Directorate-General for the Environment. Available at: http://ec.europa.eu/environment/pubs/pdf/streets_people.pdf (last accessed on 2 July 2019).

European Commission (2014), "Capital factsheet – Llubjlana/Slovenia". Part of EC study "Assessment of separate collection schemes in the 28 capitals of the EU", Municipal Waste Europe website. Available at: https://www.municipalwasteeurope.eu/sites/default/files/SI%20Ljubljana%20Capital%20factsheet.pdf (last accessed 18 August 2020).

European Commission (2018), "Financing a Sustainable European Economy – Final Report 2018 by the High-Level Expert Group on Sustainable Finance", p. 7. Available at: https://ec.europa.eu/info/sites/info/files/180131-sustainable-finance-final-report_en.pdf (last accessed 18 August 2020).

European Commission (2019), "Ljubljana becomes the first EU capital to adopt Zero Waste Goal". Available at: http://ec.europa.eu/environment/europeangreencapital/ljubljana-zero-waste-goal/ (last accessed on 9 July 2019).

European Commission (2020), Nearly Zero Energy Buildings. European Commission website. Available at: https://ec.europa.eu/energy/topics/energy-efficiency/energy-efficient-buildings/nearly-zero-energy-buildings_en (last accessed 14 April 2020).

European Commission Directorate – General Environment (2012), "Preparing a Waste Prevention Programme: Guidance document", October 2012. Available at: http://ec.europa.eu/environment/waste/prevention/pdf/Waste%20prevention%20guidelines.pdf (last accessed 18 August 2020).

European Environment Agency (2014), "Stuttgart: combating the heat island effect and poor air quality with green ventilation corridors (2014)", case study, Climate Adapt website. Available at: https://climate-adapt.eea.europa.eu/metadata/case-studies/stuttgart-combating-the-heat-islandeffect-and-poor-air-quality-with-green-ventilation-corridors (last accessed 18 August 2020).

European Union (2015), "Ljubljana European Green Capital 2016". Available at: http://ec.europa.eu/environment/europeangreencapital/wp-content/uploads/2013/02/ljubljana_european_green_capital_2016.pdf (last accessed on 2 July 2019).

European Union (2017), Effective multi-level environmental governance for a better implementation of EU environment legislation, Study, European Committee of the Regions. Available at: https://cor.europa.eu/en/engage/studies/Documents/Environmental-governance.pdf (last accessed 18 August 2020).

European Union (2018), Directive of the European Parliament and of the Council amending Directive 2008/98/EC on waste, Reference PE-CONS 11/18 ,27 April 2018. Available at: https://data.consilium.europa.eu/doc/document/PE-11-2018-INIT/en/pdf (last accessed on 25 October 2020).

EUROSCOPE (TR1023) (1999), Evaluation Results and Comparative Assessment. Available at: http://www.its.leeds.ac.uk/projects/konsult/private/level2/instruments/instrument040/l2_040c.htm/ (last accessed 18 August 2020).

Eurostat (2020), "Passenger Cars in the EU", web page. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php/Passenger_cars_in_the_EU#Highest_share_of_passenger_cars_over_20_years_old_in_Poland (last accessed 18 August 2020).

Eurostat and EIB (2018), "A Guide to the Statistical Treatment of Energy Performance Contracts", May 2018. Available at: https://ec.europa.eu/eurostat/web/government-finance-statistics/methodology/guidance-onaccounting-rules (last accessed 18 August 2020).

W. Fahmi and K. Sutton (2010), "Cairo's Contested Garbage: Sustainable Solid Waste Management and the Zabaleen's Right to the City", Sustainability, Vol. 2 (6), pp. 1765-1783. Available at: https://www.mdpi.com/2071-1050/2/6/1765 (last accessed 18 August 2020).

C. Farvacque-Vitkovic and A. Sinet (2014), "Achieving greater transparency and accountability", Municipal Finances: A Handbook for Local Governments, Chapter 8, Box 8.6. Available at: http://documents1.worldbank.org/curated/en/403951468180872451/pdf/Municipal-finances-a-handbook-for-local-governments.pdf (last accessed on 8 October 2020).

M. Filipovic (2019), "Rijeka – Smart City experiences and plans for the future". Available at: http://www.seecities.eu/seecities.eu/Portals/0/Images/Upload/Documents/C2C/City%20to%20City%20Dialogue%20-%20Cities,%20Drivers%20of%20Economy,%20Vision%202030/Day%202/1.1.%20Rijeka%20-%20Smart%20City.pdf?ver=2019-05-08-100821-320 (last accessed on 8 October 2020).

Financial Times (2019), "Number 214 to Highgate leads UK's electric bus charge – British companies use Chinese technology to power up in new age of public transport", Financial Times website, November 2019. Available at: https://www.ft.com/content/5c81dee4-ffe1-11e9-b7bcf3fa4e77dd47 (last accessed 18 August 2020).

FIRE (2018), "Italian white certificates: the new rules", Federazione Italiana per l'uso Razionale dell'Energia, www.buildup.eu, 20 November 2018. Available at: https://www.buildup.eu/en/practices/publications/italian-white-certificates-new-rules (last accessed 28 September 2020).

J. Fitzgerald (2016), "What city planners can learn from Malmo's eco-districts". Available at: https://blogs.lse.ac.uk/europpblog/2016/04/02/37589/ (last accessed 12 July 2019)

C. Ford (2017), "Slovenia has been named the greenest country in the world, and this is why". Available at: https://www.contiki.com/six-two/slovenia-has-been-named-the-greenest-country-in-the-world-and-this-is-why/ (last accessed on 9 July 2019).

M. Galindo Fernandez, C. Roger-Lacan, U. Gährs and V. Umaitre (2016), "Efficient district heating and cooling systems in the EU". Available at: http://publications.jrc.ec.europa.eu/repository/bitstream/JRC104437/study%20on%20efficient%20dhc%20systems%20in%20the%20eu%20-dec2016_final%20-%20public%20report6.pdf (last accessed 11 October 2020).

GEF and UNDP (2010), "Promoting Energy Efficiency in Buildings: Lessons Learned From International Experience". Available at: https://www.thegef.org/sites/default/files/publications/EEBuilding_WEB_2.pdf (last accessed 8 October 2020).

Gianni-Origoni & Grippo-Cappelli Partners (2017), "Il nuovo regime dei certificate bianchi: cosa cambia?" Available at: http://www.gop.it/doc_pubblicazioni/652_3j1fi3dkur_ita.pdf (last accessed 8 October 2020).

GIZ (2012), "Recovering resources, creating opportunities. Integrating the informal sector into solid waste management", GIZ on behalf of the German Federal Ministry for Economic Cooperation and Development. Available at: https://www.giz.de/de/downloads/giz2011-en-recyclingpartnerships-informal-sector-final-report.pdf (last accessed 18 August 2020).

Global Opportunity Explorer (2018), "Cape Town: Industrial Resource Exchanges Reduce CO2". Available at: https://goexplorer.org/cape-town-industrial-resource-exchanges-reduce-co2/ (last accessed on 30 September 2020).

Global Platform for Sustainable Cities and World Bank (2018), Urban Sustainability Framework (USF), First edition, Washington, D.C. Available at: http://documents.worldbank.org/curated/en/339851517836894370/pdf/123149-Urban-Sustainability-Framework.pdf (last accessed 18 August 2020).

Go to Burgas (2020), "Public Transport." Available at: https://www.gotoburgas.com/en/index/static/24 (last accessed on 20 October 2020).

Government of Alberta (2020), "Intermunicipal Collaboration Frameworks", web page. Available at: https://www.alberta.ca/intermunicipalcollaboration-framework.aspx (last accessed 18 August 2020).

Government of Estonia (2019), Estonia's 2030 National Energy and Climate Plan, Final version 19 December 2019. Available at: https://ec.europa.eu/energy/sites/ener/files/documents/ee_final_necp_main_en.pdf (last accessed 12 October 2020).

GreenCape (2018), "WISP Case Study: Banners to Bags". Available at: https://www.greencape.co.za/assets/Uploads/GC3-20181005-WISPCaseStudy-BannerstoBags-Web.pdf (last accessed on 30 September 2020).

J. Große, N. B. Groth, C. Fertner, J. Tamm and K. Alev (2015), Urban energy planning in Tartu [PLEEC Report D4.2 / Tartu], EU-FP7 project PLEEC. Available at: https://curis.ku.dk/ws/files/142223033/D4.2_Tartu_2015_01_14_final.pdf (last accessed 12 October 2020).

K. Heinrich (2018), "Parma's journey to world-class food waste recycling levels", in Beyondfoodwaste.com, 22 August 2018. Available at: https://beyondfoodwaste.com/parmas-journey-to-world-class-food-waste-recycling-levels/ (last accessed 25 October 2020).

Herne Hill (2015) "Herne Hill Flood Alleviation Scheme Shortlisted for Award", April 2015. Available at: http://www.hernehill.org.uk/news/herne-hill-flood-alleviation-scheme-shortlisted-award (last accessed 18 August 2020).

M. Holder (2018), "BMW takes full ownership of DriveNow carsharing scheme", March 2018, Business Green website. Available at: https://www.businessgreen.com/bg/news/3028696/bmw-takes-full-ownership-ofdrivenow-carsharing-service (last accessed 18 August 2020).

S. Howell (2012), "Local authorities must break down silos to deliver better public services", The Guardian website, September 2012. Available at: https://www.theguardian.com/local-government-network/2012/sep/14/localis-report-public-service-delivery (last accessed 18 August 2020).

ICLEI (n.d.), "Ljubljana (Slovenia)". Available at: https://iclei-europe.org/member-in-the-spotlight/previous/ljubljana-slovenia/ (last accessed on 20 October 2020).

ICLEI (2011a), "Freiburg: Successfully reducing automobile traffic". Available at: http://old.iclei.org/fileadmin/PUBLICATIONS/Case_Stories/4._EcoMobility/ICLEI_CaseStories_EcoMobility_Freiburg.pdf (last accessed on 2 July 2019).

ICLEI (2011b), "Lund, Sweden; An ambitious city of ideas and innovation". Available at: https://sustainablemobility.iclei.org/wpdm-package/lund-sweden-an-ambitious-city-of-ideas-and-innovation/ (last accessed on 26 June 2019).

ICLEI (2014), "Amman, Jordan – Urban agriculture: finding multi-purpose Urban NEXUS solutions through collaborative action", Urban Nexus case story, August 2014. Available at: http://old.iclei.org/fileadmin/PUBLICATIONS/Case_Stories/Urban_NEXUS/26_Urban_NEXUS_Case_Story_Amman_ICLEI-GIZ_2014.pdf (last accessed 18 August 2020).

ICLEI – Local Governments for Sustainability (2016), "Burgas, Bulgaria". Available at: https://sustainablemobility.iclei.org/ecomobility-alliance-back-up/burgas-bulgaria/ (last accessed on 19 October 2020).

ICLEI and GIZ (2014), "Operationalizing the Urban NEXUS – Towards resource-efficient and integrated cities and metropolitan regions", Deutsche Gesellschaft für Internationale Zusammenarbeit and ICLEI – Local Governments for Sustainability. Available at: https://www.sustainable-urbanisation.org/sites/sgup/files/publications/operationalising_the_urban_nexus.pdf (last accessed 18 August 2020).

IFC (n.d.), "Bucharest Water and Sanitation", Urban Water. Available at: https://library.pppknowledgelab.org/documents/4722/download (last accessed on 30 September 2020).

Inclusive Design Research Centre (n.d.) "Co-designing Inclusive Cities", IDRC website. Available at: https://cities.inclusivedesign.ca/ (last accessed 16 April 2019).

Innovative Governance of Large Urban Systems (2017), "The Greater Moscow Region on its shifting way from transportation to mobility", S. Maltcev, IGLUS website, July 2017. Available at https://iglus.org/the-greater-moscow-region-on-its-shifting-way-from-transportation-to-mobility/ (last accessed 18 August 2020).

Institute for Building Efficiency (2010a), "Energy Performance Contracting in the European Union: Introduction, Barriers and Prospects", Issue Brief, August 2010. Available at: http://www.buildup.eu/sites/default/files/content/Institute%20BE%20-%20Energy%20Performance%20Contracting%20in%20the%20European%20Union.pdf (last accessed 18 August 2020).

Institute for Building Efficiency (2010b), "Energy Performance Contracting in the European Union: Creating Common 'Model' Definitions, Processes

and Contracts", Issue Brief, September 2010. Available at: http://www.buildup.eu/sites/default/files/content/Institute%20BE-Energy%20Performance%20Contracting%20in%20the%20EU-%20Common%20models%20definitions%2C%20Contracts%2C%20Processes.pdf (last accessed 18 August 2020).

ITDP (2015), "What's Stopping Carsharing? 4 Challenges Holding Emerging Markets Back", December 2015, Institute for Transportation and Development Policy. Available at: https://www.itdp.org/2015/12/17/whats-stoppingcarsharing-4-challenges-holding-emerging-markets-back/ (last accessed 18 August 2020).

Institute of Public Administration (2012), "Strategic collaboration in local government", Local Government research Series, Report no. 2, January 2012. Available at: https://www.ipa.ie/_fileUpload/Documents/StrategicCollaboration.pdf (last accessed 18 August 2020).

Institute on Municipal Finance and Governance (2013), "Trading Density for Benefits: Toronto and Vancouver Compared", Munk School of Global Affairs, IMFG Papers on Municipal Finance and Governance, No. 13. Available at: https://munkschool.utoronto.ca/imfg/uploads/220/imfg_no_13_moorer3_online_final.pdf (last accessed 18 August 2020).

International Bank for Reconstruction and Development and World Bank (2017), "Republic of Armenia. Support to Armenia's Second-Generation Water PPPs". Available at: https://ppiaf.org/documents/5694/download (last accessed on 28 September 2020).

International Transport Forum (2016), "Moscow wins international transport award for tackling traffic gridlock". Available at: https://www.itf-oecd.org/moscow-wins-international-transport-award-tackling-traffic-gridlock (last accessed on 20 October 2020).

International Water Association (2018), Wastewater Report 2018: The Reuse Opportunity. Available at: http://www.iwa-network.org/wp-content/uploads/2018/02/OFID-Wastewater-report-2018.pdf (last accessed on 8 August 2019).

Interreg Danube Transnational Programme (2018), "Summary of all the ATTRACTIVE DANUBE National Workshops". Available at: www.interreg-danube.eu/news-and-events/project-news/2322 (last accessed on 16 October 2020).

M. Islam (2012), "Key Factors and Readiness Perception Indicators Appraisal: Public-Private Partnership in Infrastructure Development Project in Bangladesh". Available at: https://core.ac.uk/download/pdf/61803306.pdf (last accessed on 26 October 2020).

S. Istenič (2016), "Reviving Public Spaces through Cycling and Gardening. Ljubljana – European Green Capital 2016", in Etnološka tribina: Godišnjak Hrvatskog etnološkog društva, Vol. 46, No. 39, 2016. Available at: https://www.researchgate.net/publication/311863407_Reviving_Public_Spaces_through_Cycling_and_Gardening_Ljubljana_-_European_Green_Capital_2016 (last accessed 20 October 2020).

C. Johnson (2014), "Sharing City Seoul: A Model for the World". Available at: https://www.shareable.net/sharing-city-seoul-a-model-for-the-world/ (last accessed on 30 September 2020).

B. Jovičić (2019), "SEE parliamentarians visit Ljubljana – European Green Capital and regional leader in sustainable urban mobility". Available at: https://www.transformative-mobility.org/news/see-parliamentarians-visit-ljubljana-european-green-capital-and-regional-leader-in-sustainable-urban-mobility (last accessed on 20 October 2020).

M. Kahn (2017), "Construction begins on Atlanta's Proctor Creek Greenway", Curbed Atlanta website, August 2017. Available at: https://atlanta.curbed.com/2017/8/21/16176662/proctor-creek-greenwayphase-one-construction-starts (last accessed 18 August 2020).

J. Kanters and M. Wall (2018), "Experiences from the urban planning process of a solar neighbourhood in Malmö, Sweden, Urban, Planning and Transport Research". Available at: https://www.tandfonline.com/doi/pdf/10.1080/21650020.2018.1478323 (last accessed 8 October 2020).

A. Kassam (2014), "Smarter urban water: how Spain's Zaragoza learned to use less", The Guardian. Available at: https://www.theguardian.com/lifeandstyle/2014/jul/30/zaragoza-smarter-urban-water-zaragoza-spain-learned-to-use-less (last accessed on 29 September 2020).

The Korea Times (2018), "Seoul to generate 1 GW of energy from solar by 2022". Korea Times, 26 November 2018. Available at: http://m.koreatimes.co.kr/pages/article.asp?newsIdx=259295 (last accessed 22 July 2019).

M. Kulesza (n.d.), "Methods and Techniques of Managing Decentralization Reforms in CEE Countries: The Polish Experience", Pennsylvania State University. Available at: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.111.8460&rep=rep1&type=pdf (last accessed 18 August 2020).

A. Kumar and R. Fester (2019), "Fiscal Futures: Is there a Space for Better Fiscal Accountability in South Africa's Metropolitan Municipalities?", International Budget Partnership website, March 2019. Available at: https://www.internationalbudget.org/2019/03/fiscal-futures-is-therespace-for-better-fiscal-accountability-in-south-africas-metropolitanmunicipalities/ (last accessed 18 August 2020).

A. Laszek and R. Trzeciakowski (2018), "State Decentralization in Poland Has Been Successful, but There is Still Room for Improvement". Available at: http://4liberty.eu/wp-content/uploads/2018/11/ALEKSANDER-%C5%81ASZEK-RAFA%C5%81-TRZECIAKOWSKI_STATE-DECENTRALIZATION-IN-POLAND-HAS.pdf (last accessed 9 August 2019).

LEGCO (2017), "Feed-in tariff for solar power in selected places". Available at: https://www.legco.gov.hk/research-publications/english/1718in04-feed-in-tariff-for-solar-power-in-selected-places-20180117-e.pdf (last accessed 22 July 2019).

U. Lehrer and P. Pantalone (2018), "The sky is not the limit: Negotiating height and density in Toronto's condominium boom", from Spaces of Urban Politics, pp. 85-95. Available at: https://www.researchgate.net/publication/326547999_The_sky_is_not_the_limit_Negotiating_height_and_density_in_Toronto%27s_condominium_boom (last accessed on 29 September 2020).

LGB (n.d.), "SNAGA Development and maintenance of a geospatial information system for service management". Available at: https://www.lgb.si/en/projects/snaga/ (last accessed on 1 October 2020).

M. Liksutov (2018a), "Modernising Moscow. How the Russian capital is transforming its transport services.", Intelligent Transport, 4 October 2018. Available at: https://www.intelligenttransport.com/transport-articles/72221/moscow-public-transport-network/ (last accessed on 19 October 2020).

M. Liksutov (2018b), "Building Smart Transport in Moscow", Interview by McKinsey. Available at: https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/building-smart-transport-in-moscow (last accessed on 19 July 2019).

M. Liksutov (2020), "City Snapshot: Mobility in Moscow", Intelligent Transport, 28 January 2020. Available at: https://www.intelligenttransport.com/transport-articles/95256/city-snapshot-mobility-in-moscow/ (last accessed on 20 October 2020).

A. Linder (2019), "The formalisation of South African waste pickers in a globalised recycling economy", lecture, May 2019. Available at: https://www.law.ox.ac.uk/events/formalisation-south-african-waste-pickersglobalised-recycling-economy (last accessed 18 August 2020).

LSE Cities, ICLEI and GGGI (2013), Going Green: How cities are leading the next economy. Available at: https://www.lse.ac.uk/cities/publications/research-reports/Going-Green-How-cities-are-leading-the-next-economy (last accessed on 25 October 2020).

LSE Cities, UN-Habitat, and United Cities and Local Governments (2016), "How cities are governed: Building a local database for current models of urban governance". Available at: https://urbangovernance.net/ (last accessed 18 August 2020).

A. Magni and W. Günther (2014), "Cooperatives of waste pickers as an alternative to social exclusion and its relationship with the homeless population", in Saúde e Sociedade, vol. 23 no.1, São Paulo, Jan-Mar 2014. Available at: https://www.scielo.br/scielo.php?pid=S0104-12902014000100146&script=sci_arttext&tlng=en (last accessed on 25 October 2020).

S. Maltcev (2017), "The Greater Moscow Region on its shifting way from transportation to mobility", Iglus.com, 9 July 2017. Available at: https://iglus.org/the-greater-moscow-region-on-its-shifting-way-from-transportation-to-mobility/ (last accessed on 20 October 2020).

P. Marin, M. Dambudzo and A. Andreasyan (2017), Review of Armenia's Experience with Water Public-Private Partnerships, World Bank Group, Washington, D.C. Available at: http://documents.worldbank.org/curated/en/117301510813106522/pdf/Review-of-Armenia-s-experience-withwater-public-private-partnerships.pdf (last accessed 18 August 2020).

A. Marshal (2019), "Why electric buses haven't taken over the world – yet", Wired, June 2019. Available at: https://www.wired.com/story/electricbuses-havent-taken-over-world/ (last accessed 18 August 2020).

C. Marshall (2016), "Where is the world's most hi-tech city? (And it's not San Francisco)", The Guardian website, October 2016. Available at: https://www.theguardian.com/cities/2016/oct/19/where-world-most-hi-tech-city-not-san-francisco (last accessed 18 August 2020).

McKinsey & Company (2013), "Ten quick steps to unlocking tax-revenue collection in rapidly growing markets", July 2013. Available at: https://www.mckinsey.com/industries/public-sector/our-insights/ten-quicksteps-to-unlocking-tax-revenue-collection-in-rapidly-growing-markets (last accessed 18 August 2020).

H. Mees (2014), "Entire cities could benefit from green roofs", Delta Rotterdam/Utrecht University. Available at: https://dspace.library.uu.nl/bitstream/handle/1874/306732/website.pdf?sequence=1&isAllowed=y (last accessed on 15 July 2020).

Metro (2019), "Metro partners with Getaround to offer car sharing at 27 transit stations", metro.net website page, February 2019, The Source blog. Available at: https://thesource.metro.net/2019/02/07/metro-partnerswith-getaround-to-offer-car-sharing-at-27-transit-stations/ (last accessed 5 May 2019).

R.E. Millward & Associates Ltd (2013) "Securing Cultural Benefits: Approaches to the Use of Section 37 for Arts and Culture Facilities". Available at: https://www.toronto.ca/legdocs/mmis/2013/ed/bgrd/backgroundfile-62975.pdf (last accessed on 15 July 2019).

Ministry of Finance of the Slovak Republic (n.d.), "Platobny mechanizmus vychadzajuci zo Vzorovej zmluvy o energetickej efektivnosti s garantovanou usporou energie". Available at: https://www.mhsr.sk/uploads/files/CqkpdgoU.pdf (last accessed 18 August 2020).

T. Misra (2016), "How to Build Inclusive Cities", Bloomberg CityLab, June 2016. Available at: https://www.citylab.com/equity/2016/06/how-tobuild-inclusive-cities/487322/ (last accessed 18 August 2020).

A. Moore (2013), for Institute on Municipal Finance and Governance: "Trading Density for Benefits: Toronto and Vancouver Compared". Available at: https://munkschool.utoronto.ca/imfg/uploads/220/imfg_no_13_moorer3_online_final.pdf (last accessed on 15 July 2019).

Moscow Transport (2017), "Moscow Transport strategy: main goals and achievements". Available at: https://www.unece.org/fileadmin/DAM/trans/doc/2017/wp5/2_5Sept2017_Ms_Maltseva.pdf (last accessed on 19 October 2020).

N. Mueller, D. Rojas-Rueda, H. Khreis, M. Cirach, D. Andrés, J. Ballester, X. Bartoll, C. Daher, A. Deluca, C. Echave, C. Milà, S. Márquez, J. Palou, K. Pérez, C. Tonne, M. Stevenson, S. Rueda and M. Nieuwenhuijsen (2020), "Changing the urban design of cities for health: The superblock model", Environment International, Vol. 134. Available at: https://www.sciencedirect.com/science/article/pii/S0160412019315223 (last accessed on 29 September 2020).

Municipal Department MA 18 – Urban Development and Planning (2018), Monitoring Report 2017: Smart City Wien Framework Strategy. Available at: https://www.wien.gv.at/stadtentwicklung/studien/pdf/b008520.pdf (last accessed 16 October 2020).

A. Natarajan (2020), "Metro Water's 10 big promises for Chennai citizens in 2020". Available at: https://chennai.citizenmatters.in/metro-water-promises-for-chennai-2020-13822 (last accessed on 29 October 2020).

National Assembly for Wales (2018), "Low Carbon Housing: the Challenge", Climate Change, Environment and Rural Affairs Committee, August 2018. Available at: https://www.assembly.wales/laid%20documents/crld11711/cr-ld11711-e.pdf (last accessed 18 August 2020).

National Lottery Heritage Fund (2014), "Public parks under threat" June 2014, Heritage Fund website. Available at: https://www.heritagefund.org.uk/news/public-parks-under-threat (last accessed 18 August 2020).

Y. Nishida (2013), "Energy Efficiency in Buildings: Policy and Programs in Policy and Programs in Tokyo." Available at: https://www.eu-japan.eu/sites/eu-japan.eu/files/Nishida.pdf (last accessed 11 October 2020).

D. Norris-Tirrell and J.A. Clay (2010), Strategic Collaboration in Public and Nonprofit Administration – A Practice-Based Approach to Solving Shared Problems, Routledge, Abingdon and New York. Available at: https://www.routledge.com/Strategic-Collaboration-in-Public-and-Nonprofit-Administration-A-Practice-Based/Norris-Tirrell-Clay/p/book/9781420088755 (last accessed on 26 November 2020).

E. Oblak (2019), "The story of Ljubljana: Case study". Available at: https://zerowasteeurope.eu/downloads/case-study-5-ljubljana-2/ (last accessed on 1 October 2020).

S. O'Carroll, J. Wallace, C. Pineo, L. Basson, J. Woodcock, R. Daniel and C. Mouton (2016), "The Western Cape Industrial Symbiosis Programme (WISP): An Innovative Approach to Resource Efficiency and Waste Minimisation for South African Businesses", from Proceedings of the 20th WasteCon Conference, 6-10 October 2014, Somerset West, Cape Town. Available at: https://www.3smedia.co.za/infrastructurenews/wp-content/uploads/sites/4/2016/01/O%e2%80%99Carroll-S.-et-al-80.pdf (last accessed on 30 September 2020).

OECD (n.d.a), "Breaking out of silos: Joining up policy locally", F. Froy, OECD website. Available at: http://www.oecd.org/regional/leed/43056251.pdf (last accessed 18 August 2020).

OECD (n.d.b), "Mixes of policy instruments", OECD website. Available at: http://www.oecd.org/env/tools-evaluation/mixesofpolicyinstruments.htm (last accessed 18 August 2020).

OECD and ICLEI (2016), "Green Cities Programme Methodology", Final Report, May 2016. Available at: https://www.ebrdgreencities.com/assets/Uploads/PDF/436b87ef46/Green-City-Action-Plan-Methodology-English.pdf (last accessed 18 August 2020).

100 Resilient Cities (n.d.), 100 Resilient Cities website. Available at: https://www.100resilientcities.org/ (last accessed 18 August 2020).

100 Resilient Cities (2018), "Atlanta's Proctor Creek Greenway delivers multiple co-benefits from a single intervention". Available at https://www.100resilientcities.org/atlantas-proctor-creek-greenway-deliversmultiple-co-benefits-from-a-single-intervention/ (last accessed 18 August 2020).

Opensignal (2017), "Global State of Mobile Networks (February 2017)", Opensignal website. Available at: https://www.opensignal.com/reports/2017/02/global-state-of-the-mobile-network (last accessed 18 August 2020).

P. Pantale (2014), "Density Bonusing and Development in Toronto". Available at: https://fes.yorku.ca/wp-content/uploads/2018/10/Peter-Pantalone-Major-Research-Paper-FINAL.pdf (last accessed on 15 July 2019).

J. Park (2016), "How the citizens of Seoul benefit from a sharing culture and an enhanced listening policy". Available at: https://socialinnovationexchange.org/insights/how-citizens-seoul-benefit-sharing-culture-and-enhanced-listening-policy (last accessed on 30 September 2020).

Parma Futuro Smart (2020a), "Pesatura rifiuti smart", in parmafuturosmart.comune.parma.it. Available at: http://parmafuturosmart.comune.parma.it/progetti/sistemi-smart-per-pesatura-rifiuti/ (last accessed on 25 October 2020).

I. Petek (2016), "Ljubljana, Slovenia," in IMPACTPAPEREC.EU. Available at: https://impactpaperec.eu/en/facts-figures/case-studies/ljubljana-slovenia/ (last accessed 25 October 2020).

N. Pietzsch, J.L. Duarte Ribeiro, J. Fleith de Medeiros (2017), "Benefits, challenges and critical factors of success for Zero Waste: A systematic literature review", Waste Management, Vol. 67, pp. 324-353.

The Prince's Foundation for the Built Environment (n.d.), "Strasbourg: Regaining the public realm". Available at: https://www.academia.edu/23526879/Strasbourg_Regaining_the_public_realm (last accessed on 19 October 2020).

Proračun Grada Rijeke (2018), “Proracun(ajme!)”. Available at: https://www.vojko-obersnel.com/hr/proracunaj-me/2018 (last accessed 15 October 2020).

PublicSpace (2018), “Poblenou “Superblock” Barcelona (Spain), 2018”. Available at: https://www.publicspace.org/works/-/project/k081-poblenou-s-superblock (last accessed on 29 September 2020).

Push-Pull Parking (2015), “Catalogue on Case Studies for Parking Management Solutions”, push-pull-parking.eu. Available at http://www.eltis.org/sites/default/files/trainingmaterials/pp_pm_catalogue_01062015_final.pdf (last accessed 18 August 2020).

Qualenergia.it (2017), “Prezzo die TEE alle stells: ‘effetto Governo e GSE’”. Available at: https://www.qualenergia.it/articoli/20170316-prezzo-dei-tee-alle-stelle-effetto-governo-e-gse/ (last accessed 8 October 2020).

S. Raghavan (2019), “The success and failure of Water management in Chennai”, Future Directions. Available at: https://www.futuredirections.org.au/publication/the-success-and-failure-of-water-management-in-chennai/ (last accessed on 29 September 2020).

Railway Gazette (2020), “Lund tramway gets revised launch date”. Available at: railwaygazette.com/projects-and-planning/lund-tramway-gets-revised-launch-date/55881.article (last accessed on 20 October 2020).

A. Rabi (2013), “Review and Analysis of Private Sector Participation Modalities in Water Service Delivery, with Emphasis on the Southern Mediterranean Region”. Available at: http://www.swim-sm.eu/index.php/en/resources/category/76-assessments-en (last accessed on 29 September 2020).

M. Raud (2020), “Low temperature heating project in Tartu,” in RELaTEDProject.eu. Available at: http://www.relatedproject.eu/wp-content/uploads/2020/04/RELaTED-moreinfo-Fortum-Tartu-v2.pdf (last accessed 12 October 2020).

Regions4recycling (2014), “Good practice Tallinn: Waste awareness educational campaigns for children and adults”. Available at: http://docplayer.net/22211005-Good-practice-tallinn-waste-awarenesseducational-campaigns-for-children-and-adults-june-2014.html (last accessed 18 August 2020).

M. Ricci (2020), “Food waste collection and recycling in Italy”, webinar presentation for the Bio-based and Biodegradable Industries Association, 14 May 2020. Available at: https://bbia.org.uk/wp-content/uploads/2020/06/RICCI-BBIA-FW-Collection-IT-Webinar-2020-0514.pdf (last accessed 25 October 2020).

ROCK (2019), “Cluj-Napoca Romania. Imagine the future of the city!”, Participatory Approaches and Social Inclusion in Cultural Heritage, Regeneration and Optimisation of Cultural Heritage in Creative and Knowledge Cities, Horizon 2020 programme, July 2019. Available at: https://indd.adobe.com/view/4c399cc1-0836-488c-83d4-fe21588c819b (last accessed 16 October 2020).

N. Rogers (2017), “Driving Fee Rolls Back Asthma Attacks in Stockholm”, Inside Science website, February 2017. Available at https://www.insidescience.org/news/driving-fee-rolls-back-asthma-attacks-stockholm (last accessed 18 August 2020).

N. Rolander (2018), “BMW’s DriveNow Car-Sharing Services Bite the Dust in Stockholm”, July 2018, Bloomberg website. Available at https://www.bloomberg.com/news/articles/2018-07-18/bmw-s-drivenow-car-sharingservice-bites-the-dust-in-stockholm (last accessed 18 August 2020).

M. Rousseau (2009), “Re-imaging the City Centre for the Middle Classes: Regeneration, Gentrification and Symbolic Policies in ‘Loser Cities’”, in International Journal of Urban and Regional Research, Vol. 33 (3), September 2009, pp. 770-880. Available at: https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1468-2427.2009.00889.x (last accessed on 21st October 2020).

RUAF Foundation (2016), “From strategies to operational goals for the Gent en Garde”. Available at https://ruaf.org/assets/2019/11/Gent-en-Garde.pdf (last accessed 18 August 2020).

G. Ruggieri (2017), “The State of Art of Copenhagen’s Cycling Infrastructure and Possible Application in Other Urban Contexts”. Available at: https://www.politesi.polimi.it/bitstream/10589/134158/1/2017_04_RUGGIERI.pdf (last accessed on 16 July 2019).

C. Sabatino (2017), “Solid Waste Management Systems through Social Inclusion: The case of Belo Horizonte, Brazil”. Available at: http://www.globaldeliveryinitiative.org/library/case-studies/solid-waste-management-systems-through-social-inclusion-case-belo-horizonte (last accessed on 25 October 2020).

M. Schiffbauer and G. Varela (2019), “Macro and Micro Features of Successful Economic Convergence: The Case of Poland”. Available at: http://documents1.worldbank.org/curated/en/704781547133350911/pdf/133617-MTI-Discussion-Paper-11-Fixed.pdf (last accessed 10 August 2019).

SEE Cities (2018), “UPP Technical Workshop on Municipal Finance and Urban Audit”. Available at: http://www.seecities.eu/seecities.eu/UA/itemid/84/amid/549 (last accessed on 8 October 2020).

Seoul Metropolitan Government (2017), “One in three houses in Seoul to have photovoltaic facility”, November 2017. Available at: http://english.seoul.go.kr/one-three-houses-seoul-photovoltaic-facility/ (last accessed 18 August 2020).

Seoul Metropolitan Government (2018a), “‘Solar City’ Seoul’s future energy to be promoted at Seoul Solar Expo”. Available at: http://english.seoul.go.kr/solar-city-seouls-future-energy-to-be-promoted-at-seoul-solar-expo/ (last accessed 22 July 2019).

Seoul Metropolitan Government (2018b), “Seoul Energy Corporation has launched Seoul Solar Centers in 5 regions”. Available at: http://english.seoul.go.kr/seoul-energy-corporation-launched-seoul-solar-centers-5-regions-providing-support-installment-post-m/ (last accessed 22 July 2019).

A. Serena, A. Tob-Ogu and A. Genovese (2018), “Transitioning Urban Consolidation Centres initiatives in successful operations: A Collection of EU case experiences”, The University of Sheffield. Available at: http://www.prosfet.eu/PROSFET/wp-content/uploads/2018/05/Transitioning-Urban-Consolidation-Centres-initiatives-in-successful-operations.pdf (last accessed on 29 September 2020).

I. Šerić (2017), “The EPC market in Croatia and the new Eurostat rules on EPC accounting”, European Union, November 2017. Available at https://ec.europa.eu/energy/sites/ener/files/documents/018_1b_ivan_seric_seif_milan_16-11-17.pdf (last accessed 18 August 2020).

SF Environment (2019), “Checkout Bag Charge and Recyclable or Compostable Pre-Checkout Bag Ordinance”, San Francisco Department of the Environment. Available at: https://sfenvironment.org/checkout-bagordinance (last accessed 18 August 2020).

Shareable (2013), “Is Seoul the Next Great Sharing City?”. Available at: https://www.shareable.net/is-seoul-the-next-great-sharing-city/ (last accessed on 25 September 2020).

SmartCities World (2019), “Vienna ranked top for smart city strategy”, SmartCitiesWorld.net, 14 March 2019. Available at: https://www.smartcitiesworld.net/news/news/vienna-ranked-top-for-smart-city-strategy-3965 (last accessed 24 September 2020).

N. Smedby (2015), “Assessing local governance experiments for building energy efficiency – the case of Malmö, Sweden”. Available at: https://journals.sagepub.com/doi/pdf/10.1177/0263774X15614176 (last accessed 12 July 2019).

M. Smith and J. Castellano (2015), “Costs associated with nonresidential electric vehicle supply equipment: Factors to consider in the implementation of electric vehicle charging stations”, US Department of Energy. Available at: https://trid.trb.org/view/1377403 (last accessed 18 August 2020).

Snaga Ljubljana (2018), “Snaga Ljubljana, the biggest Slovenian waste management company”. Available at: https://issuu.com/snaga4/docs/snaga_ljubljana_eng (last accessed on 9 July 2019).

Sofia Municipality (2018), “Sofia Municipal Budget”, February 2018. Available at: https://www.sofia.bg/web/sofia-municipality/start/-/asset_publisher/HMYVGw6PDFKh/content/the-budget-of-sofia-is-now-uploaded-to-the-open-data-portal?inheritRedirect=false (last accessed 18 August 2020).

D. Staničić (2019) Jo,žef Stefan Institute, Energy Efficiency Centre; presentation 28 March 2019, slide 3.

Z. Stoyanova (2014), "Sustainable Urban Mobility Plan of Burgas 2014 – 2020". Available at: http://www.southeast-europe.net/document.cmt?id=842 (last accessed on 19 October 2020).

Strasbourg Eurometropole (2015), "20 years of active policy supporting mobility within Strasbourg Eurometropole". Available at: Strasbourg.eu eurometropole (2015) (last accessed on 19 October 2020).

Sustainable Australia Fund (2020), "About us". Available at: https://sustainableaustraliafund.com.au/who-we-are/ (last accessed on 8 October 2020).

Sustainable Cities (n.d.), "Orbital Forest, a Balance Between the City and Nature Rediscovered", Sustainable Cities website. Available at: http://www.sustainablecities.eu/transformative-actionsdatabase/?c=search&action_id=eu2ii6rw (last accessed 18 August 2020).

Sustainable Cities (2018), "Alba Iulia Smart City Pilot Project", Sustainable Cities website. Available at: http://www.sustainablecities.eu/transformative-actions-database/?c=search&action_id=ixgrulm3 (last accessed 18 August 2020).

Sustainable Development Solutions Network (2016), "Getting Started with the SDGs in Cities". Available at: https://resources.unsdsn.org/gettingstarted-with-the-sdgs-in-cities (last accessed 18 August 2020).

Sustainable Water Integrated Management (SWIM) Support Mechanism (2013), "Documentation of best practices in non-revenue water management in selected Mediterranean countries", European Union-funded project, February 2013. Available at: http://www.swim-sm.eu/files/Best_Practices_in_non-revenue_water_EN_Final.pdf (last accessed 18 August 2020).

SWITCH (Sustainable Water Management Improves Tomorrow Cities Health) project (2014), "Zaragoza: combining awareness raising and financial measures to ensure water efficiency". Available at: https://climate-adapt.eea.europa.eu/metadata/case-studies/zaragoza-combining-awareness-raising-and-financial-measures-to-enhance-water-efficiency (last accessed on 8 August 2019).

D. Szescilo (n.d.), "Strengthening fiscal capacities for subnational public investment. The case of Poland". Available at: http://www.oecd.org/regional/regional-policy/Strengthening-Fiscal-Capacities-Poland-ENG.pdf (last accessed 9 August 2019).

D. Szescilo and M. Kulesza (2012), "Local Government in Poland", Local Government in the Member States of the European Union: A Comparative Legal Perspective, Madrid. Available at: https://www.researchgate.net/publication/283568884_Local_government_in_Poland (last accessed 15 October 2020).

S. Thomas et al. (2014), Energy Efficiency Watch, Energy Efficiency Policies in Europe Case Study: Energy Manager Obligation and White Certificate Scheme – Italy. Available at: http://www.fedarene.org/wp-content/uploads/2016/03/Case_Study_Manager_White-Certificates_Italy_final.pdf (last accessed 10 October 2020).

S. M. Tica, P. Živanović, S. Bajčetić, S. Gavrilović and S. Filipović (2012), "Organization and Management of Complex Interoperable Tariff and Fare Collection Systems-Example of the City of Belgrade". Proceedings of the International Conference on Traffic and Transport Engineering, p. 259, Belgrade. Available at: https://bib.irb.hr/datoteka/629846.ICTTE_Belgrade_2012_Proceedings.pdf#page=268 (last accessed 18 August 2020).

Tokyo Development Learning Centre (2017), "Addressing Solid Waste Management through the 3R Approach". Available at: https://programme.worldwaterweek.org/Content/ProposalResources/PDF/2017/pdf-2017-7137-5-Japan%20Project%20Brief_Yokohama3R.PDF (last accessed on 1 October 2020).

Tokyo Metropolitan Government (2018), "Tokyo Carbon Reporting Program for SMFs". Available at: http://www.kankyo.metro.tokyo.jp/en/climate/tokyo_carbon.html (last accessed 10 October 2020)

TomTom (n.d.), "Traffic Index 2019", TomTom website. Available at: https://www.tomtom.com/en_gb/traffic-index/ranking/ (last accessed 18 August 2020).

TomTom (2020), "Moscow region (oblast) traffic". Available at: https://www.tomtom.com/en_gb/traffic-index/moscow-traffic/ (last accessed on 20 October 2020).

Transparency International and UN-Habitat (2004), "Tools to Support Transparency in Local Governance", March 2004, Urban Governance Toolkit Series. Available at: https://www.transparency.org/en/publications/tools-to-support-transparency-in-local-governance (last accessed 23 August 2020).

Transport and Environment (2017), "Does sharing cars really reduce car use?", June 2017, briefing note. Available at: https://www.transportenvironment.org/sites/te/files/publications/Does-sharing-carsreally-reduce-car-use-June%202017.pdf (last accessed 18 August 2020).

Transport for London (2014), "International Cycling Infrastructure Best Practice Study: Appendix – City Summaries". Available at: http://content.tfl.gov.uk/international-cycling-infrastructure-best-practice-study-appendix.pdf (last accessed on 20 October 2020).

A. Trivedi and M. Chertock (2019), "Responding to Day Zero Equitably: Water Crisis Lessons from Cape Town and Chennai". Available at: https://www.wri.org/blog/2019/10/responding-day-zero-equitably-water-crisis-lessons-cape-town-and-chennai (last accessed on 23 October 2020).

J. L. Trujillo and J. Parilla (2016), "Redefining Global Cities – The Seven Types of Global Metro Economies", Global Cities Initiative, The Brookings Institution. Available at: https://www.brookings.edu/research/redefiningglobal-cities/ (last accessed 18 August 2020).

2020 Collectors Project (2020), "Case Study Parma, Italy". Available at: https://www.collectors2020.eu/wp-content/uploads/2020/08/Case_Integration_Summary_Parma.pdf (last accessed on 2 October 2020).

2030 Water Resources Group (2013), "Managing Water Use in Scarce Environments: A Catalogue of Case Studies", August 2013. Available at: https://www.waterscarcitysolutions.org/wp-content/uploads/2015/08/WRG-Managing-Water-Scarcity-Catalogue.pdf (last accessed 18 August 2020).

2030 Water Resources Group (2015), "Managing Water Use in Scarce Environments: A Catalogue of Case Studies". Available at: https://www.waterscarcitysolutions.org/wp-content/uploads/2015/08/WRG-Managing-Water-Scarcity-Catalogue.pdf (last accessed on 29 September 2020).

UCLG and World Bank (2009), "Decentralization and Local Democracy in the World. First Global Report by United Cities and Local Governments 2008". Available at: https://openknowledge.worldbank.org/handle/10986/2609 (last accessed 18 August 2020).

UK Department for Business, Energy and Industrial Strategy (2019), "Smart Meter Roll-Out. Cost-Benefit Analysis (2019)", September 2019. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/831716/smart-meter-roll-out-cost-benefit-analysis-2019.pdf (last accessed 18 August 2020).

UK Parliament (2013), "Warm Front Scheme", Commons Research Briefing SN06231, House of Commons Library, August 2013. Available at: https://researchbriefings.parliament.uk/ResearchBriefing/Summary/SN06231 (last accessed 18 August 2020).

UN (n.d.), "Cities and Pollution contribute to climate change". Available at: https://www.un.org/en/climatechange/citiespollution.shtml#:~:text=Cities%20are%20major%20contributors%20to,cent%20of%20the%20Earth's%20surface (last accessed 19 August 2020).

UN (2018a), "68 per cent of the world population projected to live in urban areas by 2050, says UN". Available at: https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanizationprospects.html (last accessed 18 August 2020).

UN (2018b), World Urbanization Prospects, The 2018 Revision, Department of Economic and Social Affairs, New York. Available at: https://population.un.org/wup/Publications/Files/WUP2018-Report.pdf (last accessed 18 August 2020).

UN (2020), "Goal 11. Make cities inclusive, safe, resilient and sustainable". Available at: https://www.un.org/sustainabledevelopment/cities/ (last accessed 18 August 2020).

UNDP (2009), Capacity Development: A UNDP Primer, United Nations Development Programme, New York.

UN Environment Programme (2017), "Winter is coming for fossil fuel heating in Banja Luka", November 2017. Available at: https://www.unenvironment.org/news-and-stories/press-release/winter-comingfossil-fuel-heating-banja-luka (last accessed 18 August 2020).

UN Environment Programme (2019), "Sustainable Cities". Available at: https://www.unenvironment.org/regions/asia-and-pacific/regionalinitiatives/supporting-resource-efficiency/sustainable-cities (last accessed 18 August 2020).

UNFCC (2017), "Sweden Plans to Be Carbon Neutral by 2045". Available at: https://unfccc.int/news/sweden-plans-to-be-carbon-neutral-by-2045 (last accessed on 26 June 2019).

UN-Habitat (2009), International Guidelines on Decentralization and Access to Basic Services for All, United Nations Human Settlements Programme, Nairobi. Available at: https://unhabitat.org/sites/default/files/download-manager-files/International%20Guidelines%20on%20Decentralization%20and%20Access%20to%20Basic%20Services%20for%20all.pdf (last accessed 18 August 2020).

UN-Habitat (2013), State of the World's Cities 2012/2013. Prosperity of Cities, United Nations Human Settlements Programme, Nairobi. (last accessed 18 August 2020).

UN-Habitat (2017), "How to improve residential energy efficiency in South Eastern Europe and CIS", Policy Discussion Brief for national governments and international organizations, April 2017. Available at: https://www.habitat.org/sites/default/files/How%20to%20improve%20REE_policy%20brief_FINAL_0.pdf (last accessed 18 August 2020).

Urban Innovation Vienna (2020), "Smart City Agency". Available at: https://www.urbaninnovation.at/en/Smart-City-Agency (last accessed 24 September 2020).

Urban Sustainability Exchange (n.d.a), "The City of Copenhagen's Bicycle Strategy". Available at: https://use.metropolis.org/case-studies/cycling-in-copenhagen#casestudydetail (last accessed on 16 July 2019).

Urban sustainability exchange (n.d.b), "The Sharing City Seoul Project". Available at: https://use.metropolis.org/case-studies/the-sharing-city-seoul-project (last accessed on 21 October 2020).

UrbaSofia (2018), Results of the ATTRACTIVE DANUBE 3rd National Workshop. Available at: https://urbasofia.eu/en/results-of-the-attractive-danube-3rd-national-workshop/ (last accessed on 16 October 2020).

URBED and the Joseph Rowntree Foundation (2006), "Making Connections: Transforming People and Places in Europe. Case Study of Roubaix, Lille (France)", updated December 2007. Available at: http://urbed.coop/sites/default/files/Case%20Study%20of%20Roubaix%20Lille.pdf (last accessed 18 August 2020).

VivaCity2020, Cities Institute, LondonMet (n.d.), "The Generation of Diversity: Mixed Use and Urban Sustainability: Clerkenwell (L. B. Islington) Case Study". Available at: http://www.vivacity2020.co.uk/Members/VivaCity%20WP2%20Case%20Study%20Clerkenwell.pdf (last accessed 18 August 2020).

J. Warren (2010), "Civilising the Streets: How strong leadership can deliver high quality of life and vibrant public spaces". Available at: http://transformscotland.org.uk/wp/wp-content/uploads/2014/12/Civilising-the-Streets.pdf (last accessed on 20 October 2020)

Water Time (2005), "Bucharest". Available at: http://www.watertime.net/wt_cs_cit_ncr.html#Romania (last accessed on 29 September 2020).

M. Wattenbarger (2018), "The Mexican town that refused to become a smart city", The Guardian website, October 2016. Available at: https://www.theguardian.com/cities/2018/oct/16/the-mexican-town-that-refused-to-become-a-smart-city (last accessed 18 August 2020).

R. Webb, G. Avram, J. Buron Garcia and A. Joyce (2018), "Transforming Cities by Designing with Communities", The Hackable City, pp. 95-117, M. de Lange and M. de Waal (eds), Springer Link.

Western Cape Government (n.d.), "Western Cape Industrial Symbiosis Programme". Available at: https://www.westerncape.gov.za/110green/projects/western-cape-industrial-symbiosis-programme (last accessed on 24 September 2020).

M. White (2019), "Veolia and Leon trial deposit return scheme in London", FoodBev Media website page, March 2019. Available at: https://www.foodbev.com/news/veolia-and-leon-trial-deposit-return-scheme-inlondon/ (last accessed 18 August 2020).

J. Whitelegg (2014), "Cycles of change: three bike-friendly European cities with lessons for the UK". Available at: https://www.theguardian.com/local-government-network/2014/jan/29/cycling-rates-european-cities-lessons-for-uk (last accessed on 20 October 2020).

WHO (n.d.), "WHO European Healthy Cities Network", World Health Organization Regional Office for Europe website. Available at: http://www.euro.who.int/en/health-topics/environment-and-health/urban-health/who-european-healthy-cities-network (last accessed 11 April 2019).

WHO and UN Environment (2017), "Cities: Transport, health and environment", Available at: http://www.euro.who.int/__data/assets/pdf_file/0019/341128/Fact-Sheet-1-City-Transport-health-and-environment.pdf?ua=1 (last accessed 11 April 2019).

K. Willsher (2018), "France's art deco jewel is reborn to make an even bigger splash", The Guardian, 21 October 2018. Available at: https://www.theguardian.com/artanddesign/2018/oct/21/france-art-deco-jewel-swimming-pool-art-gallery-reopens (last accessed on 30th September 2020).

D. C. Wilson, C. Velis and C. Cheeseman (2006), "Role of informal sector recycling in waste management in developing countries", Habitat International, Vol. 30 (4), pp. 797-808.

World Bank (n.d.), "Inclusive Cities", World Bank website page. Available at: https://www.worldbank.org/en/topic/inclusive-cities (last accessed 24 May 2019).

World Bank (2009), "Unlocking Land Values to Finance Urban Infrastructure". Available at: http://documents.worldbank.org/curated/en/723411468139800644/pdf/461290PUB0Box3101OFFICIAL0USE0ONLY1.pdf (last accessed on 6 August 2019).

World Bank (2013), "City of Rijeka MFSA summary 2013". Available at: http://pubdocs.worldbank.org/en/366021438191576243/City-of-Rijeka-MFSA-summary-24-12-2013.pdf (last accessed on 8 October 2020).

World Bank (2014), "Overcoming constraints in the financing of infrastructure". Available at: http://www.g20.utoronto.ca/2014/WBG_IIWG_Success_Stories_Overcoming_Constraints_to_the_Financing_of_Infrastructure.pdf (last accessed on 30 September 2020).

The World Bank (2016), "PPI Project Summary: Romania, Bucharest – Concession Agreement for Water and Sanitation Services". Available at: https://ppp.worldbank.org/public-private-partnership/ppi-project-summary-romania-bucharest-concession-agreement-water-and-sanitation-services (last accessed on 29 September 2020).

World Bank (2017), "Improving Local Governance in Belize's Municipalities", Results Briefs. Available at: https://www.worldbank.org/en/results/2017/10/20/improving-local-governance-in-belizesmunicipalities (last accessed 18 August 2020).

World Bank (2018), "Armenia - Municipal Water Project", Independent Evaluation Group, Project Performance Assessment Report 127226. Available at: https://ieg.worldbankgroup.org/sites/default/files/Data/reports/ppar_armeniawater.pdf (last accessed on 28 September 2020).

World Bank (2019), "Solid Waste Management", Brief, September 2019. Available at: https://www.worldbank.org/en/topic/urbandevelopment/brief/solid-waste-management (last accessed 18 August 2020).

World Bank Group (2017), "Lessons from Poland, Insights for Poland: A Sustainable and Inclusive Transition to High Income Status", World Bank, Washington, DC. Available at: https://openknowledge.worldbank.org/handle/10986/28960 (last accessed 15 October 2020).

World Bank Group (2018), "Project Appraisal Document on a Proposed Loan in the Amount of US$ 50 Million to the Republic of Albania for

a Regional and Local Roads Connectivity Project". Available at: http://documents.worldbank.org/curated/en/133741523301183905/pdf/Albania-Roads-Project-Appraisal-Document-PAD-Revised-04052018.pdf (last accessed 18 August 2020).

World Bank Group (2020), "Urban Development – Overview". Available at: https://www.worldbank.org/en/topic/urbandevelopment/overview (last accessed 18 August 2020).

World Bank Group and Government of Austria (2018), "Urban Partnership Program (UPP): Improving Local Government Capacity". Available at: http://documents.worldbank.org/curated/en/613241525861852694/pdf/MFSA-Booklet-City-data-sheets-022018.pdf (last accessed 18 August 2020).

World Bank Institute (2013), "Improving Local Governments Capacity: The Experience of Municipal Finances Self-Assessment (MFSA) in South-East Europe". Available at: http://www.seecities.eu/Portals/0/Images/Stories/Publications/MFSA%20-%20online.pdf (last accessed 18 August 2020).

World Economic Forum (2017), "Collaboration in Cities: From Sharing to 'Sharing Economy'", White paper, December 2017. Available at: http://www3.weforum.org/docs/White_Paper_Collaboration_in_Cities_report_2017.pdf (last accessed 18 August 2020).

World Energy Council and Arup (2016), "Perspective input into the World Energy Council Scenarios: 'Innovating Urban Energy'", October 2016. Available at: https://www.arup.com/perspectives/publications/research/section/perspective-input-into-the-world-energy-council-scenariosinnovating-urban-energy (last accessed 18 August 2020).

World Habitat Awards (2013), "30 Years of Planning Continuity in Freiburg, Germany." Available at: https://www.world-habitat.org/world-habitat-awards/winners-and-finalists/30-years-of-planning-continuity-in-freiburg-germany/ (last accessed on 20 October 2020).

WRI (2016), "Localizing Open Government Reforms", World Resources Institute website, December 2016. Available at: https://www.wri.org/blog/2016/12/localizing-open-government-reforms (last accessed 18 August 2020).

WWF (n.d.) "Austria". Available at: https://wwf.panda.org/get_involved/live_green/travel/on_vacation/eco_tips/austria/ (last accessed 4 June 2019).

WWF (2012), "Stuttgart green corridors". Available at: http://wwf.panda.org/?204461/Stuttgart-green-corridors (last accessed on 15 July 2020).

M. Xylia, S. Leduc, P. Patrizio, F. Kraxner and S. Silveira (2017), "Locating charging infrastructure for electric buses in Stockholm". Transportation Research Part C: Emerging Technologies, Vol. 78, pp. 183-200. Available at https://www.researchgate.net/publication/315066457_Locating_charging_infrastructure_for_electric_buses_in_Stockholm (last accessed 18 August 2020).

Zero Waste Europe (2016), "The Story of Parma". Available at: https://smartnet.niua.org/sites/default/files/resources/cs7-parma-web.pdf (last accessed on 2 October 2020).

Zero Waste Europe (2019), "The story of Ljubljana: Case study #5". Available at: https://zerowasteeurope.eu/downloads/case-study-5-ljubljana-2/ (last accessed 18 August 2020).

Zero Waste Scotland (n.d.), "Scheme Administrators", Zero Waste Scotland website page. Available at: https://depositreturnscheme.zerowastescotland.org.uk/scheme-administrators (last accessed 18 August 2020).

Abbreviations and acronyms ↘

AfDB	African Development Bank
ADB	Asian Development Bank
CDP	corporate development programme
CEE	central and eastern Europe
CTCN	Climate Technology Centre and Network
DH	district heating
the EBRD, the Bank	European Bank for Reconstruction and Development
EIB	European Investment Bank
EPC	energy performance contracting
ESCO	energy service company
EVSE	electric vehicle supply equipment
EU	European Union
GCAP	Green City Action Plan
GDP	gross domestic product
GHG	greenhouse gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
ICLEI	ICLEI - Local Governments for Sustainability
IDB	Inter-American Development Bank
ITDP	Institute for Transportation and Development Policy
IT	information technology
JSC	joint stock company
OECD	Organisation for Economic Co-operation and Development
LCV	light commercial vehicle
LSE	London School of Economics and Political Science
NGO	non-governmental organisation
PM	particulate matter
PPP	public-private partnership
PSC	public service contract
SEE	south-eastern Europe
SEMED	southern and eastern Mediterranean
UCLG	United Cities and Local Governments
UN	United Nations
UNDP	United Nations Development Programme
WHO	World Health Organization

The contents of this publication reflect the opinions of individual authors and do not necessarily reflect the views of the EBRD.

Terms, names and images used in this report to refer to geographical or other territories, political and economic groupings and units, do not constitute and should not be construed as constituting an express or implied position, endorsement, acceptance or expression of opinion by the European Bank for Reconstruction and Development or its members concerning the status of any country, territory, grouping and unit, or delimitation of its borders, or sovereignty.

One Exchange Square
London EC2A 2JN
United Kingdom
www.ebrd.com

Photography: © EBRD and iStockphoto.

Designed and produced by Pimclick and the EBRD.

1272 Effective policy options for green cities.