MOSCOW ECONOMY

MOSCOW DEPARTMENT FOR ECONOMIC POLICY AND DEVELOPMENT

EVOLVING TRENDS IN GLOBAL CITIES

Analytical report
2025

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ABOUT THE REPORT

Cities play a vital role in global economic development, generating approximately 80% of the world's gross domestic product. At the same time, they are home to just over half of the planet's population. Traditionally, cities serve as centers of innovation and testbeds for piloting new solutions across various sectors.

Resilience and competitiveness of megacities largely depend on their ability to promptly recognize global shifts and adapt to them — a challenge that is particularly relevant amidst profound transformation of today's world. This study aims to identify those evolving trends, analyze their impact on urban development, and explore the strategies adopted by leading global cities in response to the unfolding change.

The main section of the report ("Trends") outlines the key tendencies shaping the development of global megacities. These trends were identified through a series of in-depth interviews with Russian and international experts, complemented by a desk review of the most prominent global publications of recent years. In total, 14 trends influencing urban development are structured around four thematic categories:

- Demographics;
- Climate change;
- Technology advancement;
- Evolution of societal values.

Description of each trend is accompanied by an analysis of its underlying drivers, current manifestations, and potential long-term implications. To illustrate these trends, the report presents international case studies showcasing how cities are adapting to change, mitigating its negative impacts, and leveraging strategic opportunities. The cases were selected with a focus on the practical relevance and replicability of policies and solutions.

The "Expert Columns" section features excerpts from interviews with Russian and international experts, published upon their consent. These contributions provide deeper insights into the methodological and technological aspects of the research, as well as expert perspectives on the key challenges and future trajectories of megacity development.

THE CONCEPT OF THE REPORT

We extend our sincere gratitude to all Russian and international experts for their insights and contributions to this study

The research is based on a series of in-depth interviews with leading Russian and international experts across a wide range of fields — from economics and technology to social policy and urban development. The discussions focused on major global and urban trends that shape the contemporary development agenda for megacities.

- In discussions with economists and business leaders, attention was focused on the transformations taking place in labor, services, emerging industries, and the creative economy — and on how these shifts are reshaping urban economic systems.
- In conversations with experts in innovation and digital technologies, the discussions examined how digitalization is influencing urban governance and driving the automation of key processes.
- In dialogue with climatologists and ESG specialists, the focus was on strategies for sustainable development, mitigation of climate risks, and adaptation to evolving environmental conditions.
- In discussions with urban planners and real estate developers, key topics included the challenges of spatial development — from shaping the urban environment and expanding transport and engineering infrastructure to promoting citizen engagement in decision-making processes.
- Interviews with experts in education, healthcare, social policy, and culture provided insights into the key priorities and strategic directions for the social development of cities.

To support the study with robust factual and statistical material, a comprehensive desk review was carried out, drawing on a wide array of sources related to global and urban megatrends. The analysis encompassed international and Russian research papers, academic publications, analytical articles, market overviews, databases, and official municipal web platforms.

The final selection of the 14 most relevant urban development trends was the result of systematizing and cross-referencing the collected data with insights from expert interviews. This analysis highlighted the most frequently cited trends and driving factors, while also assessing the potential implications of these developments for cities.

MAP OF CITY CASES

40 interviews with experts from **7** countries

14 trends across **4** thematic blocks

110 urban practises from **60** cities worldwide

EUROPE

- Amsterdam
- Athens
- Barcelona
- Berlin
- Bristol
- Deventer
- Gothenburg
- Helsinki
- Lisbon
- Ljubljana
- London
- Lyon
- Milan
- Moscow
- Paris
- Prague
- Rotterdam
- Stockholm
- The Hague
- Umea
- Valencia
- Vienna
- Vlijmen
- Zagreb

AMERICA

- Asuncion
- Baltimore
- Boston
- Houston
- Mendoza
- Montreal
- New York
- Philadelphia
- Portland
- Redlands
- Reno
- Salem
- Salt Lake City
- San Francisco
- San Jose
- Savannah
- Seattle
- Sao Paulo
- Washington, D.C.
- Watertown

ASIA

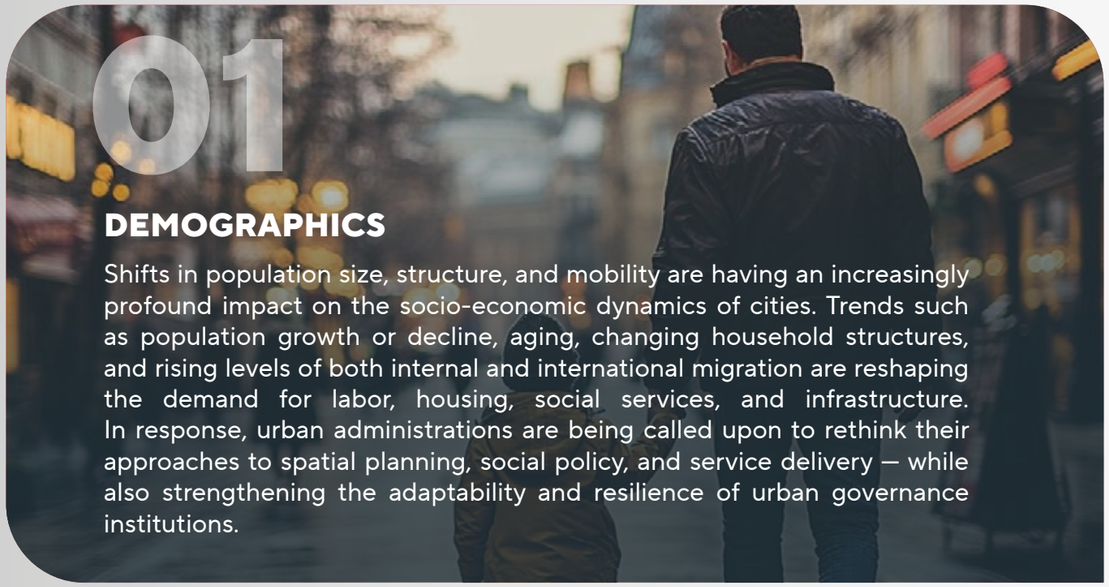
- Bangkok
- Bhubaneswar
- Dubai
- Guangzhou
- Hyderabad
- Jerusalem
- Kashiwa
- Maebashi
- Okayama
- Seoul
- Shanghai
- Shenzhen
- Singapore

AFRICA

- Accra
- Kakuma
- Nairobi

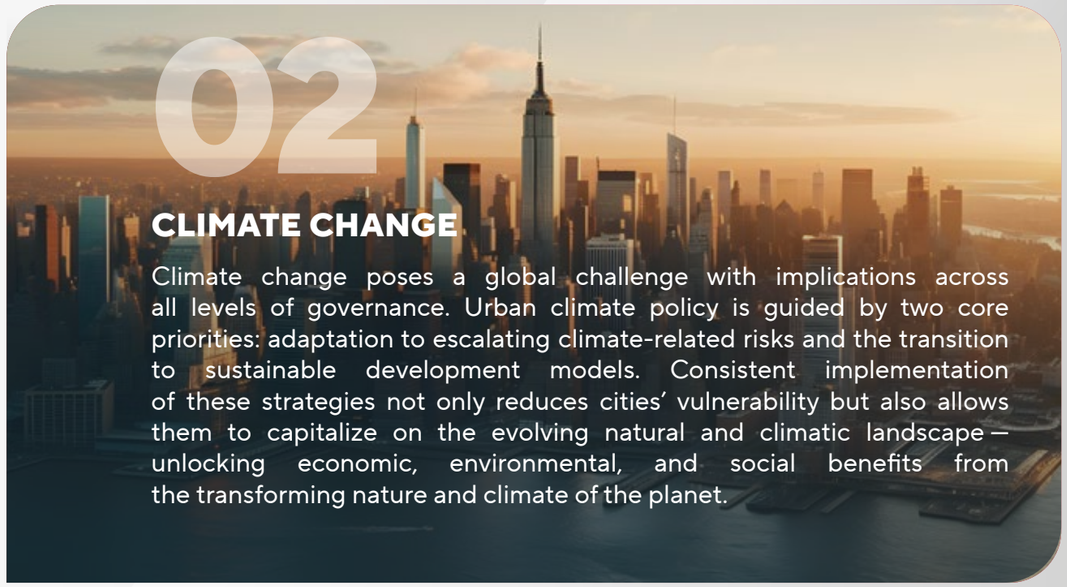
TRENDS

The trends identified through expert consultations are organized into four overarching categories, each representing a fundamental driver of structural transformation in today's megacities. These drivers influence specific domains — such as the economy, infrastructure, social dynamics, and governance — while also setting off a cascade of interconnected changes that together define the emerging urban development landscape.



01 DEMOGRAPHICS

Shifts in population size, structure, and mobility are having an increasingly profound impact on the socio-economic dynamics of cities. Trends such as population growth or decline, aging, changing household structures, and rising levels of both internal and international migration are reshaping the demand for labor, housing, social services, and infrastructure. In response, urban administrations are being called upon to rethink their approaches to spatial planning, social policy, and service delivery — while also strengthening the adaptability and resilience of urban governance institutions.



02 CLIMATE CHANGE

Climate change poses a global challenge with implications across all levels of governance. Urban climate policy is guided by two core priorities: adaptation to escalating climate-related risks and the transition to sustainable development models. Consistent implementation of these strategies not only reduces cities' vulnerability but also allows them to capitalize on the evolving natural and climatic landscape — unlocking economic, environmental, and social benefits from the transforming nature and climate of the planet.

03 TECHNOLOGY ADVANCEMENT

Rapid adoption of innovative solutions and technologies is catalyzing transformation across critical dimensions of urban development — from economy and social infrastructure to labor markets and governance. While technological progress enhances the speed, efficiency, and responsiveness of urban systems, it also introduces new challenges, compelling cities to adapt their environments and policy frameworks to a constantly evolving set of conditions.

04 EVOLUTION OF SOCIETAL VALUES

Cities have long functioned as incubators and engines of social innovation — fostering new ideas, modes of interaction, and civic practices. Today, under the influence of global megatrends, urban populations are undergoing shifts in values and worldviews, which in turn give rise to new socio-cultural, environmental, and economic expectations regarding urban environment and the systems that govern it.

DEMOGRAPHICS

01

TRENDS

1. **Population Aging**
   A growing "grey burden" or a driver of the "silver economy"?
2. **Single-Person Households**
   An economic driver or a factor of social fragmentation?
3. **Ongoing Urbanization**
   Managed development or uncontrolled sprawl?
4. **Urban Migration**
   A source of tension or a resource for development?

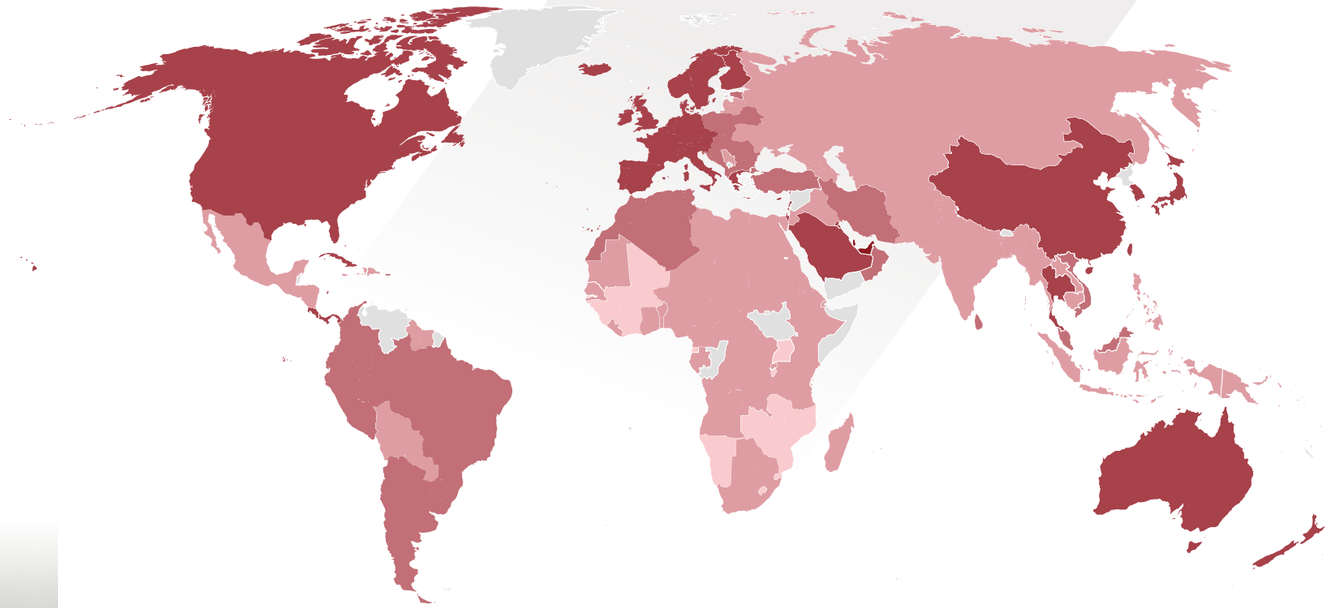
TREND 1

POPULATION AGING. A GROWING "GREY BURDEN" OR A DRIVER OF THE "SILVER ECONOMY"?

An increasing number of countries are witnessing a growing share of older adults in their population — driven by declining birth rates and rising life expectancy. In 2020, Japan was the only country where people aged 65 and older accounted for at least one-quarter of the total population. By 2040, the figure is projected to reach 46 countries [1].

According to the United Nations, people aged 65 and older accounted for 10% of the global population in 2023, up from 7% in 2000. This share is projected to increase to 14% by 2040

COUNTRIES BY THE SHARE OF ELDERLY POPULATION BY 2040



Source: Oxford Economics

Group	Share of the elderly population
1	0–9%
2	11–19%
3	20–24%
4	25–39%
5	40–55%

The growth rate of the oldest age group (aged 85 and over) will be even higher: by 2040, the number of people in this category is expected to more than double, with their share of the global population exceeding 1.6% — up from 0.9% in 2023 and less than 0.5% in 2000 [2].

As population aging unfolds alongside ongoing urbanization, the impacts of demographic change will be felt most acutely in cities. In the mid-2010s, more than 500 million people aged 65 and older were living in urban areas [3], by 2050, this number is projected to exceed 900 million (an increase of over 80%) [4]. Such a significant shift in the age structure will have profound implications for urban economies, compelling city administrations to confront new and complex challenges.

In the mid-2010s, more than 500 million people aged 65 and older lived in urban areas; by 2050, this number is projected to exceed 900 million

Growing demographic burden

One of the most pressing challenges linked to population aging is the growing demographic pressure on the working-age population. In OECD countries, the old-age dependency ratio has increased by nearly 50% over the past two decades: in 2003, there were 20 people aged 65 and older for every 100 people aged 15 to 64; by 2023, this number had risen to 29 [2]. In major cities of developed countries — such as Tokyo, Berlin, Hamburg, and Rome — the ratio now exceeds 30 older adults per 100 working-age residents [5].

As highlighted by World Bank research, one of the key challenges for cities facing high demographic pressure is the risk of slower economic growth [6]. This stems from a declining share of working-age individuals — who typically work longer hours and exhibit higher labor productivity than older adults. Labor shortages not only constrain economic growth by driving up recruitment and retention costs for businesses, but also reduce the effectiveness of municipal services. For instance, a 2023 report by the New York City Mayor's Office found that 9 out of the 15 city agencies with the highest vacancy rates failed to meet their performance targets. The staffing shortfall affected nearly all areas of urban service delivery — from social assistance programs to the upkeep of public spaces [7].

Nevertheless, as emphasized by interviewed experts, the negative impacts of demographic pressure can be significantly mitigated through productivity gains enabled by the adoption of new technologies. Wider integration of digital solutions has the potential to boost annual productivity growth in advanced economies by an estimated 0.5% to 1% [8].

In this context, it is becoming increasingly important for national and municipal authorities to launch programs aimed at developing skilled technological workforce, as well as to encourage business investment in the development and integration of new technologies, such as big data analytics, into their operations.

> "Assuming annual labor productivity growth of 1%, the level of demographic dependency on the economically active population in Russia by 2050 will not exceed that of 2020"
>
> **Alexander Shirov,**
> **Institute of Economic Forecasting,**
> **Russian Academy of Sciences**

Rising Costs of Healthcare and Pension Expenditures

Another challenge associated with the rising demographic burden is the increasing pressure on budgets at all levels, driven by the need to allocate a growing share of resources to sustain pension systems, healthcare, and social support services.

By 2040, average public pension spending across OECD countries is projected to increase from the current 8.9% to

10.2% of GDP, with this upward trajectory expected to persist beyond that horizon [9]

This will primarily impact national pension systems; however, municipal administrations with pension obligations at the local level may also face financial strain. For example, in the ten largest U.S. metropolitan areas, expenditures on pension programs for municipal employees increased by at least 15% between 2011 and 2021, and in some cases — by more than 200% [10].

As demand for healthcare services continues to grow, cities will face rising healthcare expenditures. Maintaining the health of older adults is, on average, more costly than for other age groups, as it often requires more complex and prolonged treatment. For example, in Beijing, per capita healthcare costs covered by the insurance system for individuals aged 65 and older are nearly twice as high as those for the 25 — 59 age group [11].

Technologies for Elderly Care

As with the labor market, technology can enhance the efficiency of healthcare and social services while helping to reduce costs by preventing life-threatening situations. For example, remote monitoring devices enable real-time tracking of older adults' health conditions and allow for rapid response in the event of health deterioration or accidents.

CASE STUDY

Singapore

In Singapore, the Semas remote home monitoring system has been introduced to support older adults. The system uses motion sensors to track residents' typical movement patterns and sends alerts — via alarms and text messages — to caregivers if irregularities are detected, such as prolonged periods of inactivity [12].

As smart devices become more widely adopted, digital healthcare ecosystems are playing an increasingly critical role. These platforms allow real-time transmission of health data to medical and social service providers, enabling coordinated responses. This integration helps doctors and social workers take timely preventive action and, when needed, involve additional support — such as a social worker or psychologist.

> "In megacities, where people often remain invisible to one another, the role of social workers and monitoring technologies becomes increasingly important. This is less about providing specific types of assistance and more about ongoing observation of older adults. In such contexts, the integration between medical and social services is absolutely critical"
>
> **Oksana Sinyavskaya,**
> HSE University

Development of Gerontological Care

Older adults are more likely to experience overprescription of medications, largely due to high rates of polymorbidity — the presence of multiple concurrent health conditions [13]. Taking numerous drugs prescribed by different specialists without proper coordination places additional strain on the body and can worsen a patient's condition.

Experts interviewed for this study emphasize that addressing this issue requires the development of gerontology as a distinct medical specialty and improved access to geriatric care. This would enable a more comprehensive and coordinated approach to treating older adults.

Gerontology is the scientific study of the biological, psychological, and social processes of aging in living organisms, including humans [14]

At present, the ratio of geriatric specialists to the elderly population (aged 80 and over) varies significantly across countries — from one specialist per 450 people in Austria to one per 25 000 in Türkiye [15].

> "The development of gerontology as a medical specialty within municipal public clinics is set to become a key priority over the next 10 to 15 years"
>
> **Oksana Sinyavskaya,**
> HSE University

The shortage is observed not only among gerontologists, but also among social service personnel in the field of care for the elderly. Experts note two potential approaches to overcoming the shortage of personnel in this area: attracting migrants and robotization. As the number of people employed in the industry grows, the requirements for the qualifications of workers and their skills in providing assistance to the elderly will increase. One of the promising tools for quality control of services is certification programs for private caregivers, which may include a system of personnel training at the city level.

CASE STUDY

Okayama, Japan

Since 2013, the authorities of Okayama, Japan, have been implementing a program to provide modern elderly care equipment for rent. This includes portable GPS trackers embedded in soft toys and interactive "mental robots" designed for communication and engagement. As part of the initiative, equipment manufacturers offer residents rental access to specialized devices at just 10% of the full cost, with the remaining 90% subsidized by the government. The program is designed to both support older adults and stimulate small and medium-sized enterprises involved in the development and production of care technologies [16].

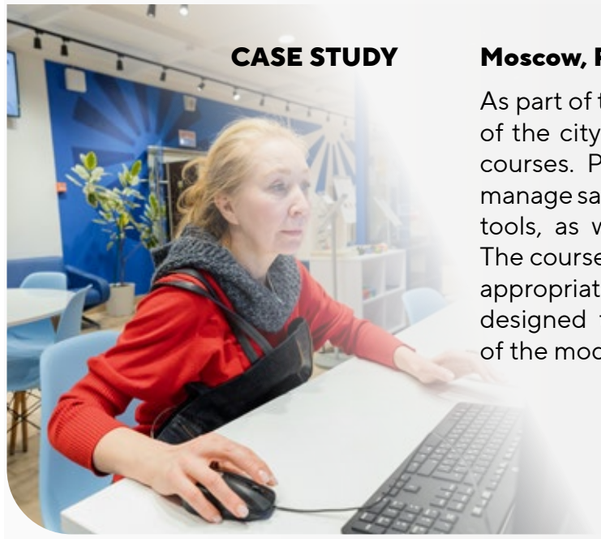
CASE STUDY

Portland, USA

In the United States, the American Caregiver Association serves as a national body responsible for the certification of caregiving professionals. It offers specialized courses and examinations for caregivers, enabling anyone to become a certified care provider or to acquire the necessary skills to care for an elderly family member [17].

Financial Literacy in a Big City

In older age, the risk of falling victim to fraud increases — particularly for those living alone or without support from family members. To address this, municipal authorities are launching financial literacy and safety training programs for elderly residents to raise awareness of common scams and equip them with tools to protect themselves.



CASE STUDY

Moscow, Russia

As part of the Moscow Longevity program, older residents of the city have the opportunity to take financial literacy courses. Participants are taught how to plan a budget, manage savings, use banking services and modern financial tools, as well as the fundamentals of financial security. The course material is presented in an accessible and age-appropriate format and includes practical case studies designed to help seniors navigate the digital economy of the modern city with greater confidence.

CASE STUDY

Valencia, Spain

In 2022, the City Council of Valencia, the University of Valencia, and Santander Bank signed a cooperation agreement to launch the Financial Education for Older Adults program. The initiative aims to enhance financial literacy among seniors by teaching them how to use digital technologies, including the basics of digital identification and cybersecurity [18].

> ”The main issue with financial literacy programs, both globally and in Russia, is that they are focused on the needs of residents in small and mid-sized cities. There is a notable lack of a well-structured initiative tailored to the realities of financial literacy in major urban centers. The financial education agenda in large cities differs substantially from that in towns with populations of 100,000 to 500,000, and even more so from rural areas. Urban residents face distinct financial needs and challenges.
>
> In the case of Moscow, for instance, a significant portion of the senior population consists of rent-receiving pensioners, individuals who are relatively affluent. Consequently, financial literacy programs designed for the average Russian retiree are often ill-suited to the context of Moscow. Another defining feature of the city is its high level of technological penetration, which brings its own set of challenges, particularly in the use of modern digital payment systems”
>
> **Sergey Trukhachev,**
> Lomonosov Moscow State University

Urban Environment Adaptation

Globally, there is a growing number of initiatives aimed at adapting urban environments to meet the needs of older adults. These efforts include the introduction of specialized traffic regulations, such as reduced speed zones and extended pedestrian signal times, the redesign of public spaces for greater accessibility, and the development of age-friendly neighborhoods equipped with essential infrastructure tailored to the daily needs of senior residents.

CASE STUDY

London, UK

The Quietways project in London is a network of dedicated walking and cycling routes laid out along low-traffic streets, as well as through parks and along waterways. These routes are designed to encourage older adults to walk and cycle more frequently, while avoiding the stress associated with navigating the noise and congestion of a large metropolitan area [19].

CASE STUDY

Portland, USA

The Portland Memory Garden is a public space specifically designed to meet the needs of individuals with memory impairments. Seasonal plants and flowers are carefully selected to stimulate the senses and evoke memories. A circular walking path, visual cues, fencing, and drinking fountains provide a safe and comfortable environment for people with memory loss and their families. One of only eight such gardens in the United States, the project was developed through the collaboration of several organizations, including the local chapter of the Alzheimer’s Association, the American Society of Landscape Architects, the University of Portland’s School of Urban Studies, and the city’s Parks and Recreation Department [20].

CASE STUDY

Kashiwa, Japan

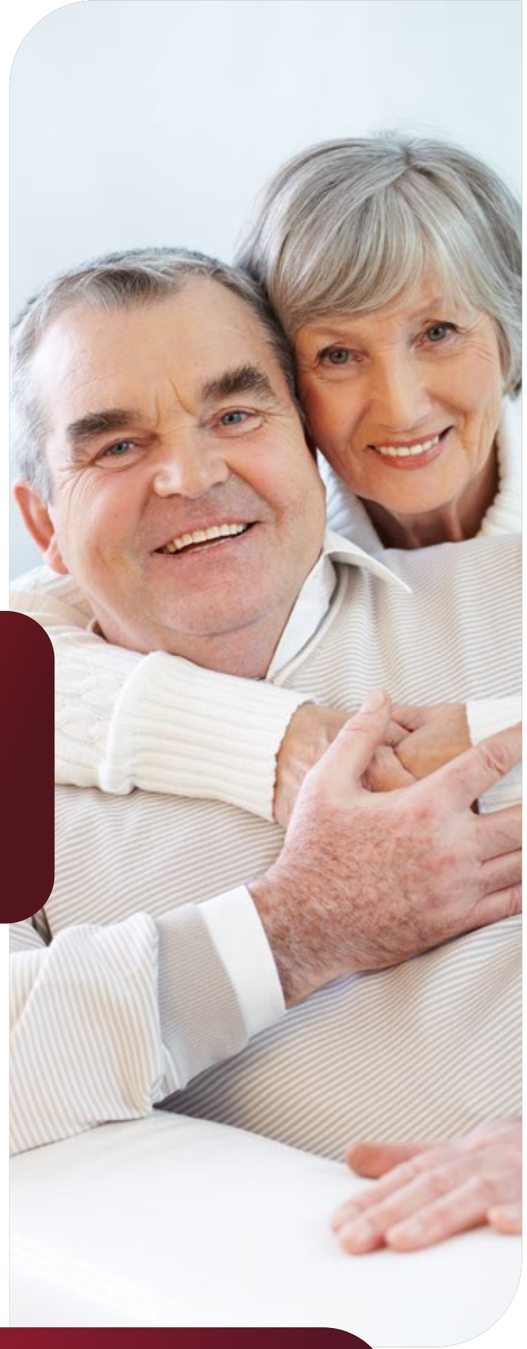
The Toshikidai Housing Complex in Kashiwa, Japan, was originally developed in the 1960s. More recently, the municipal government undertook a large-scale renovation of the district to adapt it to the needs of an aging population [19]. The project aims to create an environment where older adults can receive medical and nursing care at home, participate in community life, and remain active. Based on research and consultations with local residents, the UR company (formerly the Japan Housing Corporation) reimagined the use of space and, in 2014, opened a six-story building. The second to fourth floors house residents requiring care, while the fifth and sixth floors accommodate those who are able to live independently. The ground floor hosts a variety of medical and nursing care facilities serving the local population, and an adjacent open courtyard connects directly to a public park, fostering intergenerational interaction and supporting a state-backed model of community-based care [21].

The "Silver Economy"

Population aging also brings certain economic benefits. As healthy life expectancy increases, older adults remain economically active for longer, driving demand for goods and services, and contributing to value creation through employment and socially beneficial activities.

Globally, there is a rise of growing industry that specifically targets the needs and preferences of older individuals — commonly referred to as the silver economy.

The silver economy is an aggregate of all economic activities aimed at meeting the needs of older adults, including both the goods and services they consume directly and the multiplier effects generated by this spending



The age threshold for inclusion in the silver economy is not defined by a single fixed value, as it largely depends on the specific research context. For example, when examining various health-related factors, patterns of illness, or the statutory retirement age in a given country, different age groups may be used. As a result, the starting point for inclusion can range from 50 to 65 years of age.

In 2015, the total contribution of the silver economy to the GDP of EU countries amounted to €4.2 trillion (29% of the region's GDP)

The silver economy is experiencing steady growth, particularly in "aging" markets of North America, Europe, and several Asian countries (most notably China and Japan) [22].

In 2015, the total contribution of the silver economy to the gross domestic product of the European Union (EU) reached €4.2 trillion, accounting for 29% of the EU's GDP. Of this amount, €1.7 trillion came from direct effects, €1.5 trillion from indirect effects, and €1 trillion from induced effects, referring to the additional spending by employees working in silver economy-related sectors [23]. That same year, the sector supported a total of 78 million jobs across the EU — approximately 35% of total employment — with 30 million of those jobs resulting from direct economic activity.

The increasing aggregate purchasing power of older adults (driven by the expanding size of this consumer segment) is fueling demand for new products and services, particularly in developed economies. This, in turn, is stimulating innovation and growth across related industries. Moreover, today's retirees are technologically literate and increasingly willing to adopt modern tools and solutions to enhance their quality of life. This includes the application of technology in the following areas:

Healthcare: telemedicine, anti-aging therapy, cosmetic surgery, hormone therapy, and biotechnology [24]; wearable devices such as fitness bands and various health trackers, as well as mobile health services [23]

Home improvements: smart home solutions featuring voice control and security functions, along with services that adapt living spaces to the needs of older adults, such as the installation of support rails in bathrooms or stair lifts for wheelchairs

Education: continued learning enhances the employability of older adults by equipping them with the skills relevant to today's labor market

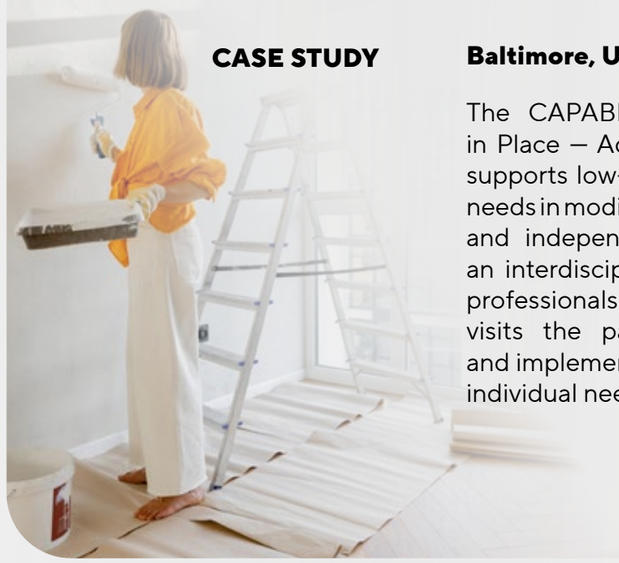
Higher education opportunities for seniors are characterized by flexible learning formats, and an increasing number of countries are integrating such programs into university systems. For example, several universities in Germany offer dedicated academic tracks for older learners (Seniorenstudium)

Tourism: mobile apps for booking flights, hotels, and guided tours [25], including platforms designed to accommodate the specific preferences and needs of older travelers

CASE STUDY

USA

The U.S.-based nonprofit organization Road Scholar specializes in lifelong learning by combining educational services with travel experiences. Its programs — lectures, guided tours, and educational trips — are primarily designed for individuals aged 50 and older. Road Scholar offers participants opportunities to explore cities, delve into art history, and visit cultural and historical landmarks [26].



CASE STUDY

Baltimore, USA

The CAPABLE program (Community Aging in Place — Advancing Better Living for Elders) supports low-income older adults with specific needs in modifying their homes to improve safety and independence. As part of the program, an interdisciplinary team, including healthcare professionals and home repair specialists, visits the participant's residence to assess and implement adjustments that align with their individual needs.

The Labor Market for the Seniors

Elderly citizens are not only becoming more active consumers but also making an increasingly significant contribution to the economy through continued employment. According to the projections by the International Labour Organization, by 2030, older individuals are expected to account for 25% of the total labor force in high-income countries, 18% in middle-income countries, and 12% in low-income countries [27].

> "Older adults (or those who may face age-related physical limitations in performing certain tasks) should be recognized as carriers of valuable experiences and skills from the past. They need to be connected to the economy and younger generations — with the people of today and tomorrow. One effective approach to integration is engaging older individuals in socially meaningful work, helping them remain part of society and feel a sense of purpose and relevance"
>
> **Alexey Repik,**
> "Delovaya Rossiya" (Business Russia) Association

City administrations face the challenge of creating conditions that support the continued labor force participation of older adults. Establishing such conditions is one of the eight core components of the Age-Friendly Cities framework promoted by the World Health Organization [28].

This framework acknowledges the importance of initiatives aimed at increasing employment among older people, as well as measures to encourage employers to hire them. It also emphasizes the need to remove physical and skills-related barriers that limit older adults' access to job opportunities.

> "In the past, an employee's professional value would drop sharply after the age of 45, but this is starting to change. We're entering a time when 40 will become the new 25, and 50 the new 30. Companies will increasingly be open to hiring people over 50, even for demanding intellectual roles, including creative industries"
>
> **Evgeniy Volnov,**
> HH Ventures

> ”Sometimes it is actually more effective to work with middle-aged or pre-retirement individuals than with younger people — after all, everyone is already competing for young talent. Greater attention needs to be paid to the retraining and upskilling of older workers, and this is where cities can play an important role. Employers are often reluctant to invest in such training, fearing that the employee may leave after resources have been spent on their development”
>
> **Anton Tabakh,**
> Expert RA Rating Agency

CASE STUDY

USA

To address workforce challenges, cities can collaborate with national-level institutions. One such initiative is the Good Jobs, Great Cities Academy, launched by the National League of Cities in partnership with the U.S. Department of Labor. The program is aimed at supporting older adults, women, and other population groups in acquiring the skills needed to access employment in infrastructure, clean energy, and manufacturing sectors [29, 30].

Older adults possess a unique asset: a wealth of experience accumulated over a lifetime. Motivated by the desire for financial independence, they are increasingly engaging in entrepreneurial activities: starting small businesses, offering consulting services, and contributing to the development of innovative products tailored to their age group. This generation often has both the expertise to provide professional guidance within their fields, and the time and opportunity to turn personal interests and hobbies into viable sources of income [24].

CASE STUDY

Hyderabad, India

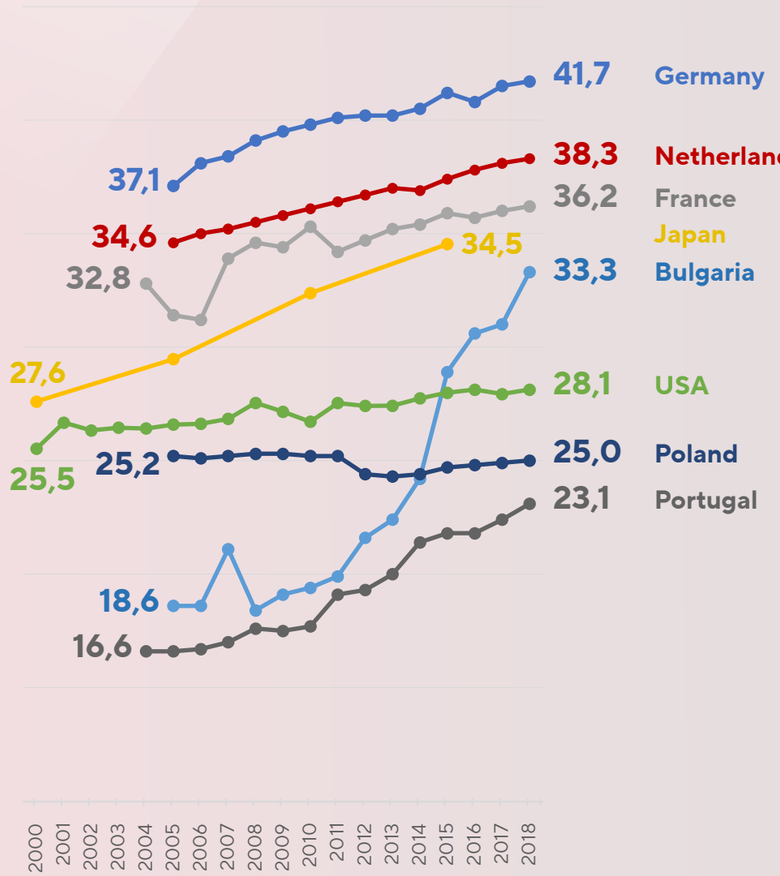
Senior Experts is a platform established in 2021 in Hyderabad that enables older adults (aged 60 and above) to remain actively engaged in professional and expert domains. Through the program, small and medium-sized enterprises as well as startups can engage senior professionals as consultants [31]. Services in human resources, consulting, accounting, and engineering are in particularly high demand.

TREND 2

SINGLE-PERSON HOUSEHOLDS. AN ECONOMIC DRIVER OR A FACTOR OF SOCIAL FRAGMENTATION?

In recent decades, there has been a steady increase in the share of single-person households across most developed countries and several developing ones [32]. This trend is especially pronounced in major cities: in Moscow, Berlin, and Paris, single-person households make up over 50% of all households — exceeding national averages by 8 to 18 percentage points [33, 34, 35].

SHARE OF SINGLE-PERSON HOUSEHOLDS, 2000-2018 (%)



Source: Our World in Data. Percentage of one-person households, 2000 to 2018

Single-Person Household Consumption Patterns

Evidence suggests that the growing share of people living alone contributes to urban economic growth. This trend is largely driven by the fact that single-person households are no longer predominantly composed of elder adults, as was often the case several decades ago. Increasingly, living alone is a lifestyle choice made by economically active individuals with higher education and stable employment [36].

Solo living also influences consumption patterns. These consumers tend to prefer smaller package sizes, spend more on convenient and personalized products, and more frequently use delivery services and offerings designed for individual comfort. As a result, markets that have traditionally focused on family-oriented consumption are being forced to adapt, developing goods and services tailored to single-person households [37].

CASE STUDY

Nakanojo, Japan

Kashiwaya Ryokan, located in Nakanojo (Gunma Prefecture), is a traditional Japanese inn that caters specifically to solo travelers [38]. The ryokan offers special packages and amenities for individuals traveling alone, including rooms without a single occupancy surcharge, flexible dining options (such as the possibility of enjoying dinner in a private setting), and three private onsen baths that can be reserved without the need to share with other guests. The staff also place particular emphasis on the emotional well-being of solo guests, fostering a warm and informal atmosphere throughout the stay.

CASE STUDY

Japan

The Japanese travel company Client Partners offers a range of services tailored to solo travelers [39]. Clients can request personalized travel companionship, which involves hiring a Japanese-speaking ”friend” to accompany them during their trip. This companion helps with navigation, translation, and provides a local perspective — allowing visitors to experience the city through the eyes of a resident.

People living alone are more likely to spend on services that substitute for traditional social connections. These include subscriptions to entertainment platforms, ready-made meal deliveries, paid hobby clubs, and virtual communities. Companies are increasingly capitalizing on this trend by developing products that foster a sense of emotional engagement and connectedness [40]. For example, Microsoft’s Xiaoice chatbot, developed for Asian markets and used by over 660 million people, leverages artificial intelligence to engage in emotionally nuanced conversations, helping users cope with feelings of loneliness. Similarly, the companion robot LOVOT — designed to mimic human body temperature and seek physical affection through hugs — addresses the need for tactile connection. During the pandemic, demand for LOVOT increased fifteenfold [41].

Solo Living vs. Loneliness

A growing social phenomenon in major cities, which is indirectly linked to the rise in single-person households, is the issue of loneliness. Surveys conducted in 2022 revealed that in the EU countries, one in eight people feels lonely most of the time, while one in three experiences loneliness at least some of the time [42].

Unlike solo living, rising levels of loneliness have a negative impact on the economy: individuals who feel isolated tend to exhibit lower productivity and reduced engagement in economic activity [37]. In megacities, the problem can be further exacerbated, as urban environments are generally marked by lower levels of social cohesion compared to rural areas [43].

Research shows: being in crowded public spaces, typical of large cities, is often associated with a heightened sense of loneliness [44]

Against the backdrop of the rising global average age, loneliness is becoming an increasingly pressing issue among older adults.

Meaningful human interaction is especially important for older adults, and one of the most effective responses is to involve older individuals in appropriate forms of employment and social projects. Such participation not only reinforces their sense of purpose and self-worth, but also enables them to make a tangible contribution to the social development.

CASE STUDY

London, UK

In London, local authorities with the help of volunteers have established community support groups for socially isolated individuals, including older adults. Municipal staff and volunteers organize activities aimed at strengthening social connections, such as creative workshops, group walks, lunch clubs, and training sessions focused on developing new skills, including digital literacy [47].

CASE STUDY

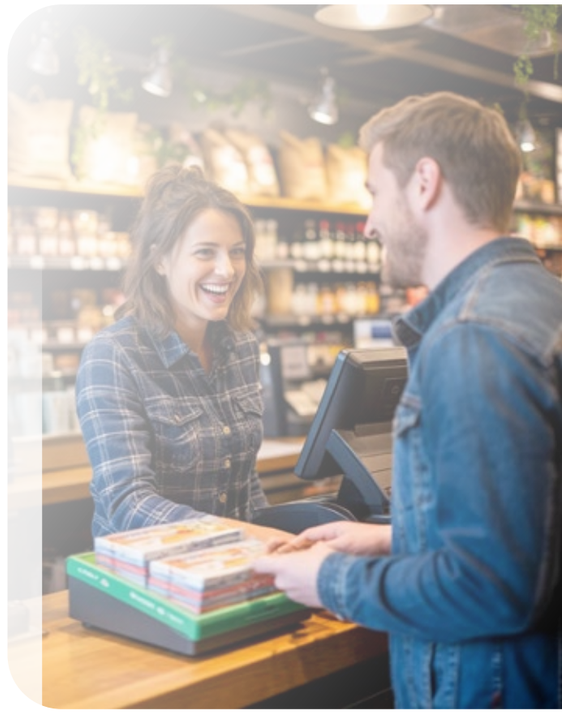
Salem, USA

In Salem, Massachusetts (USA), the local government has introduced Happy to Chat benches as part of the city's efforts to reduce social isolation. Small signs in English and Spanish invite passersby to take a seat if they are open to conversations with fellow residents [46]. Similar programs are in place in Berlin (Germany) and Gothenburg (Sweden).

CASE STUDY

Vlijmen, Netherlands

The Dutch supermarket chain Jumbo has introduced a special checkout lane called Kletskassa, which translates as "chat checkout", allowing customers to enjoy unhurried conversations with cashiers [45]. These slow lanes are part of a broader national initiative called One Against Loneliness, launched by the Dutch government. The first city to implement the chat checkouts was Vlijmen. As part of the initiative, communities of residents and organizations are being formed at both national and local levels to identify individuals experiencing loneliness and support their social inclusion.



CASE STUDY

Moscow, Russia

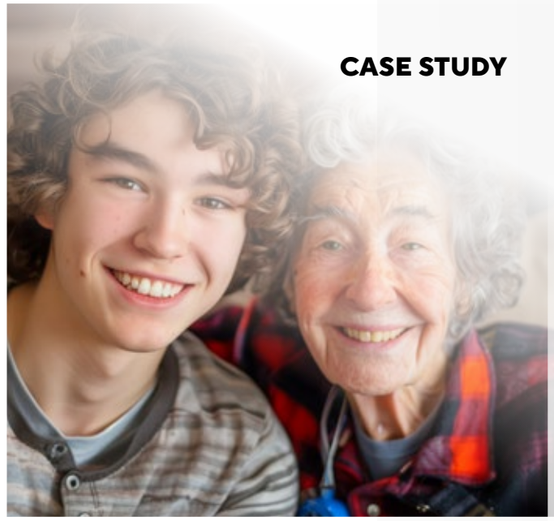
The Moscow regional volunteer center Young at Heart, established under the Moscow Volunteer Initiative, plays a key role in promoting silver volunteering. The center provides support and training for older volunteers, offering educational programs and opportunities for active engagement. In return, silver volunteers contribute to the city by participating in public events, supporting environmental and social campaigns, and organizing tours and creative workshops.

For many older adults, volunteering serves as a way to explore new interests, build social connections, and, most importantly, help others. By drawing on their experience, knowledge, and organizational skills, silver volunteers make meaningful contributions to the community while leading active, fulfilling, and socially connected lives [48].

CASE STUDY

Moscow, Russia

The Moscow Longevity program is aimed at improving the quality of life for older adults in the city. It encompasses a wide range of initiatives designed to help seniors remain active, healthy, and socially engaged. One of the program's core areas focuses on physical activity, offering classes such as dance, yoga, and fitness tailored to older participants. Skill development courses are also being actively introduced, including training in computer literacy and vocal performance. A particularly noteworthy initiative within the program is a series of virtual excursions that allow older residents to explore other countries from the comfort of their own homes. All activities are free of charge and open to any Moscow resident of retirement age [49].



CASE STUDY

Deventer, Netherlands

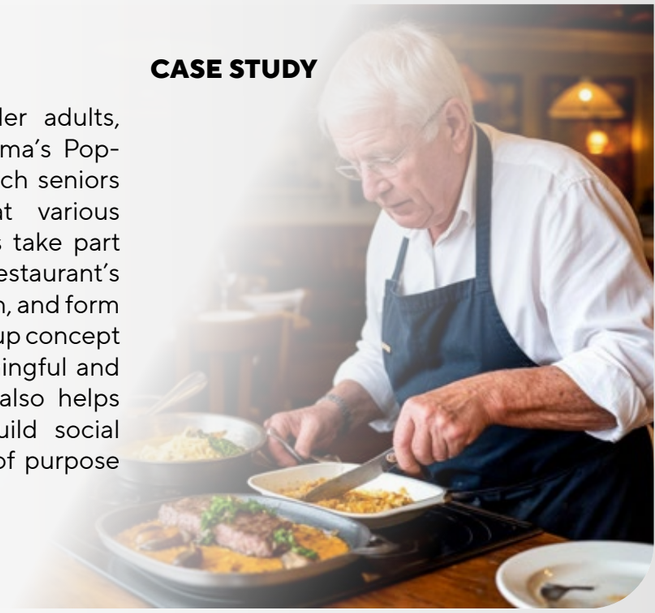
In the Netherlands, many students face challenges in securing rental housing near their universities due to a nationwide housing shortage and high rental costs. At the same time, older adults often suffer from social isolation, which negatively affects their mental and physical well-being. To address both issues, the Humanitas Retirement Village in the town of Deventer launched a unique initiative: students are offered free accommodation in exchange for providing 30 hours of assistance to elderly residents each month. This support may include helping seniors use social media and email, sharing hobbies, or simply spending time together in friendly conversations.

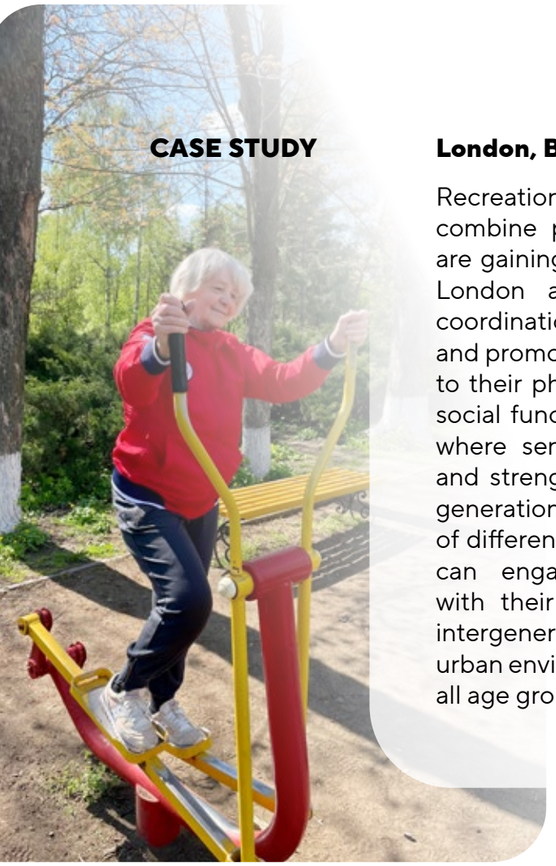
This approach not only improves the quality of life for older residents but also fosters a unique intergenerational environment in which young and older people enrich one another through shared experience, knowledge, and meaningful human connection [50].

Rotterdam, Netherlands

To adress social isolation among older adults, the city of Rotterdam launched the Oma's Pop-up ("Grandma's Dinner") project, in which seniors prepare traditional Dutch dishes at various restaurants across the city. Participants take part in a cooking workshop led by the host restaurant's professional chef, engage in conversation, and form new social connections. The Oma's Pop-up concept not only offers older individuals a meaningful and enjoyable way to spend the day, but also helps them feel part of a community, rebuild social ties, and experience a renewed sense of purpose and belonging [51].

CASE STUDY





CASE STUDY

London, Bangkok

Recreational spaces known as ”senior playgrounds”, which combine play elements and outdoor fitness equipment, are gaining popularity in cities around the world, including London and Bangkok. These facilities help improve coordination and balance, support weight management, and promote independence among older adults. In addition to their physical benefits, such spaces serve an important social function: they provide a setting for communication, where seniors can meet new people, build friendships, and strengthen social ties. Particularly valuable are multi-generational recreational areas designed for people of different ages — for example, places where grandparents can engage in physical activity and play together with their grandchildren. This approach helps reinforce intergenerational connections, fosters a more inclusive urban environment, and supports a high quality of life across all age groups [52].

Digital tools also play a role in alleviating the challenges of loneliness and social isolation by enabling social engagement through neighborhood networks and group chats. These platforms support the creation of local community groups that facilitate mutual assistance and shared activities such as organizing neighborhood lunches or local celebrations. Within such groups, older adults can receive help with everyday tasks, enjoy companionship during walks, or be accompanied to medical appointments.

CASE STUDY

Ljubljana, Prague, Vienna

The European project called SEE U supports older adults in developing digital skills by involving them in the creation of interactive tours within their local neighborhoods. During workshop sessions, participants learn how to use various digital tools and receive assistance in designing digital walking routes based on shared interests such as favorite places, scenic views, or informational content about historic buildings and public spaces. The project has already been launched in Ljubljana, Vienna, and Prague, and is open to older adults regardless of their level of digital literacy [53].

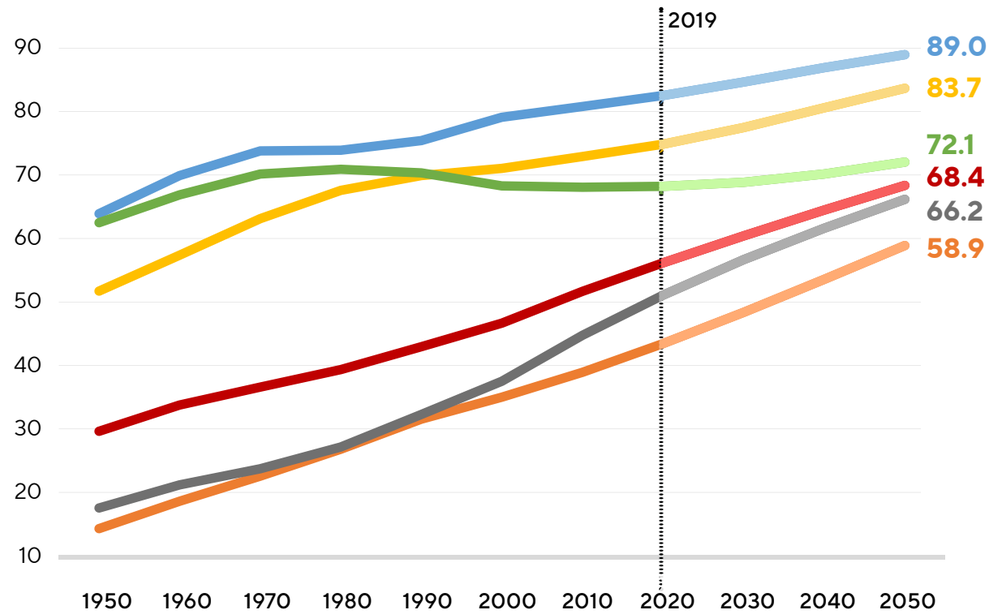
TREND 3

ONGOING URBANIZATION. MANAGED DEVELOPMENT OR UNCONTROLLED SPRAWL?

The world is undergoing rapid urbanization and metropolitan expansion. Between 2000 and 2020, the share of the global population living in urban areas rose from 46.7% to 56.2% [54], and by 2050 it is projected to reach 70% [55]. According to UN projections, this growth is occurring not only in megacities — with the number of urban agglomerations exceeding 10 million expected to rise from 33 in 2018 to 43 by 2030 — but also in smaller cities. Urban areas with fewer than 1 million residents, particularly in Asia and Africa, are currently among the fastest-growing [56].

Cities are powerful engines of economic growth: while housing 56% of the world's population, they generate 80% of the global gross domestic product [55]

SHARE OF URBAN POPULATION BY CONTINENT (%)



Actual data (1950-2018), projected data (2019-2050)
Source: World Urbanization Prospects: The 2018 Revision. United Nations, Department of Economic and Social Affairs, Population Division (2018)

Cities attract people by offering economic opportunities, access to labor markets, social services, culture, and education. At the same time, urbanization places growing demands on the rapid development of all types of infrastructure, the provision of affordable housing, and the creation of jobs.

When public authorities fail to effectively address these challenges, it often leads to a process of spatial urban expansion that unfolds in an unregulated and uncontrolled manner. This phenomenon is observed not only in developing countries, where limited financial resources constrain the ability to pursue planned urban growth, but also in advanced economies, where factors such as rising housing costs in city centers [57] and the growing popularity of remote work — accelerated significantly during the COVID-19 pandemic [58] — contribute to outward urban sprawl.

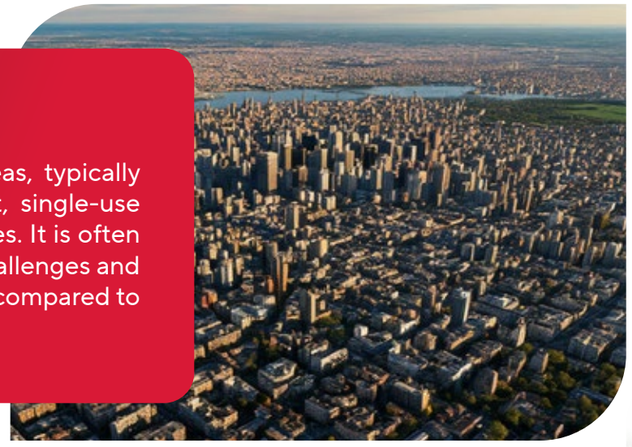
Urban Sprawl: Drivers and Consequences

The expansion rate of urbanized areas exceeds global population growth by 50%

Between 2023 and 2030, the total area of built-up land globally is projected to increase by 1.2 million square kilometers [58]. For comparison, the total built-up area of all EU countries in 2015 amounted to 180,000 square kilometers [59]. This unregulated expansion of urban land has come to be known as urban sprawl.

Urban sprawl

is the rapid outward expansion of city areas, typically characterized by low-density development, single-use zoning, and a reliance on private automobiles. It is often criticized for exacerbating transportation challenges and for the inefficient use of land and resources compared to compact, high-density urban development



The issue of uncontrolled urban expansion is relevant to both the Global South and the Global North, although the drivers behind it may differ. In developing countries, the primary factor is often population influx, while in developed economies, the key contributor is disproportionate rise in housing prices in urban cores relative to income growth. For example, in the United States, the Price-to-Income Ratio increased from 2.9 in 2000 to 4.6 in 2022, exceeding 11 in some cities [60]. Similar trends can be observed in the United Kingdom [61], Australia [62], and other OECD countries [63]. Historically, suburbanization has been driven by the desire for better housing conditions and the aspiration to live in private homes — a factor that remains relevant today. Experts note a growing interest in individual housing construction, supported by a surge in developer-led projects and the introduction of specialized mortgage programs. However, the development of this segment also faces a range of challenges, including a shortage of professional management companies, inadequate infrastructure in low-density residential settlements, and high maintenance costs associated with private housing.

One of the negative consequences of urban sprawl, according to the interviewed experts, is the increasing distance residents must travel to access employment, social, commercial, and service centers. This can lead to reduced accessibility of urban services and isolation of certain neighborhoods. A prominent example is Los Angeles, where the metropolitan area historically developed according to a low-density suburban model — resulting in extensive sprawl, transportation challenges, and spatial segregation in parts of the city.

One approach to limiting outward urban expansion is establishment of green belts around the city [64].

CASE STUDY

London, UK

London's Green Belt was first introduced in the city's development plan in 1947 and continues to serve its purpose today — preventing the outward expansion of urbanized areas and encouraging the reuse of previously developed land [65].

CASE STUDY

Milan, Italy

Unlike London, Milan's Green Belt is composed not of forested areas, but primarily of agricultural land. It emerged as a result of the city's evolving food policy and the implementation of the Milan Food Policy program. The core idea of the program is for the city to procure food, such as for public institutions like school cafeterias, directly from local farmers whose operations are located in the peri-urban areas surrounding Milan. This approach reduces transportation costs and harmful emissions, while also ensuring the supply of fresh, locally produced food.

Urban Sprawl in Developing Countries

Unregulated urban expansion in low-income countries poses a significant risk of slum formation — areas marked by substandard housing, inadequate infrastructure, and limited safety. This challenge is further intensified by increasing migration flows into cities [66], as the rapid influx of people from rural areas often exceeds the capacity of formal urban planning systems and the availability of affordable housing.

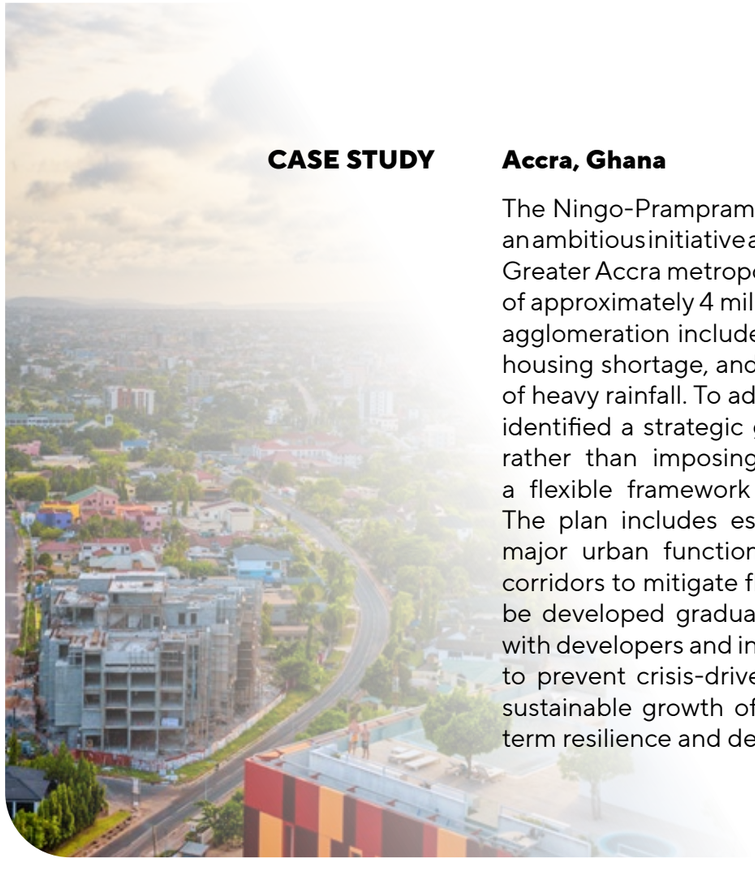
Overall, the share of the urban population living in slums declined from 46% in 1990 to 25% in 2022. However, due to the global population growth, the absolute number of people residing in informal settlements has increased — from 895 million in 2000 to 1.1 billion in 2022, according to the UN-Habitat [67]. The majority of the slum population is concentrated in three regions: East and Southeast Asia (362.6 million people), Sub-Saharan Africa (265.4 million), and Latin America and the Caribbean (93.4 million) [68].

> “Slums are the physical manifestation of the informal economy. In most large urban agglomerations, there is a clear correlation: if one-third of the economy operates within the informal sector, roughly one-third of the population will reside in informal settlements”
>
> Nicholas You,
> Guangzhou Institute for Urban Innovation

A key question raised by researchers studying informal settlements is how cities can shift from partial slum upgrading and practices that inadvertently contribute to their formation, toward a strategic approach that prevents their emergence altogether. Such an approach must involve forecasting and timely planning of urban land use and infrastructure development, the design of financing mechanisms for constructing new urban districts, and the identification of infrastructure solutions that reflect both financial constraints and sustainable development priorities — such as emphasizing decentralized energy systems over more costly centralized infrastructure.

For national governments in countries facing challenges related to urban sprawl, an effective strategy may also involve working with migration source areas. Improving the quality of infrastructure in rural regions can help slow down or even reverse the trend of migration to urban areas.

> “The best-case scenario is to stay ahead of the pace of informalization and carry out preventive action in the city: to define the spatial parameters of urban growth, including whether the city will expand vertically or horizontally, and to update the respective planning documents accordingly. This should be followed by the creation of a financing system to support urbanization, whether through funding the expansion of the street network or the modernization of water supply and other infrastructure to accommodate higher intensity of use”
>
> Enrique Silva,
> Lincoln Institute of Land Policy



CASE STUDY **Accra, Ghana**

The Ningo-Prampram Development Project in Ghana is an ambitious initiative aimed at managing expansion of the Greater Accra metropolitan area, which has a population of approximately 4 million. The key challenges facing the agglomeration include explosive urban sprawl, a severe housing shortage, and frequent flooding during periods of heavy rainfall. To address these issues, the authorities identified a strategic growth area near the capital and, rather than imposing a rigid master plan, proposed a flexible framework to guide organic development. The plan includes essential infrastructure connecting major urban functions, along with designated green corridors to mitigate flood risks. The rest of the area will be developed gradually and adaptively, in partnership with developers and investors. This approach is intended to prevent crisis-driven expansion and to support the sustainable growth of Greater Accra in line with long-term resilience and development goals [69].

Functional Densification of Urban Development

> "Cities that, all else being equal, focus on developing already built-up areas rather than relying on unchecked outward expansion are likely to be more successful"
>
> Ruslan Goncharov,
> HSE University

One of the key mechanisms for addressing urban sprawl is functional densification. This approach focuses on the redevelopment of existing built-up areas within the city's boundaries and the use of underutilized urban land for new construction. Particular emphasis is placed on creating a mixed-use environment: increasingly popular mixed-use developments integrate residential, office, retail, and other functions within a single site or large building.

> "Today, when approving any development project, a significant share of the designed floor area is allocated for commercial use. The European and Asian practice of dedicating around 20% of new developments to non-residential space has become a common trend, whereas just five years ago in Russia, it was still acceptable to plan for only 2% commercial provision. However, there is now a broad consensus that retail and office premises are an essential component of the urban environment"
>
> Leon Pryazhnikov,
> Samolet Group

CASE STUDY

New York, USA

Hudson Yards in New York City is a mixed-use district that illustrates the advantages of integrating various functional spaces within a single urban area. This large-scale redevelopment project of a former industrial zone in Manhattan includes the construction of 1.7 million square meters of residential and commercial space, including affordable housing, along with hotels, shops, restaurants, and cultural venues. Buildings within the district are subject to requirements for greenery and the installation of energy-efficient systems [70].

Managed spatial development of cities is increasingly being implemented through the frameworks of polycentric urban models and the "15-minute city" concept. For example, China adopts polycentricity as a core spatial planning strategy [71], with over 90% of its cities structured around four or more urban centers. In Europe, efforts are more focused on increasing the functional density across urban areas. Since 2016, Paris has been implementing the "15-minute city" initiative. The city government has identified six essential urban functions (housing, employment, education, healthcare, commerce, and recreation) and is working to modernize infrastructure so that residents can access all of them within a short walking or cycling distance from their homes. To support this goal, new cycling infrastructure is being developed, and schoolyards are being repurposed as local public parks in areas lacking green spaces [72].

A polycentric city

is an urban area characterized by the presence of multiple centers, typically serving different functions and organized within a defined hierarchy — for example, with one primary center and several subcenters

Remi Lemoy,
"Monocentric or Polycentric City?
An Empirical Perspective"

The "15-minute city"

is a decentralized model of urban planning in which each neighborhood is designed to include all the essential functions for living and working [73]. The core principle is that residents should be able to reach their workplace and basic urban services, such as shops, schools, healthcare facilities, and leisure areas, within a 15-minute walk or bike ride from their homes

"A comfortable urban environment requires a high density of functions. Even if your neighborhood has excellent environmental conditions, you are unlikely to feel satisfied if the nearest pharmacy is three kilometers away when you urgently need painkillers. At the same time, there is a functional hierarchy based on demand levels. For example, a theater, as a unique service, is not necessarily appropriate or in high demand in every neighborhood. By contrast, grocery stores, which have minimal market areas, can be located almost everywhere. Most large cities exhibit a polycentric structure, characterized by the concentration of functions in specific areas"

Ruslan Goncharov,
HSE University

A high density of urban functions improves the efficiency of public service delivery. In particular, maintaining a consistent standard of access to essential services and emergency response for residents of rural areas or distant suburbs requires significantly higher per capita expenditures compared to providing the same services to people living in more concentrated urban environments.

The potential introduction of a property tax that accounts for population density is aimed at encouraging residence in more compact, densely populated areas. This approach is driven by the fact that infrastructure development and public service provision in such zones are more cost-effective and efficient than in dispersed suburban areas. It also supports sustainable urban development, promotes a fairer distribution of the tax burden, and contributes to improved environmental conditions.

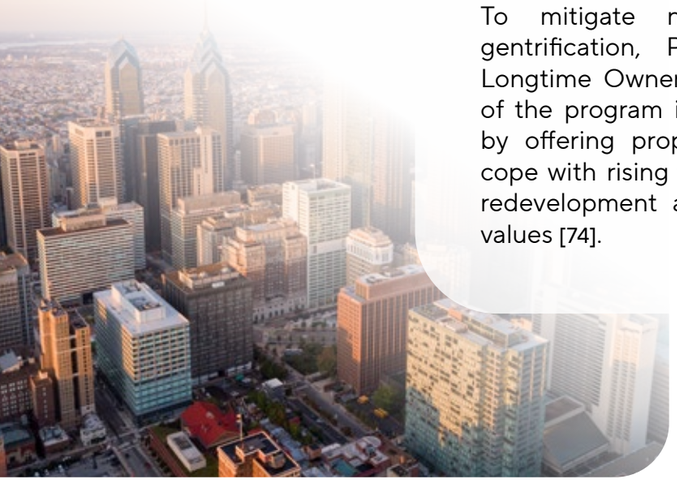
Source: Quanturum. Density tax to replace property tax and end congestion: Future of Cities P5, 2020

Revitalization, or urban redevelopment, refers to the transformation of deteriorated urban areas into renewed, vibrant districts. This process typically involves attracting new residents and investors, upgrading social infrastructure, and creating employment opportunities. However, revitalization is often accompanied by gentrification — a phenomenon that can have adverse effects on long-term residents. Rising housing prices and rental costs, shifts in the social composition, and increases in the cost of goods and services may force residents to relocate. It is therefore essential for authorities to anticipate and effectively manage these risks.

Gentrification

is a process of social and economic transformation in a specific urban area that occurs as a result of reinvestment in neighborhood improvement, redevelopment of existing housing, and construction of new residential stock. This process typically leads to increased attractiveness and elevated status of the area, along with rising property values and service costs due to an influx of more affluent residents

CASE STUDY



Philadelphia, USA

To mitigate negative social consequences of gentrification, Philadelphia has implemented the Longtime Owner Occupants Program. The core idea of the program is to support long-term homeowners by offering property tax relief that helps residents cope with rising tax bills resulting from neighborhood redevelopment and associated increase in property values [74].

Transport System Development

> "The infrastructure of future megacities must be reimagined in terms of what it means to move people, energy, and goods"
>
> Nicholas You,
> Guangzhou Institute for Urban Innovation

Another key strategy for addressing uncontrolled urban sprawl and the resulting issues such as territorial isolation is improving transport accessibility. Prioritizing public transportation, developing multimodal systems, and expanding infrastructure provide residents with a wider range of mobility options and make urban transport more accessible. Importantly, transport planning must consider not only administrative but also functional boundaries of cities to ensure inclusive and efficient connectivity.

Functional city boundaries

are the limits of a city's functional zone, which encompasses both the core urban area and its surrounding agglomeration. These boundaries are typically defined by population density and commuting patterns between residential areas and workplaces [75]

For modern megacities and metropolitan areas, speed of travel and reliability of journey time have become key requirements for transportation systems. In this context, the Mobility as a Service (MaaS) concept is seen as a promising solution. It envisions the creation of fast and predictable multimodal transportation systems accessible through a single digital platform that enables users to plan, book, and pay for various mobility options (such as buses, metro, taxis, or bicycles) all in one place. MaaS has already been successfully implemented in cities such as Vienna, Helsinki, and Berlin [76].

According to forecasts, in 50 global megacities with a combined population of 500 million, the benefits of using integrated mobility systems (such as increased safety and reduced environmental pollution) could reach USD 600 billion [77].

According to the surveyed experts, the main trends shaping the future of urban mobility include the development of personal mobility solutions, electric vehicles, and autonomous transport systems.

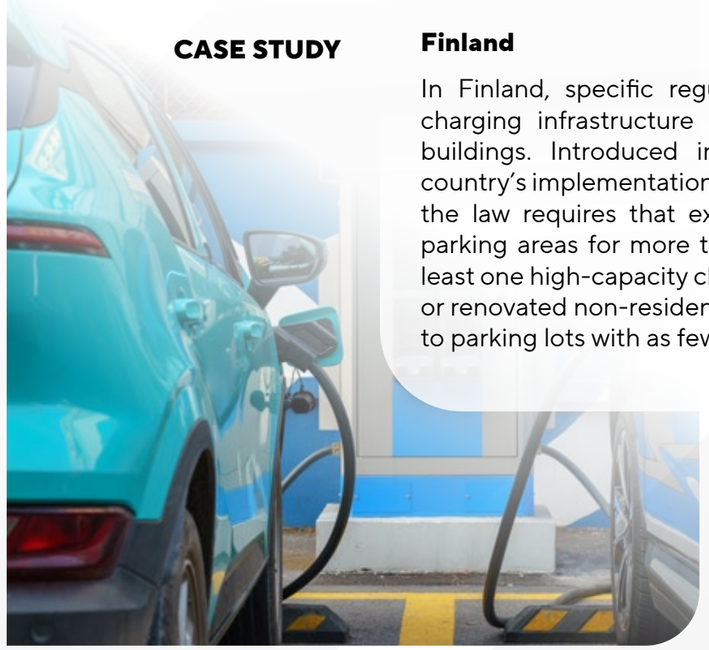
> "In major global cities competing for highly skilled professionals, time becomes a key resource. Urban residents primarily seek an environment that allows them to maximize the efficiency of every minute, whether during a work break or while commuting between meetings. In such cases, the cost and format of transportation may be secondary to the need for speed and convenience. When a city is congested and travel times are long, this can create significant challenges. As a result, having an efficient and diverse public transport system, along with well-developed delivery and mobility services, becomes critically important"
>
> Ruslan Goncharov,
> HSE University

> ”In Moscow, there are fewer e-scooter rides on weekends than on weekdays, and a significant share of trips occurs during morning and evening rush hours. This means that scooters are no longer just a form of entertainment — they have become a mode of public transportation and an integral part of the city’s infrastructure”
>
> Artem Molchanov,
> Yandex Go

In 2023, the global fleet included 41 million electric vehicles and nearly 50,000 electric buses [78]. To promote this environmentally friendly mode of transport, city authorities are introducing tax and tariff incentives for EV owners and expanding charging infrastructure. At both municipal and national levels, regulations are being adopted that require parking spaces to be equipped with charging stations, while support measures are being implemented for manufacturers and suppliers of charging equipment.

CASE STUDY **Moscow, Russia**

Moscow is implementing a comprehensive strategy to develop sustainable and environmentally friendly transport. Today, the city operates more than 2,300 electric buses across 200 urban routes, and by 2030, this number is expected to reach 5,300, effectively phasing out the use of diesel-powered public transport. Alongside the expansion of its electric public transport network, Moscow is adopting a clean model for river transportation: e-shuttles currently operate on three routes and have already carried over 2 million passengers. The city is also improving conditions for electric vehicle owners: there are now approximately 350 charging stations in operation, and EV drivers benefit from free parking and other incentives that encourage the transition to cleaner modes of transport. These efforts not only shape a sustainable transportation framework for Moscow but also strengthen its position as one of the global leaders in green mobility.



CASE STUDY **Finland**

In Finland, specific regulations mandate the installation of charging infrastructure in parking areas for non-residential buildings. Introduced in November 2020 as part of the country’s implementation of the EU Energy Efficiency Directive, the law requires that existing non-residential buildings with parking areas for more than 20 vehicles be equipped with at least one high-capacity charging station. For newly constructed or renovated non-residential buildings, the requirement applies to parking lots with as few as four spaces [79].

As part of the ongoing modernization of metropolitan transport systems, the potential for large-scale deployment of autonomous vehicles is a subject of active discussion. This transition is expected to bring several benefits, including reduced traffic congestion, lower emissions of harmful pollutants — given that a majority (58%) of autonomous vehicles currently in use are electric [80] — and a decline in road accidents.

It is also expected that reduced demand for private cars will make it possible to free up and repurpose a significant share of urban spaces currently occupied by parking lots. Taken together, all of these developments may deliver positive economic effects for the global economy amounting to USD 850 billion per year [81].

The large-scale deployment of autonomous transport will necessitate the development of smart urban infrastructure, where automated control systems manage traffic flow to optimize the movement of vehicles. Prototypes of such integrated systems are already under development, laying the groundwork for more efficient and responsive urban mobility networks.

CASE STUDY

Guangzhou, China

Rapid urbanization of Guangzhou has led to a range of complex transportation challenges, including traffic congestion, disruptions in public transit operations, and increased accident rates. In response, city authorities launched a comprehensive digital transformation of the transportation system, leveraging 5G technologies, sensor infrastructure, data processing centers, and automated management systems. Today, Guangzhou's successfully implemented innovations, ranging from smart metro and high-speed rail and bus systems to the Internet of Vehicles technologies, are being replicated in other cities across China [82].

An unresolved issue that continues to hinder the advancement of autonomous transport is the legal status and liability in the event of an accident involving robotic vehicles. Specifically, it remains unclear how to determine fault and who should be held accountable.

> "The legal framework for addressing this issue could be borrowed from the aviation industry: today, aircraft are operated by autopilot for a significant portion of the flight, and this precedent could serve as a reference point"
>
> Artem Molchanov,
> Yandex Go

Economic Barriers to Urban Growth

Urban growth and expansion can be constrained not only by spatial, but also by economic factors. In particular, the limits of a city's development are closely tied to changes in the structure of the economy and the availability of attractive employment opportunities.

> "A decline or even disappearance of the real sector in the economy erodes middle-class wages, leading to growing polarization. A layer of highly paid professionals emerges, employed in high-tech and high-income sectors such as IT and finance. At the same time, a second, much larger group is formed: those working in the service sector (from utilities and transport to food services and retail), where wages tend to fall below the national average.
>
> A city reaches its growth limits when the quality and attractiveness of available jobs begin to decline due to wage constraints. If wages stagnate or fall, or if unemployment rises significantly, the incentives to relocate to the city gradually diminish. Another important factor is the changing economic structure of megacities, which often leads to a growing need for social support. This, in turn, can put increasing pressure on municipal budgets and negatively affect the city's fiscal sustainability"
>
> **Alexander Shirov,**
> **Institute of Economic Forecasting, Russian Academy of Sciences**

TREND 4

URBAN MIGRATION. A SOURCE OF TENSION OR A RESOURCE FOR DEVELOPMENT?

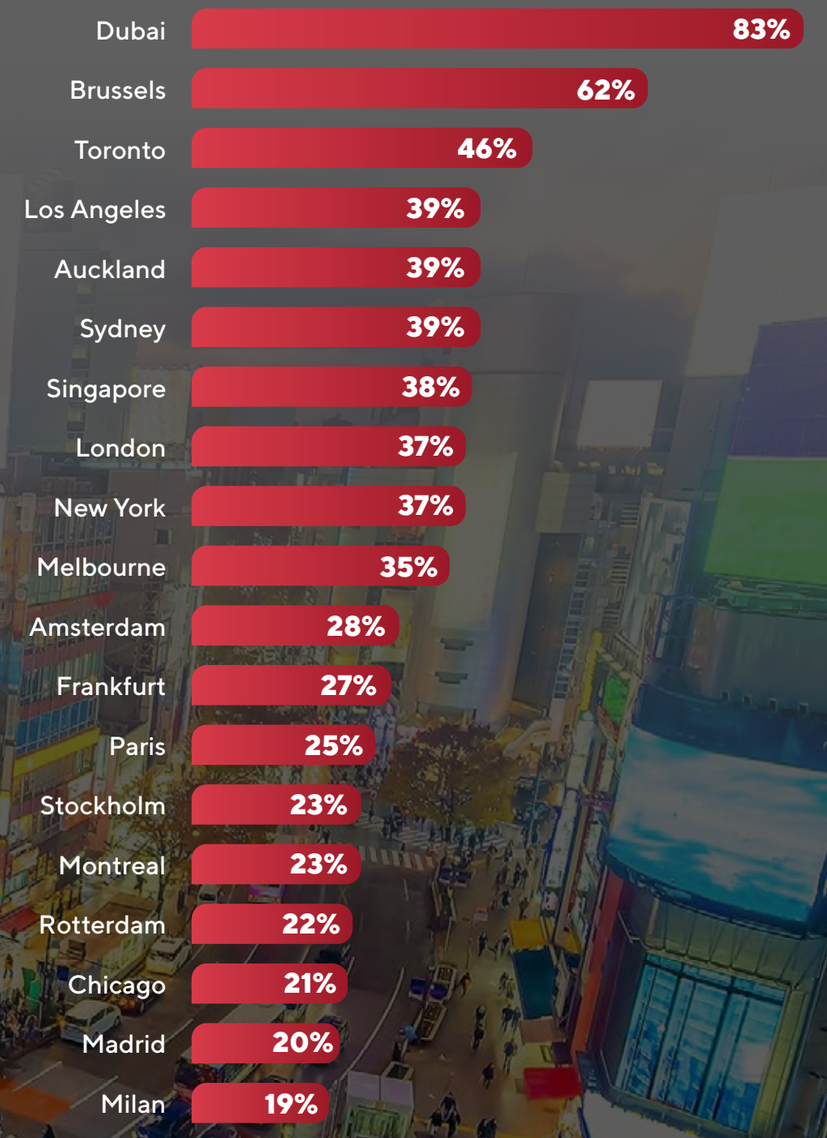
In 2020, the number of international migrants worldwide reached 281 million, representing 3.6% of the global population. Although migration is not a new phenomenon, its scale has significantly increased over the past three decades. Between 1990 and 2020, the number of migrants in the three main destination regions — Europe, Asia, and North America — almost doubled [83].

Migration has a particularly significant impact on urban social dynamics: approximately 92% of immigrants in the United States, 95% in the United Kingdom and Canada, and 99% in Australia reside in cities. As of 2015, one in five international migrants lived in one of the world's 20 major metropolitan areas, including Berlin, Brussels, Buenos Aires, Washington D.C., Hong Kong, London, Los Angeles, Madrid, Moscow, New York, Paris, Beijing, Seoul, Sydney, Singapore, Tokyo, Toronto, Vienna, or Shanghai. This is directly reflected in the demographic composition of large global cities.

In New York, London, and Toronto, immigrants account for more than one-third of the population, while in Dubai their share exceeds 80% [84]

The concentration of migrants in megacities significantly influences their demographic and economic structures. Cities are the primary beneficiaries of migration, yet they also bear the responsibility of addressing a range of cultural, social, and spatial challenges.

SHARE OF FOREIGN-BORN POPULATION IN MEGACITIES, 2016 (%)



Source: World Economic Forum

"Migrants have historically gravitated toward large cities, which have long been more multicultural than smaller towns. Today, migration flows are intensifying — driven by a mix of economic demand, personal choice, and necessity. Regardless of the cause, cities must be prepared to respond effectively to the associated challenges. On the one hand, migration offers clear benefits: diversity is inherently productive, and cities need both workers and taxpayers. On the other hand, migration often faces understandable resistance, which must be addressed through mechanisms that help integrate newcomers into the urban community, particularly through education and healthcare systems"

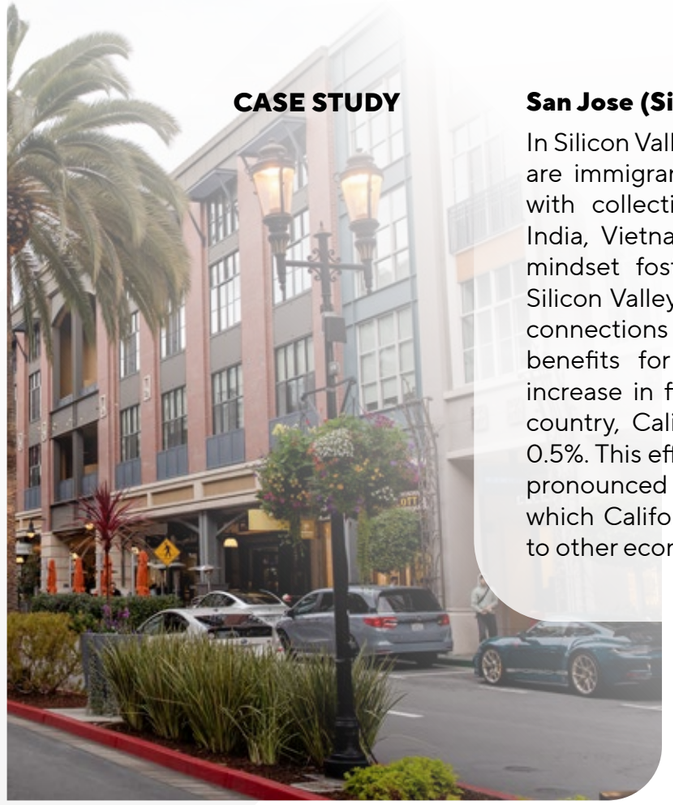
Irina Denisova,
New Economic School (NES)

Advantages of Cultural Diversity

"Cultural and human capital diversity can serve as valuable resources, as people with different professional backgrounds bring distinct competitive advantages. They represent an additional asset for reshaping the economy and launching new sectors that a country or city prioritizes. For example, data shows that individuals from southern cultures tend to have a stronger inclination toward entrepreneurship; thus, attracting migrants from these regions can stimulate entrepreneurial activity.

Belonging to a collectivist culture also means that migrants often maintain strong ties with their country of origin, which, much like in the case of Silicon Valley, can be an additional asset worth considering by both urban and national policymakers"

Elena Nikishina,
Lomonosov Moscow State University



CASE STUDY

San Jose (Silicon Valley), USA

In Silicon Valley, over a quarter of highly skilled workers are immigrants, including individuals from countries with collectivist cultural traditions such as China, India, Vietnam, and the Philippines. The collectivist mindset fosters strong transnational ties between Silicon Valley and migrants' countries of origin. These connections translate into measurable economic benefits for the sending countries: for every 1% increase in first-generation immigrants from a given country, California's exports to that country rise by 0.5%. This effect is especially pronounced is especially pronounced in the case of the Asia-Pacific nations, to which California exports nearly four times more than to other economies of comparable size worldwide [85].

"The world today does not require globalization in its traditional form, but rather a plurality of perspectives, approaches, and emerging "centers of life" and "centers of thought." As the pace of change accelerates, complexity deepens, entropy rises, and the volume of information expands, humanity faces a growing array of large-scale, unpredictable challenges. In such an environment, diversity becomes a vital resource. What we need is not uniformity, but a broader spectrum of responses — an active, exploratory form of survival. We cannot foresee which ideas, practices, or systems may prove essential, or which may ultimately hold the key to resilience and renewal"

Alexey Repik,
"Delovaya Rossiya" (Business Russia) Association

Competition for Human Capital

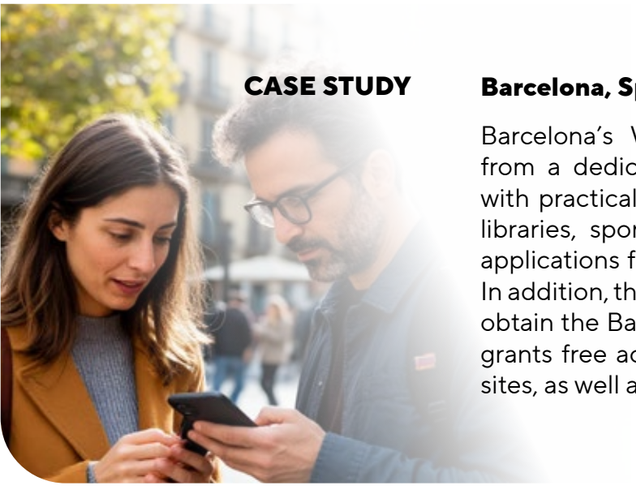
Attracting talent, particularly highly skilled professionals, has become a critical strategic priority for both nations and megacities.

> “For a person to want to move to a city, it is not only the comfort of the urban environment that matters, but also a sense of fundamental security, both physical and legal. For example, one must be confident that, if necessary, they can turn to courts and receive a fair judgment. A person should feel comfortable organizing their life and have space to apply their talents. Generally, individuals with a high level of human capital are drawn by the potential for self-realization and, of course, the opportunity to earn an income”
>
> Elena Nikishina,
> Lomonosov Moscow State University

One of the increasingly popular tools for enhancing a country’s appeal to skilled migrants is the Talent Visa. These programs offer residence permits to foreign nationals who can make a significant contribution to the country’s economy and cultural development, such as in information technology, sports, business, or creative professions, along with the right to seek employment. Applicants must meet specific eligibility criteria that demonstrate their value, which may include a high income level, an executive position at a highly rated company, published works, or awards in professional competitions and international events.

One example of local-level practices aimed at attracting and integrating migrants is so-called “welcome packs” provided to new residents upon arrival in the city. These packages typically contain multilingual information about local life and may include incentives such as coffee vouchers or theater tickets. Some cities go further by launching special initiatives designed to help migrants become part of the city’s social and cultural fabric.

An especially noteworthy practice is the creation of the role of a cultural ambassador — a position open to socially active individuals from specific ethnic communities who have lived in the city for a long time and are well acquainted with its institutions. The responsibilities of such ambassadors may include raising migrants’ awareness of city services and local life, making public services more relevant to migrant communities, and fostering dialogue between migrants and long-term residents. These efforts help promote integration and reduce potential tensions between different groups of the urban population [86, 87].



CASE STUDY

Barcelona, Spain

Barcelona's Welcome Pack, available for download from a dedicated city portal, provides new residents with practical information about local services such as libraries, sports facilities, public markets, and mobile applications for navigating the public transport system. In addition, the city offers newcomers the opportunity to obtain the Barcelona Card Workation — a city card that grants free access to numerous museums and cultural sites, as well as discounts on admission fees [88].

With the growing prevalence of remote work, it becomes increasingly important for cities to attract not only those who will fill locally available job vacancies, but also individuals who choose the city as their base while working remotely for employers elsewhere. These remote workers contribute to the local economy by living in the city, consuming goods and services, and paying taxes.

A prominent example of an effective tool for attracting remote workers at the national level is the Digital Nomad Visa — a program that grants individuals the legal right to work remotely, provided they meet a minimum income threshold. These permits allow remote professionals to travel the world, while legally residing and working from abroad. For host countries, such programs serve as a means to stimulate the local economy by encouraging foreign nationals to live in a country over extended periods. As of today, more than 66 countries have introduced digital nomad visas or similar schemes [89].

CASE STUDY

Georgia, USA

The Savannah Economic Development Authority in the U.S. state of Georgia launched an incentive program in 2020 aimed at attracting tech professionals. Under this initiative, qualified technology workers are eligible to receive up to USD 2,000 in relocation assistance when moving to Savannah [90].

"The number of global citizens — that is, individuals not tied to a single place of residence, who live across multiple cities and countries — is expected to grow. The challenge of retaining human capital will remain, but when it comes to global citizens — who are typically highly educated and well-compensated: the goal will shift from ensuring that they permanently reside in these cities to ensuring that they spend a significant portion of their time there.

To achieve this, cities need strategies for developing visible competitive advantages and specializing in areas that attract high-quality human capital. Most often, this means a focus on education and science, for example, professors who are drawn to teach or conduct research in a lab where they have a strong team. In this context, the quality of education, particularly higher education, becomes particularly important, as it is the key factor that differentiates cities in terms of their attractiveness. Cities with strong academic and scientific ecosystems will have an added advantage in attracting talented, affluent, and high-potential professionals"

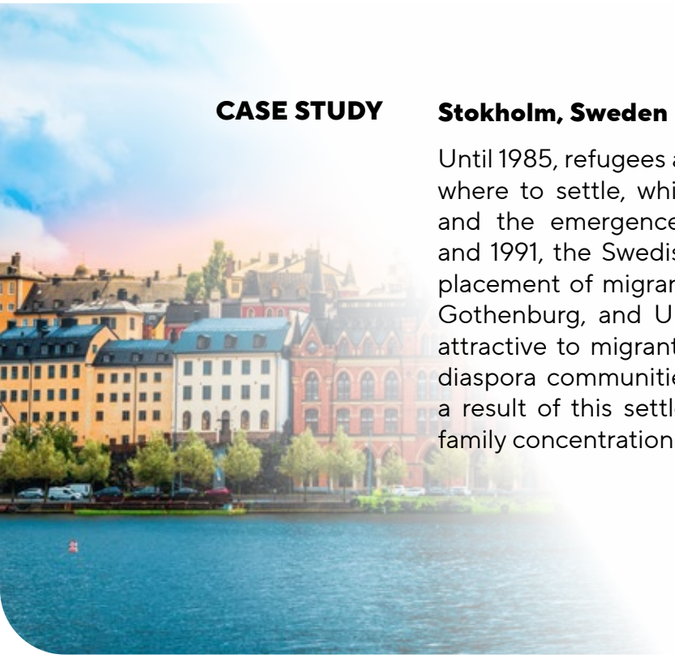
Andrey Sharonov,
National ESG Alliance

Challenges of Assimilation and Integration

One of the common challenges associated with urban migration is emergence of ethnic ghettos — urban areas predominantly inhabited by people of the same nationality or cultural background, with limited integration into the broader life of the city. The formation of such ghettos is often accompanied by poverty, crime, unemployment, and isolation from the surrounding community, which can lead to strained relations with the local population.

In megacities, this situation is often exacerbated by spatial segregation: migrant neighborhoods tend to be located far from business hubs, and poor transportation connectivity limits access to quality education and employment opportunities [91]. As a result, businesses that emerge within such enclaves are typically inward-facing, catering primarily to their own ethnic communities. This is largely due to the demand for culturally specific goods, such as particular types of food. Consequently, these businesses remain disconnected from the broader urban economy, and newcomers may end up operating in opposition to, rather than as part of, local economic system [92].

In addition, numerous studies confirm the phenomenon of native population outflow in response to rising numbers of migrants. For example, a 2015 study of the UK labor market found that native residents with higher incomes tended to move out of neighborhoods with a growing concentration of immigrants with low levels of education [93].



CASE STUDY

Stokholm, Sweden

Until 1985, refugees arriving in Sweden were free to choose where to settle, which led to uneven spatial distribution and the emergence of ethnic enclaves. Between 1985 and 1991, the Swedish government began to regulate the placement of migrants in major cities such as Stockholm, Gothenburg, and Uppsala — cities that were particularly attractive to migrants due to the presence of established diaspora communities and employment opportunities. As a result of this settlement regulation policy, the trend of family concentration within enclaves was curbed [92].

CASE STUDY

Singapore

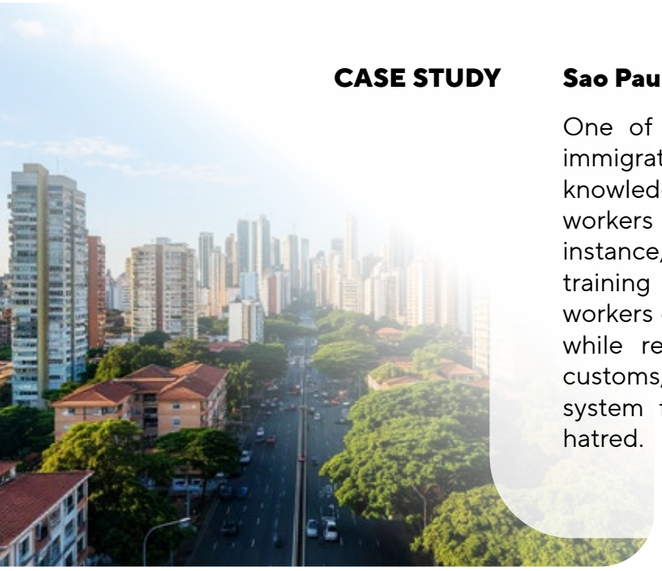
In Singapore, the Ethnic Integration Policy was introduced to prevent the formation of enclaves by limiting the proportion of residents from any single ethnic group within a housing block [94].

In addition to regulating the geography of settlement, cities pay attention to the social integration of newcomers, including interacting with native residents, cultivating in them a respectful attitude and tolerance towards national diversity.

CASE STUDY

Barcelona, Spain

Barcelona has incorporated a social criterion into its public procurement process, which provides bidders with the opportunity to receive several additional points if they employ refugees or individuals seeking asylum [95].

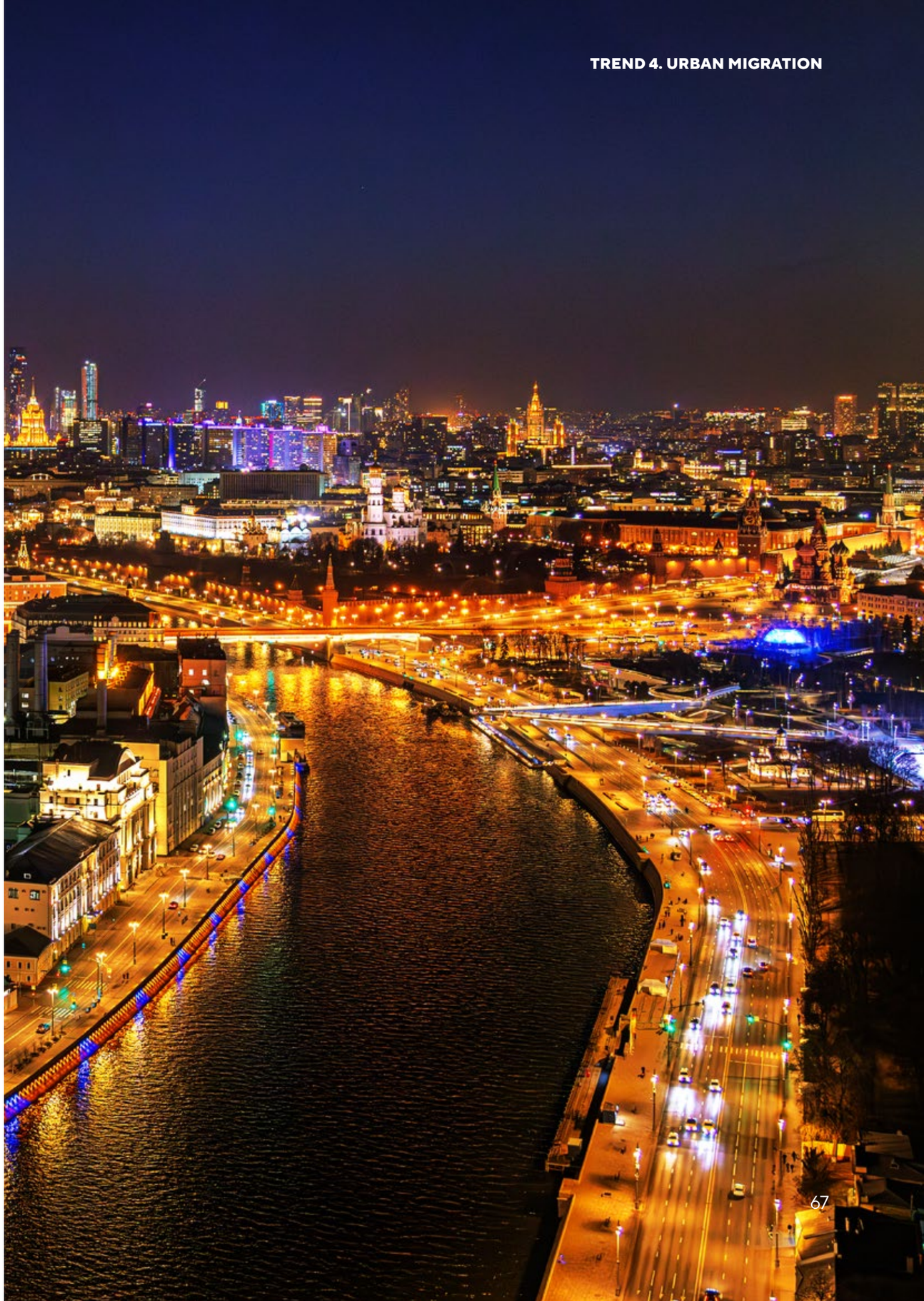


CASE STUDY **Sao Paulo, Brazil**

One of the key components of Sao Paulo's immigration policy is strengthening the knowledge and capacity of municipal service workers on various aspects of migration. For instance, a program launched in 2021 includes training for municipal employees and social workers on how to assist migrants and refugees while respecting their cultural and religious customs, as well as enhancing the reporting system for the incidents motivated by racial hatred.

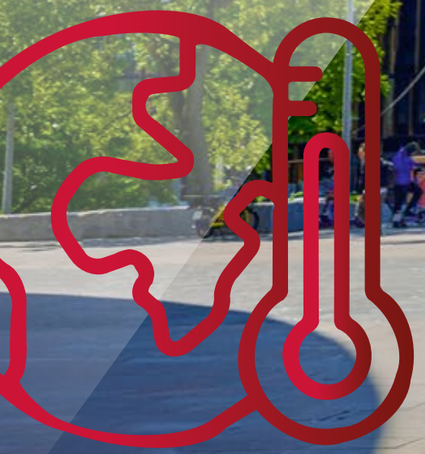
CASE STUDY **Kakuma, Kenya**

The Kakuma refugee camp in Kenya, which has existed for over 30 years, is home to more than 288,000 refugees from neighboring countries, representing over 30 ethnic groups with diverse cultural, linguistic, and religious backgrounds. A chronic shortage of basic resources in the camp, such as access to water, has often led to tensions and conflicts, particularly among youth, who make up around 60% of the camp's population. To address this issue, the "Sports for Cohesion" project was launched in 2022. Football tournaments were organized as a way for young people to meet, learn about each other's cultures, and build friendships. This communication-building effort helped reduce tensions in the camp, resulting in lower crime rates and fewer conflicts [96].



CLIMATE CHANGE

02



TRENDS

5. **Climate Change Adaptation**
   Inevitable Costs or Strategic Investments?
6. **Decarbonization Priorities**
   Short-term Solutions or Complex Programmes?

TREND 5

CLIMATE CHANGE ADAPTATION. INEVITABLE COSTS OR STRATEGIC INVESTMENTS?

Climate change, manifested in rising global temperatures and sea levels, is contributing to an increase in the frequency and intensity of extreme weather events such as heatwaves, floods, droughts, hurricanes, wildfires, etc. [97].

The global damage caused by hazardous climate events continues to rise steadily. According to the World Meteorological Organization, the average daily economic losses from extreme meteorological, climate, and hydrological events recorded between 2010 and 2019 amounted to USD 383 million — seven times higher than the same indicator for the period 1970–1979, which stood at USD 49 million [98].

Cities are by no means immune to this challenge.

In 2023, over 80% of cities worldwide that reported climate-related data through the CDP platform indicated that they had already experienced significant impacts of climate change [99]

The increasing frequency of extreme weather events poses a growing threat to cities, exerting complex negative impacts and presenting local administrations with new challenges in mitigating these effects.

NUMBER OF DISASTERS

(natural hazards) worldwide:
1980–1999 VS. 2000–2019

	1980–1999	2000–2019
Wildfires	163	238
Volcanic eruptions	84	102
Hurricanes	1 457	2 043
Landslides	254	376
Floods	1 389	3 254
Extreme temperatures	130	432
Earthquakes	445	552
Droughts	263	338

Source: CRED, UNDRR. The human cost of disasters: an overview of the last 20 years (2000—2019), 2020

Livability Challenges: Cities and Their Residents in High-Risk Zones

Challenge 1
Adverse Effects on Health and Productivity

A universal climate-related challenge faced by most cities around the world is heatwaves — prolonged periods of unusually high temperatures that significantly exceed seasonal norms. Due to climate change, the duration, intensity, and frequency of these heatwaves continue to increase.

According to current estimates, by 2050, average summer temperatures will reach 35°C in more than 970 of the world's largest cities, putting 1.6 billion urban residents at risk [100]

Extreme heat, which amplifies the urban heat island effect, poses a major threat to the health and well-being of city residents. Heatstroke, dehydration, cardiovascular strain, and worsening of chronic illnesses all become increasingly pressing concerns as major cities overheat.

The urban heat island effect
is the phenomenon whereby urbanized areas experience significantly higher temperatures during hot periods compared to surrounding rural or natural landscapes

Studies covering the period from 2000 to 2019 indicate that approximately 489 thousand heat-related deaths occur globally each year [101]

In Europe alone, more than 60 thousand people died from heat-related stress during the summer of 2022 [102]

"What qualifies as a heatwave, what constitutes just as extremely hot weather, and how dangerous such events are to public health — these are important and complex questions, especially for healthcare systems, which are responsible for mitigating risks to human life and health through both preventive and emergency measures. To prepare and respond effectively, it is essential to understand the temperature thresholds — in essence, the points at which specific actions must be taken. These thresholds vary by country. In the European cities, the critical temperature is considered to be around 26 °C sustained over 3–4 days; in the cities of the Middle East, Central Asia, and parts of South Asia, it exceeds 34 °C. Every degree matters: think of the human body — at 36.6 °C, you're healthy; one degree higher and you're ill; if that temperature persists for several days, you're seriously ill"

Boris Porfiriev,
Institute of Economic Forecasting, Russian Academy of Sciences

The adverse effects of extreme temperatures on human health are also reflected in reduced labor productivity. Heat accelerates physical fatigue, impairs concentration, and increases the need for breaks, all of which lead to a marked decline in employee performance. As a result, the economy itself speaking broadly suffers significant losses. According to the 2020 estimates, in just 12 cities across both developed and developing countries, average total economic losses attributed to heat-related productivity decline amounted to USD 44 billion [103].

> "During periods of extreme heat, a city's economic and social life slows down or comes to a standstill because normal functioning becomes impossible. Megacities will need to take serious action and invest significant resources to ensure that the urban environment remains operational, efficient, and safe for residents"
>
> Ivan Kuryachiy,
> Novaya Zemlya Project and Consulting Company

Challenge 2
Risk of Drinking Water Shortages

Amid ongoing urbanization and rising demand for drinking water — projected in some sources to increase by 80% by 2050 [104] — and under the pressures of climate change,

it is anticipated that within the next 30 years, nearly half of the world's urban population will face water scarcity [105]

Elevated temperatures, prolonged droughts, reduced precipitation, and increased frequency and intensity of floods directly affect urban water supply levels [106]. These climate impacts lead to declining surface and groundwater levels and an increased demand for water, especially in agriculture and irrigation systems, which account for the majority of freshwater use (e.g., in Europe, this sector consumes about 60% of total freshwater withdrawals [107], and in some developing countries, the figure can reach 95% [108]). As a result, water resources are being increasingly depleted, and access to safe drinking water is becoming progressively more limited. For instance, in 2018, following a prolonged drought, Cape Town came close to becoming the first major city in the world to run out of water [109]. The so-called "Day Zero" — the complete shutdown of the municipal water supply for 4.6 million residents — was averted thanks to emergency measures aimed at drastically reducing consumption and improving the efficiency of water distribution across the city. These actions helped prevent water sources from drying up before the onset of the rainy season [110].

Extreme weather events also negatively affect water quality, as higher temperatures, more frequent floods, and droughts exacerbate many forms of contamination — from sediment buildup to pathogens and pesticides [111]. This can lead to a deterioration in sanitary conditions and an increase in disease incidence.

Due to climate change and population growth, the future of global food production may increasingly depend on developing new areas for agriculture and adopting innovative farming technologies. In particular, new technologies have the potential to transform deserts into fertile lands.

Source: European Parliament. A framework for foresight intelligence, 2021

Challenge 3
Strain on Urban Infrastructure

Adverse weather events significantly increase the strain on urban systems, including utilities infrastructure, commercial properties, and residential real estate. Extra energy volumes consumed for cooling buildings during heatwaves increases the load on the energy infrastructure, often leading to supply disruptions or power outages during peak hours. Floods temporarily disable water supply systems, causing the destruction of urban structures and the erosion of roads. This all creates risks to the lives of city residents and leads to significant financial losses and restoration costs, as well as a general decline in socio-economic activity in the city.

For instance, the damage from the three of the strongest storms in 15 years that hit Germany, including Berlin, in February 2022 amounted to approximately €1.4 billion [112]. The Berlin Fire Department received a total of over 15,000 emergency calls from the city residents [113]. The maximum wind speed reached 120 km/h, leading to the destruction of some buildings and disruption of transportation (suspension of rail traffic in and around the city, cancellation of flights) [114].

Urban Responses: A Focus on Adaptation

To protect residents and strengthen the resilience of urban systems and infrastructure against climate risks and their associated impacts, cities are primarily relying on engineering and technological solutions, which is currently the most common approach to climate change adaptation.

Climate change adaptation

is the adjustment of natural, social, or economic systems in response to observed or anticipated climatic variations, as well as their consequential effects [115]

These measures include, but are not limited to:

- introduction of the monitoring and forecasting systems, such as sensors designed to track water levels in bodies of water and equipment utilized for meteorological prediction
- deployment of solutions designed to mitigate the impact of natural disasters, for example, the construction of dams for flood prevention and drainage systems for the management of rainwater runoff

The efficacy of such measures is substantially predicated upon regulatory support and established urban planning frameworks. This may encompass regulations and standards governing the construction of protective infrastructure, urban adaptation plans, and other guiding documents that stipulate the municipality's approach to climate change preparedness.

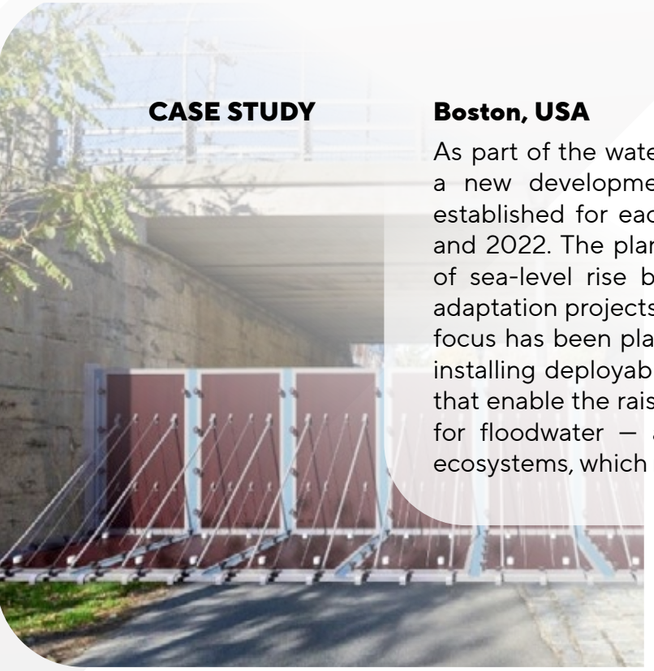
CASE STUDY

Moscow, Russia

Moscow is actively advancing its climate change adaptation agenda, with a strong focus on enhancing the resilience of urban infrastructure and ensuring the well-being of its residents. As part of the Moscow Climate Change Adaptation Strategy, the city is implementing a wide range of initiatives — from modernization of the utility systems to improving the energy efficiency of buildings.

A key priority is adoption of the nature-based solutions, particularly expansion and functional optimization of green spaces to counteract the impacts of heatwaves and intense rainfall.

In parallel, Moscow is promoting the development of low-carbon transport by incentivizing the use of electric vehicles and expanding pedestrian and cycling infrastructure to support more sustainable urban mobility.



CASE STUDY

Boston, USA

As part of the waterfront modernization project in Boston, a new development plan, Climate Ready Boston, was established for each coastal neighborhood between 2017 and 2022. The plan encompasses a predictive assessment of sea-level rise by 2070 and a suite of implementable adaptation projects for areas at risk of flooding. The primary focus has been placed on creating elevated public spaces, installing deployable flood protection barriers — structures that enable the raising of barriers to block critical pathways for floodwater — and the restoration of marine coastal ecosystems, which reduce the impact of waves [116].

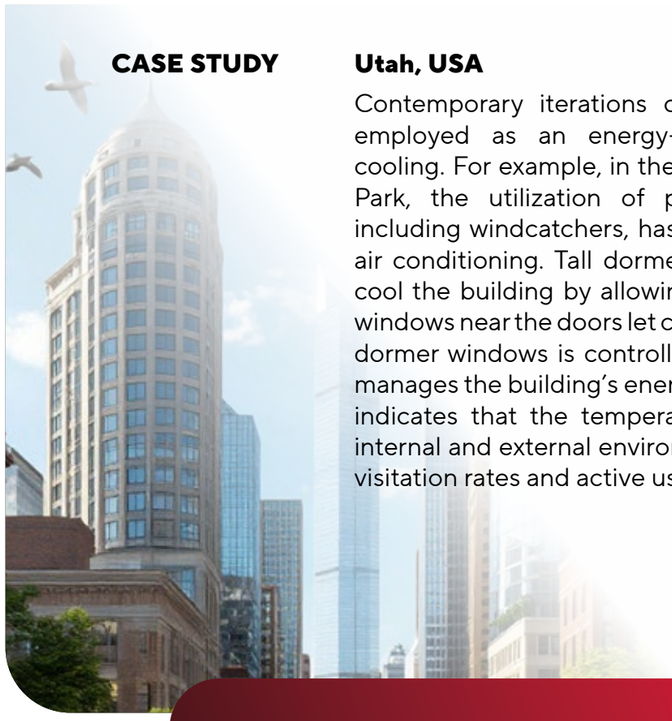
The construction sector is witnessing an increase in the adoption of novel, sustainable building materials that retain their properties under conditions of elevated temperature, while concurrently facilitating building cooling [117]. Phase-change materials, which can alter their characteristics in response to changes in external conditions such as temperature and pressure, have the potential to enhance thermal comfort and reduce energy consumption in buildings by stabilizing indoor temperatures and minimizing peak loads for cooling and heating [118].

Solar radiation modification refers to solutions aimed at mitigating the impact of climate change by dispersing aerosols into the stratosphere, thereby increasing the reflectivity of the Earth's surface. A number of scientists believe that the introduction of reflective aerosols into the upper atmosphere, emulating the cooling effect of large volcanic eruptions and ensuring the reflection of a portion of incoming sunlight back into space, could eliminate or, at the very least, constrain the escalating effects of greenhouse gases.

Source: The DEGREES Initiative, 2025. What is SRM?

> "In light of climate change and the thawing of permafrost, adaptation of construction technologies is required. In Norilsk, numerous cases of compromised apartment profile integrity have been observed over the past 20 years, but both construction technologies and sub-freezing technologies are available. And they are actively being implemented in this region, as it is vitally important. For example, special holes are made during construction for soil thermal stabilization, through which cold air 'flows' into the soil, promoting its further freezing and strengthening"
>
> **Pavel Konstantinov,**
> **Lomonosov Moscow State University**

With regard to adaptation to rising temperatures and heatwaves in specific areas, experts suggest that traditional architectural solutions, such as windcatchers, which provide natural ventilation of buildings, thereby reducing the need for energy-intensive air conditioners, could be a promising instrument. Decreased electricity consumption reduces the strain on urban infrastructure, which, in turn, enhances the city's overall resilience to climate challenges.



CASE STUDY

Utah, USA

Contemporary iterations of windcatchers are currently employed as an energy-efficient method for space cooling. For example, in the visitor center of Zion National Park, the utilization of passive cooling technologies, including windcatchers, has virtually resolved the issue of air conditioning. Tall dormer windows in the towers help cool the building by allowing hot air to escape, while low windows near the doors let cooler air in. The operation of the dormer windows is controlled by a computer system that manages the building's energy consumption [119]. Research indicates that the temperature differential between the internal and external environments was 16 °C, despite high visitation rates and active use of the center [120].

Nature-based solutions

are actions to protect, conserve, restore, sustainably use, and manage natural or modified terrestrial, freshwater, coastal, and marine ecosystems, which effectively and adaptively address social, economic, and environmental challenges, while simultaneously providing for human well-being, ecosystem services, resilience to disasters, and benefits for biodiversity

One of the promising avenues for adapting to increasingly frequent disasters is nature-based solutions, which, according to experts, often prove to be more effective and economically advantageous compared to traditional engineering solutions. The European Commission defines nature-based solutions as "solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience" [121]. In addition to the aforementioned positive impacts, this instrument contributes to the development of the water-green framework of cities, which is a goal of many modern metropolises.

The urban water-green framework

is a network of interconnected urban areas characterized by vegetation cover and urban water bodies integrated into the urban environment [122]

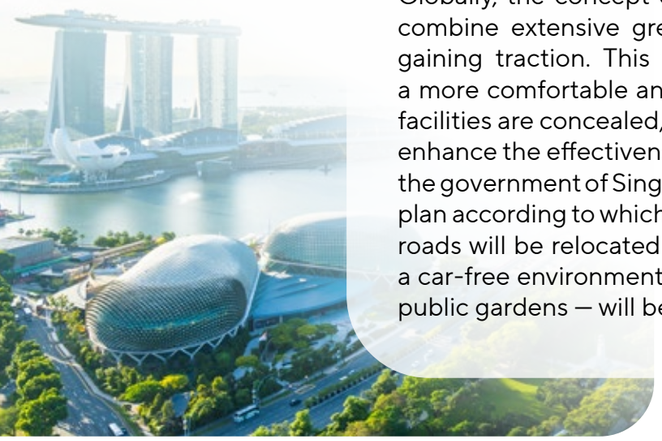
Examples of nature-based solutions are diverse. For instance, the planting of mangrove forests in coastal areas reduces the impact of storms on property and infrastructure, while also providing habitat for fish, birds, and plants, thereby supporting biodiversity. Protection of urban wetlands and maintenance of their hydrological integrity reduces the risk of flooding by enabling the retention of excess water [123]. In turn, restoration of native forests along riverbanks to prevent landslides also has a mitigation effect, expressed in increased carbon sequestration.

Overall, according to the estimates by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, nature-based solutions can account for up to 37% of the emission reductions from the level required to achieve the goals of the Paris Agreement by 2030 [125].

Climate change mitigation

is the adoption of measures to reduce greenhouse gas emissions and increase their absorption [124]

CASE STUDY



Singapore

Globally, the concept of creating urban residential areas that combine extensive green spaces with smart technologies is gaining traction. This trend is driven by people's desire for a more comfortable and natural environment, where technical facilities are concealed, yet modern technologies are applied to enhance the effectiveness of ecological solutions. For example, the government of Singapore has developed a city development plan according to which engineering networks, parking lots, and roads will be relocated underground as much as possible, and a car-free environment with abundant greenery — squares and public gardens — will be created at ground level.

> "The main thing that will change in the appearance of cities is a colossal increase in landscaping, transforming cities into gardens"
>
> Alexei Muratov,
> KB Strelka

CASE STUDY

Moscow, Russia

The "Million Trees" campaign is the largest greening program in Moscow, launched in 2013. The goal is to decorate the courtyards of residential buildings and the grounds of social institutions (schools, kindergartens, polyclinics, hospitals, and other facilities) with greenery. Planting locations and plant varieties are selected by Muscovites, who vote in the "Active Citizen" project. As part of the program, more than 4 million trees and shrubs have been planted.

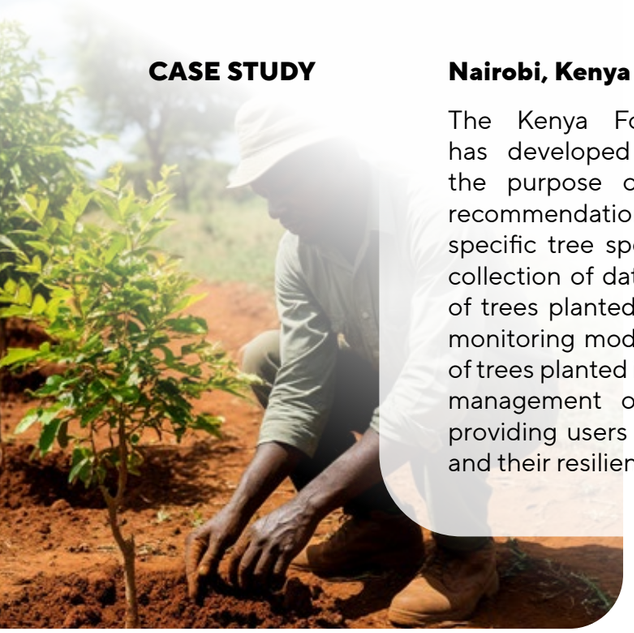
The "sponge city" concept is another example of nature-based solutions. A sponge city is an urban area with abundant natural components (e.g., trees, lakes, parks) designed to absorb precipitation and prevent flooding [126], while also promoting water accumulation in aquifers [127]. In addition, green urban infrastructure contributes to the improvement of residents' psychological well-being, and also acts as a mitigation measure, providing "carbon sequestration" [129]. Some major cities in the world — Mumbai, Nairobi, New York, Auckland, and Singapore — are already "sponge-like" by 30% or more [130].

According to one study, the presence of green spaces and natural elements in urban environments can reduce residents' feelings of loneliness by as much as 28% [128]

Carbon sequestration
is the long-term storage of carbon in carbon sinks (plants, soil, geological formations, and the ocean) [131]

A relatively recent development in the field of nature-based solutions is smart greening, which involves the strategic selection of plant species based on their functionality and adaptability to urban conditions. By analyzing climate data and the needs of local ecosystems, city authorities can identify the most suitable plants — those that not only require minimal maintenance but also serve critical functions such as improving the urban microclimate, supporting outdoor recreation, and preventing excessive heat accumulation in soil, building facades, and sidewalks [132]. For instance, in polluted urban areas, horse chestnut (Aesculus) can be planted to capture dust and smog with its broad leaves, while glossy cotoneaster (Cotoneaster lucidus) is often used due to its resistance to air pollution. Research also shows a growing trend toward combining local and non-native species in urban planting strategies to help mitigate the adverse effects of climate change [133].

Gas resistance of plants
is the ability of plants to withstand relatively high concentrations of toxic gases and other gaseous substances that are usually not components of air [134]



CASE STUDY

Nairobi, Kenya

The Kenya Forestry Research Institute in Nairobi has developed a mobile application, KEFRIApp [135], the purpose of which is to serve as a source of recommendations for selecting locations for growing specific tree species. The application also facilitates the collection of data on tree planting, assessing the number of trees planted on public and private land. A dedicated monitoring module tracks the survival and mortality rates of trees planted in various areas [136]. This enables effective management of greening and reforestation projects, providing users with detailed information on plant health and their resilience to environmental changes.

One of the important components of adaptation is informing and educating the public. To counter extreme climatic events, it is of critical importance to increase the awareness of citizens of the adaptation measures and their preparedness to them.

Athens, Greece

The company ARTi Analytics BV, in collaboration with the National Observatory of Athens, developed the Extrema Global application, which, depending on the location, indicates places in cities where it is possible to cool down: parks, swimming pools, fountains, and public buildings with air conditioning. When planning a route to the destination point, the application offers three options: the fastest, the coolest, and the coolest with rest stops [137]. Athens was the first city to implement this application, after which it was adapted for other cities, including Rotterdam, Paris, Milan, and London, taking into account local conditions and needs.

CASE STUDY

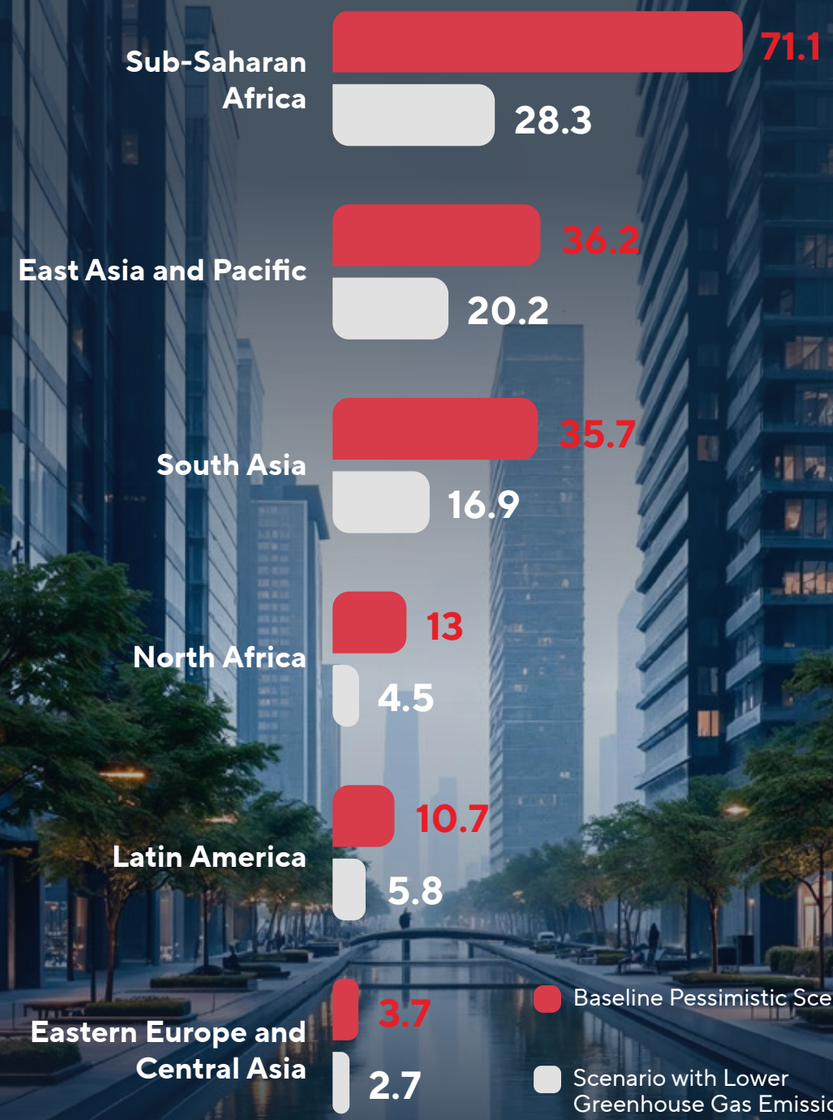
Experts note inadequacy of information about heatwaves in many cities, including in Russia: most warnings focus on rain and thunderstorms, while digital applications for informing the population about heat have not received due attention from city authorities [138].

Climate-Induced Migration

> "Cities are generally capable of responding to one major natural disaster, perhaps two. But after three or four, they simply give up, and then people leave"
>
> Daniel Hoornweg,
> Ontario Tech University

One of the consequences of the increasing frequency and severity of extreme weather events is the emergence of climate-induced migration. People displaced by natural disasters often seek safer living conditions in urban areas, accelerating cityward migration. Under a negative climate scenario, it is projected that by 2050, up to 216 million people could be displaced within their own countries — primarily from rural regions to cities — if urgent action is not taken to reduce global greenhouse gas emissions [139, 140].

Projected Number of Internal Climate Migrants by 2050 (millions)



Source: Clement, Viviane; Rigaud, Kanta Kumari; de Sherbinin, Alex; Jones, Bryan; Adamo, Susana; Schewe, Jacob; Sadiq, Nian; Shabahat, Elham. 2021. Groundswell Part 2: Acting on Internal Climate Migration

Between 2014 and 2017, the average number of forced displacements of people within their country's borders due to natural disasters (including extreme weather events) was 20.4 million per year, and in the period from 2021 to 2023, it increased to 27.6 million [141].

Experts suggest distinguishing between the two groups of people seeking to relocate due to the effects of climate change, each having a different impact on the city:

Climate Refugees

are people leaving their homes due to a threat to life and health caused by climate change and having no possibility of returning. Climate refugees include, for example, residents of the island nations whose homes have been destroyed by flooding. Recent research indicates that, as a result of the climate crisis, up to 8 million refugees could move to the 10 cities studied by 2050: Bogota (Colombia), Amman (Jordan), Karachi (Pakistan), Dhaka (Bangladesh), Accra (Ghana), Freetown (Sierra Leone), as well as the Brazilian cities of Curitiba, Sao Paulo, Rio de Janeiro, and Salvador [142]. For the recipient cities, this creates additional costs for humanitarian aid and increases the strain on urban infrastructure, the healthcare and social service systems, which threatens to increase tensions, competition for resources, and the emergence of conflicts between refugees and the local population

Climate Migrants

are people who decide to relocate not due to a direct threat to life or health, but primarily to improve their standard of living. The majority of climate migrants have sufficient financial resources, a high level of education, and professional qualifications, which makes them more attractive to the destination regions. This group of migrants can create economic benefits for the host cities, including accelerating GDP growth, improving labor market dynamics, transferring capital, and promoting cultural development

Many cities have already initiated plans and programs to prepare for the adaptation of climate refugees and migrants using available tools.

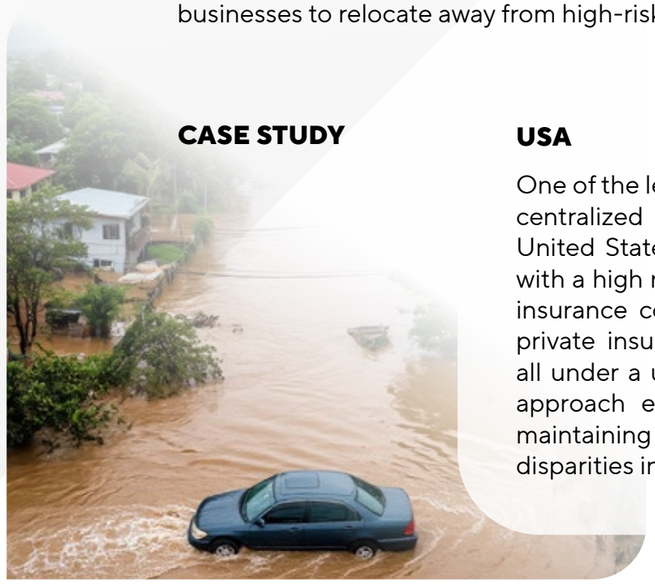
Due to significant climate change, many of the currently inhabited territories are becoming uninhabitable. This will lead to massive waves (up to 1.5 billion people) of climate refugees, which will force countries to revise their immigration and refugee policies.

Source: European Parliament. Mass climate migration: future scenarios, 2021

Climate Risks: Insurance as a Regulator

Growing intensity and frequency of natural disasters pose significant challenges to insurance companies, compelling them to revise their approaches to risk assessment. The scale and unpredictability of such events contribute to highly unstable loss patterns: damages may remain low for extended periods but can suddenly spike when disasters strike, affecting large numbers of policyholders simultaneously and generating massive financial losses. This concentrated risk places a substantial burden on private insurers and can, in extreme cases, lead to insolvency.

To mitigate this, insurance providers in high-risk regions often raise premiums significantly. However, this can lead to widespread underinsurance or even complete withdrawal from insurance coverage by residents and businesses — resulting in more severe social and economic vulnerabilities. For example, in the U.S. state of Colorado, where the risk of wildfires is high, many homeowners and businesses struggle to obtain property insurance. Between January 2019 and October 2022, the average homeowner's insurance premium in the state rose by 51.7% [143], prompting some businesses to relocate away from high-risk areas.



CASE STUDY

USA

One of the leading practices in disaster insurance is the centralized National Flood Insurance Program in the United States. Under this program, residents of areas with a high risk of flooding are required to obtain flood insurance coverage. Policies can be issued either by private insurers or directly by a government agency, all under a unified, regulated tariff structure [144]. This approach ensures broad access to insurance while maintaining financial sustainability and minimizing disparities in coverage.

Inability to protect property from climate risks leads to a decrease in its value: potential buyers and investors begin to avoid such properties due to the high probability of damage from natural disasters. Studies show that a 1% increase in the risk of flooding per year leads to a 0.6% decrease in housing prices in the potential flood zone, and a 1% increase in temperature in areas at risk of drought is associated with a decrease in property values of 0.99% and rent of approximately 0.55% [145].

CASE STUDY

Colorado, USA

In Colorado, growing frequency of wildfires and hailstorms has led to increased insurance denials, particularly in high-risk areas. Following the 2023 wildfires, it became evident that many homeowners were significantly underinsured: only 4% of respondents expected their insurance to fully cover restoration costs, while 10% anticipated receiving less than half of what was needed. The total estimated shortfall in insurance payouts reached up to USD 179 million, with low-income households disproportionately affected.

In response, local authorities introduced targeted programs such as Wildfire Partners in Boulder County and RealFire in Eagle County. These initiatives assist homeowners in assessing property-specific wildfire risks, provide tailored recommendations to reduce potential damage, and offer support in financing protective measures. Homeowners who successfully complete a final inspection receive a certification recognized by insurance companies, which can help preserve or even improve insurance coverage terms. Such programs enhance insurance accessibility and strengthen community resilience to escalating climate threats [146].

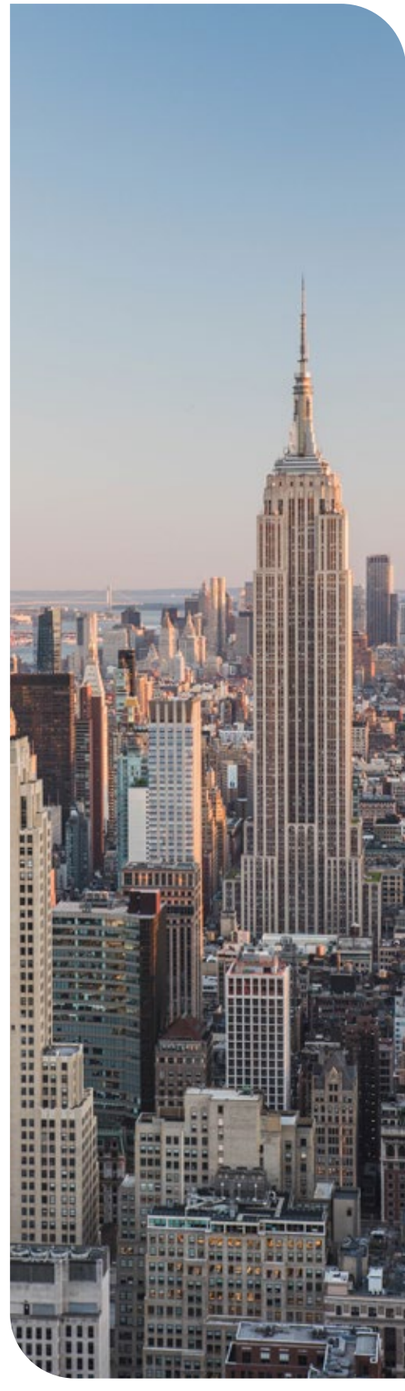
Adaptation Measures as a Cost-Effective Investment

Measures to adapt to climate change can be seen not as forced additional costs, but as economically justified investments. Often, their implementation creates secondary economic effects: for example, in New York, there is an increase in housing values in areas with improved engineering structures [147]. A clear example of a built-in adaptation effect is the use of modern materials in pipelines, which increase the stability of and functionality of systems, and prolong their service life.

Research shows that investments in climate adaptation can generate substantial economic returns by preventing future losses and enhancing the resilience of ecosystems [148]. For instance, every dollar invested in adaptation measures can yield between 2 and 10 dollars in economic benefits by strengthening resilience and lowering recovery costs following natural disasters [149]. According to expert assessments, the average cost-benefit ratio for adaptation is 4:1, while for early warning systems — one of the most effective forms of adaptation — this ratio ranges from 9:1 to 20:1.

Modeling and scenario planning are essential tools in the development of comprehensive climate adaptation strategies. By simulating various adaptation approaches and evaluating their potential outcomes, these tools enable decision-makers to assess risks and opportunities in the context of both existing infrastructure and projected climate conditions. This analytical foundation supports more informed, evidence-based choices and helps identify the most effective and cost-efficient adaptation measures.

When discussing the cost-effectiveness of the adaptation measures, it can be challenging to precisely determine what portion of the costs is specifically related to climate change adaptation. For example, investment in building a dam can simultaneously address the flooding problems and improve the transportation infrastructure, making it difficult to separate these objectives. However, in most cases, this is not so important. It is far more important to understand how effective adaptation measures are in general, and to compare the results obtained with the amount spent on them.



“

”The vast majority of adaptation measures are part of everyday activities: for example, in industry, this is part of occupational safety and health measures, measures for civil defense and actions in the event of emergencies; preventive and emergency repairs; modernization of equipment and infrastructure (for example, replacing metal pipes with more resistant polymer or composite materials). In essence, these are economic activities, including a certain adaptation component, providing effects on reducing the impact of temperature, humidity, wind loads, etc. on a person or an economic object. Accordingly, the expenses for these measures are part of the current costs and investments. Specialized measures aimed solely at achieving the climate change adaptation effects (not pursuing economic goals such as increasing the output and quality of products, increasing profits, etc.) constitute only a small part of the total volume of these measures (about 5%). An example of such measures are air conditioners installed to create comfortable indoor temperature”

Boris Porfiriev,
Institute of Economic Forecasting,
Russian Academy of Sciences

TREND 6

DECARBONIZATION PRIORITIES. SHORT-TERM SOLUTIONS OR COMPLEX PROGRAMMES?

Alongside adaptation to climate change, the humanity's efforts are directed towards reducing the contribution of the anthropogenic factor to this process by implementing measures to prevent, reduce, and absorb greenhouse gas emissions, the increasing concentration of which intensifies the greenhouse effect and contributes to an increase in the average global temperature [150].

Urbanized territories are responsible for at least 67% of the global carbon and methane emissions

Cities have a great impact on the global dynamics of greenhouse gas emissions. According to the Intergovernmental Panel on Climate Change, in 2020, urbanized areas were responsible for at least 67% of the global carbon and methane emissions not related to agriculture and land use [151]. For comparison, in 2000, this share was estimated at 56%. Megacities make a significant contribution to this volume. Existing estimates indicate that the 100 largest agglomerations in the world in terms of emissions account for 18% of the total carbon footprint of humanity, while they are home to only 11% of the planet's population [152].

Against the backdrop of the increasing contribution of cities to the global emissions, their involvement in the fight against climate change is also growing, which is reflected, among other things, in the increasing participation of cities in the global initiatives in this area, assuming obligations to reduce greenhouse gas emissions and achieve net carbon neutrality — a zero balance between anthropogenic emissions and the absorption of greenhouse gases.

1,145 CITIES AROUND THE WORLD

joined the Cities Race to Zero global initiative launched at the end of 2020 [153], committing to achieve a zero balance of greenhouse gas emissions no later than 2050

Source: C40. About Cities Race to Zero

City authorities possess a range of measures and tools to pursue carbon reduction goals — both through the direct reduction of emissions from sources under their control (primarily buildings and transport) and by leveraging market-based mechanisms to promote decarbonization in sectors where their influence is more limited, such as electricity generation.

Reducing the Consumption of Hydrocarbon Fuels

Burning of fossil fuels for energy is the main source of anthropogenic greenhouse gas emissions, and the share of this source in the total volume of emissions is continuously growing. Thus, in 1950 emissions from the combustion of coal, petroleum products, and gas accounted for about half of the global CO_2 emissions, while in 2022 this share was almost 90% [154].

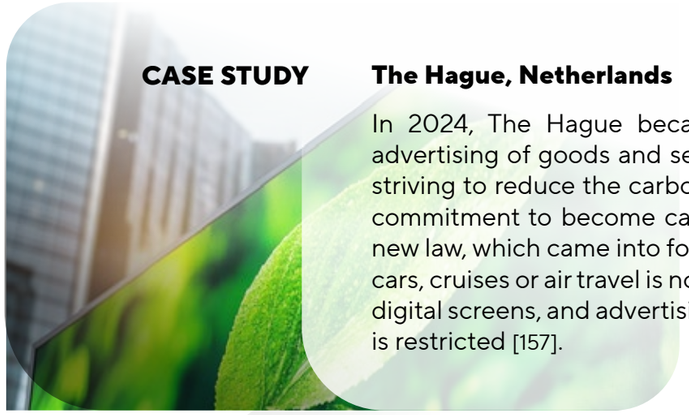
Due to the fact that cities concentrate over two thirds of the world's energy consumption [155], their efforts to reduce dependence on hydrocarbons and increase energy efficiency play a key role in the decarbonization process. This is becoming even more relevant in the context of expected significant growth in energy demand: according to the forecasts by the US Energy Information Administration, electricity production in the world will increase by 30-76% by 2050 compared to 2022 [156].

CASE STUDY **Moscow, Russia**

The Renovation Program, launched in Moscow in August 2017, aims to improve the residents' living conditions by offering modern, fully finished apartments in new buildings — within the same neighborhood — in exchange for housing in outdated five-story buildings, at no cost to participants.

However, the program goes beyond relocation. It transforms the urban landscape and enhances overall quality of life. Outdated housing stock is being replaced with modern buildings featuring advanced thermal and sound insulation, significantly reducing energy consumption and associated carbon dioxide emissions. Research indicates that the energy use of these new buildings is approximately half that of the old ones. Over a 30-year horizon, the resulting reduction in energy consumption under the program is equivalent to avoiding 32 million tons of CO_2 emissions.

An integral component of the program is the landscaping and integrated redevelopment of courtyard areas, which not only improves comfort and aesthetics but also enhances the environmental sustainability of residential neighborhoods.



CASE STUDY **The Hague, Netherlands**

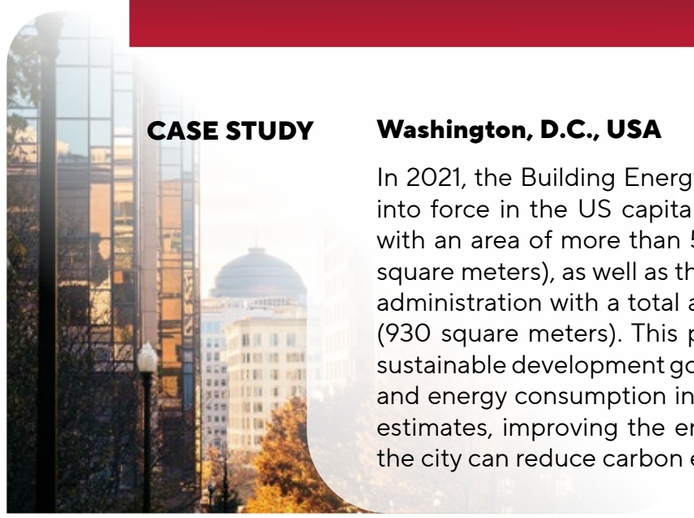
In 2024, The Hague became the first city in the world to ban advertising of goods and services using fossil fuels in public places, striving to reduce the carbon footprint in accordance with the city's commitment to become carbon neutral by 2030. According to the new law, which came into force on January 1, 2025, advertising diesel cars, cruises or air travel is now not allowed on billboards, bus stops or digital screens, and advertising of energy companies using fossil fuels is restricted [157].

Energy Efficiency in Real Estate

As the surveyed experts note, one of the priority areas for cities in this area is to improve energy efficiency in the real estate sector, since buildings account for about 30% of global final energy consumption and more than half of electricity consumption [158].

The construction of new energy-efficient buildings in accordance with green standards in construction and the modernization of the existing stock using energy-saving technologies have a decisive influence on reducing energy consumption during the life cycle of buildings.

> "In general, the main potential for cheap emission reduction is everything related to energy efficiency"
>
> Igor Makarov,
> HSE University



CASE STUDY **Washington, D.C., USA**

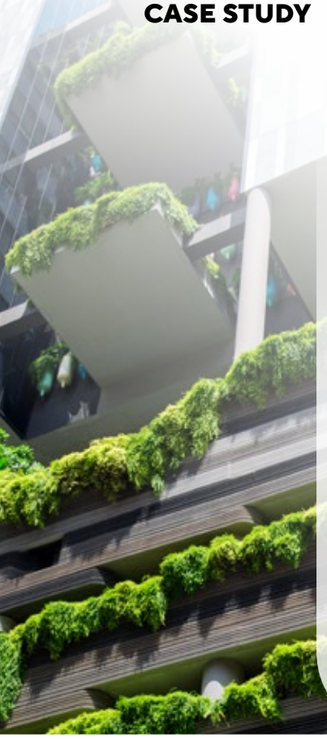
In 2021, the Building Energy Performance Standards (BEPS) came into force in the US capital, which applied to all private buildings with an area of more than 50 thousand square feet (4.6 thousand square meters), as well as those owned by the district or the district administration with a total area of at least 10 thousand square feet (930 square meters). This program was designed to achieve local sustainable development goals to reduce greenhouse gas emissions and energy consumption in the city by 50% by 2032 (according to estimates, improving the energy efficiency of existing buildings in the city can reduce carbon emissions in the district by 10%) [159].

According to available estimates for six countries — the United States, Brazil, China, Germany, India, and Türkiye — between 2000 and 2016, buildings certified under LEED, the world's most widely adopted green building standard, generated energy savings amounting to USD 7.5 billion [160]. When factoring in additional benefits — such as reduced environmental and climate impacts — the total value of positive effects over the same period is estimated at USD 13.3 billion.

CASE STUDY

Portland, USA

In accordance with the current green building policy (originally adopted in 2001), all city facilities must meet a certain level in accordance with LEED certification: new projects — LEED Gold standard, existing buildings — LEED Silver and above [161].



CASE STUDY

Singapore

Singapore has a voluntary building certification program called BCA Green Mark. It assesses the impact of buildings on the environment and overall environmental characteristics, aiming to promote sustainable design and ensure energy and resource efficiency of buildings. The program was launched in 2005, and as of the end of 2020, in Singapore there were already more than 4 thousand construction projects (covering an area of ~123 million square meters, that is, more than 43% of the total area of Singapore's building stock) that have passed BCA Green Mark certification [162]. This program is part of the Singapore Green Building Masterplan (SGBMP 2021), according to which the city intends to achieve three key goals by 2030:

- 80% of new construction projects must meet ultra-low energy consumption standards 80% of buildings (by total area) must be greened
- The energy efficiency of the best-in-class green buildings should increase by 80% from the 2005 level [163]

In addition to developing standards and certification systems, higher energy efficiency in buildings is achieved through the use of smart construction and operation technologies.

The IT systems integration allows automated management of heating, ventilation, air conditioning, and lighting systems, optimizing energy consumption depending on the needs of residents and environmental conditions [164]. To prevent network failures and increase energy efficiency, smart grids are also being introduced in cities — the distribution networks using digital technologies, sensors, and software to balance the supply and demand of electricity in real-time, while minimizing costs and maintaining network stability and reliability.

Thanks to financial support from the World Bank, smart grids are being introduced in the Global South countries, including India and Brazil [165]. Many developers also start to use electric heat pumps with low emissions.

A heat pump works by circulating a refrigerant in a closed loop. It extracts heat from various sources — air, geothermal energy, water, or waste heat from enterprises. This heat is then amplified by a compressor and transferred to the desired location through a system of heat exchangers, which absorb the heat and direct it to the heat emitter. Due to the heat transfer mechanism, heat pumps are much more efficient than traditional heating technologies that generate heat, such as boilers or electric heaters, and can be cheaper to operate — both for heating homes and in industrial processes.

> "Of course, technologies related to alternative energy sources are promising in terms of increasing energy efficiency. And if solar panels, for example, are not yet economically viable with our solar activity, then heat pumps allow us to sufficiently improve the energy efficiency of the building and be economically feasible. In particular, a heat pump using heat from the ground or building wastewater systems, in combination with a building resource management IT system, can improve the overall energy balance by 50%. These systems can be used in all city facilities, they are already paying off in just a few years"
>
> Yuriy Khakhanov,
> Skolkovo Foundation

According to the International Energy Agency (IEA), the efficiency quotient of a typical residential heat pump is approximately four — meaning its energy output is four times greater than the electric power required for its operation. Nevertheless, in 2021 heat pumps met only about 10% of global space-heating demand [166]. Currently, one of the main obstacles to their widespread adoption is high technology cost and substantial upfront installation expenses, combined with limited consumer awareness of heat-pump benefits [167]. To overcome this challenge, the EU Member States are introducing subsidies for installing heat pumps at industrial facilities [168]. Meanwhile, local authorities in other regions are setting ambitious targets to increase deployment of this technology: for example, California plans to install 6 million heat pumps in its municipal heating and cooling systems by 2030 [169].

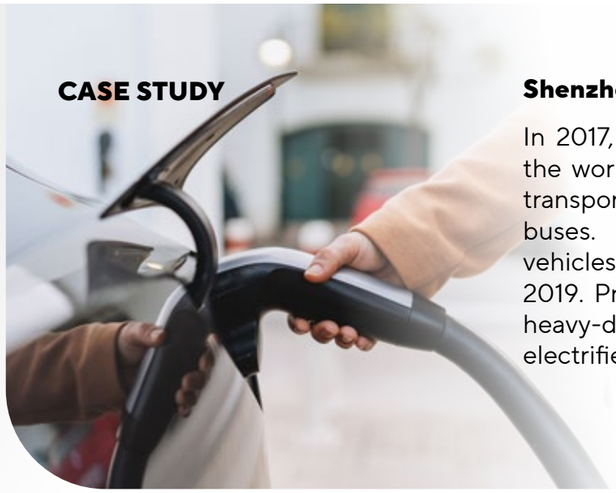
Estimates of the effectiveness of energy efficiency upgrades in existing buildings show that such projects lead to an average reduction in energy consumption of 7.2%. However, the actual level of savings in each case varies significantly depending on a range of factors — including the specific technologies used, the physical characteristics of the building, and the income levels of its residents [170].

In turn, large-scale programs aimed at replacing the old housing stock with energy-efficient buildings achieve more significant resource savings. For example, homes constructed under Moscow's renovation program consume half the energy of older housing [171]. However, experts point out that such projects are economically viable only in major cities with growing populations, where return on investment in housing renewal can be secured through the sale of extra floor area.

Transport: Reducing Fossil Fuel Consumption

When planning urban development, cities should pay particular attention to reducing fossil-fuel consumption by surface transport, which in 2022 accounted for over one quarter of the global petroleum consumption and roughly 10% of the total greenhouse gas emissions [172] (overall, fuel combustion by transport is responsible for about one-third of the urban greenhouse gas emissions [173]).

One of the most effective ways to reduce reliance on fossil energy sources in this sector is to replace internal-combustion engine (ICE) vehicles with electric ones



CASE STUDY

Shenzhen, China

In 2017, Shenzhen became the first city in the world to fully electrify its urban public transport fleet, deploying 16,359 electric buses. Moreover, its taxi fleet (21,609 vehicles) was fully electrified by the end of 2019. Private cars, refuse trucks, and other heavy-duty vehicles are also being gradually electrified [174].

According to the IEA projections, the volume of the greenhouse gas emissions avoided through the replacement of internal-combustion engine vehicles with electric transport will exceed 2 gigatons of the CO_2-equivalent by 2035. Net reduction in the greenhouse gas emissions — taking into account additional emissions from power generation required to meet the increased electricity demand associated with transport electrification — is estimated at 1.8 gigatons [175].

Municipal administrations in megacities worldwide are already proactively accelerating the transition to electric vehicles by implementing targeted infrastructure and financial measures — such as expanding charging networks, offering tax and other incentives, and providing direct subsidies to cover part of the vehicle cost or the expense of installing home-based charging stations.

In some countries with well-developed electric vehicle markets, incentive measures are being reassessed — both through the withdrawal of benefits for electric transport and by reforming the taxation methods. Traditional models of funding transport infrastructure, which rely on taxes levied per gallon or liter of fuel, are being undermined by the growing share of hybrid and electric vehicles, since fuel consumption no longer serves as a measure of driver usage.

Road user charging (RUC) and taxes based on vehicle miles traveled (VMT) are being piloted experimentally in various countries and regions, notably in the United States and Australia [176].

An alternative could be a "beneficiary pays" system, which collects revenue from people who use the transportation system but do not participate in its financing. For example, people who receive package deliveries or use ride-sharing apps, who implicitly benefit from the functionality of the transport infrastructure but currently do not pay for its use, would be included in financing it through indirect payments.

In the future, rechargeable batteries will be able to last so long that they will never need to be replaced. Scientists at the University of California have managed to develop a battery that lasts for 200,000 recharges instead of the standard 300-500. Such an invention is capable of revolutionizing the battery manufacturing industry, as well as the development of related technologies.

Source: University of California. Making better batteries: A battery you can charge hundreds of thousands of times, 2016

Experts note that in the near future, the growth rate of the electric vehicle market may be limited due to the growing deficit of rare earth metals.

The concern is related to the increase in global demand for these resources, which are also of key importance in the renewable energy sector. According to the IEA forecast, at the pace of energy transition needed to achieve the goals of the Paris Agreement, demand for rare earth elements will quadruple by 2040 [177].

Decarbonization of the Urban Energy Sector

One of the fundamental elements of the climate change mitigation policy is to increase the share of renewable energy sources in energy balances at all levels.

Experts see strong potential for the large-scale adoption of renewable energy sources in countries with underdeveloped national energy systems. These regions represent a significant emerging market for renewable technologies, which, through economies of scale, can contribute to further cost reductions in the sector.

At the city level, however, a different set of constraints emerges. Most megacities lack sufficient local generating capacity to meet their full energy demand and therefore rely heavily on regional and national power grids. Moreover, current assessments suggest that — given the present state of renewable energy technologies — it is not feasible to install enough renewable generation capacity within urban boundaries to fully satisfy energy needs [178].

> "It's easier to develop something from scratch than to change existing systems. In this sense, in Africa, the system will probably be built mainly on low-carbon technologies. Another thing is that it will not be a replacement for fossil fuels, but additional energy to meet growing demand"
>
> Igor Makarov,
> HSE University

The emergence of small, safe, and relatively inexpensive modular nuclear reactors with a capacity of several tens to 300 MW. This will be sufficient to meet the energy needs of a million-plus city.

Source: World Nuclear Association. Nuclear Power Reactors, 2025

Given cities' limited control over the energy sector, experts regard equipping of buildings with solar-generation systems as a universal — applicable to a greater or lesser extent in cities across different latitudes and climatic conditions — approach to expanding the use of renewable energy in urban power supply.

> "Equipping buildings with solar-energy generation installations is sensible even for Moscow. You can't supply an entire building this way, but you can cover 10–20 % of its energy consumption. In other words, this isn't about revolutionary changes — you're simply creating, so to speak, an energy-supply basket"
>
> Andrey Kolpakov,
> Institute of Economic Forecasting, Russian Academy of Sciences

Cities are increasingly adopting the use of "green" certificates, issued by electricity producers that generate power from renewable energy sources.

A "green" certificate (also known as a certificate of origin of electricity) is an official document that verifies that a specific amount of electrical energy — typically 1 megawatt-hour (MWh) — was generated from renewable energy sources at a certified facility. Importantly, the certificate confirms the origin of the electricity, not its direct physical delivery to the end consumer.

By purchasing "green" certificates, local authorities have the opportunity to claim that corresponding power volumes consumed by them were obtained from renewable energy sources, regardless of the sources from which it was actually generated. Thus, this tool allows local authorities to fulfill their emission reduction obligations while maintaining the actual structure of the energy balance.

Paris, which is almost entirely dependent on electricity supplies from other regions, has been purchasing 100% of the electricity needed to supply municipal buildings and street lighting from renewable sources since 2016 [179]. This indicator is ensured by the requirement for suppliers to provide certificates of origin of electricity, confirming that the volume of electricity produced by them from renewable energy sources is at least equal to the volume supplied under the contract. Nevertheless, the electricity purchased under this scheme comes from a common network, which makes it physically impossible to ensure the actual supply exclusively from renewable sources [180].

CASE STUDY

Houston, USA

The administration of Houston — the largest city in the state of Texas — is the leading municipal consumer of green energy among cities participating in the Green Power Partnership program of the US Environmental Protection Agency. Houston's mayor's office was one of the pioneers in purchasing green energy, acquiring its first Renewable Energy Certificates (RECs) as early as 2008 through a contract with a local utility provider. By 2020, the city had purchased over 1 billion kilowatt-hours of green electricity, covering approximately 90% of the municipal administration's annual energy consumption [181].

Through the "green" certificates trading, power generating companies that produce energy from renewable sources receive a channel for attracting additional financial resources. However, there is a risk that the mass use of this tool may negatively affect the development of renewable energy sources and lead to a deceptive bureaucratization of the energy transition, when certificates compensate for the growth of electricity consumption, and not the actual replacement of sources, as a result of which there is no actual reduction in emissions.

Existing assessments indicate that the purchase of "green" certificates does not always result in a substantial increase in investment in new renewable energy capacity. This is largely due to the certificates' relatively low and volatile prices, which may fail to create strong financial incentives for additional generation. This is especially true when certificates are sourced from regions with an oversupply of renewable energy, where demand for such certificates has a limited impact on stimulating new projects [182].

Setting Local Goals by Cities

According to the monitoring resource Net Zero Tracker, 278 out of 1,186 cities with populations over half a million have declared their commitment to achieving carbon neutrality. In nearly half of these cities, this goal is enshrined in law or an officially adopted strategy.

CASE STUDY

Moscow, Russia

Over the past 10 years, Moscow's CO_2 emissions have been reduced by more than half — partly due to leveraging efficiency reserves in the energy sector. The increase in efficiency and, consequently, emission reductions are supported by the city's use of intelligent energy management systems, improved generation processes, the switch from heavy fuel oil to gas for backup fuel, and the elimination of the last inefficient coal-fired boiler plants.

Cities face a complex challenge in ensuring consistent accounting of emissions, partly because some urban systems responsible for greenhouse gas emissions extend beyond their administrative boundaries (this is particularly true for the energy sector, where generation facilities may be located outside city limits). This complicates the assessment process necessary to understand both the overall emissions structure and the potential for reductions — whether within or beyond the city boundaries.

Nevertheless, setting local goals has its advantages.

First, it allows demonstrating the commitment to climate policy, which can increase trust among the population and stakeholders, and activate the participation of citizens and local organizations in addressing the climate issues.

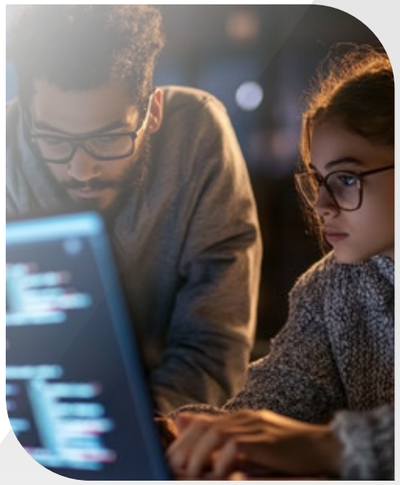
Second, successful examples of local initiatives serve as inspiration for other cities and regions, creating models to follow and promoting broader adoption of sustainable practices.

> "The global climate is one and the same, and we either act together or not act at all. Individual cities may well achieve carbon neutrality as early as tomorrow, but it is important to understand at what costs this will be accomplished"
>
> Sergey Bobylev,
> Lomonosov Moscow State University

> "Setting goals for achieving carbon neutrality carries a powerful signaling effect. When you set such a goal, it motivates both you and the surrounding cities to follow your example"
>
> Igor Makarov,
> HSE University

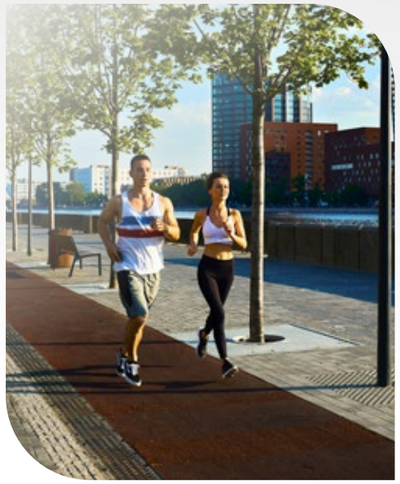
Secondary Effects of Implementing Mitigation Measures

As previously illustrated in the case of the real estate sector (through measures such as improving building energy efficiency and increasing energy savings), mitigation measures have significant co-benefits for urban management and the quality of life of city residents, in addition to directly reducing the carbon footprint.



Unlocking Additional Economic Potential of the Working Population

In particular, measures taken by authorities to develop public transport (including electric transport) and restrict private vehicle use reduce road congestion and the economic losses associated with traffic jams. Traffic congestion decreases productive time, increases fuel consumption, raises air pollution levels, and leads to more road accidents. Evidence suggests such losses can amount to up to 8% of the gross regional product [183].



Improving Urban Residents' Health

Mitigation measures also have a positive impact on the health of urban residents. For example, the development of public transportation, pedestrian, and cycling infrastructure — which helps reduce greenhouse gas emissions — encourages physical activity, which is associated with a decreased risk of numerous diseases, including cancer, cardiovascular diseases, and diabetes [184].

Improving Air Quality

One study estimated that if all the measures outlined in New York's climate strategy — aimed at reducing emissions by 80% by 2050 — had already been implemented at the time of analysis, the city could have achieved an annual reduction in air pollution-related economic losses of USD 3.4 billion. This projected benefit is primarily attributed to a decrease in premature deaths associated with elevated PM2.5 concentrations, as well as a reduction in hospitalizations due to respiratory and cardiovascular diseases caused by air pollution [185].

A similar positive secondary effect is seen in the preservation and expansion of urban green spaces, which help absorb greenhouse gases

Increasing the density of green spaces within 500 meters of one's residence is estimated to reduce mortality risk by 4% [186]. This may result from decreased urban noise and stress levels, improved air quality, mitigation of the urban heat island effect, and other positive impacts.

Thus, adaptation and mitigation measures implemented by cities not only help combat climate change but can also support and strengthen the socio-economic development of urban areas.

TECHNOLOGY DEVELOPMENT

03

TRENDS

7. **Artificial Intelligence**
   Catalyst for Efficiency or Job Disruptor?
8. **Reindustrialization of Cities**
   A Step Back or a Leap Forward?
9. **Platform Employment**
   Flexibility of Conditions or Loss of Guarantees?
10. **Smart Cities**
    Benefits of Digitalization or Risks of Vulnerability?
11. **E-Commerce**
    Consumer Convenience or Urban Degradation?

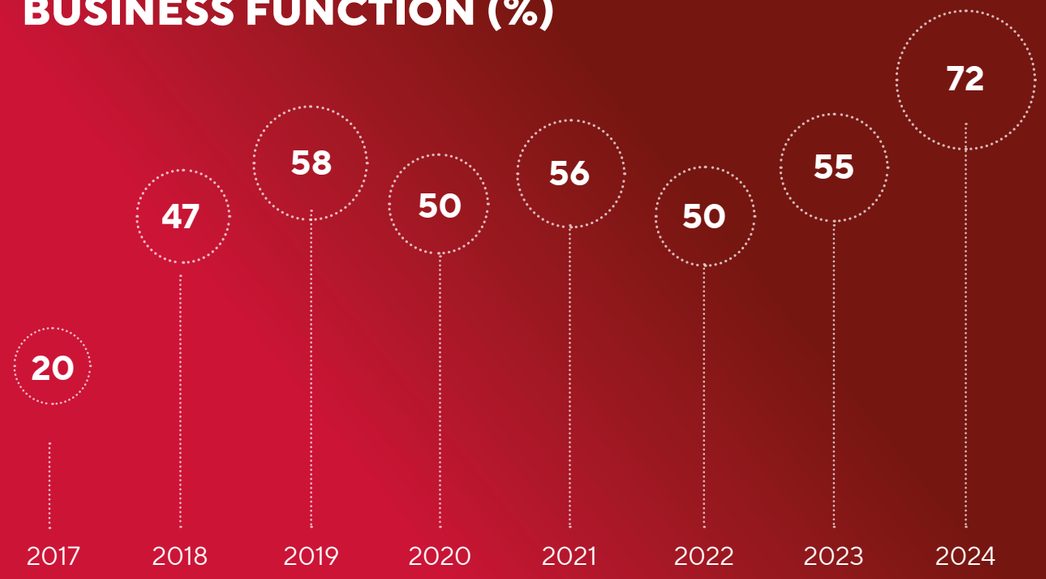
TREND 7

ARTIFICIAL INTELLIGENCE. CATALYST FOR EFFICIENCY OR JOB DISRUPTOR?

Technological innovation is reshaping every facet of human life — work, education, everyday routines, and social interaction. Among these shifts, the development of artificial intelligence (AI) stands out as the most widely discussed trend in recent years. The accelerating pace of AI adoption is clearly reflected in the business survey data below.

While in 2017 only 20% of companies worldwide used AI in their operations, by 2024 this figure had risen to 72% [187]

SHARE OF ORGANIZATIONS THAT HAVE IMPLEMENTED AI IN AT LEAST ONE BUSINESS FUNCTION (%)



The survey results are based on responses from a broad and diverse group of participants, representing all major world regions, industries, company sizes, and organizational types

Source: McKinsey Global Survey on AI

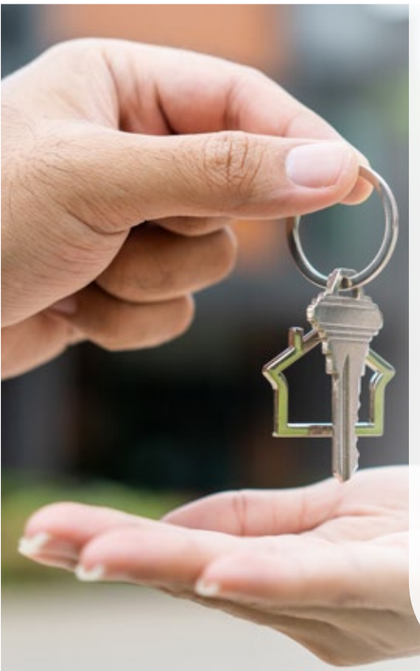
Cities are actively participating in the ongoing technological transformation. AI systems are being integrated into the key sectors of the urban economy, including transportation, healthcare, waste management, energy, and public safety. As AI technologies advance, they offer cities new opportunities to enhance efficiency, responsiveness, and resilience in addressing contemporary challenges. However, these technological shifts also bring significant social implications — such as labor market disruptions and widening digital divide. These risks require careful consideration and proactive management by urban administrations to ensure that innovation benefits all residents and supports inclusive, sustainable urban development.

Priority Areas for AI in the Urban Economy

AI plays an important role in the development of modern cities, enhancing their functionality, environmental sustainability, and quality of life. The technology shows promising results, particularly in transportation, healthcare, and environmental protection. Additionally, effective big data analysis is being applied across all areas of urban management.

Traffic flow management has become one of the key areas for AI application in cities. By analyzing data on road conditions, congestion, and public transport movement, AI helps optimize the transportation system's operation. This reduces travel time, lowers carbon dioxide emissions, and increases the overall efficiency of urban infrastructure use.

CASE STUDY



Amsterdam, Helsinki

The algorithm registries of Amsterdam and Helsinki contain detailed descriptions of the artificial intelligence systems and algorithms used in city services. For example, Amsterdam has implemented strict limits on short-term housing rentals to minimize negative impacts on residential areas: residents can rent out their homes to tourists for no more than 30 nights per year and to a maximum of four people at a time, and they are required to report this to the municipality.

To combat violations, a pilot project was launched in July 2020 using an algorithm that analyzes data on past illegal rentals from the previous five years. This helps the oversight and control department prioritize complaints from neighbors or platforms and allocate limited resources to investigate the most probable cases of illegal rentals.

Through registries containing information about such algorithms, residents can not only familiarize themselves with the city's main management systems but also provide feedback for possible adjustments [188, 189].

Singapore

Singapore aims to become a leader in the AI development by implementing innovations aligned with its "Smart Nation" strategy, adopted in 2014 to improve the citizens' quality of life. As part of this initiative, the Smart Mobility 2030 project utilizes AI to manage traffic flows and reduce congestion through predictive analytics and real-time data monitoring.

The city-state also applies AI to enhance healthcare quality and optimize social housing services, enabling efficient resource allocation and timely maintenance [190].

CASE STUDY

CASE STUDY

Moscow, Russia

Moscow is at the forefront of adopting AI-based solutions in healthcare. The city's MosMedAI platform offers medical professionals across Russia access to advanced artificial intelligence tools for the rapid analysis of CT scans, MRIs, and X-rays. AI algorithms assist in promptly identifying pathological signs and detecting potentially dangerous changes in medical images.

As of today, more than 1,200 medical institutions across 71 regions are connected to the platform, with over 2.7 million medical images already processed. This not only enhances the speed and accuracy of diagnostics but also significantly reduces the workload on healthcare professionals.

"The potential of AI must be utilized primarily in areas where human intelligence struggles to process vast amounts of information. This is relevant not only in the treatment and diagnostics of complex diseases but also in fields such as territorial planning for the development of healthcare, which relies on AI to analyze various scenarios and their impact on achieving the country's healthcare development goals.

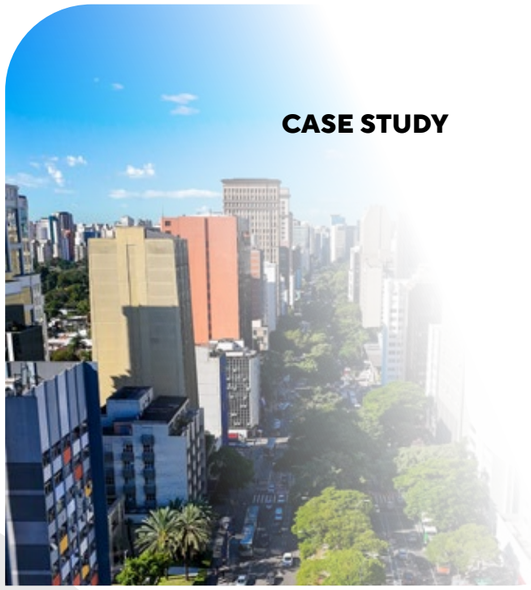
Currently, responsibility for healthcare provision in the regions lies with regional authorities, but the financial capabilities of those regions vary significantly. As a result, the cost and scope of territorial programs differ widely. Some regions can afford extensive reconstruction and construction of medical facilities and set higher mandatory health insurance tariffs, while others cannot. Consequently, patients in less well-resourced regions either receive less qualified care locally or are referred to other regions, where their treatment is paid from the receiving region's territorial mandatory health insurance fund at that region's tariffs.

Using AI at the federal level to forecast the expenditures of all territorial OMS funds and to evaluate the efficiency of constructing and operating large medical centers would prevent cases where regional authorities build excessive medical infrastructure that lacks sufficient patient demand and, therefore, adequate funding for its operation. Essentially, this involves using AI to analyze the effectiveness of various healthcare development scenarios"

Vladimir Geraskin,
DMG Consulting Company

Artificial intelligence is playing an increasingly prominent role in healthcare, enabling more accurate disease diagnostics, the development of personalized treatment plans, and improved forecasting of physician workloads.

Another key area of AI application is environmental protection. Through the use of computer vision technologies, AI facilitates automated waste sorting, which enhances recycling efficiency, reduces the volume of waste, and alleviates pressure on landfills — contributing to more sustainable urban ecosystems.



CASE STUDY

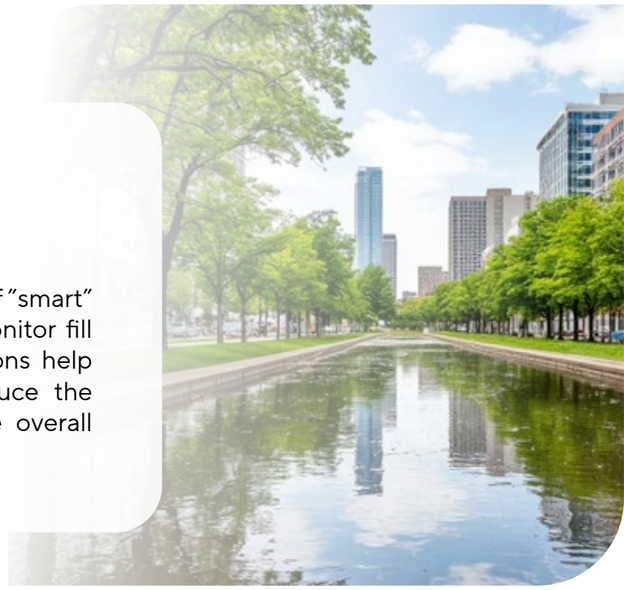
Sao Paulo, Brazil

In Sao Paulo, a solution has been developed to assess and forecast air quality using artificial intelligence and big data analytics. The application utilizes data from mobile networks, complemented by information from weather sensors, traffic flow, and air pollution levels. This helps predict pollution levels 24 to 48 hours in advance, enabling city authorities to take preventive measures [191].

CASE STUDY

San Francisco, USA

San Francisco has implemented a system of "smart" trash bins equipped with sensors that monitor fill levels and other parameters. Such solutions help improve waste collection efficiency, reduce the risk of disease spread, and enhance the overall environmental condition of cities [192].



Imbalances in Labor Market Demand and Supply

The impact of artificial intelligence extends beyond individual industries and becomes significant at the level of the entire economy.

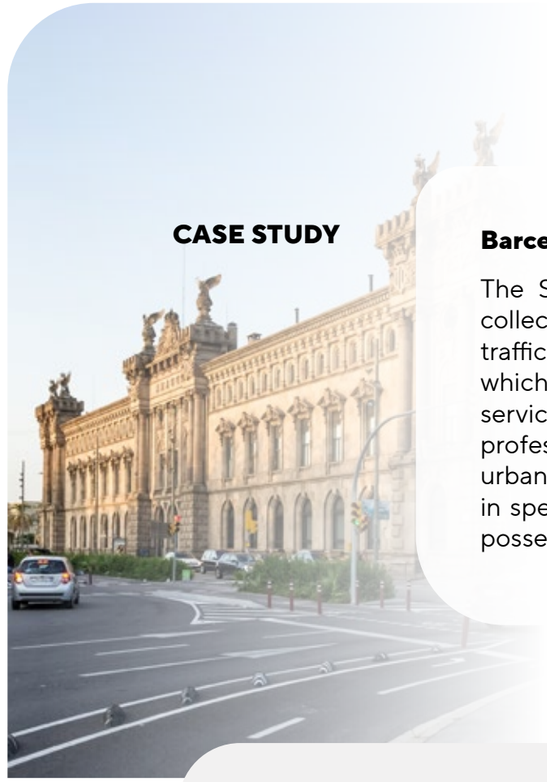
At its current level of development, AI could affect 40% of existing jobs worldwide, including 60% in developed countries [193]

Due to its ability to automate standardized cognitive tasks, the technology is gradually beginning to replace routine intellectual professions in areas such as accounting, data processing, and basic legal analysis. Specialists whose skills are limited to performing routine tasks face a risk of job loss, while demand is increasing for workers capable of managing, developing, and implementing AI solutions. This imbalance intensifies the risks of structural unemployment and calls for the introduction of new educational programs aimed at developing skills that meet the demands of the digital age.

“”We are already seeing situations where ‘white-collar’ workers struggle to find employment for extended periods. As professions are displaced by artificial intelligence, there is a need for tools that enable rapid retraining and transition to another field. This could mean employment in other sectors — industry, agriculture, healthcare — where there is demand for labor, or a shift to an individual path where people become consultants or high-level freelancers. They might engage in entrepreneurship, including creative urban entrepreneurship in a broad sense: opening cafes, daycare centers, or creating leisure services.

The problem is that currently no one is purposefully developing the transition tools that would support individuals and provide everything necessary to navigate the complex process of making such choices”

Evgeniy Volnov,
HH Ventures



CASE STUDY

Barcelona, Spain

The Sentilo monitoring platform created in Barcelona collects a wide range of urban data in real time — from traffic intensity and air quality to waste management — which is then processed by AI algorithms to optimize city services. This and similar platforms create demand for new professions such as data analysts, systems integrators, and urban AI strategists. The Barcelona administration invests in specialized training programs to ensure that residents possess skills relevant to the modern labor market [194].

“”It is still difficult to predict in which direction artificial intelligence will develop, but I believe that sooner or later, AI proficiency will become a mandatory skill. Just as today people say, ‘I am proficient in Microsoft Office,’ it will become essential to know how to write prompts and use AI effectively. This will become a basic requirement for doctors, engineers, teachers — essentially, for all professionals.

Learning this can be done quite quickly, but those accustomed to simply typing search queries into Google or Yandex face challenges because interacting with AI requires a different approach. However, it is not that difficult to learn”

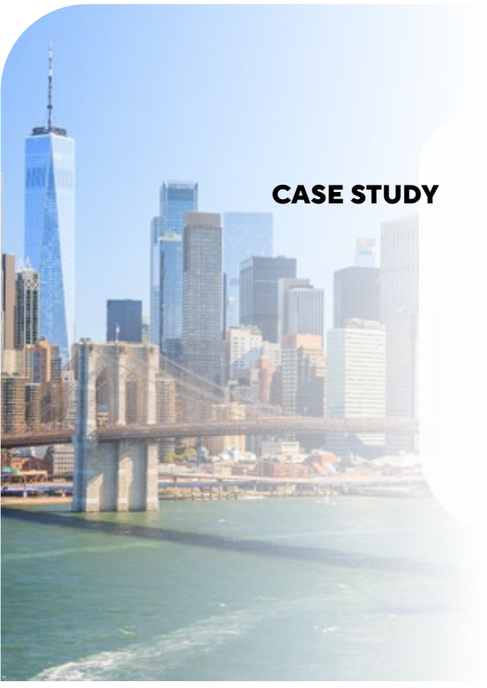
Alexander Voloshin,
Moscow School of Management SKOLKOVO

Prompt
is a request in the form of text, information, or code addressed to artificial intelligence to obtain the desired result

CASE STUDY

Boston, USA

Due to the concerns about improper AI use, the Boston city administration has developed documents and guidelines to assist employees in using these tools.



CASE STUDY

New York, USA

The New York City Administration plans to hire AI ethics officers. Their responsibilities will include developing policies, creating AI risk management plans, and coordinating related activities across departments. Additionally, an advisory committee will be established to support the development of legislation [195].

At the same time, the need to revise educational programs — particularly by putting more emphasis on practical skills currently relevant in the labor market — carries certain risks. Therefore, decisions in this regard must be made carefully to avoid imbalances.

> “If employers start ’calling the tune,’ it would, frankly, be the end of everything, because their perspective is very much shaped by short-term trends and local conditions”
>
> Timothy Edward O’Connor,
> American University of Central Asia

Another social consequence of AI replacing routine tasks is the increase in low-paid jobs related to servicing and supporting these technologies. This type of work, known as ”microwork,” includes performing minor tasks such as data labeling, algorithm verification, content moderation, and other forms of routine labor necessary for training and optimizing AI systems.

It is also important to remember the ”last mile” paradox: even with full automation of processes, there remains a final stage that automation cannot cover and still requires human labor. This paradox is most evident in internet delivery services, where the final step of transporting goods to the consumer cannot currently be done without manual work.

Risks of Widening Digital Divide

> "The development of technology is accompanied by a phenomenon known as the "digital divide" between those who have free access to modern technologies and those who face various limitations — primarily older adults and members of other vulnerable groups"
>
> Belinda Yuen,
> Singapore University of Technology and Design

The digital divide manifests at various levels:

1) in the level of access to technology;
2) in differences in the skills to use them;
3) in inequalities in the benefits that different social groups derive from technology use [196].

Digital inequality exacerbates social isolation and limits opportunities for personal and professional growth for those without full access to digital resources.

Information bubbles limiting knowledge

Development of AI and smart algorithms may lead to a reduction or sharp decline in the overall intelligence and erudition of people. In the worst case, this could result in the formation of social "bubbles," enclosed environments in which individuals possess limited knowledge or awareness of life beyond their immediate experience. This process is partly driven by algorithms used by social networks and search engines that deliver filtered content to users based on their online behavior history.

Source: European Parliament. A Framework for Foresight Intelligence, 2021

The greatest gap in terms of access to technology is observed between urban and rural areas: in 2023, an estimated 50% of the rural population worldwide did not have internet access, compared to only 19% of the residents of urban areas [197].

Within cities, the situation varies: the digital divide manifests at the second and third levels among older adults, minorities, and other socially vulnerable groups — that is, a gap in skills and benefits derived from using digital tools.

Thus, in cities special attention should be paid not so much to primary digitalization — meaning the provision of infrastructure for access to digital tools — but rather to secondary digitalization, which refers to the scale of use of such services and the level of trust in them

For example, the prevalence of financial digital services usage can serve as a good indicator of a society's digital maturity, as it reflects the population's real level of trust in digital technologies and their ability to use them.

CASE STUDY

Amsterdam, Netherlands

In Amsterdam, a charitable project called Cyberbank provides free laptops — donated by city residents — to those in need and offers digital literacy training. The initiative includes free technical support and training sessions to help recipients confidently use digital technologies and expand their opportunities in education, work, and everyday life [198].

With the spread of AI, the risk of a critical increase in the third-level divide — regarding the benefits received — intensifies, as access to artificial intelligence significantly amplifies intellectual inequality. Economically developed regions are much better prepared to adopt AI thanks to advanced digital infrastructure, substantial investments, and readiness to implement cutting-edge technologies. Poor cities and countries face greater challenges adapting to the negative consequences of automation: they lack effective social protection systems and retraining programs, and experience resource shortages to mitigate economic shocks. Moreover, AI reduces dependence on human labor, undermining the competitive advantages of low-cost economies [199].

Artificial Intelligence as a Means to Increase Productivity

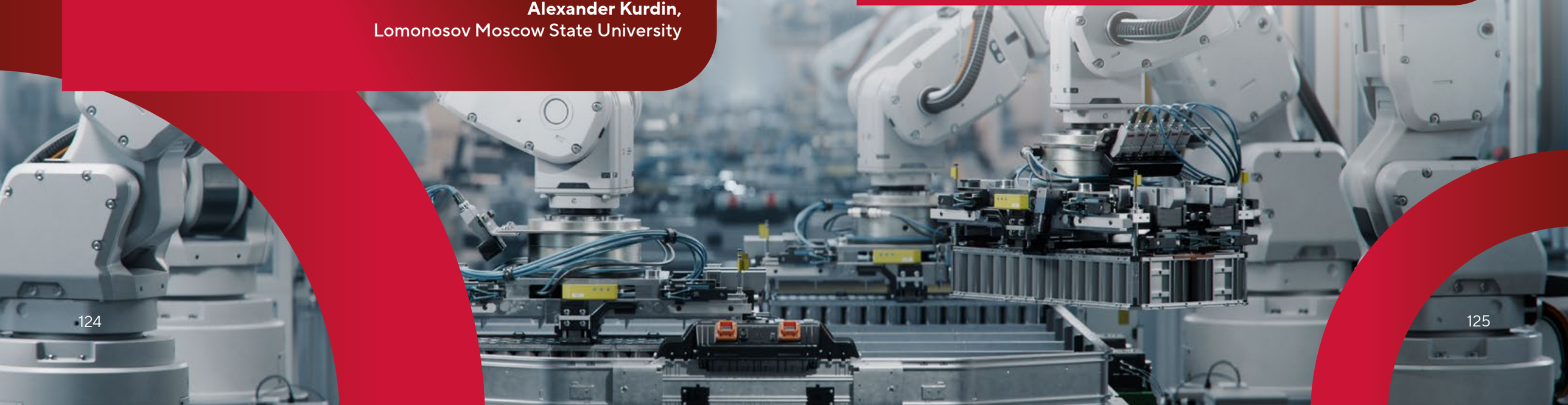
Whereas throughout most of human history new technologies primarily replaced routine physical labor, generative AI is capable of performing a wide range of intellectual tasks. For example, over 60% of tasks currently performed by credit specialists, business analysts, statisticians, and tele-sales managers can be automated using AI [199].

However, in many fields, the potential of AI lies not in completely replacing human labor but in using it to enhance worker productivity. The greatest benefits from AI adoption may be gained by specialists such as mathematicians, bioengineers, editors and database architects, insurance underwriters [200], as well as professionals in other occupations involving important decision-making that requires creativity and unconventional thinking.

> "A successful example of professions with strong potential for AI augmentation is lawyers and judges. The efficiency of processing diverse legal documents significantly increases with the use of artificial intelligence. At the same time, it is unlikely that anyone would consider replacing a judge or lawyer with AI: this is a field that requires making complex and important ethical decisions, sometimes with life-altering consequences"
>
> **Alexander Kurdin,**
> Lomonosov Moscow State University

The potential for automation is limited in professions involving personal human relationships, where empathy, emotional intelligence, and other qualities natural to humans but inaccessible to machines are important. Fields such as childcare, social work, psychotherapy, and many others will continue to be managed by people.

> "Moravec's paradox states that cognitive functions perceived by humans as complex are relatively easy to automate, whereas functions considered simple by humans are difficult to automate. Moravec highlights an interesting phenomenon: modeling the thinking process of a 30-year-old person is comparatively straightforward, while replicating the movements of a two-year-old child presents a significantly more complex challenge. It is believed that tasks involving fine motor skills and physical movement will remain difficult to automate for the foreseeable future"
>
> **Evgeniy Volnov,**
> HH Ventures



TREND 8

REINDUSTRIALIZATION OF CITIES. A STEP BACK OR A LEAP FORWARD?

Since the second half of the 20th century, the developed world has been going through the process of deindustrialization, characterized in particular by a decline in the share of industrial workers within the total employed population [201].

For example, in the 23 of the most developed countries worldwide, employment in manufacturing declined from 28% to 18% between 1970 and 1994 [202]

Deindustrialization has become particularly pronounced in large cities, driven by the shift from an industrial to a service-based economy, high urban land costs, and environmental considerations.

However, today in these same countries an increasingly evident trend towards reindustrialization has emerged driven by several factors. First, new industry is fundamentally different from traditional manufacturing. Modern production facilities are generally compact and high-tech, requiring skilled workers, while becoming energy- and resource-efficient and environmentally friendly for urban areas. Second, the nature of demand is shifting: it is moving away from standardized products toward individualized goods, the production of which is conveniently located close to the consumer. Additionally, such localization reduces vulnerability to disruptions in global supply chains, which became evident during the COVID-19 pandemic. Finally, third, the innovation-driven urban economy often requires integration with industrial capacities to create prototypes of new products, scale production, and quickly adjust product ranges and processes.

According to a 2024 survey by Capgemini, the majority (72%) of large industrial organizations in Europe and the United States already have or are developing strategies to bring production back to domestic markets. These strategies include building new factories, modernizing or upgrading existing plants, constructing "gigafactories" (large-scale facilities for producing equipment for electrification and decarbonization), and shifting to work with local suppliers [203].

72% of large industrial organizations in Europe and the United States already have or are developing their reindustrialization strategy, which may include:

- construction of new factories;
- modernization or upgrading of existing plants through the implementation of new technologies;
- construction of "gigafactories" (typically large-scale battery manufacturing facilities);
- relocation of supply chains to domestic production.

Survey results from 1,300 executives of companies across 13 industrial sectors in the USA, the UK, and Europe. The sample included companies with a turnover of at least USD 1 billion.

Source: Capgemini Research Institute, Reindustrialization Executive Survey, February 2024

Industry 4.0: Opportunities and Benefits of Returning Manufacturing to Cities

The industry that is currently returning to cities primarily belongs to "Industry 4.0" — a term describing the new phase of the industrial revolution that began in the 21st century, based on the use of information technologies and automation. Solutions such as the Internet of Things, industrial artificial intelligence, digital twins, robotics, 3D printing, and additive manufacturing have led to the emergence of so-called smart factories — cyber-physical systems that utilize advanced technologies for manufacturing activities.

Smart Factory

is a concept used to describe application of modern technologies aimed at creating ultra-flexible, self-adjusting production. Such manufacturing systems integrate and regulate the interactions of information flows, workers, suppliers, and consumers. Other names for smart factories include digital or intelligent factories [204]

In recent years, the concept of "Industry 5.0" has been discussed as a new paradigm for industrial development [205]. This concept emphasizes the importance of industry for society, placing worker well-being at its core. A key condition for ensuring sustainable growth is the combination of advanced technology efficiency with human creativity and talent. Industry 5.0 pays particular attention to maintaining a balance between economic development and the planet's resource constraints.

One of the main advantages of integrating technologies such as the Internet of Things, big data, cloud computing, 5G networks, artificial intelligence, robotics, and additive manufacturing into production processes is the ability to enable flexible, personalized manufacturing that quickly adapts to changing market demands.

Introduction of innovative technologies also enables production processes to become cleaner, quieter, and more compact, facilitating manufacturers' integration into urban environments [206]. Reduced energy consumption, waste minimization, increased product durability, lowered health risks, improved production quality, and resource reuse have become key characteristics of advanced manufacturing that adhere to the principles of sustainable development.

CASE STUDY

Singapore

The Singaporean company Alpha Biofuel manufactures compact systems for processing used cooking oil into biodiesel. The company works with waste from restaurants, hotels, and catering companies, and the resulting biofuel is used to power electric generators, freight transport, and marine vessels.

Development of modern industry is an important part of urban economic policy, as the establishment of production facilities within a city implies the creation of quality jobs.

> ”The issue of economic diversification through supporting the real sector is also a matter of balancing income structure. For example, when manufacturing is relocated outside the city boundaries, the share of jobs in the service sector increases. Many of these jobs, especially low-wage jobs, are filled by migrants, while the overall number of workplaces does not grow. At some point, this raises the question of where a significant portion of the native population will work”
>
> **Alexander Shirov,**
> **Institute of Economic Forecasting, Russian Academy of Sciences**

Synergy of Industrial and Scientific Potential

Development, implementation, and maintenance of technologies create a demand for highly skilled personnel, particularly AI developers and data scientists. Since these specialists primarily study, live, and work in major cities, the growing demand for this highly qualified workforce inevitably leads manufacturers to prefer locating their production facilities in large urban centers, close to universities, laboratories, and research institutes.

> ”The new industry in cities will be innovative, based on small-scale production, creating prototypes. Experimental and design work will also remain, since the ‘brains’ are concentrated right here, in the cities”
>
> **Natalia Zubarevich,**
> Lomonosov Moscow State University

At the same time, research centers and laboratories are also interested in developing collaborations with manufacturing enterprises.

> ”One of the challenges in science and technology policy is that development centers often lack their own manufacturing facilities for testing, implementation, and creating pilot batches. In such cases, significant costs arise at the intersection of science and industry.
>
> To address this issue, various attempts are currently underway to organize integration. There is a variety of formats: clusters, technoparks, scientific-educational centers involving industrial enterprises. This is not about mass industrial production but about co-locating divisions of manufacturing companies and scientific centers within a cluster. It is important to note, first, that clusters are not intended to house large-scale serial production enterprises, and second, that clusters should foster interaction among different organizations and ensure a competitive environment. This enhances the efficiency of technological development.
>
> In summary, clusters are an excellent concept that has proven its effectiveness; this approach should continue to be developed further to ensure the integration of science into industry”
>
> **Alexander Kurdin,**
> Lomonosov Moscow State University

Creation and development of industrial clusters, technoparks, and other forms of support for manufacturing sectors in cooperation with the scientific community are reflected in numerous strategies at both the city and national levels.

CASE STUDY

Germany

An example of a successfully implemented government support measure for small and medium-sized enterprises is the German program ZIM (Zentrales Innovations programm Mittelstand). Under this program, if one company develops an innovative technology and another acquires or licenses it, both companies can receive government support: grants for research and development, as well as subsidies for expenses related to technology transfer [207].

Amid rising geopolitical tensions and growing instability in global supply chains, increasing investment in national science and technology and strengthening technological sovereignty have become urgent priorities for many countries. Strategies such as reshoring (returning production to the home country) and friendshoring (relocating production to politically allied countries) are gaining momentum — particularly visible in the evolving foreign economic relationship between China and the United States [208].

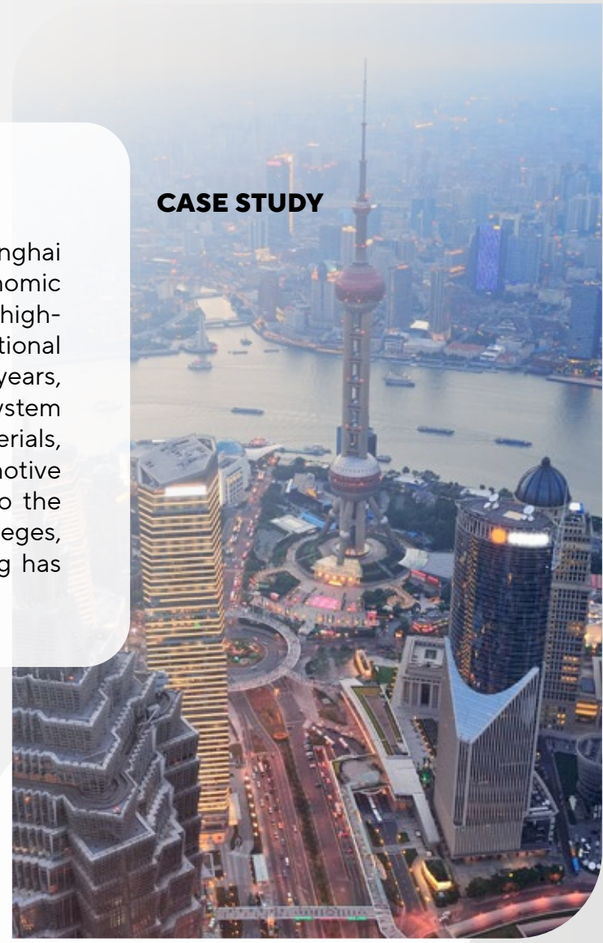
Reshoring
is the process of bringing back production to the home country that was previously relocated to countries with lower production costs (typically developing countries)

Friendshoring
is the redirection of supply chains and relocation of production to countries considered politically and economically safer in terms of partnership

CASE STUDY

Shanghai, China

The Caohejing Hi-tech Park in Shanghai simultaneously functions as a national economic and technological development zone, a high-tech industrial development zone, and a national export processing zone. Over the past 30 years, the park has developed an innovation ecosystem focused on five key sectors: new materials, aerospace technology, biomedicine, automotive manufacturing, and clean energy. Thanks to the proximity of more than 20 universities and colleges, as well as 120 research institutes, Caohejing has access to Shanghai's rich talent pool [209].



Challenges in the Development of Urban Industry

Locating industry within a city is a complex task that requires consideration of many factors. Beyond the need for equipping facilities with purification systems and modernizing production processes to reduce environmental impact, the issue of limited available land for industrial facilities remains pressing. This problem is further exacerbated by competition for urban space, primarily with residential development projects.

For example, London lost about 1,500 hectares of industrial land between 2001 and 2020, which was repurposed mainly for residential development [210]

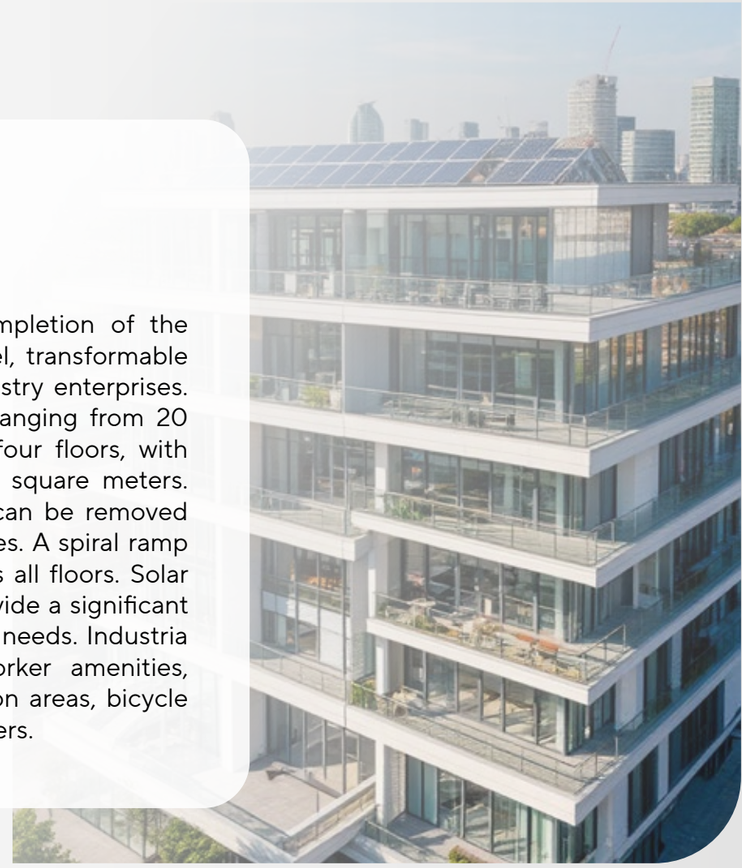
Cities respond to this challenge through various spatial development policies aimed at protecting urban manufacturing capacities and overall economic activity. For instance, a key indicator in the London Plan regarding this issue is availability of industrial land, which is based on the principle of no overall net loss [211] of manufacturing and warehouse space in designated industrial areas. This means preventing any reduction in their total capacity [212] by improving land use efficiency, for example, through increasing building heights and mixed-use development of industrial and non-industrial facilities [213].

One example of such solutions in cities is the strategy of verticalization — the construction of multi-story industrial buildings. Industrial enterprises in the suburbian and rural areas are typically located on large plots, allowing for sprawling, low-rise facilities. However, in urban environments where land is scarce, the concept of "vertical factories" becomes increasingly relevant.

CASE STUDY

London, UK

In 2023, London saw the completion of the Industria project — a multi-level, transformable building designed for light industry enterprises. The building houses 45 units ranging from 20 to 450 square meters across four floors, with a total available area of 11,400 square meters. Partition walls between zones can be removed to create larger combined spaces. A spiral ramp allows freight vehicles to access all floors. Solar panels installed on the roof provide a significant portion of the residents' energy needs. Industria also offers well-developed worker amenities, including a food court, relaxation areas, bicycle parking, locker rooms, and showers.



The concept of mixed-use development is currently evolving, which will integrate industrial zones with residential and commercial areas, resulting in the creation of multifunctional districts. This approach fosters a harmonious environment where production, work, and daily life coexist in unity — provided that city authorities maintain adequate control to ensure compliance with regulations governing industrial operations — without compromising any of these activities. In this context, the potential of small-scale industries, such as food production, is particularly emphasized [217].

Sustainable Development Priorities

During reindustrialization of cities, the question of adhering to sustainable development principles inevitably arises. In this regard, successful integration of industrial facilities into the urban environment is facilitated by implementation of environmentally friendly technologies in production processes, compliance with green building standards for industrial facilities, creation of public spaces, and greening initiatives.

CASE STUDY

Portland, USA

In 2015, construction was completed on the vertical factory The New York [223] in Portland. The industrial building's five floors can each accommodate up to 14 manufacturing tenants. If laid out as a single-story facility, The New York would have occupied the area of three entire city blocks [218]. The building is elevated on columns, allowing freight trucks to access it and creating space for parking underneath [219]. Special attention was given to green building principles during design: architects focused on natural ventilation, daylighting, and mitigating stormwater runoff through green roofs and onsite water collection systems.

In the context of creating conditions for sustainable development of the urban economy, experts emphasize the importance of setting priorities for industrial policy. This approach will not only enable efficient use of the city's existing resources but also achieve a balance between innovation, environmental sustainability, and social development.

"Industrial policy should be developed considering the city's targeted specialization and its existing competencies, workforce, and capital.

If a city has competitive enterprises, their operations should be supported — it is unacceptable to simply shut down production, ignoring existing technological and human resource bases. Unlike industrial cities, modern cities are not built around industrial enterprises, but industry can still be maintained in a city if it is modern and does not pose significant risks to sustainable development.

In this context, industrial policy should take on the character of a sectoral policy and focus on supporting industries that bring dividends to the city: those that have the greatest impact on innovation activity, sustain high-skilled employment, and at the same time produce moderate negative effects in terms of sustainable development.

Sectoral policy should focus on optimizing the dividends that specific industries bring to the city. If they are essential for livelihood or crucial to the city's competitiveness, they should remain in the city despite any negative effects. In other cases, the goal should be to minimize harm — not by abandoning industry entirely, but by ensuring that its intellectual centers, which rely on being within the urban infrastructure and close to educational institutions and research centers, stay in the city"

Alexander Kurdin,
Lomonosov Moscow State University

TREND 9

PLATFORM-BASED EMPLOYMENT. FLEXIBILITY OF CONDITIONS OR LOSS OF GUARANTEES?

Over the past 10–20 years, digital technologies have significantly increased accessibility of alternative forms of employment. Spread of the internet, mobile communications, platforms and aggregators has popularized the types of work such as freelancing, remote work, and temporary contracts. According to the World Bank, in 2023 there were 545 national and global online platforms operating across 186 countries [220], while the demand for gig workers (platform-based workers) has grown by 41% between 2016 and 2023.

Gig economy

is a work model where businesses do not hire employees on staff, but engage specialists for specific projects and tasks. This system is also called the freelance economy

Flexible employment affects cities both indirectly, by creating challenges in providing social guarantees for working urban residents, and directly, by influencing the patterns of urban space usage.

Market Equilibrium: Inclusion in Exchange for Guaranteed Security

One clear sign of the spread of new employment formats is the growing number of professionals switching to freelance work. This model, on one hand, offers workers flexibility, but on the other, increases instability and creates situations of underemployment. Part-time work is becoming increasingly popular in creative fields such as design, marketing, content management, and information technology.

According to the World Bank global study, most gig workers are under 30 years old and seek additional income by flexibly balancing work with studies or other jobs. Another large group of platform workers consists of women. In most of the regions examined by researchers, female participation in the gig economy is higher than in the overall labor market or the informal sector [220].

A key challenge posed by the spread of this new form of employment is ensuring that this segment of workforce has access to social protections, including pension coverage.

"Traditional salaried employment is becoming increasingly rare. This poses a major challenge to pension systems in every country where they exist. Europeans are still holding on as much as possible to the structures built in the 20th century, but even there, it is clear this issue will unfold over the next few decades.

At the same time, I would caution against dramatizing the impact of platform-based employment on pension rights and retirement savings. Currently, about 86–87% of platform workers in Russia also hold jobs in the traditional economy. In other words, the platform economy mainly serves as a source of supplementary employment or provides income during certain life stages — for example, for young people still studying, it offers a flexible work format that doesn't require missing classes. Women with young children, while officially on maternity leave, can earn extra income through platforms. Older individuals who, for various reasons, find it difficult to secure traditional employment can take on jobs within the platform economy. From the perspective of current consumption, ongoing income, and living standards, this is rather a benefit.

If the platform economy grows faster than the traditional economy and the number of people relying primarily on platform-based employment increases, then the risks of social insecurity will undoubtedly rise.

Another challenge in Russia is that the average level of social benefits is quite low despite nearly universal social coverage, and the difference between the social pension for those who have not worked and the insurance pension is minimal. As a result, people see little incentive to rely on the insurance pension. Consequently, platform workers currently show very little interest in paying insurance pension contributions or in voluntary pension savings.

In this respect, our system differs from, for example, European countries, where the social welfare state is much stronger and people genuinely have something to lose when moving from traditional salaried employment to platform work. Therefore, there is significant pressure on platforms in those countries to either pay contributions or avoid undercutting wages. In Europe, both trade unions and workers, supported by the social welfare state, stand firmly on this issue.

It is also important to remember that the platform economy is not the only path through which people move away from salaried employment. More traditional forms of self-employment exist, many of which do not involve paying social insurance contributions. While individual entrepreneurs do make such payments, most pension system experts agree that, overall, the amounts paid are insufficient.

In the future, the core of the insurance pension system — the contribution-paying base — is inevitably going to shrink, and consequently, the role of basic pensions, which are not tied to contributions, will increase. I do not believe that pension systems will be completely abandoned, as this would be disadvantageous for both business and the state.

From a business perspective, older adults in developed countries are consumers. We see the same trend in Moscow and other large megacities: people in early old age actively attend theaters, cinemas, and travel. In megacities, the image of an older person as a traveler has become firmly established: "I have free time now, so I travel." Pre-retirees and young pensioners continue to refresh their wardrobes and take care of their appearance up to a certain age.

Therefore, if pensions were taken away from them, many areas of consumer spending would decline, which would negatively impact businesses. For the state, absence of pensions would pose a risk of increased poverty among the growing elderly population.

Looking 30 to 40 years ahead, it is likely that the portion of insurance pensions will remain small and probably shrink further, while a segment of nearly uniform pensions will emerge for people above a certain age. In that case, platform workers will not be more disadvantaged than others. If they understand that these pensions are insufficient, they will start saving on their own.

At the Higher School of Economics, we conduct surveys on household economic behavior and separately interview the top income decile. The results show that once a person reaches a certain income level — enough to meet their most immediate consumption needs — they begin to save and invest. Among the top decile, which includes both wealthy and moderately well-off individuals, the proportion of savers increases sharply.

Therefore, if incomes continue to rise steadily, we can expect people to start setting aside funds for retirement. This is why it is important to educate individuals — starting around the age of 30 to 35 — on how they can save and invest in various forms. However, this will always be in addition to some minimal state-guaranteed support.

In the 2000s, corporate pension schemes developed quite rapidly. Given the current labor shortage, these schemes could potentially become a source of future pensions. Employers might revive corporate pension plans as a tool to attract and retain employees. However, this would also require coordinated policies between businesses and the government to ensure it remains beneficial for companies as well"

Oksana Sinyavskaya,
HSE University

The Spread of "Swarm Work"

"Swarm work" involves breaking down a task into many small assignments completed by a large group of subcontractors, often unknown to the task initiator. These assignments are distributed either directly or through platforms. Swarm work includes both micro-tasks (small, quick jobs requiring minimal effort) and macro-tasks (larger, more complex assignments that demand specialized skills or more time). The flexibility and scalability of swarm work enable the completion of a wide range of tasks by harnessing the collective capacity of a distributed workforce.

Source: European Parliament. A Framework for Foresight Intelligence, 2021

Remote Work: Impacts on Cities

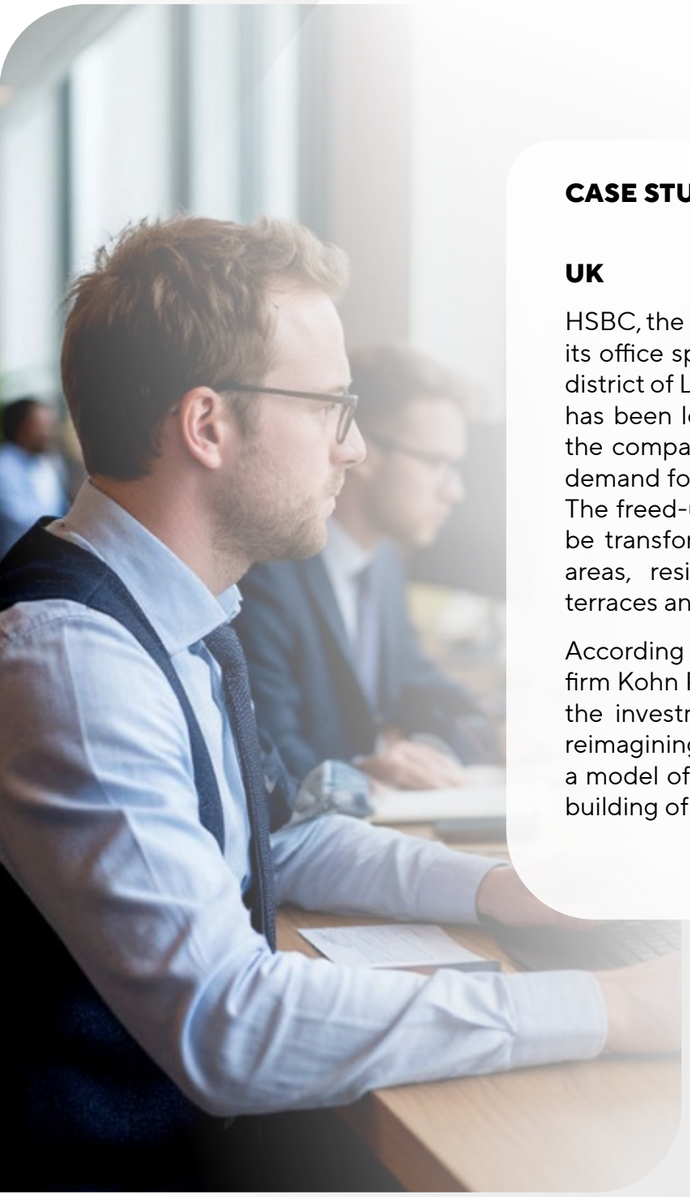
Remote work has become especially popular during the pandemic. Modern digital tools — such as cloud platforms, video conferencing, and collaboration software — enable employees to perform their duties from anywhere without the need to commute to offices daily. For companies, this shift opens new opportunities by granting access to a wider talent pool that was previously limited by geographic boundaries. Flexibility in human resource management has become fundamental in today's rapidly changing market.

At the same time, with the rise of remote work in cities, researchers have identified what is called the "doughnut effect". This phenomenon involves dispersal of economic activity away from city centers as remote work becomes more popular [221].

For example, a study of several large U.S. cities compared pre- and post-pandemic data (covering 2018–2023) on the Mastercard cards transaction activity, household changes in postal addresses, real estate market fluctuations in city centers and suburbs, and commuter migration patterns. These data sets were analyzed alongside employment structure dynamics.

The results showed that about 60% of households leaving the centers of major cities relocated to the suburbs within the same metropolitan area. This trend is explained by growing popularity of hybrid work, where employees are required to visit their offices several days a week. Continuing popularity of the hybrid model post-pandemic suggests that the doughnut effect will persist.

Thus, the growth of remote work in cities leads to reduced economic and transportation activity in central districts, and declining demand for office space. For example, according to an international investor survey conducted in 2023, 90% of respondents expected that many office buildings in the United States will be repurposed within the next five years [222].



CASE STUDY

UK

HSBC, the largest bank in the UK, plans to vacate its office space in the prestigious Canary Wharf district of London, where the financial institution has been located for the past 20 years. Due to the company's shift to a hybrid work model, its demand for office space has decreased by 40%. The freed-up floors of the tower are planned to be transformed into leisure and entertainment areas, residential units, as well as designer terraces and greenhouses.

According to representatives from the design firm Kohn Pedersen Fox, involved in the project, the investment initiative envisions a complete reimagining of the office building, turning it into a model of a "highly sustainable multifunctional building of the future" [223].

CASE STUDY

Washington, D.C., USA

In 2023, the Washington, D.C. city government forecasted significant budget revenue losses over the next three years due to declining property tax income from large office buildings. This decline is attributed to the growing number of remote and hybrid workers. The mayor set a goal to diversify land use in the downtown area and attract 15,000 new residents by 2028.

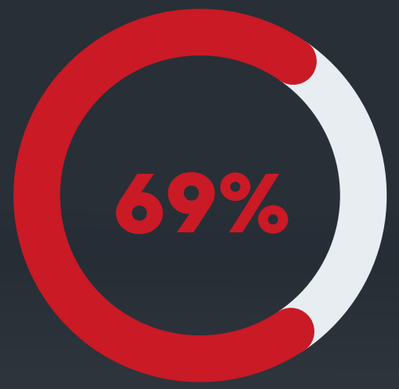
As part of this initiative, the "Downtown Housing" program was launched to encourage the creation of new housing by converting commercial properties into residential units through the provision of special tax incentives. This program removes barriers that investors identified as the most serious obstacles to housing construction and occupancy [224].

TREND 10

SMART CITIES. BENEFITS OF DIGITALIZATION OR RISKS OF VULNERABILITY?

Smart technologies have become an integral part of urban life. Their use enables real-time data collection and analysis, informed decision-making, and efficient service delivery. The level of digital infrastructure development directly impacts the quality of daily life and business environment, as well as the prospects for economic and social development — and ultimately, the territorial competitiveness.

Not surprisingly, nowadays the majority of cities worldwide are already implementing smart city strategies. According to the UN-Habitat data from 2024, nearly 70% of cities have at least a conceptual document or strategy for smart city development. Furthermore, 56% of city administrations have a dedicated organizational unit to manage initiatives in this area, and over 30% have adopted strategies for introducing the artificial intelligence technologies.

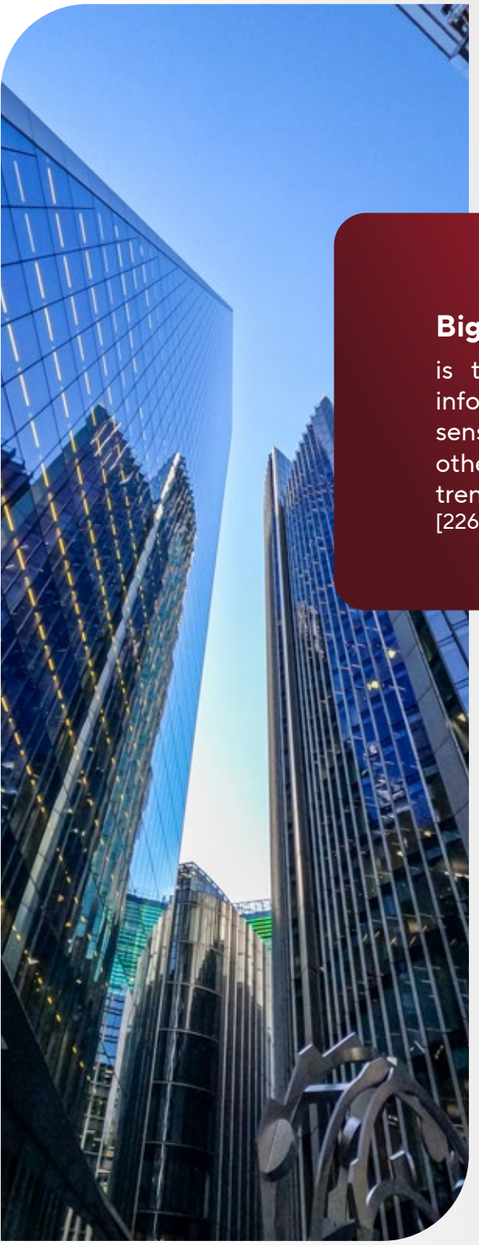


OF THE CITIES WORLDWIDE HAVE ALREADY DEVELOPED A CONCEPT, VISION, OR STRATEGIC PLAN FOR SMART CITY DEVELOPMENT [225]

Source: UN-Habitat
World Smart Cities Outlook 2024

Smart solutions are now used across the entire spectrum of urban management sectors: transportation and utilities, healthcare and education, urban planning, public safety, and environmental protection. At the same time, the exponential growth in cities' reliance on technology brings a set of challenges, such as increased energy demand to support technological infrastructure and the need to ensure cybersecurity for urban systems.

Smart City: Solutions and Areas of Application



A smart city is a large-scale ecosystem of continuously advancing intelligent technologies, with big data analytics, Internet of Things (IoT), and digital twins among its most important components.

Big data analytics

is the process of examining vast amounts of information from diverse sources — such as IoT sensors, social media, financial transactions, and others — to uncover valuable insights, patterns, trends, and correlations to inform decision-making [226]

Integration of the big data analytics into urban management significantly enhances the efficiency of core city functions. In transportation, data analysis enables forecasting of traffic loads, optimizing public transit routes and frequency, and seamlessly integrating transit with other mobility options such as carsharing and personal mobility devices. In housing and utilities, smart systems support accurate forecasting of resource consumption, reduction of energy losses, and timely maintenance of infrastructure. In urban planning, spatial data analysis helps identify underserved areas lacking educational, healthcare, or commercial facilities, allowing for more precise and responsive territorial development.

CASE STUDY

Seoul, South Korea

Seoul has implemented an integrated public transport management system that uses smart cameras in the metro to monitor passenger flow and adjust train speed and frequency in real time. In addition, sensors installed on rolling stock components enable predictive maintenance by detecting potential failures before they happen [227].

IoT technology relies on a vast network of sensors embedded in urban infrastructure and devices, all interconnected to collect and transmit real-time data. This continuous flow of information is sent to a centralized urban operations center, enabling real-time monitoring and decision-making. IoT forms the backbone of smart city infrastructure, helping to make urban environments more efficient, safe, comfortable, and sustainable

Digital twin

is a virtual model of a city that combines data on development, infrastructure, transport network, environmental conditions and other aspects of city life. This data allows for dynamic modeling of city development, when, for example, adding one element instantly changes related parameters. Digital twins also help test the solutions before implementation

CASE STUDY

Lisbon, Portugal

Lisbon has implemented a digital twin of the city to support strategic planning for flood resilience. This advanced simulation technology models the urban landscape in detail, allowing authorities to identify the areas at risk of flooding and assess the potential effectiveness of preventive measures. By using the digital twin, city planners can make data-driven decisions to upgrade infrastructure, reduce flood impacts, and enhance the overall safety and quality of life for residents [228].

Moscow, Russia

Since 2019, Moscow has been operating its own digital twin — a cutting-edge platform that supports urban planning, strategic decision-making, and real-time monitoring of key development projects. Built entirely in-house and based on open-source software, the system enables authorities to model the construction of residential, industrial, and social infrastructure with high precision. Its creation required over 12 million high-resolution images of the city, captured from both aerial and ground perspectives. These images are updated annually to ensure the photogrammetric model remains current and reliable. The digital twin has become a vital tool for improving project oversight, optimizing city resources, and enhancing transparency and efficiency in urban management.

CASE STUDY

CASE STUDY

Dubai, UAE

As part of its urban development strategy, the Dubai Municipality has introduced Dubai Here — a smart digital platform designed to manage infrastructure projects and urban planning in a fully integrated environment. [229] The platform connects all key stakeholders, enabling seamless submission of project documents, automated calculation of landowner compensations, and efficient coordination of approvals. By digitizing and centralizing these processes, Dubai Here has dramatically reduced approval times, accelerating the launch of major infrastructure initiatives and driving the city's economic growth. The platform exemplifies how digital tools can enhance transparency, efficiency, and coordination in urban governance.

Challenges of Digital Urban Development

The growing dependence of cities on technology presents a number of challenges that urban administrations will need to address in the near future. Among them are the increasing energy demands required to support technological systems, the rising significance of cybersecurity threats, and the difficulty of ensuring an integrated approach to implementation of smart solutions across urban environments.

Challenge 1
Rising Energy Consumption

According to forecasts by the US Energy Information Administration (EIA), global electricity generation is projected to increase by 30 to 76% by 2050 compared to 2022

Rapid advancement of technology, exponential growth in data processing, and shift to next-generation communication standards are expected to be the key drivers of rising electricity demand. In 2024, global electricity consumption for data centers, cryptocurrency mining, and AI technologies reached around 460 TWh. By 2050, data centers alone are projected to consume between 2,500 and 4,500 TWh per year. To accommodate this surge, cities will need to scale up electricity generation — prioritizing renewable energy sources to meet sustainability targets — modernize power infrastructure, and implement smart consumption management systems to ensure a stable, efficient, and environmentally responsible energy supply.

> ”We need to pay closer attention than ever before to the energy balance — especially when it comes to renewable sources like solar and wind, which do not always guarantee a stable supply. At the same time, data-driven systems require a consistent and reliable flow of electricity to function properly”
>
> **Dmitry Titov,**
> Aquarius Group of Companies

Improving energy efficiency of data centers will help reduce the load on the power grid. Such solutions are already being actively implemented. For example, liquid cooling systems, previously used only for supercomputers, are beginning to be widely used in traditional data centers, including by tech giants like Google and Microsoft. Compared to traditional air systems, these systems can reduce cooling energy consumption by more than 18%

CASE STUDY

Stockholm, Sweden

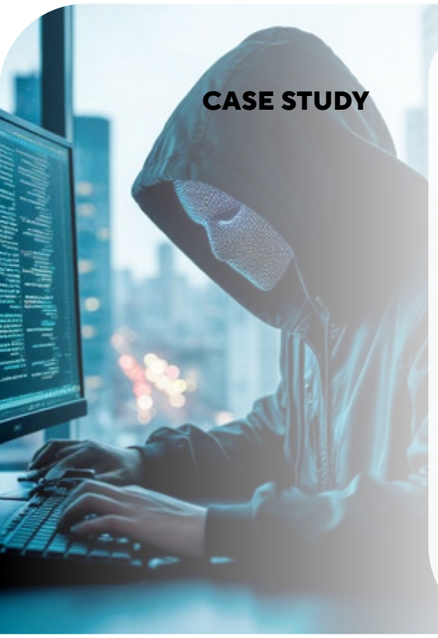
In Stockholm, data center operator DigiPlex partnered with energy company Stockholm Exergi to implement an innovative heat recovery solution. Under the agreement, the excess heat generated by DigiPlex’s data centers is captured and redirected to support the city’s district heating network. According to project estimates, the recovered heat is sufficient to warm around 10,000 apartments. [230].

Challenge 2
Escalating Cybersecurity Threats

Growing reliance of urban infrastructure on digital technologies significantly increases the risk of disruption due to cyberattacks. Malicious actors can exploit vulnerabilities in outdated software or gain unauthorized access through unsecured connections, potentially disabling critical systems and services. Respondents to the Global Risks Perception Survey (GRPS) conducted by the World Economic Forum in 2022 ranked poor cybersecurity among the top 10 risks that have worsened over the past five years, underscoring the urgent need for cities to strengthen their digital defenses.

At the regional level, cybersecurity risks are ranked among the top five concerns in East Asia, the Asia-Pacific region, and Europe. Several smaller nations with advanced digital economies — such as Denmark, Israel, Japan, Singapore, and the United Arab Emirates — have also listed this threat among their top five most critical risks, highlighting the heightened exposure of digitally advanced cities to cyber threats and the need for proactive security strategies. [231].

According to the UN-Habitat study, 35% of municipal authorities reported facing difficulties in ensuring data protection within the framework of their smart city initiatives [225]



CASE STUDY

New York City, USA

New York City is taking a proactive approach to enhancing cybersecurity by investing in public education, workforce training, and community engagement. The New York State Office of Information Technology Services develops and publishes accessible educational resources to help residents understand and mitigate digital risks. In parallel, the city hosts high-profile events such as an annual cybersecurity conference and a youth-focused technology competition, aimed at raising awareness and fostering interest in digital security among the next generation. These initiatives form part of a broader strategy to build a cyber-resilient city by strengthening digital literacy and promoting a culture of security across all levels of society [232].

The rapid digitalization of urban life significantly increases the risk of personal data leaks, potentially leading to unauthorized identification of individuals and exposure of sensitive information. Safeguarding data in this context requires the deployment of advanced cryptographic technologies, rigorous cybersecurity protocols, and, wherever feasible, the anonymization of user information. At the same time, the vast scale of data collection and processing in smart cities is testing the limits of existing data protection laws, underscoring the urgent need to modernize legal frameworks to keep pace with evolving technological and economic conditions [233].

> “Cybersecurity is emerging as a major priority for venture capital investment globally, driven by the growing recognition that digital risks will continue to escalate and demand robust countermeasures. One of the most promising fields within cybersecurity is identity management — technologies that ensure secure and accurate identification while safeguarding privacy and personal data protection, especially in the context of increasingly sophisticated threats such as deepfakes”
>
> **Vasily Auzan,**
> Frontier

Challenge 3
Complexities of Project Management

Introduction of smart solutions in urban governance is accompanied by a number of complex management challenges. In many respects, the issues faced by cities mirror those encountered by corporations undergoing digital transformation: insufficient funding, outdated legacy systems with limited interoperability, a lack of digital skills among users, and administrative protocols and regulatory frameworks that are struggling to keep pace with rapidly evolving technologies.

One of the commonly cited issues is insufficient integration between sector-specific IT systems in cities, resulting in data duplication, incompatible formats, and critical information gaps.

73% **of municipalities cite absence of unified technical standards as a significant obstacle to the development of smart city initiatives** [225]

Without system integration, full potential of advanced technologies — such as digital twins, artificial intelligence, and big data analytics — cannot be unlocked, as these solutions rely on consistent and coordinated data flows. This makes an integrated approach to smart city development essential. Projects must be designed to align with overarching urban development objectives, respond to user needs, and remain adaptable to the rapid evolution of technology.

CASE STUDY

Moscow, Russia

Launched in 2014, Active Citizen has become Moscow's leading digital platform for civic participation, turning residents into active contributors to urban development. What began as a simple voting tool has evolved into a comprehensive platform for citizen engagement, enabling Muscovites to influence decisions on a wide range of city projects.

Thanks to the platform, more than 2,000 public spaces — including courtyards, streets, parks, and embankments — have been transformed based on citizen input. It has also played a key role in shaping new service standards for clinics, libraries, and government centers, while enriching the city's cultural calendar through improved and more inclusive festivals.

Today, Active Citizen allows users not only to vote on proposals but also to submit their own ideas, participate in city initiatives, explore educational quests, and stay updated on Moscow's news and events. With over 7.2 million participants and more than 4,000 decisions implemented, the platform stands as a global benchmark for large-scale, tech-enabled participatory governance.

CASE STUDY

Bristol, UK

Bristol is Open (BIO) is a pioneering joint initiative by Bristol City Council and the University of Bristol, aimed at building one of the world's most advanced, integrated digital infrastructures. Managed through a unified software environment, the system includes high-capacity fiber-optic networks, 5G coverage, and a network of sensors installed on street lighting, forming a powerful platform for real-time urban data collection and smart city experimentation.

A key feature of the project is its commitment to open access — providing public authorities, non-profit organizations, researchers, and businesses with tailored access to urban data, enabling them to test and implement innovative solutions. The infrastructure is deliberately designed to be modular, reprogrammable, and open to new partners, including startups and research institutions, ensuring long-term adaptability.

Crucially, the development of digital infrastructure is not an end in itself. Rather, it is positioned as a tool to help the city achieve broader goals — such as environmental sustainability, improved service delivery, and the growth of a future-oriented, innovation-driven economy [234].

CASE STUDY

Moscow, Russia

The I.MOSCOW digital platform is a unified gateway to Moscow's innovation ecosystem, designed to support innovators and technology companies. It offers access to a wide range of tools and services, including investor matchmaking, training on intellectual property rights, assistance in selecting test sites for piloting new products, and applications for startup development and scaling programs. The platform features more than 20 support services, making it a central resource for driving technological growth and entrepreneurship in the city.

"You can't build a sustainable city in pieces — focusing on green or blue spaces while ignoring waste policies, or assessing air and water pollution without considering food systems. These issues are deeply interconnected, and I'm encouraged to see a growing shift toward systems thinking and more integrated approaches.

For a long time, urban governance has operated with separate strategies for transport, water management, land use, and economic development. But this fragmented model often fails to capture the full picture and overlooks the complex ripple effects of policy decisions.

A compelling example of systems thinking comes from Seattle, which set a bold goal to become the most sustainable city in North America. To measure progress, city officials chose a single, powerful indicator: the number of salmon that swim up the Cedar River — within city limits — to spawn and return to the ocean. When numbers began to decline, the city launched a search for root causes. They found that rising river temperatures were the key issue. This led to a comprehensive review of the entire watershed, identifying which upstream actions were disrupting the ecosystem. By addressing the true sources of the problem, Seattle was able to design targeted, effective interventions"

Nicholas You,
Guangzhou Institute for Urban Innovation

TREND 11

E-COMMERCE: CONSUMER CONVENIENCE OR URBAN DEGRADATION?

Internet Expansion:
between 2014 and 2024, the number of internet users worldwide doubled, reaching 5.56 billion people

Growing internet penetration — particularly through mobile devices — has made online shopping increasingly accessible and widespread. The COVID-19 lockdowns played a major role in accelerating the shift toward remote commerce. In parallel, advancement of digital advertising technologies has introduced new and more immersive ways to promote products and services. For example, virtual and augmented reality tools now allow consumers to "try on" items virtually, significantly improving online shopping experience. As a result, the global e-commerce market, already vast, is set to continue its strong upward trajectory [235].

The growth of e-commerce has already had a significant impact on cities, bringing with it a range of challenges that are still in early stages of being addressed. One major consequence is declining demand for traditional retail spaces, prompting questions about how to repurpose these areas. At the same time, the rise of e-commerce infrastructure is reshaping criteria for residential and office location decisions, as proximity to logistics hubs becomes more important. Last-mile delivery is probably the most pressing issue, putting strain on urban transport systems and calling for new solutions to balance efficiency with livability

BY 2027, THE SHARE OF E-COMMERCE IN GLOBAL RETAIL SALES IS PROJECTED TO REACH 41%, UP FROM 18% IN 2017

Share of E-Commerce in Global Retail Turnover

Source: BCG Winning Formulas for E-Commerce Growth, 2023

BY 2030, THE GLOBAL E-COMMERCE MARKET IS EXPECTED TO REACH USD 21.2 TRILLION, MORE THAN TWICE THE SIZE OF ITS 2024 VALUE OF USD 8.6 TRILLION

Source: Mordor Intelligence. E-Commerce Global Market Report

Transformation of Retail Spaces

Brick-and-mortar stores are facing mounting challenges amid growing competition from online retailers. Relatively high overhead costs — such as rent, staffing, and inventory storage — place traditional businesses at a disadvantage. According to Morgan Stanley, from 1995 to 2021, the US saw more physical stores close each year than open, driven by the rise of e-commerce and shifting demographic trends [236].

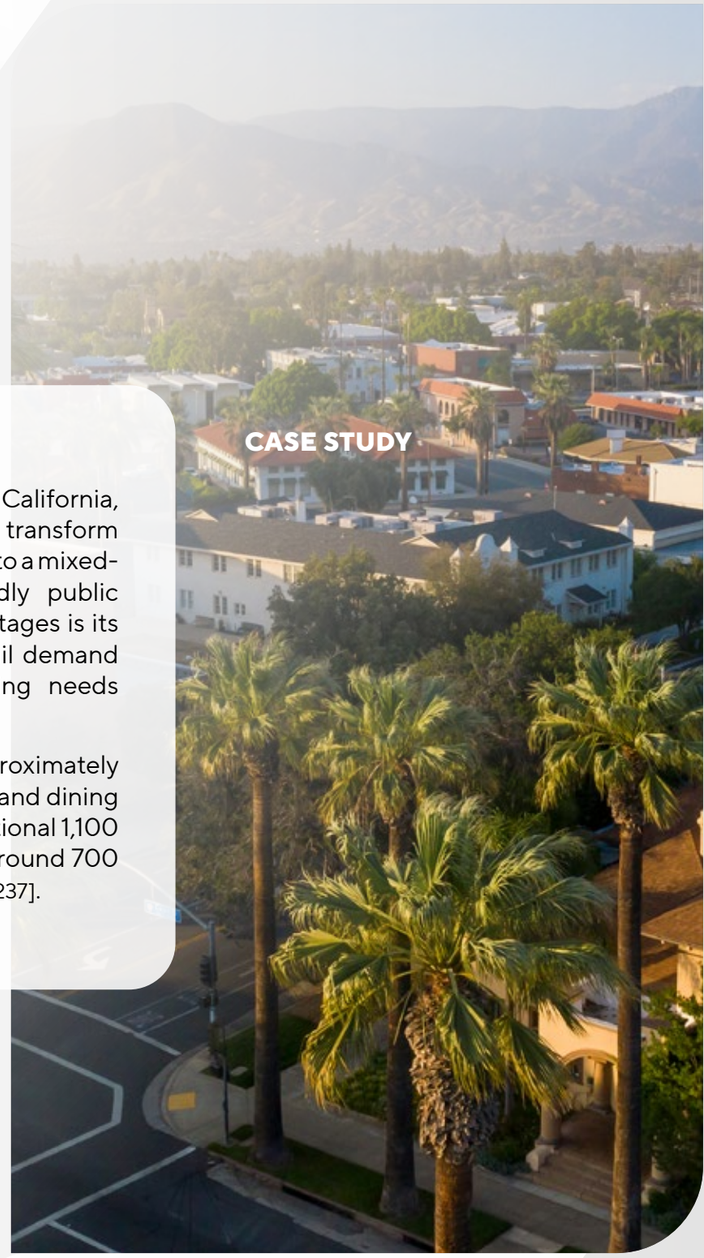
Declining interest in offline retail is reshaping the commercial real estate sector. Traditional stores with full inventory and storage are increasingly being converted into smaller showrooms, while underutilized shopping malls are being repurposed to serve public and cultural functions — becoming home to fitness centers, lecture halls, galleries, and event spaces. This trend reflects a return to the original concept of shopping malls as multifunctional spaces that blend retail with entertainment. Over time, leisure components were largely pushed out in favor of more commercially lucrative retail operations. Today, however, expanding the recreational and community-oriented role of these spaces is once again gaining relevance. In many cases, malls are being redeveloped as mixed-use complexes that include residential units. In developed cities, shortage of housing has become a far more pressing issue than the lack of retail space — prompting a shift in how urban real estate is planned and utilized.

CASE STUDY

Redlands, USA

In 2022, the city of Redlands, California, approved a redevelopment plan to transform an aging downtown shopping mall into a mixed-use district with pedestrian-friendly public spaces. One of the mall's key advantages is its central location, but over time, retail demand in the area declined while housing needs increased significantly.

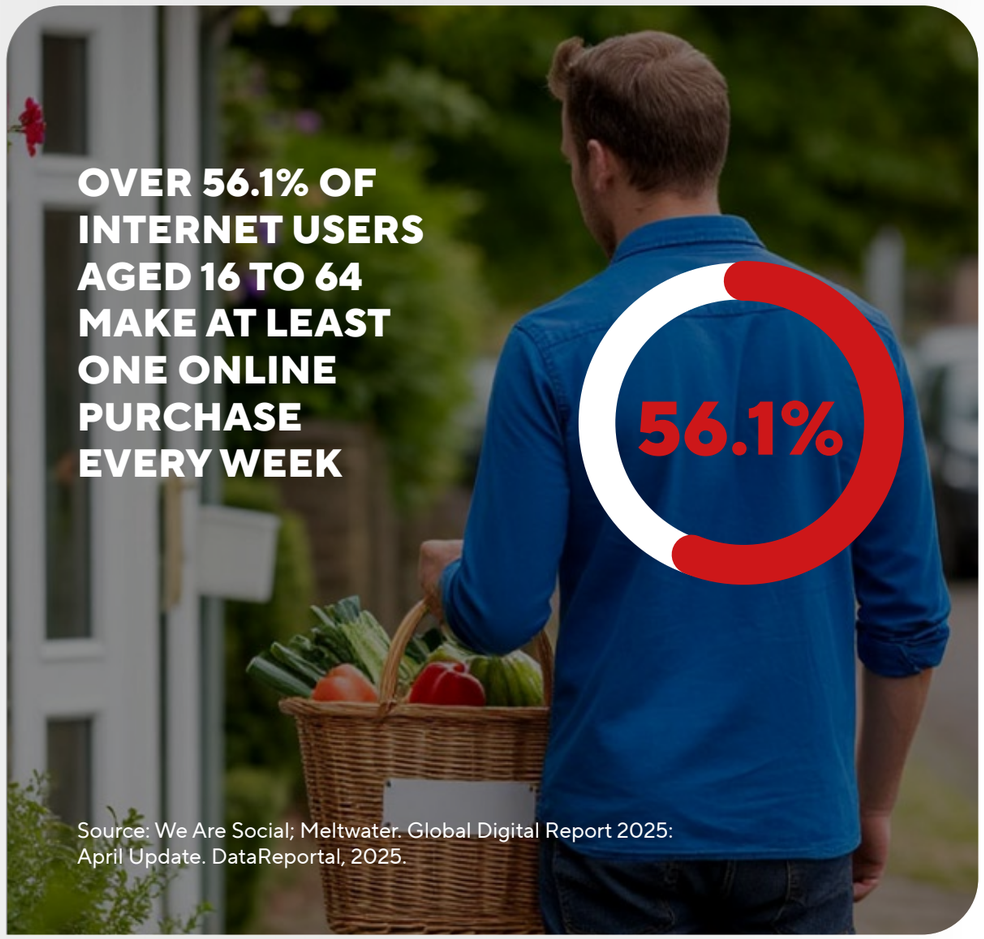
Under the redevelopment plan, approximately 7,000 square meters of commercial and dining space will be retained, while an additional 1,100 square meters of office space and around 700 residential units will be introduced [237].



Passive Accessibility

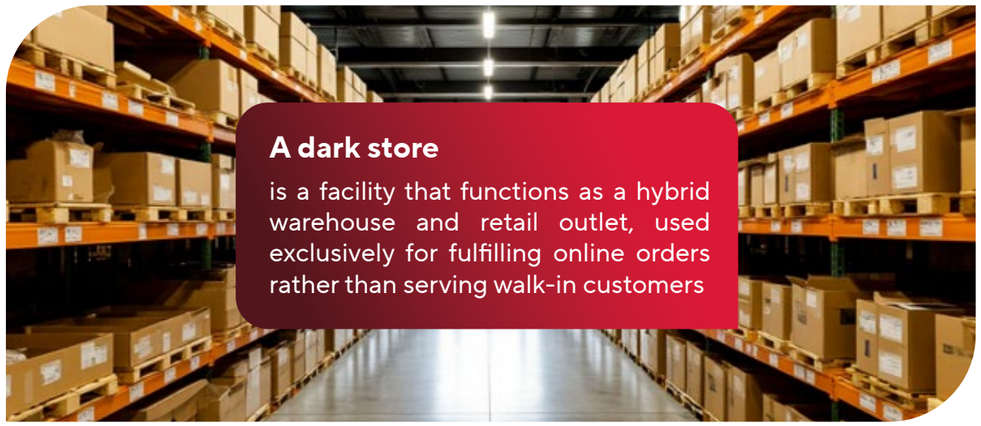
A major shift in consumer behavior is the transition from active to passive accessibility — from a model where the consumer travels to the product, to one where the product is delivered directly to the consumer.

Delivery is no longer seen as a secondary service, but as a core component of the customer experience — one that directly affects a business's competitiveness. In a global study conducted by DHL involving 12,000 consumers across 24 countries, 54% of respondents cited high delivery costs and 46% pointed to long delivery times as key reasons for abandoning a purchase [238].



Source: We Are Social; Meltwater. Global Digital Report 2025: April Update. DataReportal, 2025.

In this context, approaches to the placement of retail infrastructure are also evolving. Unlike traditional high-traffic-dependent formats such as cafes and restaurants, newer models — like dark stores and pickup points — remain effective even in low-traffic zones. These formats are designed for courier-based delivery or targeted customer visits. As a result, under the new paradigm of passive accessibility, retail facilities are being distributed more evenly across urban landscape — without compromising economic efficiency.



A dark store

is a facility that functions as a hybrid warehouse and retail outlet, used exclusively for fulfilling online orders rather than serving walk-in customers

As a result, the rise of passive accessibility is influencing the residential and office real estate market, as residents and tenants begin to prioritize different factors when choosing a location.

> "During the pandemic years, passive accessibility of goods and services became a key factor in how people interact with urban space — fundamentally reshaping expectations of the city environment. For example, with fewer residents making regular trips to grocery stores, the presence of multiple shops nearby is no longer as critical when choosing a place to live. Instead, greater importance is placed on being located within the coverage zones of major delivery services or close to pickup points"
>
> **Ruslan Goncharov,**
> HSE University

Last-Mile Delivery Challenges and Possible Solutions

Today, the most expensive stage of delivery is the so-called last mile — the final leg of the journey from a distribution center to the end consumer. In 2018, last-mile logistics accounted for 41% of total supply chain costs [239]. Unsurprisingly, businesses are increasingly focused on minimizing these expenses.

Remote commerce — particularly last-mile delivery — has several negative externalities for cities. The growing volume of deliveries contributes to increased traffic congestion, higher emissions, deteriorating air quality, and worsening of public health outcomes for urban residents.

According to estimates by Accenture, if current delivery business models remain unchanged, the number of vehicles on urban roads worldwide could increase by over 60% by 2030 [240]

As a result, the push to optimize delivery processes is driven not only by business interests, but also by city authorities, who are increasingly concerned with reducing congestion, emissions, and the broader urban impact of last-mile logistics.

There are several promising directions for rethinking the delivery process. One approach is to assign all logistics operations within a district to a single local operator, responsible for handling deliveries from all companies within that area — thereby reducing duplicate routes and traffic. Another option is to scale back door-to-door delivery in favor of greater use of pickup points and parcel lockers, which can consolidate deliveries and reduce vehicle movements.

A further strategy involves optimizing logistics through big data analytics. Data-driven solutions enable a deeper understanding of delivery patterns — such as frequency, types of goods, and routing behavior — making it possible to design more efficient and sustainable logistics systems.

Gothenburg, Sweden

The city administration of Gothenburg entered into a data-sharing agreement with local logistics companies, resulting in mutual benefits. By gaining insights into how loading zones were being used across the city, municipal authorities were able to more effectively manage parking regulations and curbside space. At the same time, logistics providers used this data to optimize their delivery routes, reducing unnecessary travel within the city and minimizing fuel consumption [241].

CASE STUDY

London, UK

London has launched Kerb, a smart app that allows drivers to locate and pre-book loading spaces based on real-time traffic conditions. In coordination with the city authorities, the Kerb platform even provides access to restricted zones where standard parking is typically prohibited. By reducing the time spent searching for suitable unloading spots, the app has increased delivery efficiency, enabling drivers to complete up to 21% more deliveries.

According to the developers, this improved efficiency could reduce CO_2 emissions in London by 15,000 tonnes per year. Kerb is also piloting a dock management solution, allowing parking reservations to be aligned with cargo ship schedules — ensuring better use of limited dockside space [242].

CASE STUDY

CASE STUDY

Rotterdam, Netherlands

The Rotterdam-based Logistiek 010 network — comprising nearly 3,000 logistics companies — is working in collaboration with the city government and academic institutions to eliminate inefficient delivery routes and reduce the negative urban impact of freight transport.

One of the initiative's key achievements is the creation of a zero-emission zone for service and delivery vans. Starting in 2025, all newly registered vans and trucks operating in this zone must be equipped with zero-emission engines. Vehicles purchased before that date will be allowed to operate under a transition period until 2030 [243].

Another way to improve last-mile delivery efficiency is by leveraging alternative spatial and temporal resources — such as using waterways for transport or shifting deliveries to nighttime hours. Nighttime deliveries allow freight vehicles to move through densely populated urban areas with less congestion and easier access to unloading zones.

The main barrier to this model is noise pollution during nighttime hours. However, this challenge is increasingly being addressed through electrification of delivery fleets: electric vehicles are typically much quieter than those with internal combustion engines, making them more suitable for late-night operations.

Barcelona, Spain

Barcelona has implemented nighttime deliveries using freight trucks equipped with noise-reduction technologies. According to city data, two large "quiet" trucks operating at night can replace seven smaller conventional trucks used during the day. This is made possible by significantly higher speeds on uncongested streets at night — on average, three times faster than daytime travel on busy roads [244].

CASE STUDY

Paris, France

In Paris, IKEA delivers goods from a suburban warehouse into the city via the Seine River. Upon arrival, packages are transferred from boats to electric vehicles for last-mile delivery. This multimodal solution has enabled the company to increase home deliveries while reducing the CO_2 emissions by a factor of five compared to traditional road transport — thanks to a reduction of delivery van mileage by 300,000 kilometers [245].

CASE STUDY

Among the key challenges to improving last-mile delivery efficiency, experts highlight the number of couriers and the cost of maintaining and operating delivery vehicles.

> "Reducing the cost of transport used for deliveries is a critical factor for the continued growth of the entire sector. Failure to address this issue could lead to longer wait times for consumers"
>
> **Artyem Molchanov,**
> Yandex Go

Rapid development of rover delivery — using autonomous delivery robots to transport small packages — offers new opportunities for optimizing logistics and reducing delivery times. However, widespread implementation still requires significant infrastructure improvements, such as creation of dedicated lanes or zones that allow these robots to move safely and without obstruction through urban environments.

EVOLUTION OF SOCIETAL VALUES

04

TRENDS

12. **Sustainable Behavior**
    Raising Awareness or Penalizing Violators?
13. **Social Justice**
    Widening Inequality or Consolidated Action?
14. **A City for All**
    Equal Access or Inclusive Environments?

TREND 12

SUSTAINABLE BEHAVIOR. RAISING AWARENESS OR PENALIZING VIOLATORS?

Urbanization, by transforming natural habitats into built environments, has historically contributed to biodiversity loss and land degradation. The environmental consequences associated with urban growth — such as air and water pollution, poor sanitation, urban heatwaves, and exposure to hazardous chemicals — have had, and continue to have, a significant impact on health and well-being of city dwellers.

According to the World Health Organization estimates, 91% of the urban residents worldwide are exposed to polluted air. Urban transportation systems contribute not only to air and noise pollution, but also to additional risks such as traffic-related injuries and health problems associated with sedentary lifestyles [246].

At the same time, cities are home to a high concentration of well-educated, high-income residents who increasingly prioritize quality of life, physical and mental health, and life expectancy. As a result, urban populations are increasingly supportive of environmental initiatives, creation of green spaces, and efforts to reduce traffic congestion. This shift is also reflected in changing everyday habits: people are opting for eco-friendly products, using energy-efficient appliances, and switching from private cars to public transport and bicycles

Environmentally conscious demand exerts a dual influence: on one hand, it creates economic incentives for companies and municipalities to implement climate adaptation measures; on the other, it shapes social expectations, encouraging the long-term adoption of sustainable practices. A majority of business leaders — 77% — recognize the shift in consumer preferences and agree that sustainability concerns will increasingly impact their supply chains and ecosystem partners [247].

According to the 2024 study by ESG Today and Morgan Stanley, 80% of investors plan to increase their investments in sustainability-related solutions and projects over the next two years [248]

"Corporate social responsibility (CSR) is nothing new for business. What's changing now is the motivation behind it. What was once seen as an obligation — often driven by external pressure — is increasingly becoming a conscious strategic priority. Businesses now recognize that their long-term success and ability to attract and retain top talent, depends on their commitment to sustainability. Whereas in the past CSR might have been viewed as a kind of tax — 'I'll give a portion of our profits to build a hospital, a school, or a road' — today it's seen as an investment in human capital. Corporate social responsibility is evolving into a core component of value creation, integrated directly into business operations. This shift reflects a growing awareness of the future economic risks and rewards tied to sustainability"

Andrey Sharonov,
National ESG Alliance

Creating a Sustainable Urban Environment: Key Challenges

Improving environmental conditions in major cities faces numerous constraints rooted in socioeconomic, infrastructural, and governance-related factors.

Challenge 1

First, densely populated, heavily built-up, and infrastructure-rich urban areas require particularly massive environmental transformation. High population density places intense pressure on key resources such as water, energy, and land, while also demanding continuous operation of complex infrastructure systems — including heat, power and water supply, as well as urban transport. This makes large-scale ecological shifts more difficult to implement and sustain in metropolitan settings.

"Megacities have exhausted nature's assimilative capacity for purifying air and water. Environmental capacity — a key concept — refers to the ability of natural systems to absorb pollution. In large urban areas, this capacity has already been exceeded"

Sergey Bobylev,
Lomonosov Moscow State University

Challenge 2

Second, environmental initiatives — such as creating green spaces, expanding public and electric transportation, transitioning to renewable energy, or modernizing stormwater and sewage systems — require substantial investment, which many city administrations simply cannot provide for. According to the UN Environment Programme (UNEP), global spending on nature-based solutions in urban areas must increase from USD 200 billion in 2023 to USD 542 billion by 2030 in order to meet climate, biodiversity, and land degradation targets [249].

Challenge 3

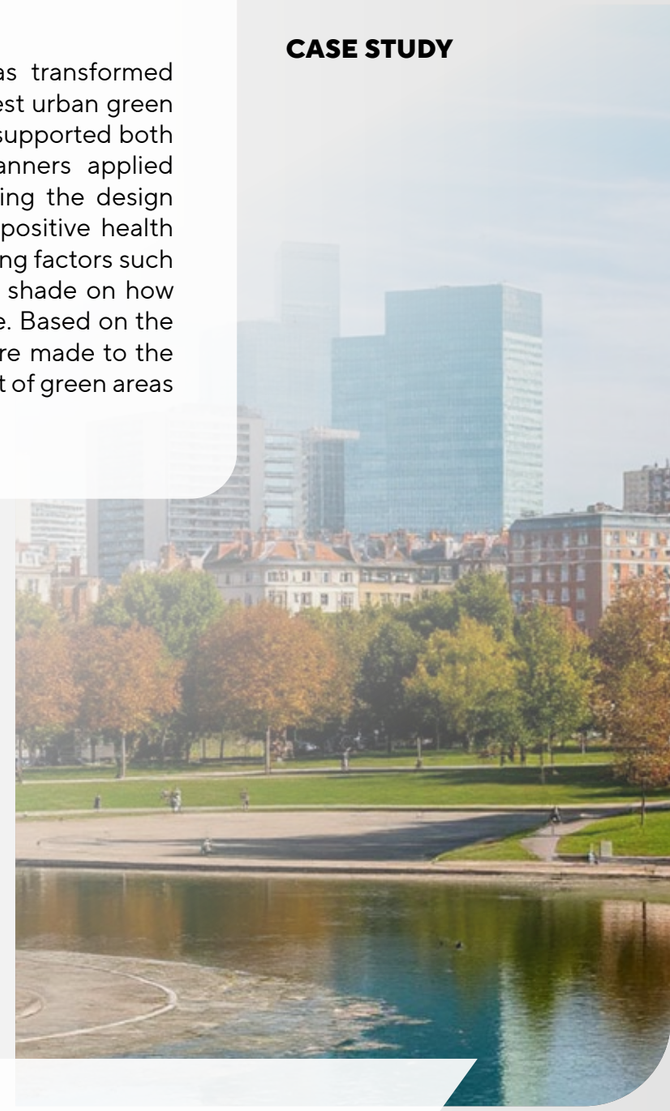
Third, one of the key difficulties lies in the need to account for a wide range of interrelated factors when implementing environmental initiatives. Effective environmental management in cities requires continuous monitoring of both ecological and socioeconomic indicators that impact the urban environment.

Moreover, all major urban projects and programs — whether in land use, transport development, energy and infrastructure, or waste management — must undergo strategic assessment to ensure that environmental considerations are integrated from the earliest stages of planning and implementation [250].

CASE STUDY

Lyon, France

In Lyon, a former industrial site was transformed into Zenith Park, now one of the largest urban green spaces in France. To ensure the park supported both public health and sustainability, planners applied health impact assessment (HIA) during the design phase. This method helps maximize positive health effects of urban planning by considering factors such as the impact of vegetation and tree shade on how visitors perceive ambient temperature. Based on the HIA findings, several adjustments were made to the park's design, including the placement of green areas and built structures [251].



New Environmental Behavior: Awareness, Infrastructure, and Regulation

The level of environmental awareness among urban residents directly influences the adoption of sustainable practices by shaping demand for green projects, products, and services. While many cities have already seen a cultural shift toward environmental values, achieving tangible outcomes depends on the authorities' ability to design incentive systems that align with local urban culture. These systems must strike a balance between education, infrastructure provision, and — where necessary — regulatory measures and penalties.

CASE STUDY

Moscow, Russia

The Green Ring of Moscow is a 160-kilometer cycling route that connects 25 city parks with major transport hubs, including metro stations and the Moscow Central Diameters. Designed for both recreational use and daily commuting, the route features 60 bike and e-bike rental stations. The Green Ring not only promotes zero-emission transport, but also significantly improves access to urban green spaces, supporting a more sustainable and active urban lifestyle.

CASE STUDY

Moscow, Russia

Since 2021, Moscow has been using an innovative environmental monitoring system that visualizes the level of transport emissions in real time, down to the level of individual streets. This intelligent platform allows not only to promptly identify the areas with excessive emissions, but also to respond instantly — redirect traffic flows, adjust the operation of traffic lights. The environmental map has become an important tool in the arsenal of city authorities, turning the fight for clean air from an abstract concept into an exact science with measurable results and targeted solutions.

Asuncion, Paraguay

In Paraguay's capital city, Asuncion, a number of initiatives are underway to improve the urban environment, with a strong emphasis on community engagement and public awareness. Educational programs and partnerships with local communities play a central role in the design and development of green spaces. Citizens are actively involved in both the planning and implementation of these projects, fostering greater environmental awareness and a shared sense of responsibility for the urban ecosystem [252].

CASE STUDY

"From the standpoint of public readiness to engage in solving environmental problems, people already express a strong desire for better environmental conditions. At the same time, there is still a lack of clear understanding of what exactly constitutes a 'good' or 'poor' environmental situation. In many cases, people tend to conflate urban beautification with environmental quality. Our research shows that when asked to choose between street beautification and ecological initiatives, residents often prefer the former — which is understandable. In a recent survey of the Muscovites, one-third of respondents described the city's environmental situation as neutral. These are likely residents who are more concerned with the quality of public amenities than with environmental indicators. On a day-to-day level, environmental concern often arises in response to visible issues — like piles of household waste, polluted water bodies, or nearby industrial facilities. Moscow's active public space improvements have contributed to a general perception of a favorable environmental situation. To enhance the effectiveness of the city's environmental efforts, more direct communication with residents is needed, along with ongoing public education and outreach.

Evidence suggests that successful implementation of environmental initiatives largely depends on the level of public trust in government institutions. For example, during the COVID-19 pandemic in Sweden, citizens were advised to stay at home — and the majority voluntarily complied. In contrast, in countries with lower levels of institutional trust, such recommendations are less likely to be followed, often requiring stricter enforcement and additional public communication efforts to ensure compliance.

Switzerland offers a compelling example of how to structure effective waste separation system. The country is considered a global leader in this area, with a greater variety of waste categories for sorting than most other nations. Its success is driven by a comprehensive approach that combines user-friendly infrastructure and services with strict enforcement mechanisms. Recycling containers are placed in convenient, high-traffic locations, including along commuting routes. Specialized sorting centers are also available, where residents can drop off items such as old clothing, shoes, and other specific waste types. For those unwilling to sort their waste themselves, the system offers pre-paid bags at a higher price, which includes the cost of downstream sorting. Enforcement is carried out by a so-called 'waste police', who ensure compliance with the rules. If unsorted trash is discarded, authorities may trace the offender using receipts or documents found in the waste — and impose substantial fines. This blend of accessibility, incentives, and accountability has made Switzerland's waste management model both efficient and widely supported by the public.

The Swiss experience confirms that success of implementing environmental strategies depends on the ability to design a system that aligns with the cultural context and societal expectations.

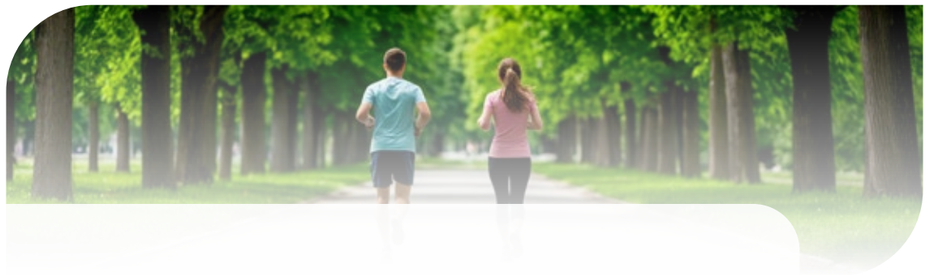
In South Korea, access to waste bins is controlled through individual ID cards, allowing for personalized monitoring and accountability. In Beijing, authorities have embraced gamification as a behavioral tool: a mobile app engages citizens in a points-based system tied to their transportation choices. For example, driving a personal car earns no points, walking earns the maximum, while public transport or cycling falls somewhere in between. These points can be redeemed with partner companies, turning sustainability into a form of interactive, everyday reward. It's a clever marketing strategy — and when aligned with cultural values and social norms, it can be highly effective. If such an approach fits your local context and resonates with your society, it can be a powerful driver of positive change.

Thus, developing an effective environmental strategy requires a comprehensive approach that combines public education, the gradual introduction of new practices, and the creation of user-friendly infrastructure. Only under these conditions can cities foster a high level of environmental responsibility among residents and ensure long-term sustainable development"

Viktoriya Bityukova,
Lomonosov Moscow State University

Green Spaces for Environment and Public Health

Urban environmental initiatives — such as development of green spaces, including parks, gardens, and pedestrian pathways — play a key role in improving both environmental and public health. These areas help reduce air pollution, lower noise levels, and support biodiversity within city boundaries. At the same time, green spaces encourage residents to engage in physical activity, such as walking and exercising, which contributes to better physical health. Access to nature has also been proven to reduce stress, improve mood, and help prevent mental health disorders, contributing to a more harmonious and livable urban environment.



CASE STUDY

Lyon, France

The enform@Lyon app, developed by the city's sports department, aims to improve public health by making urban sports more accessible and turning Lyon into a citywide fitness space. The app offers running and walking routes adapted to all fitness levels, including options for people with limited mobility, and incorporates existing urban sports infrastructure. Users can track personal health data, follow tailored workout routines, and access information about local landmarks and cultural sites — allowing them to combine exercise with exploration. The app also promotes community engagement through free events and regular city-wide fitness challenges [253].

CASE STUDY

Zagreb, Croatia

The therapeutic garden in Zagreb was established on a former industrial site to provide residents — including people with disabilities — access to a green, inclusive space for gardening, socializing, and relaxation. In addition to accessible garden beds and shared areas, the garden features a multisensory park, allowing visitors to engage with the environment through all five senses. The project was designed in collaboration with specialists experienced in working with children and adults with developmental disabilities, ensuring that the space meets a wide range of physical, cognitive, and emotional needs [254].

The Sharing Economy: Cost-Efficient Conscious Consumption

One of the most effective strategies for addressing society's growing environmental concerns is sharing economy. By enabling shared use of underutilized resources — such as cars, bicycles, books, tools, and housing — it reduces the demand for new goods and, in turn, lessens the environmental impact of production and consumption. For cities, sharing economy also presents new economic opportunities: it helps lower waste management and infrastructure maintenance costs, while attracting investment in innovative service models that promote sustainability and resource efficiency.

The global sharing economy is forecasted to grow by more than 30% annually in the coming years, reaching a total market value of USD **1.8** trillion by 2031 [255]

According to the 2024 Sharing Economy Index, which analyzes 60 cities around the world in terms of availability and accessibility of sharing services, the top five cities most conducive to sharing practices are Vilnius, Buenos Aires, Madrid, Belgrade, London, and Washington [256]

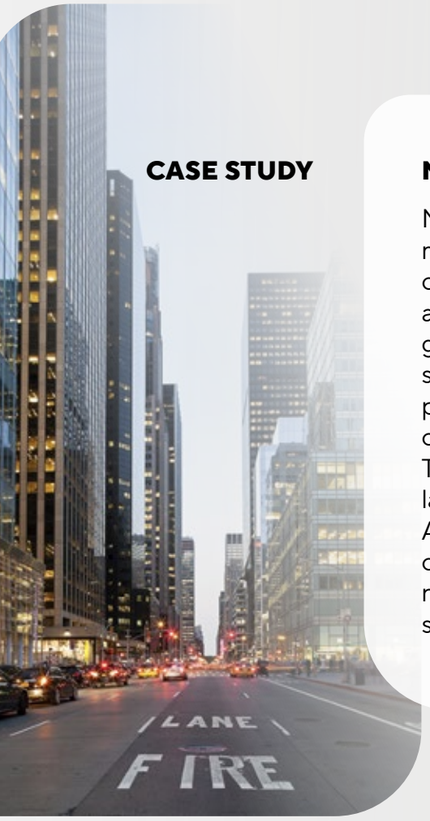
Sharing services are becoming an integral part of urban life, with both businesses and city administrations adopting them for a variety of reasons — ranging from economic efficiency (such as municipal car-sharing programs) to social, cultural, and sustainability goals. Some services, like short-term bike rentals or shared use of library spaces, serve multiple purposes simultaneously, supporting mobility, education, and community engagement while promoting more sustainable patterns of consumption.

CASE STUDY

Umea, Sweden

The Swedish city of Umea actively promotes the development of the sharing economy with a strong focus on sustainability. One example is Fritidsbanken, a free lending service for sports equipment, toys, and leisure items. The items are donated by individuals and businesses, refurbished, and made available to the public at no cost. Another initiative, U-bike, offers electric cargo bikes for rent. These bikes provide a low-carbon alternative to car trips and can carry loads of up to 100 kg, with options for child-friendly transport. Together, these programs help reduce emissions, promote circular resource use, and make sustainable mobility and recreation more accessible to residents [257].

CASE STUDY



New York City, USA

New York City is home to over a thousand vacant land parcels, many located in low-income neighborhoods. In 2011, the city launched the "596 Acres" initiative, granting residents access to underused public land for purposes such as gardening, recreation, and neighborhood events. Information signs — in both English and Spanish — were installed nearby participating sites, inviting residents to apply for permits to convert vacant land plots into gardens, parks, or urban farms. The signs also provided parcel ID numbers from the city's land registry and contact details for respective city officials. As a result, more than 200 sites were transformed, and local communities established around 40 new shared spaces, nearly all of which were later granted formal public space status by the city [258].

Hedonic Pricing: Time to Put Value on the Environment

Development of sustainable urban infrastructure has a positive impact not only on quality of life, but also on urban economy — driving up real estate values and making investments in eco-friendly development increasingly attractive. In recent years, market value of energy-efficient homes has risen noticeably, highlighting the growing importance of environmental performance and living comfort for property buyers [259].

According to the UN Environment Programme (UNEP) data, presence of green spaces within 100 meters of a home can increase its value by an average of €10,000

"We all pay for health and nature in cities — even though there's no formal market for clean air or well-being. But when you look at a real estate map of Moscow and overlay it with environmental data, you'll see that some of the city's cleanest districts — are also the most expensive. Of course, factors like transport accessibility and social infrastructure play a role, but overall, it's clear that people are willing to pay for healthier environments. This is what we call hedonic pricing — a concept more and more cities are using to measure the positive impact of environmental quality and livability on property values"

Sergey Bobylev,
Lomonosov Moscow State University

Hedonic Pricing

is a model that identifies the factors influencing the price of a good based on the assumption that its value is determined by both internal characteristics and external conditions. This pricing model is frequently used to quantify the value of environmental or ecosystem services that directly affect property prices [260]

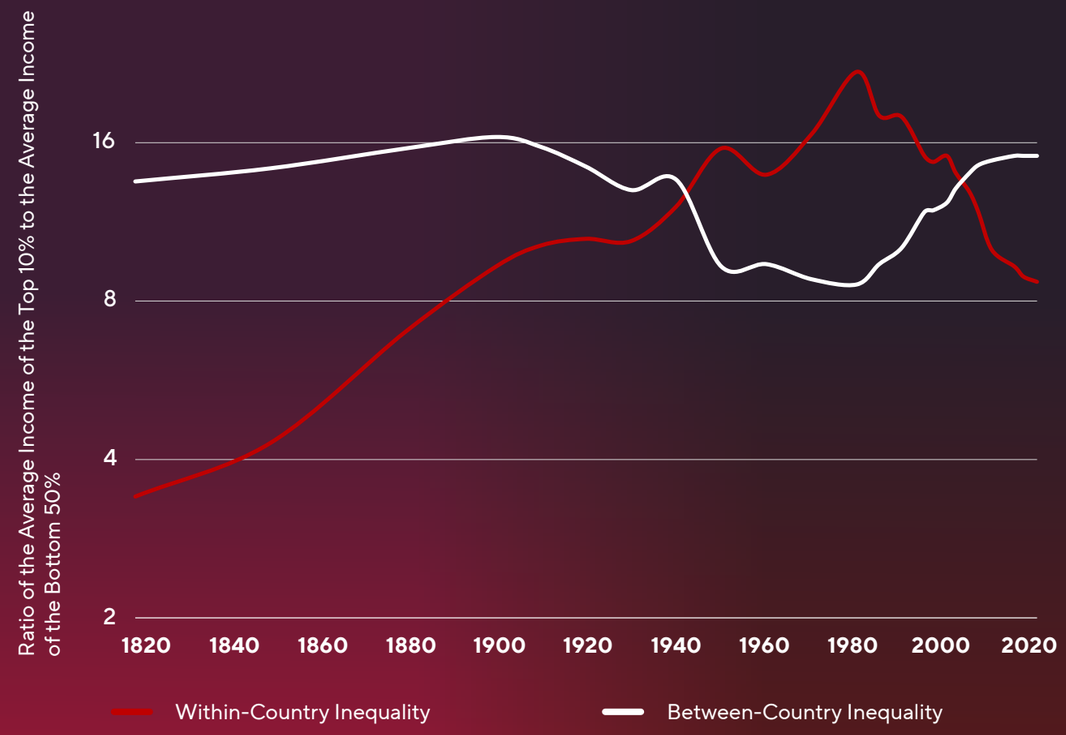
TREND 13

SOCIAL JUSTICE. WIDENING INEQUALITY OR CONSOLIDATED ACTION?

Research shows that within-country income inequality reached its lowest point globally in the early 1980s and has been rising ever since [261]. Recent data indicates that the primary driver of global inequality today is widening income gap within nations, rather than between them. While differences in average income across countries remain significant in absolute terms, their relative contribution to global inequality has diminished [261].

In major cities, the problem of rising economic inequality is particularly pronounced — and this holds true for metropolises in both developed and developing countries [262]. Despite generally low levels of absolute poverty in large urban centers, the stark gap between high- and low-paying jobs leads to elevated levels of relative inequality. According to the Organisation for Economic Co-operation and Development (OECD), the Gini coefficient — a common measure of income inequality — is higher in capital regions than the national average in 18 out of 24 countries for which such data is available [263].

GLOBAL INCOME INEQUALITY: BETWEEN-COUNTRY VS. WITHIN-COUNTRY INEQUALITY, 1820–2020



Source: World Inequality Report 2022. Global Inequality from 1820 to Now: The Persistence and Mutation of Extreme Inequality

The Gini coefficient

is a metric used to assess the level of inequality in the distribution of income or wealth within a population. Its value ranges from 0 (perfect equality) to 1 (maximum inequality) [264]. The Gini index, a percentage-based representation of the coefficient, ranges from 0 to 100

CASE STUDY

Moscow, Russia

Social support for residents is a top priority for the Moscow City Government. Key initiatives include regional pension supplements, various forms of allowances, and targeted assistance for low-income families, large households, and people with disabilities. On January 1, 2024, the city launched the Moscow Social Treasury — a unified center for administering social support programs. This centralized system processes all applications for social benefits from Moscow residents and currently offers access to over 97 services.

Despite generally higher living standards, inequality tends to be more pronounced in large cities than in smaller ones. For example, in Latin America and the Caribbean, the average Gini index in 2009–2010 was 51.8 in cities with populations over 5 million, 45.6 in cities with 500,000 to 1 million residents, and 43.4 in cities with fewer than 100,000 residents [265].

Economic inequality exacerbates social tensions and calls for new approaches in regulation and social policy, which is reflected in countries' growing efforts to expand social protection programs [266]. Data from around 100 countries show that public spending on basic services — education, healthcare, and social protection — is on the rise, now accounting for approximately 50% of total government budgets [267]. On average, this figure stands at 60% in advanced economies and 40% in other countries.

The social aspect is becoming increasingly important for business.

The 2025 Edelman Trust Barometer shows that 67% of consumers are more likely to trust companies that pay attention to social issues such as diversity, equity, and inclusion [268]

The European Commission's adoption of the Corporate Sustainability Due Diligence Directive in 2022 reflects a growing emphasis within the ESG (Environmental, Social, Governance) framework on the social dimension — namely, socially responsible corporate conduct. This includes critical issues such as diversity, income inequality, worker safety, and racial discrimination [269].

Rising Cost of Living and Housing Shortages: Solutions from Cities and Countries

Combined effects of the pandemic, climate disasters, and geopolitical instability in recent years have impacted the production and supply chains of food and energy, leading to a significant rise in prices worldwide. Today, high cost of living and the poverty trap have become some of the most serious challenges to socioeconomic development at both the national and urban levels.

Odisha, India

In 2020, the Indian state of Odisha launched the Odisha Urban Wage Employment Initiative to support vulnerable workers in the informal sector affected by the COVID-19 pandemic. The program provided people with opportunities to participate in public works projects — including construction of drainage systems, infrastructure, social centers, and greening efforts — aimed at strengthening local infrastructure and enhancing community resilience. As a result, 700,000 people, including women and migrants, took part in these projects, with USD 12 million allocated to pay for their labor.

CASE STUDY

One of the most pronounced consequences of economic inequality in megacities is spatial segregation. This refers to isolated settlement of urban social strata according to income levels. A study conducted across major cities in different regions of the world highlights a global trend of increasing spatial segregation, driven primarily by the displacement of low-income residents to urban peripheries and less developed areas due to rising property prices in more prestigious locations [270]. This process leads to deterioration of housing conditions for a significant portion of the urban population.

According to McKinsey's projections, by 2025 the number of urban households living in inadequate housing or facing financial hardship due to housing costs will reach 440 million, or 1.6 billion people. This figure is expected to rise to 2.5 billion people by 2050 [271]

Spatial segregation
is separation of the population groups within a defined area — whether by income, race, ethnicity, language, or religion — that occurs either naturally or through social processes. This segregation often results in economic and social isolation, disparities in housing quality, and unequal access to infrastructure, services, and opportunities for livelihoods [272]

Spatial segregation not only restricts low-income groups' access to quality housing but also acts as a factor that entrenches and exacerbates socio-economic inequality, underscoring the importance of implementing measures to mitigate its effects.

"Social justice encompasses many aspects, beginning with income inequality, which is reflected in patterns of residential settlement and spatial segregation. The American experience vividly illustrates this through urban zoning systems that often reinforce property and social stratification. In the European and international context, inequality is most apparent in the issues related to housing cost and accessibility.

At the same time, addressing social justice becomes increasingly difficult, especially when it comes to property stratification, which is intensifying — particularly in large megacities.

Improving public transportation systems and overall urban mobility, enhancing the connectivity of peripheral neighborhoods, and reducing travel times are also responses to the demand for social justice. Increasing the role of bicycles in the city contributes to social equity as well, since cycling is accessible to everyone regardless of their economic status"

Alexei Muratov,
Strelka KB

One commonly used tool to combat urban segregation is introduction of regulations requiring developers to allocate a portion of new housing projects for social or affordable housing. These measures aim to promote social integration and improve living conditions for low-income populations by fostering mixed-income communities. However, such policies also present challenges. They can increase development costs and, when coupled with rigid zoning laws and lengthy permitting procedures, may hinder housing supply. As a result, these interventions do not always contribute to stabilizing housing prices and can, in some cases, exacerbate affordability issues.

CASE STUDY

Montreal, Canada

In 2021, Montreal adopted inclusionary zoning regulations requiring developers to allocate 10 to 20% of new housing units as affordable apartments priced below the market rate. A similar policy, in effect from 2005 to 2018, helped create approximately 6,000 affordable housing units in the city [273].

"Centers of the global tech economy — such as San Francisco and Tel Aviv — are facing housing affordability crises. The influx of ultra-wealthy residents, often very young, drives up real estate prices. Cities are adopting strategies aimed at increasing the supply of affordable housing, but progress remains slow"

Vasily Auzan,
Frontier

CASE STUDY

Jerusalem, Israel

The "Discounted Apartment" (Dira B'Hanacha) program is an initiative by Israel's Ministry of Construction and Housing aimed at providing 10,000 apartments at subsidized prices across 31 cities in the country. The program operates as a lottery, primarily targeting first-time homebuyers. The initiative seeks to reduce social inequality, strengthen local communities, and promote the development of emerging urban neighborhoods. Additionally, it helps stabilize the rental market by reducing competition for housing [274].

CASE STUDY

Barcelona, Spain

Barcelona plans to fully ban short-term housing rentals starting in 2029, ceasing the issuance and renewal of licenses for apartments rented out for tourism purposes. This measure aims to increase availability of the rental housing for local residents, as rental prices in the city are currently the highest in Spain [275].

Escaping the Poverty Trap: The Role of Education and Healthcare

The consequences of economic inequality extend beyond the housing sector to healthcare and education. In healthcare, this is primarily reflected in unequal access to quality medical services among different social groups, resulting in relatively poorer health outcomes and lower labor productivity among low-income populations.

In education, negative effects of inequality are long-term and persistent. In systems where access to prestigious institutions is largely determined by economic means, education becomes a tool that reinforces social stratification. Such a system not only perpetuates existing inequalities but also reproduces them across generations. In this context, experts emphasize the need to ensure equitable access to educational resources as a key condition for mitigating socio-economic polarization — especially in countries where secondary and higher education are fee-based. City governments can play a crucial role by establishing support mechanisms for local residents.

> "Access to high-quality education is strongly linked to improved economic outcomes over a person's lifetime. Consequently, when capable children from low-income families are systematically excluded from top educational institutions, it reinforces and perpetuates economic inequality across generations"
>
> Irina Denisova,
> New Economic School

Philadelphia, USA

The Mayor's Scholarship Program at the University of Pennsylvania provides financial aid to low-income residents of Philadelphia who attend city schools or those in the neighboring counties. Scholarships cover tuition costs and are awarded based on individual assessments of family income documentation. The program is jointly administered by the City of Philadelphia and the university [276].

CASE STUDY

CASE STUDY

Moscow, Russia

Online doctor appointments, electronic prescriptions, and digital medical records are all services provided by the Unified Medical Information and Analytical System (UMIAS), which forms the foundation of Moscow's integrated digital healthcare platform. Launched in 2011, UMIAS now connects hundreds of medical institutions, millions of patients, and thousands of doctors. It has streamlined numerous processes in the city's healthcare system and created convenient channels for interaction between doctors and patients, as well as among medical professionals across outpatient and inpatient care.

CASE STUDY

Moscow, Russia

The "Professions of the Future" Center embodies the principle of accessible education for all ages and social groups. Here, schoolchildren, adults, and people without prior work experience have free access to modern training programs featuring VR simulators, personalized mentorship, and guaranteed internships with 3,000 employers. More than 20,000 participants have joined the program and acquired new professional skills, while 75,000 school children have taken part in career guidance programs.

Addressing Social Issues with the NGOs' Involvement

The growing demand for social justice is evident in many countries and cities through the creation of NGOs focused on addressing social issues. Their flexibility enables them to enhance accessibility and quality of social services, complementing government initiatives.

"In some cities, NGOs are beginning to replace municipal services in certain areas, such as child summer care programs. Engaging non-profit organizations depends on awareness, progressiveness, and educational background of city leaders, as well as their understanding that this approach can achieve multiple goals at once: improving the quality of social services, saving budget funds, or delivering more services within existing budgets while attracting more competent and motivated people than those in traditional government institutions. This shift marks a key distinction between modern and traditional urban governance models. Moreover, in the context of aging populations and rising demand for social services, partnering with NGOs can offer an effective and sustainable solution.

In Russia, there was a dedicated program involving eight regions of the Russian Federation, aimed at demonstrating that service providers in these areas can operate more efficiently than their budget-funded counterparts. These providers work not only for a salary but also out of passion. They tend to be more flexible and innovative than traditional government institutions"

Andrey Sharonov,
National ESG Alliance

TREND 14

A CITY FOR ALL. EQUAL ACCESS OR INCLUSIVE ENVIRONMENTS?

Cities become attractive and competitive when they offer a diverse range of opportunities and meet the needs of different population groups.

For example, one group of residents prefers commuting to work outside the city by car, while another chooses to live downtown and get around by scooter. When designing office spaces, the needs of both groups should be considered, including providing adequate parking and access routes to buildings. For women in a large city, safety is paramount, along with convenient access for strollers, as well as facilities for changing and nursing infants. Tourists require clear multilingual navigation, easy access to information about the city, and straightforward routes to key attractions.

CASE STUDY **Moscow, Russia**

The Passenger Mobility Support Center is a free city service designed for people with disabilities, elderly citizens, parents with children under 7, and organized groups. Originally operating only within the metro system, the service now extends to the Moscow Central Circle, Moscow Central Diameters, surface and river transport, as well as Aeroexpress trains — helping passengers reach over 330 key city locations. The service is accessible via the Moscow Metro and Moscow Transport mobile apps, official websites, telephone hotlines, and an SMS service for the hearing impaired. Since its launch, the program has assisted 1.3 million passengers, significantly enhancing their mobility and independence within the urban environment.

Additionally, Moscow operates the Social Taxi service with trained drivers and specially equipped vehicles, which has completed over 2.5 million trips. Almost all surface transport in Moscow is low-floor, featuring ramps and designated spaces for wheelchairs. At 430 bus stops, platform-level boarding areas have been installed. Metro stations are equipped with tactile navigation, audio prompts, and light indicators on platforms. All these measures make moving around the city convenient and safe for everyone.

According to the survey of Russian consumers on socially responsible businesses and their products and services, 25% of respondents reported that inclusion directly affects them or someone close to them. One in three expressed willingness to purchase goods and services from brands that actively promote an inclusive agenda. Moreover, 59% indicated their readiness to support the development of accessible environments and inclusion in various forms — including volunteering, donating, participating in themed campaigns, or sharing content that supports inclusive communities

RESULTS OF THE SURVEY OF RUSSIAN CONSUMERS: ATTITUDES TOWARD INCLUSION, ACCESSIBILITY, AND SOCIAL RESPONSIBILITY

25% of respondents indicate that inclusion personally affects them or their close ones

1/3 are willing to purchase goods and services from sustainable brands that promote an inclusive agenda

59% are willing to contribute to the development of accessible environments and inclusion

Source: E+ and Better (by Okkam). Attitude of Russian Consumers Towards Socially Responsible Business, Its Products and Services, 2024

Accessibility of the Urban Environment

There are population groups — whose numbers are growing — for whom requirements for comfort and inclusivity in the urban environment (in terms of accommodating their specific needs) are not merely preferences but urgent necessities, conditions for survival. This primarily concerns people with disabilities and the elderly.

Today, there are 1.3 billion people with disabilities worldwide, accounting for 16% of the global population

People with disabilities, like other vulnerable population groups, are more frequently subject to discrimination [277]. In the coming decades, the number of elderly people is expected to grow rapidly — from 1 billion in 2030 to 1.6 billion in 2050, representing about 17% of the world's total population [278]. Growing attention to the needs of the vulnerable groups is influencing urban policies: inclusive solutions — both environmental and technological — are becoming the standard in an increasing number of cities worldwide.

CASE STUDY

Boston, USA

The mobile app BlindWays helps visually impaired pedestrians find their way to bus stops using tips provided by local residents. Users can also contribute any helpful clues that make locating stops easier, such as indications of proximity of fire hydrants or benches, as well as related sounds or smells [279].

Elderly people encounter numerous difficulties in everyday life, such as balance problems, impaired vision, cognitive decline, and reduced physical capacity. Urban adaptations to support the elderly mainly focus on transportation infrastructure: establishing zones with lower speed limits, shortening distances between transit stops and social services, widening sidewalks, and extending pedestrian crossing times.

CASE STUDY

Seattle, USA

The mobile app AccessMap adds an extra layer to conventional mapping services by helping elderly residents of Seattle plan routes to their destinations based on accessibility criteria. Routes for people with limited mobility are designed to avoid steep slopes, curbs without ramps, and areas of repair or construction work.

Cities are seeing a growing number of projects aimed at increasing environmental inclusiveness for women and children. Common places that evoke fear and insecurity among women include dark doorways, empty and poorly lit streets, underground parking lots, and pedestrian crossings. Urban planning practices have developed numerous measures to make cities safer and more welcoming for women, such as improved lighting in public spaces, transparent building entrances, and emergency call buttons. Adaptations for children include initiatives to enhance urban safety, such as barriers preventing children from suddenly running into the street, as well as solutions to assist lost children — like designated waiting points in the Moscow metro where lost children can wait for help.

Inclusive Public Spaces

Public spaces have become central in the urban revolution unfolding in global megacities over the past two decades. Parks, waterfronts, green areas, and pedestrian zones create environments for interaction with nature, sports, and spontaneous socializing. All these contribute to enhancing the physical and psychological well-being of city residents [280, 281].

> "All trends in urban development aim to make the city environment more comfortable, relocate harmful industries, and bury infrastructure underground to free up space. If something doesn't make city life more comfortable, it is simply unlikely to happen"
>
> Andrey Kolpakov,
> Institute of Economic Forecasting, Russian Academy of Sciences

Well-developed public space infrastructure is crucial for social harmony in the city: being free of charge, these spaces are accessible to all groups of residents regardless of income level. Equal access is particularly important for marginalized and underserved neighborhoods and populations, who often lack access to paid services. Today, inclusiveness of public spaces in cities is ensured through two main approaches: simplifying access for people with limited mobility and ensuring territorial availability of such spaces throughout the city.

CASE STUDY

Mendoza, Argentina

The Aliar Plaza project in Mendoza aimed to create a set of public spaces in one of the city's neighborhoods that specifically address the needs of women and girls. The project initiators collaborated with local female residents to analyze the current state of public spaces, identify deficiencies and issues, and develop criteria for an optimal solution. A competition for conceptual designs was held, and residents selected a proposal that included the creation of a multifunctional zone featuring a playground with comfortable seating for supervision, a local market, weather-protected bus stops, and an amphitheater for events [282].

> "Vulnerable groups of city residents may face barriers when using urban services or infrastructure. Public spaces provide opportunities to enjoy nature, meet new people, interact with strangers, and make friends. In a densely populated city, this becomes an important factor for physical and mental well-being"
>
> Belinda Yuen,
> Lee Kuan Yew Centre for Innovative Cities,
> Singapore University of Technology and Design

International organizations, city administrations, and architectural firms develop guidelines for creating inclusive and comfortable spaces that meet diverse needs. For example, parks should include both open areas where people can see their surroundings and be visible, as well as secluded spots for quiet solitude. Spaces for people with disabilities must feature barrier-free environments, including smooth pathways; a combination of steps, ramps, and decking with handrails on inclines and declines; and tactile surfaces. Rest areas placed every 50–100 meters and near main attraction points in parks provide the necessary comfort for those with mobility challenges [283].

CASE STUDY

Moscow, Russia

Many parks in Moscow feature playgrounds adapted for children with disabilities. These spaces are equipped with wheelchair-accessible ramps and additional safety features. Play elements — such as swings, cycle trainers, and slides — are specifically designed to develop motor skills, coordination, and both physical and mental growth in children. Each playground has its own artistic concept, making the play experience unique.

CASE STUDY

Vienna, Austria

The Vienna City Department for the Advancement and Coordination of Women's Issues developed and implemented a set of measures to facilitate cemetery access for elderly women — the primary visitors of these spaces. The measures include installing smooth pathways suitable for wheelchair and walker users; placing water taps at lower heights for easier access by shorter individuals; providing free carts for transporting water and soil; adding seating and benches; and installing clearly visible signage and restrooms [284].

Density of Local Infrastructure

Improving quality of life and ensuring comfort also depend on density of local services and small businesses in neighborhoods. The presence of quality stores, bakeries, cafes, and hair salons near residents' homes fosters a sense of attachment to their neighborhood, strengthens local identity, and enhances social connections. An increasing number of cities worldwide are focusing on ensuring that services are accessible within walking or biking distance.

> "Between 92% and 95% of French people live within a five-minute walk of a bakery, which is why, for example, in French films, you often see people walking the streets of Paris carrying a baguette. An additional 200 vegetable shops in Moscow would create a tangible sense of city life — the opportunity to buy fresh, delicious tomatoes near home. This is why neighborhood policies focused on ground-floor commercial spaces, shopping streets, and pedestrian routes are needed. By implementing such policies, you also stimulate the creative economy"
>
> Sergey Kapkov,
> Lomonosov Moscow State University

CASE STUDY

Seoul, South Korea

In 2003, Seoul initiated the Cheonggyecheon River restoration project, aiming to uncover and revitalize a waterway that had long been buried beneath a highway. During the project, agreements were reached with small businesses to facilitate their temporary relocation. Upon completion, the restored river and enhanced riverbanks revitalized the surrounding area — stimulating business activity and increasing the number of small enterprises. The introduction of water and green space also improved the microclimate of the city center by enabling natural airflow and supporting urban vegetation. The transformation of the area into a high-quality public space significantly enhanced overall comfort and livability, contributing to a nearly 50% increase in local property values [285].

Annexes

EXPERT COLUMNS

Citizen Engagement in Urban Governance

Alexei Muratov,
Architect, Partner at Strelka KB

The way city residents are involved in urban development decisions largely depends on the governance culture of a particular country.

In countries with established democratic traditions – including parts of Latin America and India – some urban projects demonstrate a high level of citizen engagement. However, the process of coordinating and advancing these projects often takes significant time. On the upside, this typically leads to more balanced outcomes that reflect the interests of a wide range of urban stakeholders. In contrast, countries with more centralized political systems, such as China, are able to make decisions more quickly. Yet these decisions often involve less public consultation, which can result in social consequences that are not fully considered and may pose risks to vulnerable groups.

Globally, many approaches to citizen engagement have been developed, but they are not always transferable across contexts. For example, how applicable are Brazil's engagement models to a country like Russia? In Brazil, public participation is often tied to participatory budgeting, especially in communities facing poverty and resource scarcity. Here, civic engagement serves as a tool to mobilize financial contributions from residents, helping local governments implement projects with direct citizen funding. In contrast, cities like Vancouver, Canada, approach public involvement differently. Authorities there do not seek financial input from residents; instead, engagement is used primarily as a political tool to foster public support and strengthen voter alignment ahead of elections.

Ivan Kuryachiy,
Urban and Regional Development Expert, Co-founder of the Project Consulting Company "Novaya Zemlya"

Strong local self-governance is increasingly recognized as an effective mechanism for integrating community interests into urban management.

A notable example is the experience of London's borough councils, where large office and commercial developments are often carried out through the redevelopment of existing buildings. In this process, borough representatives act as advocates for local residents, striving to balance new construction with the quality of life in surrounding communities. Local administrations negotiate with the Greater London Authority and private developers to secure additional infrastructure and public benefits. As a result, developers often co-invest in social, cultural, and recreational facilities that support the broader community.

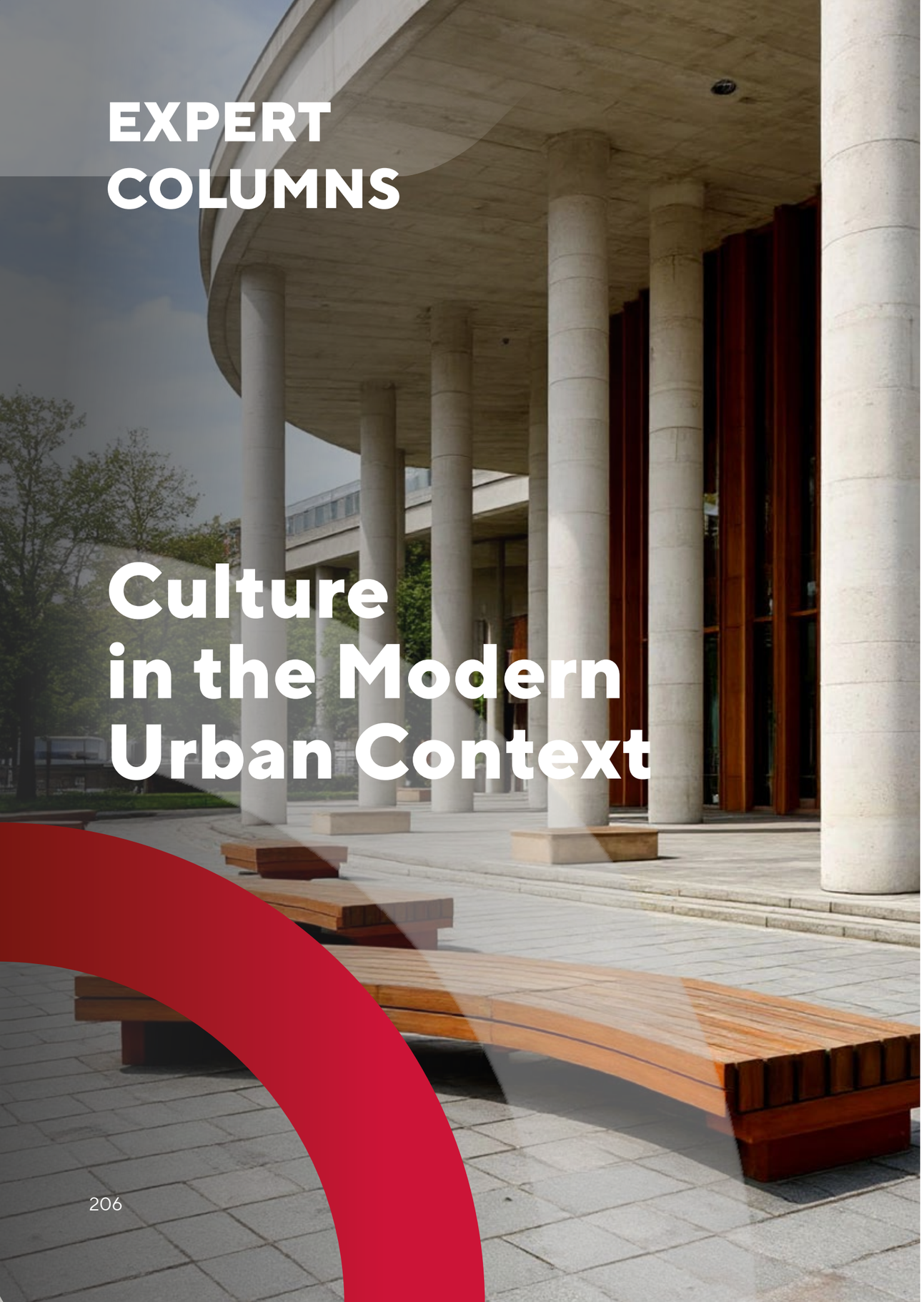
Some boroughs have gone even further by establishing their own development companies focused on building social housing. This localized approach to urban management empowers neighborhoods to make decisions independently and shape development in line with residents' interests. At the same time, governance models differ widely across cities, shaped by long-standing relationships between municipal authorities, business actors, and civil society.

Elena Nikishina,
PhD in Economics, Associate Professor, Deputy Head of the Department for Research Work, Department of Applied Institutional Economics, Faculty of Economics, Lomonosov Moscow State University

Housing and communal services remain a sensitive issue for many urban residents. In this area, several models of governance are used – ranging from management companies and homeowners' associations to territorial public self-governance bodies.

Territorial public self-governance bodies, which are common in smaller cities and towns – such as in the Voronezh region – have proven effective thanks to a strong culture of institutional trust. Residents understand that they can self-organize and, with support from regional authorities, achieve tangible results. This confidence in local initiative strengthens people's belief in their own capabilities and fosters constructive relationships between communities and public institutions.

Such an environment of mutual trust often contributes to what economists describe as a favorable institutional equilibrium. According to the model proposed by P. Aghion and co-authors, there are two types of institutional equilibrium: bad and good. In a bad equilibrium, trust levels are low, and society places high demands on government regulation. Where both public oversight and societal trust are weak, the quality of governance suffers, and problems are resolved inefficiently. By contrast, a good equilibrium is characterized by high levels of trust, active public engagement, and shared responsibility. Citizens monitor government performance, expect less regulation, and collaborate to solve problems, which results in higher-quality governance and more efficient outcomes at lower cost. The example of territorial public self-governance in Russian regions provides a valuable case study for understanding how grassroots mechanisms can enhance institutional quality. It offers practical lessons that may be useful for wider implementation in other regions.



EXPERT COLUMNS

Culture in the Modern Urban Context

Anton Kalgaev,
Curator of Sociocultural, Publishing, and Exhibition Projects in Architecture and Urban Development, Partner at Frontier Consulting Company

Cultural Policy

It is important to distinguish between two forms of cultural life in cities: managed cultural policy and independent urban culture. Cultural policy refers to institutions such as museums, galleries, and cultural centers. It is typically overseen by governments or supported by corporate funding. Urban culture, by contrast, evolves organically – often driven by popular trends, subcultures, or online communities. It responds rapidly to current moods in society and is shaped by microtrends, which may appear superficial but reflect deeper social dynamics. Museums, as part of cultural policy, try to remain relevant by following major and minor trends. In recent years, for example, we've seen a decline in the influence of the environmental agenda in culture – once central to museum programming, it has gradually lost urgency and been replaced by newer themes. Museums increasingly align their content with fashionable topics to stay within the bounds of contemporary discourse.

Despite evolving trends, certain museum functions remain constant. The museum is a product of modern European civilization – an institution formed during the late 19th-century industrial era. It plays a key societal role by shaping perceptions and producing shared meanings. As such, it serves as a tool for constructing and reinforcing community identity, mythology and collective memory. Following cultural theorist Benedict Anderson, who explored the concept of imagined communities, museums play a crucial role in shaping national identity. To form a nation as an "imagined" whole, one needs three elements: a map, a census, and a museum. The museum symbolically communicates the idea: "This is our history. We belong to this story. These are our people." In doing so, it draws the boundaries of inclusion and exclusion – defining who is "ours" and who is "not ours". This mechanism of identity formation is not inherently negative; rather, it reflects the fact that all communities, by nature, are imagined.

Today, rising social fragmentation in cities is once again bringing the museum's unifying role into focus. Museums are being reimagined as platforms for fostering community engagement. There is growing debate about their future purpose: should they remain temples of preservation, or become active participants in community-building? While the rhetoric of heritage and memory remains important, museums increasingly take on pragmatic roles — facilitating dialogue, fostering inclusion, and empowering diverse groups to share and co-create narratives. But this raises a critical question: whose heritage, and whose values, are being preserved? As both a space and an institution, the museum inevitably influences community

life. Yet the narrative it conveys — and whose voice it centers — Is ultimately a matter of cultural policy.

The city inevitably shapes the cultural agenda, even if it does not formally claim this role. Spatial organization, support for certain initiatives, and funding for arts and media all contribute to forming the cultural landscape. A city cannot remain detached; the question is only the degree of its involvement. It may limit itself to coordination or take on the role of organizer. The same logic applies to infrastructure issues: it can build roads and allow people to decide where to park, or strictly regulate parking spaces — both approaches are possible. Even choosing not to intervene actively simply hands over influence to those who possess resources. The cultural environment always reflects a certain narrative, which may be expressed with varying degrees of clarity and emotional tone, but it remains an integral part of urban policy.

Urban Culture

Urban culture cannot be strictly classified into pragmatic categories. In a city, there is production and commerce — areas that are clearly material in nature. But alongside these, some people skate on rollerblades, others paint graffiti on walls — activities that don't fit neatly into rigid categories. This is precisely what urban culture is about. For example, graffiti may no longer be painted over but instead recognized as a cultural value. However, this is not a universal trend — it doesn't mean every graffiti is preserved. Styles and trends change, and with them, attitudes toward street art vary across different cities and contexts.

With the rise of social media, the culture of presentism — the desire to assert oneself here and now — has taken on new public forms. Parades as a means of collective expression have become one of the tools of this culture. For example, the Victory Parade is a classic modernist spectacle where spectators and participants are separated: some march through the Red Square, while others watch on television. In contrast, the "Immortal Regiment" offers a different model — the same mass participation, but with an individual dimension, where everyone carries their own personal story. In the 21st century, parades have become not only a tool of remembrance but also a way to assert identity or presence in public space. Social media have only intensified this trend, making publicity an integral part of everyday life.

Continuing this line of transformation, flash mobs come to mind — once seen as a phenomenon capable of changing politics and culture. They did change something: for example, the number of cultural studies publications on this term has certainly increased. But the flash mob format itself has evolved: what remains is a kind of rallying call on social media and an individual decision to participate, while the place of collective action has shifted online. Spontaneous street actions have transformed into TikTok challenges. Children and adults perform actions on city streets under certain conditions, record them, and the audience for this content can be anywhere. So where is this "mob" now? Does it even exist beyond social networks? Does it have an impact? Yes, it does. But does it bring change? It seems not. However, it is possible that such practices are part of large-scale transformations that are currently impossible to fully identify, even in the medium term.

The Revival of the Value of the Original

Museums were once perceived as passive spaces: paintings on walls, silence, and the simple act of looking. Today, this format may seem outdated, but in reality, it already contained a form of interactivity. The very process of contemplation served as a tool for engagement: visitors observed, reflected, and learned.

Looking at objects presented to you is actually a rather sophisticated practice — where else do people encounter this? This kind of interactivity: you look and learn how to be good.

Overall, the level of interactivity in museums has remained more or less the same, but it is now achieved through different methods. Moreover, digitalization has at some point reached saturation and is no longer perceived as an innovative approach. At the same time, we observe a revival of the value of the original. Through architecture, technology, and exhibition design, museums emphasize the significance of the real artifact: "This is the original, and that matters." Encountering an authentic work of art — such as the Mona Lisa at the Louvre — evokes deep emotions, as a person has long been repeatedly exposed to its image in books, media, and on the internet. This accumulated visual experience is processed by the mind and enhances the impact of the first "live" encounter.

Authenticity is not negated by any technologies; rather, technologies serve as garnish and arrangement for it. Moreover, these technologies themselves create spaces and generate sensations and impressions that possess the same truthfulness and physicality as the real thing. The modern museum is an experience industry, similar to cinema or theater. Visitors can immerse themselves in the Napoleonic era through a historical exhibition with authentic artifacts, a feature film, or a digital installation

that allows them to find themselves on the battlefield. All these formats serve one purpose — engagement — and the choice of method depends on the project concept and available resources.

Culture is becoming stratified into accessible forms (such as Netflix) and elite forms (theater, museum). Offline is the new luxury.

However, this thesis is debatable. For example, video games are often seen as a mass entertainment genre, but some require such significant financial and time investments that they become inaccessible to many.

As for theater, it is transforming but not disappearing. However, it's important to clarify what exactly we mean by theater: Broadway musicals, productions in academic theaters, or grand shows in Las Vegas? Modern productions are becoming multimedia experiences, incorporating video projections, complex sound design, and tactile effects.

Industrial Zone Redevelopment

The trend of reorganizing former industrial areas is far from over. This is a natural process overall. Historically, large cities developed as industrial centers — it was impossible to be a metropolis without an industrial belt or an industrial district. But what should be done with these now-unused spaces?

It's natural to recall the cycle of gentrification: vacant factory buildings with high walls, inexpensive to renovate and rent, begin to be occupied. A similar process occurs in secular societies with churches — they are converted into theaters, libraries, hostels, bars. Large, underutilized real estate either adapts to new functions, becoming loft spaces, or is demolished to make way for new developments. And this process will undoubtedly continue.

It's interesting to consider which spaces will become vacant in the future, where culture will be needed in the next phase of urbanism, and where new opportunities will arise. After COVID-19, there were talks about the death of offices and shopping centers, and culture was introduced into those spaces.

What about the return of industry to cities? In Moscow, for example, reindustrialization is underway, but not on old sites — new ones are being created. Will these new factories be, like the old ones, taken over by art? That remains uncertain. Modern factories are less often architecturally striking or built for longevity.

New Technologies and Their Impact on Culture

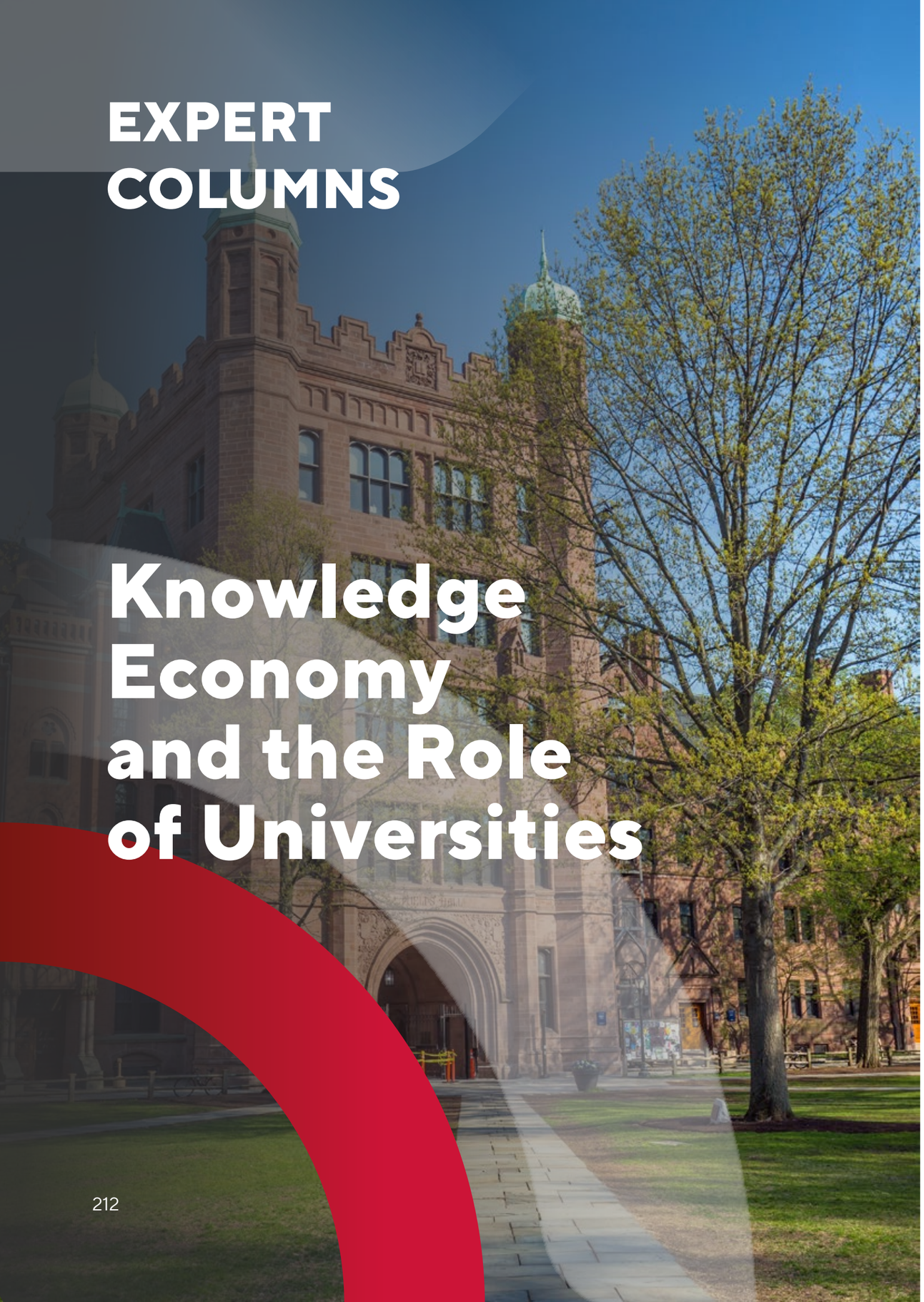
Modern machine learning technologies enable dubbing films and videos while preserving the actor's voice and intonation, but in a different language. This creates a powerful effect and changes the perception of speech, making it more natural and convincing. How will this impact the reception of information? This can be compared to how the translation of the Bible into various languages once transformed the cultural landscape.

I'm skeptical about machine-generated content, but its interpretation is a whole different matter — especially when it comes to instant translation. This opens up a vast space for influence — not just deepfakes, but something much subtler. What does this new medium mean in itself? It's a kind of removal of a cultural barrier. But what will pass through these barriers? Information conveyed seemingly without interpretation, or new rhetorical and behavioral patterns? What will Churchill's murmuring sound like to Russian ears? Or Trump's clipped, fragmented phrases? Or the carefully measured speech of Xi Jinping?

Will this lead to the emergence of a universal culture? Such translation doesn't erase differences; on the contrary, it makes them more apparent. Even when listening to a French play in Russian, you begin to keenly feel how distinct French culture is. This creates a new kind of distance — a new form of globalization.

EXPERT COLUMNS

Knowledge Economy and the Role of Universities



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Strengthening Urban Universities

There is a clear trend: new universities are predominantly being established in large cities, while the concept of small university towns is losing popularity. Universities in metropolises are strengthening their positions — even those that were once considered less prominent. For example, New York University (NYU), once a small private institution, has become a flagship of education. Meanwhile, small colleges in rural areas remain on the periphery or cease to exist altogether.

There are several factors driving the increasing attractiveness of cities for universities.

Firstly, a key factor is the development of connections between universities, creative industries, and the tech sector. The spatial proximity of educational and research centers to businesses enhances collaboration and fosters the growth of the knowledge economy. For example, a remarkable transformation has occurred over the past 20 years at the Massachusetts Institute of Technology (MIT) campus. Once a small, nearly isolated university district in Boston with just one hotel and restaurant, it now resembles a bustling urban neighborhood. This process was sparked by the arrival of Microsoft research centers, biotech firms, and other innovative companies. By strengthening their presence in major cities, universities are becoming not only educational hubs but also vital parts of the urban economic ecosystem.

Secondly, there is a shift in preferences among students and faculty. Universities in major cities are more attractive due to better infrastructure, internship opportunities, and research collaboration. Large cities actively invest in education, strengthening their universities. For example, NYU has shown impressive growth, reflecting the overall trend: large, well-funded universities are becoming even stronger, while the gap between them and smaller institutions widens.

Thirdly, an important driver for the development of universities in large cities is the demand from urban residents for continuing education. Cities have high labor mobility, and the greater the employment dynamics, the higher the demand for short-term educational programs, additional courses, and professional retraining. In response to this need, universities are expanding their range of educational services, targeting diverse population groups.

The influence between universities and cities is a two-way process. Universities play a key role in the internationalization of large cities, especially culturally. The

main migration flows into megacities consist of two groups: low-skilled workers employed in services and industry, and students. The latter contribute significantly to the cultural diversity of the city, making universities an important factor in urban globalization. The urban environment also adapts to this new group and its specific needs: in large cities, student-oriented spaces — cafes, bars, coworking centers — are emerging and growing alongside expanding universities.

Internationalization of University Presence

An important global trend is the expansion of universities' geographic presence. Increasingly, universities establish partner campuses abroad, integrating into the international educational landscape. For example, in China, there is a university founded by the prestigious Xi'an Jiaotong University in collaboration with the University of Liverpool, and in Tashkent, a university operates with the participation of the University of London. Even traditionally conservative public technical universities, which have focused primarily on their domestic markets, are beginning to open branches outside their home countries.

The primary driver of this expansion is economic. International campuses generate stable revenue for the parent university, attract students who might otherwise choose other institutions, and help strengthen the academic brand. For example, after solidifying its position in the United States, New York University expanded by opening campuses in Shanghai and Abu Dhabi. However, this model is not only a commercial venture but also a tool of soft power. International campuses foster long-term ties between countries, facilitate student exchanges, and create alumni networks loyal to the university's home country.

At the same time, in some countries, university projects are driven less by foreign institutions and more by national businesses interested in fostering international cooperation. For example, the business community in Tashkent actively invests in creating modern educational centers, such as the MGIMO branch, aiming to integrate the region into global economic processes. A similar trend was observed in Russia, where, for instance, the Skolkovo Moscow School of Management moved toward joint programs with Western universities. Transitioning from partnership educational programs to a full-fledged international campus is just one step away.

"Black Swans"

Overall, it can be noted that the boundaries of academic freedom in universities are becoming the subject of new debates, with some countries moving toward more stringent regulation of the educational environment. In China, these processes occur less openly but with greater consistency. In Russia, the nature of these changes is influenced by the broader socio-economic context. Significant shifts in state policy toward universities are possible in the near future, as in most countries, the government remains their primary source of resources.

The pandemic was definitely a "black swan" event for the higher education system. It demonstrated that learning can be more flexible and not tied to a specific location. Universities expected that after the pandemic, the educational process would return to its previous routine, but this did not happen. Both students and even high school seniors now demand greater flexibility in learning. This shift, which initially seemed temporary, is actually becoming a lasting trend with a significant impact on the future of higher education.

Growth of Academic Entrepreneurship

In major European cities, there has been a noticeable rise in private universities. Over the past decades, the proportion of students enrolled in these institutions has significantly increased, especially in Germany, where private universities are becoming increasingly popular. In cities like Berlin, this trend is particularly pronounced. Private universities are playing an increasingly important role in the education system, adapting flexibly to new challenges.

The situation in Russia is different: the private higher education sector has almost disappeared, limiting opportunities for the development of alternative learning models. However, there is a positive trend: there is active growth in private schools, including networks. This phenomenon is characteristic of many megacities worldwide, where private educational institutions are becoming an important part of the urban landscape.

ABBREVIATIONS AND TERMS USED IN THE STUDY

Abbreviations

3D — 3-dimensionall

5G — Fifth Generation

AI — Artificial Intelligence

ASI — Artificial Superintelligence

BCA Green Mark — Building and Construction Authority Green Mark

BEPS — Building Energy Performance Standards

CAPABLE — Community Aging in Place - Advancing Better Living for Elders

COVID-19 — Coronal Virus Disease 2019

CRED — Centre for Research on the Epidemiology of Disasters

DNA — deoxyribonucleic acid

ESG — Environmental, Social, Governance

EU — European Union

GDP — Gross Domestic Product

GPS — Global Positioning System

GRP — Gross Regional Product

GRPS — Global Risks Perception Survey

HIA — Health Impact Assessment

HSE University — National Research University Higher School of Economics

ICE — internal combustion engine

IEA — International Energy Agency

IEF — Institute for Economic Forecasting

IPBES — Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services

IT — Information Technology

KEFRI — Kenya Forestry Research Institute

IoT — Internet of Things

LEED — Leadership in Energy and Environmental Design

NES — New Economic School

NGO — non-governmental organization

NOA — National Observatory of Athens

OECD — Organisation for Economic Co-operation and Development

OMS — compulsory health insurance

OUWEI — Odisha Urban Wage Employment Initiative

PM 2.5 — Particulate Matter 2.5

RAS — Russian Academy of Sciences

REC — Renewable Energy Certificate

RES — Renewable Energy Sources

RTI — road traffic incident

RUC — Road User Charging

SCR — corporate social responsibility

SEE U — Senior Explorers of Urban Environments

SGBMP — Singapore Green Building Masterplan

UAE — United Arab Emirates

UK — United Kingdom of Great Britain and Northern Ireland

UN — United Nations

UN-Habitat — United Nations Habitat

UNEP — United Nations Environment Programme

UNDRR — United Nations Office for Disaster Risk Reduction

USA — United States of America

VMT — Vehicle Miles Traveled

VR — Virtual Reality

ZIM — Zentrales Innovations programm Mittelstand

Terms

Adaptation to climate change is the adjustment of natural, social, or economic systems in response to observed or expected changes in climate and their subsequent impacts.

Big data analytics is the process of examining vast amounts of information to uncover valuable insights, patterns, and trends. By integrating data from diverse sources — such as IoT sensors, social media, financial transactions, and others — it helps identify correlations and inform more effective decision-making across urban systems.

Carbon sequestration is the long-term storage of carbon in carbon sinks (plants, soil, geological formations, and the ocean).

Climate Migrants are people who decide to relocate not due to a direct threat to life or health, but primarily to improve their standard of living.

Climate refugees are people leaving their homes due to a threat to life and health caused by climate change and having no possibility of returning. Climate refugees include, for example, residents of island nations whose homes have been destroyed by flooding.

Dark store is a facility that functions as a hybrid warehouse and retail outlet, used exclusively for fulfilling online orders rather than serving walk-in customers.

Friendshoring is the redirection of supply chains and relocation of production to countries considered politically and economically safer in terms of partnership.

Functional city boundaries are the limits of a city's functional zone, which encompasses both the core urban area and its surrounding agglomeration. These boundaries are typically defined by population density and commuting patterns between residential areas and workplaces.

Gas resistance of plants is the ability of plants to withstand relatively high concentrations of toxic gases and other gaseous substances that are usually not components of air.

Gentrification is a process of social and economic transformation in a specific urban area that occurs as a result of reinvestment in neighborhood improvement, redevelopment of existing housing, and construction of new residential stock. This process typically leads to increased attractiveness and elevated status of the area, along with rising property values and service costs due to an influx of more affluent residents.

Gerontology is the scientific study of the biological, psychological, and social processes of aging in living organisms, including humans.

Gig economy is a work model where businesses do not hire employees on staff, but engage specialists for specific projects and tasks. This system is also called the freelance economy.

Hedonic Pricing is a model that identifies the factors influencing the price of a good based on the assumption that its value is determined by both internal characteristics and external conditions. This pricing model is frequently used to quantify the value of environmental or ecosystem services that directly affect property prices.

Mitigation is the adoption of measures to reduce greenhouse gas emissions and increase their absorption.

Nature-based solutions are solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience.

Polycentric city is an urban area characterized by the presence of multiple centers, typically serving different functions and organized within a defined hierarchy — for example, with one primary center and several subcenters.

Prompt is a request in the form of text, information, or code addressed to artificial intelligence to obtain the desired result.

Reshoring is the process of bringing back production to the home country that was previously relocated to countries with lower production costs (typically developing countries).

Smart Factory is a concept used to describe the application of modern technologies aimed at creating ultra-flexible, self-adjusting production. Such manufacturing systems integrate and regulate the interactions of information flows, workers, suppliers, and consumers. Other names for smart factories include digital factories or intelligent factories.

Spatial segregation is the separation of population groups within a defined area — whether by income, race, ethnicity, language, or religion — that occurs either naturally or through social processes. This segregation often results in economic and social isolation, disparities in housing quality, and unequal access to infrastructure, services, and opportunities for livelihoods.

The "15-minute city" is a decentralized model of urban planning in which each neighborhood is designed to include all the essential functions for living and working.

The Gini coefficient is a metric used to assess the level of inequality in the distribution of income or wealth within a population. Its value ranges from 0 (perfect equality) to 1 (maximum inequality) [264]. The Gini index, a percentage-based representation of the coefficient, ranges from 0 to 100.

The silver economy is an aggregate of all economic activities aimed at meeting the needs of older adults, including both the goods and services they consume directly and the multiplier effects generated by this spending.

The urban heat island effect is the phenomenon whereby urbanized areas experience significantly higher temperatures during hot periods compared to surrounding rural or natural landscapes.

The urban water-green framework is a network of interconnected urban areas characterized by vegetation cover and urban water bodies integrated into the urban environment.

Urban sprawl is the rapid outward expansion of urban areas, typically characterized by low-density development, single-use zoning, and a reliance on private automobiles. It is often criticized for exacerbating transportation challenges and for the inefficient use of land and resources compared to compact, high-density urban development.

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