

EFFICIENT AND BALANCED SPACE USE: SHAPING VIBRANT NEIGHBOURHOODS AND BOOSTING CLIMATE PROGRESS IN EUROPE



FOREWORD

THIS WHITE PAPER REVEALS NEW OPPORTUNITIES FOR POLICYMAKERS, INVESTORS, AND EVERYONE WHO AIMS FOR A FAIRER, MORE SUSTAINABLE AND RESILIENT BUILT ENVIRONMENT THAT PROVIDES BETTER QUALITY OF LIFE. WE HOPE THIS PAPER'S SYSTEMIC ANALYSES AND SUGGESTIONS SPARK AN ACTION-FOCUSED DISCUSSION AT EUROPEAN, NATIONAL AND CITY LEVEL, AS WELL AS AMONG REAL ESTATE AND INFRASTRUCTURE INVESTORS.

Europe has committed to reaching unprecedented environmental and social goals, including a 55% reduction in greenhouse gas emissions by 2030, drastically reducing land-take, and decoupling resource consumption from economic prosperity. It has also promised to leave no one behind, which entails improving equality among Europeans in terms of quality of life and access to opportunities.

The built environment, particularly in cities and urban areas, is at the heart of achieving climate goals as well as resilience – being a major lever in saving materials and energy.

It is therefore encouraging to see Europe's urban initiatives, coalitions and innovation programmes growing, be it movements like the New European Bauhaus, more technical programmes like the NetZeroCities initiative, regulatory strategies like the Renovation Wave, the increasing urban focus by the European

Investment Bank and Cohesion Funds, or the continued action by coalitions such as the Covenant of Mayors, ICLEI or Eurocities.

However, most of Europe is currently overlooking a massive systemic opportunity: the more efficient, balanced use of space in Europe's built environment. It is possible to offer resource-efficient, low-carbon housing and infrastructure in high-quality, connected neighbourhoods to all Europeans - but only with a systemic strategy for urban areas beyond city centres. While Europe features great examples of space-smart, multi-benefit neighbourhoods – in Freiburg, Zürich, Aachen, Grenoble, Utrecht, Hamburg, Győr and many other places – this is not yet the norm. Every year, Europe builds millions of houses and infrastructure that end up underutilised. This effectively means wasting millions of tonnes of energy, emissions-intensive materials and land for houses and infrastructure that do not deliver sufficient function to society.

Building on the 2020 report “A System Change Compass: Achieving the European Green Deal in Times of Recovery”, this White Paper gives crucial insights into the opportunity of a more systemic approach to the built environment. Efficient, balanced space use is a prime example of boosting environmental and social goals together.

Through 10 physical transitions and five multi-stakeholder approaches we can achieve significant progress. The current situation – of energy poverty and material supply challenges, inflation and a mounting housing crisis – makes this agenda even more important.

While cities have a major role to play in implementing better space-use strategies, they cannot do it alone. It will need cross-municipal regional cooperation, Europe-wide standard setting, scaled public and private investments and community reinvigoration to realise the benefits of vibrant, prosperous

neighbourhoods with efficient, balanced space use. EU policymakers and initiative leaders must use their major agenda-setting power to boost all of these elements. And so must Europe's financial institutions.

Europe's vibrant cities, communities and neighbourhoods are a major part of any country's economy. They are also the anchors of a space and landscape transformation that can enable greater economic wellbeing and a just climate transition; it is high-time to treat them as such – with expanding support, and a clear, shared, and systemic vision.



Janez Potočnik, Co-Chair of the International Resource Panel, Member of The Club of Rome, SYSTEMIQ Partner, and former European Commissioner for Science & Research and for the Environment

A handwritten signature in black ink that reads "Janez Potočnik". The signature is stylized and fluid, with a long horizontal stroke at the end.



Sandrine Dixson-Declève, Co-President of The Club of Rome, Chair of the Economic and Societal Impact of Research and Innovation (ESIR) expert group, Ambassador for Europe of the Energy Transition Commission

A handwritten signature in black ink that reads "Sandrine Dixson-Declève". The signature is highly stylized and cursive, with a long horizontal stroke at the end.

EXPERT GUIDANCE FOR ACTION

“The EIB has been supporting integrated, sustainable urban development for decades, aimed at fostering vibrant, inclusive and resilient cities. This paper offers valuable insights to policymakers and investors, and challenges them to think of innovative and efficient planning and design of the built environment to enable sustainable cities thrive in the future”. *Werner Hoyer, President, European Investment Bank*

“The urban built environment is at the heart of implementing the European Green Deal. Our triple planetary crisis of climate change, biodiversity loss and pollution can only be solved through a balanced and well planned use of space, increasing the resilience of our cities and villages, while reducing their environmental footprint. When we seal soil to build on top, we are losing irreversibly all its key ecosystem services, exposing cities to higher flood peaks and more intense heat island effects. We should therefore implement a ‘land take hierarchy’, giving priority to reusing and recycling land for our built environment. In addition, policymakers and finance institutions can use the insights of this paper to add a powerful solution to their toolbox for a sustainable built environment.” *Virginijus Sinkevičius, EU Commissioner for Environment*

“Across generations, policymakers and practitioners have recognised European cities for their vibrant and efficient neighbourhoods. As such, their social and environmental success has had a positive influence beyond the continent. However, despite the celebrated examples of compact cities, Europe has also adopted negative global trends related to urban sprawl. This white paper sets the foundations for a much-needed data-based framework for Europe to lead the way, once more, in efficient and balanced land use, inspiring public and private sector action towards sustainable urban systems.” *Artur Carulla, Partner, Allies and Morrison*

“People live in buildings, but they thrive in neighborhoods with active communities and great access to services. For far too long we have viewed buildings as a cold asset and not had the needs of the people living there at heart. NREP has just partnered with C40 to turn the “15-minute city” into a reality. The recommendations in this paper go to the heart of that vision through rethinking space and sprawl. Balanced densification should be top of the agenda of investors and city planners across Europe.” *Mikkel Bülow-Lehnsby, Chairman and Co-founder of NREP*

“Capturing the systemic inefficiencies of our built environment and cities, this timely report re-considers the fundamental logic of compact urban development based on a systematic analysis and through the lens of evidence-based policy making. It clearly articulates the enormous societal costs of inefficient space use and makes a robust case for maximising the utility of our existing built environments and infrastructures. For concrete future interventions, the report helpfully identifies ten physical transitions for an efficient and balanced space use of vibrant neighbourhoods.” *Philipp Rode, Executive Director, LSE Cities, London School of Economics and Political Sciences*

“Cities are among the largest contributors to climate change, accounting for nearly 40% of energy-related CO2 emissions. On top, urban areas are more exposed to the impacts of climate change. The global building stock is set to double by 2060 due to population growth and urbanization, which could further contribute to a warming world. Keeping global temperatures within safe levels will not be achievable without action at the levels of cities and the built environment – in Europe and globally.

A balanced, compact, and energy efficient built environment and smart use of space will be crucial, as this White Paper points out. We need cities that balance socio-economic activities with green spaces and community activities, connected through low-carbon and resilient infrastructure. In short, we need a built environment that is climate and future-proof and that contributes to improving quality of life, health and access to economic opportunities for all parts of society." *Stientje van Veldhoven, Vice President and Regional Director for Europe, World Resources Institute*

"This White Paper demonstrates clearly the benefits of a more holistic, whole life carbon approach to Europe's built environment, establishing a set of guidelines that will help achieve this transition. By adopting a resource sufficiency approach and encouraging radical collaboration between policymakers and stakeholders from across the building value chain, actions taken at each stage of buildings' lifecycles can result in huge carbon savings and better-quality environments for people to live in. European policy must be updated accordingly with urgency to accelerate the energy-efficient

renovation of our existing buildings and ensure an optimal standard of new buildings promoting efficient, vibrant neighbourhoods." *Audrey Nugent, Director of Global Advocacy, World Green Building Council*

"The most sustainable building is the one we didn't need to build. We are locked into existing structures that have served us well but are not radical enough to realise the new forms of value required to address the climate crisis with only 8 years left before tipping points reach the point of no return. All over Europe (and the world) there is vacant space that could be repurposed for further uses. Planning policy needs updating to allow greater multiuse activities, assets remain unlocked sitting in land banks for future development, hereditary trusts with owners migrated away from small towns to larger cities leave poorly utilised and in some cases abandoned assets causing urban decline particularly in smaller cities. The ideas described in this paper can only be implemented with new policy that is more holistic and counts the value in more ways than purely economic return." *Sean Lockie, Arup*

"The developments described in the paper are concerning and urgent. The physical solutions are promising but can only be implemented with a fundamental shift in the policy framework that currently encourages the treatment of the built environment as primarily a means to extract value rather than support sustainable living and wellbeing. As a next step, researchers and policymakers need to take a hard look at the macroeconomic and financial drivers of these trends and also rethink ownership structures of land and housing." *Dr Joshua Ryan-Collins, Associate Professor in Economics and Finance, Institute for Innovation and Public Purpose, Faculty of the Built Environment University College London*

"This White Paper makes an important contribution to the net zero debate in Europe that frequently ignores the role of the built form of cities. By highlighting the importance of cities, and their urban composition, this paper should be read by anyone who aims to make Europe greener and more prosperous. From policymakers to advocacy groups." *Guilherme Rodrigues, Centre for Cities*

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Images: We have made reasonable efforts to identify and attribute images in this report. Please contact us on any points of fact or representation.

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EXECUTIVE SUMMARY

Cities provide the social and economic foundation for Europe, not only concentrating living space, but also spaces of social interaction, access to services, culture and commercial activities. Vibrant cities and urban areas shape Europe's prosperity, with the built environment as their backbone.

- 72% of Europeans live in urban areas, around 39% in cities of different sizes and characters, and the number is growing.
- At the same time, access to urban life is becoming less equal. Housing crises are mounting, especially in larger Northern European cities.
- In Europe, cities and urban hubs have the potential to be the most resource- and emissions efficient form of settlement. At this time, some cities perform particularly well while others are not yet effectively using their urban potential.
- As home to the majority of people and businesses, urban areas remain responsible for most of Europe's emissions.

It is therefore a core task for cities, countries and Europe as a whole to make high-quality urban living accessible to more people, while optimising the resource efficiency of urban hubs, minimising their emissions and waste, and boosting climate adaptation.

The urban built environment is at the heart of this task. The built environment is a major emitter of greenhouse gases (40% of total European GHG emissions), a major consumer of emissions-intensive materials (ca. 50% of abiotic materials) and a cause of waste (ca. 1/3 of Europe's waste). Negative impacts are much higher (per resident) in low-density settlements with a lack of diverse services (currently dominant in rural, sub-urban and small-town areas) than in well-designed, balanced urban areas (currently mostly found in urban centres).

In addition to its direct impacts, built environment design influences much of urban areas' dynamics and citizen behaviours, including heating and cooling needs, distances of daily travel, and choices of transport mode. Built environment design can also significantly enable – or hinder – healthy social interactions, idea exchange and innovation, social cohesion, human interactions with nature and nature-based solutions for extreme heat or flooding.

Current efforts to improve Europe's built environment are important, but fail to meet Europe's climate and social targets. European climate strategies and national strategies increasingly emphasize plans for retrofitting existing building and making new buildings more energy efficient – for example the EU "Renovation Wave". While these plans are indispensable, they are far from enough to reach Europe's goal of reducing 55% of emissions by 2030, or fulfilling the Green Deal's promises of decoupling resource use from economic prosperity, or net-zero land-take by 2050.

Current built environment policies disregard the systemic problem of inefficient space use in the built environment. This leads to **excess material consumption and emissions that do not efficiently deliver for societal wellbeing** (illustrated in Figure 1). Every year, Europe builds millions of houses, roads and other infrastructure – which use hard-to-decarbonise materials – that end up being under-utilised. Most Europeans (61% and rising) live in a single-family home in a low density area. As a result they need 4 to 10 times more roads and asphalt, twice as much energy and live in a home using 50% more material, with several rooms not even in use. Meanwhile, 23% of Europe's cities are shrinking fast, leaving vacancies and decay if this shrinking is not purposefully managed. Yet Europe is still building 15 million new dwellings per year.

Figure 1: Europe's current built environment suffers from systemic inefficiencies and imbalances

SYSTEMIQ

**Environment
Economic
Social**

2.5° – 6°C

higher European urban summer temperatures caused by excessive **grey infrastructure** [2]

65%

Of suburban population live further than 1km from general **services** [12]

18%

Higher **transport emissions** for suburban dwellers² [11]

50%

More **material used per person** in single-unit buildings [4, 5]

16%

of dwellings not occupied [5]

2x

Energy demand per person for heating in detached single-unit houses [9]

35%

of dwellings **under-occupied** [1]

18%

of dwellings **overcrowded** [1]

4 - 10x

Longer average **road length** in villages and dispersed rural settlements [6]

75%

Higher **infrastructure costs** in under-used sprawled developments [17]

20%

Higher **energy grid losses** in sprawled areas [10]

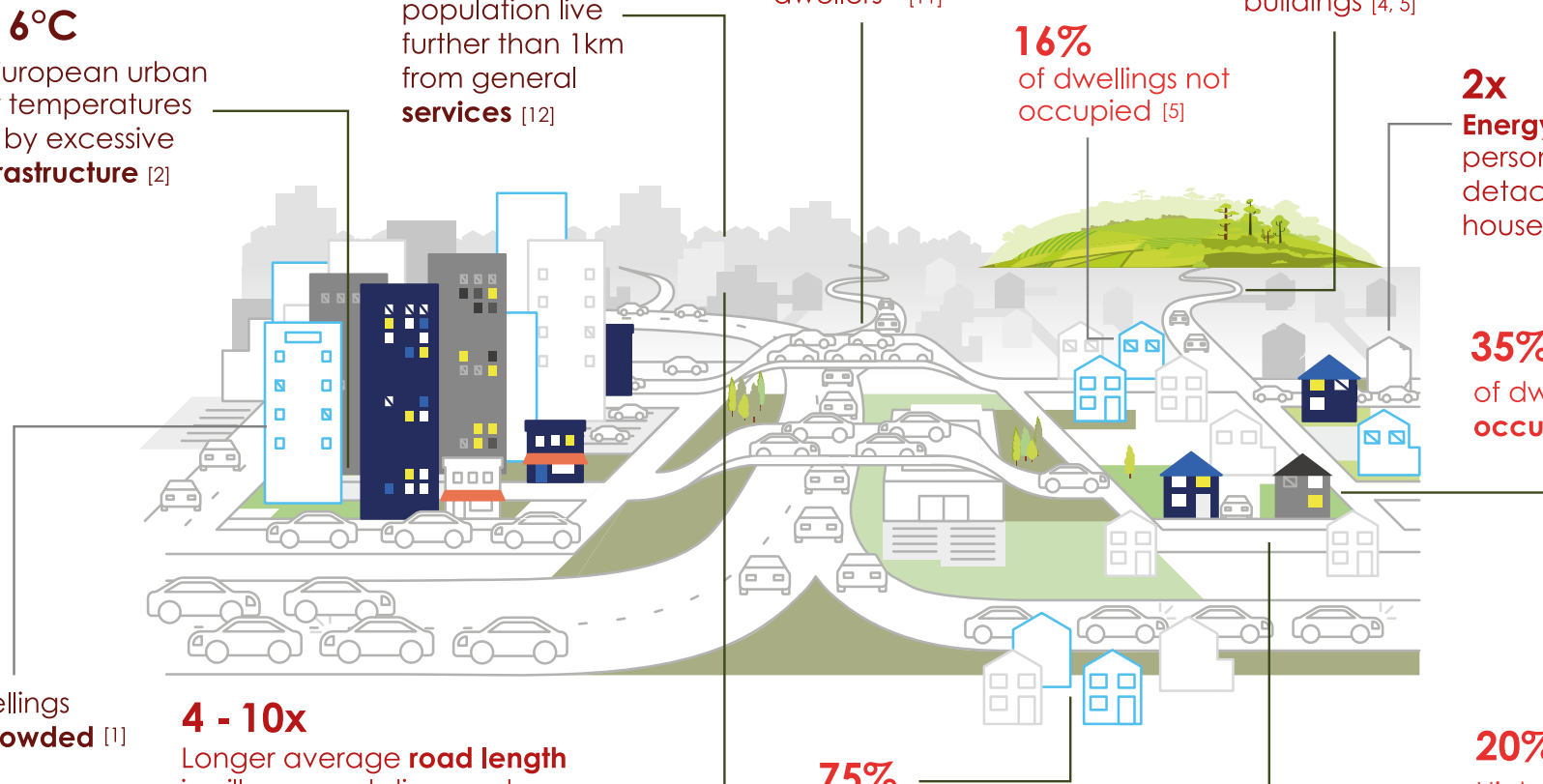


Illustration of inefficiencies and imbalances in urban space use- illustrative only, usually not all challenges contained in one single city
Sources: : [1] Eurostat, 'Eurostat - European Statistics'. [2] Intergovernmental Panel on Climate Change, 'IPCC Sixth Assessment Report - Mitigation of Climate Change'., 2022. [4] International Resource Panel, 'Resource Efficiency and Climate Change: Material Efficiency Strategies for a Low-Carbon Future', 2020.; [5] Eurostat, 'Eurostat - European Statistics'; [6] Lewis Dijkstra, Hugo Poelman, and Linde Ackermans, 'ROAD TRANSPORT PERFORMANCE IN EUROPE', WP 01/2019 (European Commission, 2019). [9] London School of Economics and Political and EIFER, 'Cities and Energy', London School of Economics and Political Science, 2014.; [10] Johansson et al., Global Energy Assessment (GEA), 2012.; [11] Munoz et al - The impact of urbanization on Austria's carbon footprint, 2020.; [12] Kompil et al - Mapping accessibility to generic services in Europe: A market-potential based approach, 2019.; [13] Mueller et al - Health impact assessment of cycling network expansions in European cities, 2018. [15] Gies et al - Parking standards as a steering instrument in urban and mobility planning, 2021.; [16] Joint Research Centre (European Commission), 'What Drives Car Use in Europe?', JRC Publications Repository, 2017.[17] Example Finland, excluding parking, based on Kurvinen & Saarti - "Urban Housing Density and Infrastructure Costs", 2020.

While a growing number of initiatives and coalitions aim to look at European built environment and urban dynamics in an integrated way, these initiatives do not include explicit pathways for tackling systemic inefficiencies resulting from poorly utilised space.

Building on the logic of the 2020 report “A System Change Compass: Achieving the European Green Deal in Times of Recovery” and the research by the UN International Resource Panel, the analysis of this paper aims to kick off a more systemic approach.

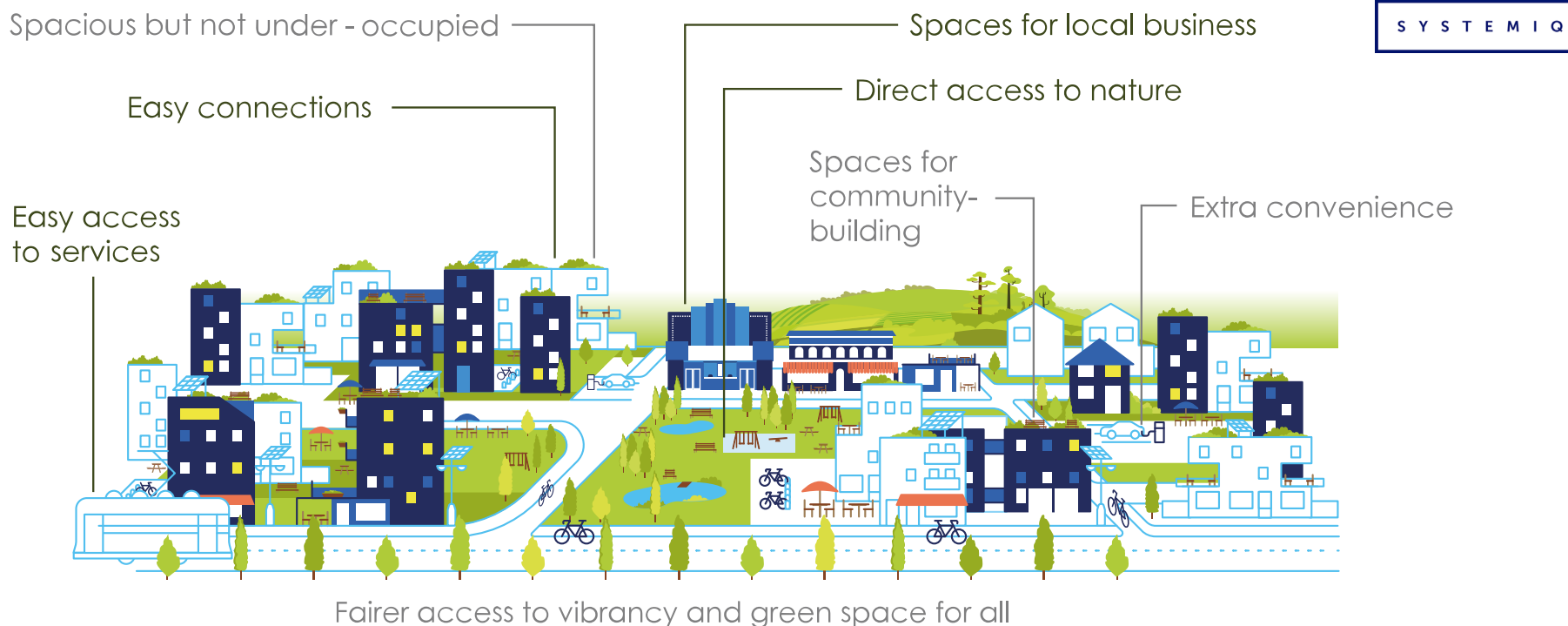
Balanced, efficient space use is a massive opportunity for social well-being, climate mitigation and adaptation, and nature. To tackle systemic waste and emissions while improving urban life in vibrant neighbourhoods, policymakers, planners and investors need to prioritise better space use.

It is a prime opportunity to tackle environmental and social goals hand-in-hand.

Efficiency – often referred to as compactness or density – must be combined with **balance**, meaning the provision of green spaces, and of diverse spaces for community interactions, local businesses and culture, as well as low-carbon transport links – see illustrated in Figure 2.

The IPCC calculates that globally 25% of urban greenhouse gas emissions could be saved by 2050, by making urban areas compact – leading them to consume less material and energy in housing and mobility. The UN International Resource Panel calculates that ca. 24% of buildings’ life-cycle emissions could be reduced (in addition to insulation measures) just by utilizing floor space 20% more efficiently by 2050 in G7 countries.

Figure 2: The benefits of efficient, balanced space use enable vibrant neighbourhoods



Within Europe, the opportunity of better space use is vital for reducing building and infrastructure emissions: **45% of emissions from new buildings and new road infrastructure could be saved over the course of one year by applying efficient yet balanced designs to all new residential developments.** That is a savings of 41 million tonnes of CO2 emissions per year, roughly equivalent to all of France's annual manufacturing and construction emissions.

This can go hand-in-hand with climate adaptation, if balanced well. **Space efficiency reduces land use, and the land that is freed up can be used to provide green spaces across neighbourhoods – if strategically planned across the whole city.** This balanced greening could reduce extreme summer temperatures in Europe by 2.5 – 6°C, which would be literally life-saving with summer temperatures already exceeding 49°C in parts of Europe (measured in Syracuse in 2021). The importance of freeing up space for nature-based solutions for multiple facets of social and environmental health can hardly be overstated.

There is a more basic, yet still overlooked **fundamental social benefit: More efficient yet balanced spatial designs will provide more high-quality housing to more people**, especially when applied across urban areas and regions beyond the city centre.

In addition, an efficient, balanced city drives economic value: interactive, diverse, green neighbourhoods show higher productivity and lower health cost following the principle of the 15-minute city. On the public side, infrastructure cost savings alone can amount to 75% in compact versus sprawled settlements. The investment opportunity of turning sprawled areas into more efficient, connected hubs on the one hand, and improving already efficient, compact areas into balanced areas with green social space and natural cooling solutions on the other hand, should be enormous - if it is approached on a per-neighbourhood level, in cooperation between real estate, infrastructure and community investors.

While concepts such as 'compactness', 'smart growth', '15-minute city' or 'liveable density', and 'reducing sprawl' are now common parlance, and their benefits agreed upon in global literature, these ideas are not yet being researched, monitored or planned in a structured and integrated way across Europe. This White Paper suggests a first framework that could make better space use for systemic resource efficiency part of Europe's strategic agenda.

Efficient, balanced space use for vibrant neighbourhoods is neither new nor is it a technocratic agenda. It is, in fact, a defining trait of Europe's appeal and of its long history of famous cities. This paper suggests how to revive that appeal in circumstances of climate and resource constraints.

Current trends in space use are worrying in terms of resource efficiency and social equity. For 50 years, Europe has not improved the efficiency with which its urban areas use land (a key indicator within efficient space use). The past 10 years show marginal improvements in urban land-efficiency but these are concentrated in a few regions and mainly in larger cities, often making already dense neighbourhoods even denser. Simultaneously, many inefficient areas are becoming even more inefficient, as the number of Europeans living in low-density areas and single-family homes has grown substantially over the past decade. On the building level, under-occupation (un-used rooms) and un-occupation (vacancy) seem to be worsening, although data is scarce. In many places, such as England, Europe is facing its gravest housing space inequality in over 50 years. It is time to turn trends around and realise the great potential of urban areas.

Europe is well placed to turn trends around: It already knows how to shape vibrant, balanced and efficient neighbourhoods. Fortunately, Europe can look to many examples of neighbourhoods with balanced, efficient space use that deliver high quality of life and satisfaction to its residents, often at a fairer affordability than other popular cities. These success stories include well-known large cities like Barcelona, Vienna, Zürich and Lisbon; medium cities with more recent improvement like Freiburg, Aachen, Grenoble, Utrecht, Cluj-Napoca or Leipzig; and small-medium cities like Maastricht.

The examples demonstrate space-efficient neighbourhoods: places with multi-functional spaces, plenty of green space, high-quality multi-unit buildings with community spaces, and local shops and amenities – often organised through (partially) cooperative and public management.

The task is to learn from historic and more recent good examples, and help secure Europe's world-famous 'urban DNA'.

Great opportunities can be found in both large and medium-small cities. Growing cities and towns are crucial, but shrinking areas must not be overlooked. This paper suggests 15 urban profiles to help identify priority challenges. Europe's strength lies in its diversity of smaller and larger cities, different regional characteristics, diverse urban shapes and housing styles. Each city type comes with its own set of priority challenges and improvement opportunities to boost efficiency and balance.

Generally, larger cities perform better in terms of land efficiency. However, most must work on their balance, particularly green space access - with particular urgency in Southern Europe. Medium-sized and smaller cities show a more mixed performance. Many have great potential to reach a sweet spot in efficiency and balance for a high quality of life – through gentle densification (especially in Northern Europe), moderate improvement of public transport (especially Southern and Eastern Europe) and promotion of diverse business and cultural spaces.

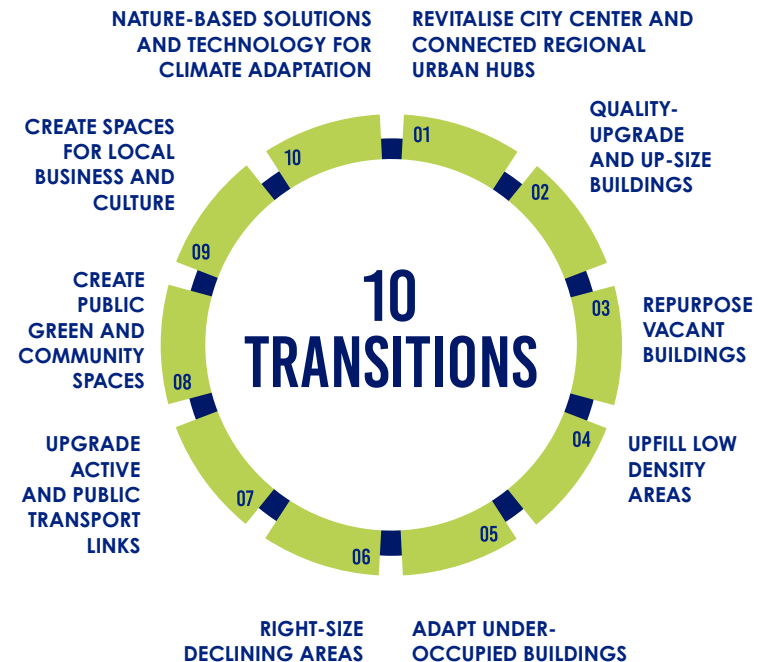
Investing in diverse urban sizes and characteristics, including the strategic densification and economic/service diversification of smaller towns, can strengthen a region's productivity, alleviate housing crises, and improve utilisation of infrastructure – provided these investments (re-)generate efficient, multi-functional hubs connected with low-carbon transport following the "15-minute city" spirit.

Urban areas that are shrinking in population must not be overlooked. Some have the potential to provide great quality of life and efficiency through targeted revitalisation investments (e.g. Leipzig), while others

need targeted right-sizing in regional and European cooperation to prevent unnecessarily sealed land, unused materials and a spiralling sense of decay causing damage to the region's prosperity.

10 physical transitions can improve the efficiency and balance in space use, enabling vibrant neighbourhoods. The case study and literature analysis of this paper finds 10 physical transitions (see Figure 3) towards enabling resource efficient, vibrant, connected neighbourhoods through improving space use of and within buildings – illustrated with concrete examples. The transitions have no hierarchy, but enable each other and are best applied in combination of several transitions. The most relevant combination depends on the respective city profile, as detailed in this White Paper.

Figure 3: 10 Physical Transitions towards efficient, balanced space use in vibrant neighbourhoods



There are still significant barriers to better space use, which must be overcome to implement the physical transitions: In most regions the demand for denser, vibrant yet balanced living is rising (shown, for example, by the growth of many large and medium-size urban centres). But the supply of balanced housing models, such as affordable multi-family homes with good noise insulation and garden access in multi-functional blocks, is slowed by fragmented land ownership or lack of integrated planning at neighbourhood level by public and private developers.





Most policymakers, investors and households lack awareness of the massive benefits that come with balanced efficiency. Old perceptions of the single-family home as a beacon of prosperity still lead to widespread demand for inefficient spatial designs, such as detached houses – often without an understanding of the hidden costs and inconveniences of low-density living. In many regions, economic conditions and policies exacerbate this, for example through subsidising sprawling infrastructure or single-family houses while applying little control or support around the affordability of inner-city housing. The price of living in space-efficient yet attractively balanced neighbourhoods is simply too high in too many cases, driven by a combination of high concentration of demand in a few larger centres and the marketization of housing as an investment asset rather than a function to citizens.

This paper's 9 case study analyses show that multi-stakeholder approaches are instrumental in overcoming these socio-economic barriers and implementing the 10 physical transitions:

1. A vision-building process must 'crowd in' citizens of all incomes and investors into a joint purpose that promotes vibrancy and productivity. Efficiency is not a goal in itself, but must be utilised as a tool in pursuing a more connected, productive, inclusive, resource-resilient urban area – including suburbs and connected areas.
2. Public capacity (i.e. the right institutional set-up and expertise) must be built to enable strategic zoning, master-planning, public investments, and orchestration of diverse private and public investors, potentially combined with expanding public land ownership.
3. Public-private and cooperative investment set-ups are already shown to be a recurrent and critical element in large-scale transformations.
4. Culture and community engagement has proven successful in overcoming adverse social norms, underpinning the benefits of connected, vibrant neighbourhoods.
5. Design innovation must trigger awareness and demand for highly attractive, efficient living models.

City leaders are essential, but national and EU policy, as well as private actors must encourage, innovate and help scale. Local governments are at the forefront of leading such multi-stakeholder approaches. But national actors, EU actors and private actors are indispensable to push the momentum and help scale implementation – see Figure 4.

Figure 4: Key Actors must play their part In Scaling Multi-Stakeholder Approaches

City governments: leaders at the heart of it all	National and EU policies: essential as enablers	Public and private investors: needed as drivers of the momentum	Individuals, associations and small businesses: essential as innovators
			
<ol style="list-style-type: none"> 1. Orchestrate multi-stakeholder strategies <ul style="list-style-type: none"> Inclusive vision building, with systemic sustainability and resilience understanding Public capacity building and regulation: zoning, master-planning, pricing, infrastructure investments Orchestrate integrated investment models crowding in private and community investments – also ensuring diverse affordability Encourage design as well as culture and social innovation 2. Pursue public land and housing ownership, and support cooperative models 	<ol style="list-style-type: none"> 1. Set targets for material, land and energy use in the built environment system Define clear progress metrics for urban areas, aligned across EU institutions and initiatives – and investment taxonomies Integrate efficient and balanced space use as a top strategic goal in energy, industrial, soil and social strategies Dedicate more funds to scaling 10 transitions beyond pilots Remove economic incentives to sprawl e.g. subsidies, cheap land price Support affordability of compact, balanced housing 	<ol style="list-style-type: none"> 1. Set clear sustainability standards for portfolio, incl. spatial dimension Prioritise investments in 10 physical transitions in relevant cities for better space use Prioritise (re-)developing in collaboration with local authorities or with housing cooperatives Pilot (joint) investments in new locations with particular improvement need Public banks to kick-start investments into 10 transitions through concessional loans and de-risking, through support to local public capacity building and proactively crowding-in private investors 	<ol style="list-style-type: none"> Citizens and home-owners: join or create citizen associations to advance a shared vision for the city Developers and architects: pilot efficient and balanced building blocks (as part of a neighbourhood vision), locally and in new areas of strong need Local business and investors: Sponsor local green spaces and local culture, to attract skilled workforce

Many larger cities with pressured housing markets are already quite active in integrated planning. However, smaller cities and towns, which are currently the most inefficient group, often lack ambition or the understanding of how balanced efficiency could benefit them, but that doesn't mean they don't have promising opportunities to improve, especially when cooperating in cross-municipality regional programmes.

This paper urges EU-level actors, including financial institutions, innovation and cultural initiatives **to make full use of their considerable awareness-creation and agenda-setting power to promote and enable efficient, balanced space use.**

This must include clear standards and regulation – for example, for minimum density and public transport links. It must also include positively promoting the benefits of balanced efficiency beyond (but in cooperation with) large urban centres.

In times of dire pressure, this is our opportunity to pursue the original European project of improving prosperity and fairness through cooperation. Europe is world-renowned for its quality of life in vibrant cities; it is high time we secure and widen the circle of benefits to a larger group of European citizens and neighbourhoods through strategically pursuing efficient, balanced space use.



Photo: Jorge Franganillo

1. INTRODUCTION AND OBJECTIVES: ENABLING EFFICIENT, VIBRANT URBAN LIVING FOR MORE PEOPLE

The European Green Deal committed Europe to unprecedented goals, including a reduction of 55% in greenhouse gas emissions by 2030, and reducing land-take to net zero by 2050. It also set out a vision of improving equity and securing fair prosperity, with “no person or place left behind”. At the same time, Europe is under unprecedented pressure to boost its resilience in terms of energy and materials.

Cities and urban areas have a crucial role to play in all these agendas. More than 70% of Europeans live in urban areas (an increasing trend),¹ and nearly 40% in cities. This is where they work and develop their social relationships. It is where most businesses create value, where most art and culture are produced and acquired, and where innovations happen.²

Cities and urban hubs are already more resource- and emissions-efficient than any other form of settlement, in terms of the built environment or mobility. However, some cities perform particularly well, whereas others are not yet using their potential effectively. And despite that comparative efficiency, urban areas are responsible for most of Europe’s emissions, given that they are home to most of its people and businesses.

It is therefore a core task - for cities, countries and Europe as a whole - to make high- quality urban living available to more people. Doing so will require cities to optimise the resource efficiency of urban hubs, minimise their emissions and waste, and boost climate adaptation.

Urban areas are undergoing major changes – some might call it a paradigm shift. They face rising pressures from climate change, from increasing resource vulnerabilities, from migration into and within Europe, and from changing societal demands shaped by technological possibilities in remote working and mobility. The stark inequalities within and between cities are reflected in Europe’s dire housing crises. But trends in cities are also shaped by a powerful desire for social community.

It is essential to use this momentum of change in the right way: for prosperous cities, but also for the European project overall. Vibrant, diverse, well-designed mixed-use urban neighbourhoods are at the heart of European innovation, social cohesion and tolerance. This is not a technocratic agenda, nor is it a new model for Europe. In fact, vibrant neighbourhoods are at the heart of Europe’s world-wide fame and appeal. Thus, the challenge – and opportunity – is to maintain the fundamental benefits of European cities while responding to shifting conditions of climate, resource-resilience and digital opportunities.

A key element of getting the paradigm shift right is changing the way we use space in urban areas, towns and suburbs. It must enable more people to live in vibrant neighbourhoods that reduce over-consumption of energy, materials and land.

¹ European Investment Bank, “The Story of Your City: Europe and Its Urban Development, 1970 to 2020.”

² European Investment Bank.

This connection between space use, resource efficiency and a sustainable, socially equitable way of living is gaining recognition, mainly through the much-discussed “15-minute city” concept.^{3,4} Yet most European and national climate and resource policies still neglect this lever. Almost none of Europe’s climate, energy efficiency or circular strategies refer to the systemic inefficiencies in Europe’s built environment: they ignore the continuous sprawl around many cities and towns, the fact that many cities keep building while their population is shrinking, and the increasing number of un-occupied and under-occupied buildings.

Europe is overlooking a significant systemic opportunity, when it needs it most. To start plugging this awareness and action gap, this White Paper aims to:

- Raise awareness of the vital need to tackle **the inefficiencies and imbalances in space use in Europe’s built environment**. This means looking both at how land is used by buildings and connected infrastructure, and at how floor space is used within buildings, as major drivers of negative effects on climate, land, material and social equity.
- Raise awareness of the **possibility and opportunity of improving space use in the built environment, particularly the urban built environment** – how land is used by building patterns and the infrastructure that they require (at macro level) and how floor space is used within buildings (at micro level).

- Offer a novel framework for **understanding the specific space-use patterns and trends across Europe at these macro and micro levels**, in order to develop targeted EU, national and city strategies, and to refine the framework - through European debate - into a systemic monitoring and steering tool.
- Suggest **practical solutions for city leaders, national and EU policymakers, sources of public and private finance, designers and citizens, in the form of 10 transitions to tackle the physical challenges and 5 multi-stakeholder approaches** to overcome the socio-economic barriers. Immediate action must be combined with further discussion on how to scale these solutions in different contexts.
- Draw attention to valuable, existing – but under-utilised – research, as well as **point out important research gaps** to Europe’s academics and their funders. For this, see dedicated boxes in each chapter.

This White Paper is based on extensive literature review, 9 deep case-study analyses, additional shorter examples, and expert consultations. It combines a synthesis of existing data with our own novel analyses – including a quantitative estimation of Europe’s potential for GHG reductions, a quantitative analysis of Europe’s space-use patterns and trends, and a qualitative case-study analysis for solution approaches in architecture and construction as well as governance and leadership. You can find more detail on methodology in Analysis Deep Dive A.

³ Luscher, Dan, “The 15-Minute City Putting People at the Center of Urban Transformation.”

⁴ ARUP, C40, “Green and Thriving Neighbourhoods Guidebook.”

2. EUROPE'S URBAN BUILT ENVIRONMENT IS AT THE HEART OF ACHIEVING CLIMATE AND SOCIAL AMBITIONS, BUT CURRENT POLICIES OVERLOOK SYSTEMIC INEFFICIENCIES

The built environment – including houses, roads and other built infrastructure – is Europe's biggest consumer of material (50%⁵) and a major energy consumer (40%⁶ consumed in buildings alone). It also shapes the dynamics of a city and urban area in its everyday functions, from transport distances and modal choices (urban transport accounts for 23% of EU emissions⁷) to space available for business and culture, innovation and relationship building.

All this places the built environment system at the heart of Europe's environmental and social challenge. Built environment impacts, including excess material use, land use and emissions, are much greater in settlements with inefficient spatial design. In particular, urban hubs have a great role to play in optimising the built environment for best and fairest quality of life while minimising overconsumption of materials, energy and land.

However, at EU, national and even city level, most climate policies do not consider the built environment beyond insulation and retrofitting. These levers are necessary, but they do not address a deeper, more fundamental issue. Europe's built environment is creating massive excess material consumption, land use and emissions: by building houses and infrastructure that are under-utilised and thus do not efficiently deliver their basic function to society. (see Figure 5)

5 EU Commission, Internal Market, Industry, Entrepreneurship and SMEs, "Buildings and Construction."

6 Rousselot and Pinto Da Rocha, "Energy Efficiency Trends in Buildings in Europe | Policy Brief | ODYSSEE-MURE."

7 "The Urban Mobility Observatory."

We refer to this systemic challenge as 'inefficient and imbalanced space use'. We include spaces within buildings that are un-used or under-used, and land that is inefficiently used by settlements and by the infrastructure, particularly roads, that they require.



Photo: Krzysztof Golik

Figure 5: Key impacts of inefficient, imbalanced space use in cities - on natural resources, public cost and public wellbeing

Environment
Economic
Social

2.5° – 6°C

higher European urban summer temperatures caused by excessive **grey infrastructure** [2]

65%

Of suburban population live further than 1km from general **services** [12]

18%

Higher **transport emissions** for suburban dwellers ² [11]

50%

More **material used per person** in single-unit buildings [4, 5]

16%

of dwellings not occupied [5]

2x

Energy demand per person for heating in detached single-unit houses [9]

35%

of dwellings **under-occupied** [1]

18%

of dwellings **overcrowded** [1]

4 - 10x

Longer average **road length** in villages and dispersed rural settlements [6]

75%

Higher **infrastructure costs** in under-used sprawled developments [17]

20%

Higher **energy grid losses** in sprawled areas [10]

S Y S T E M I Q

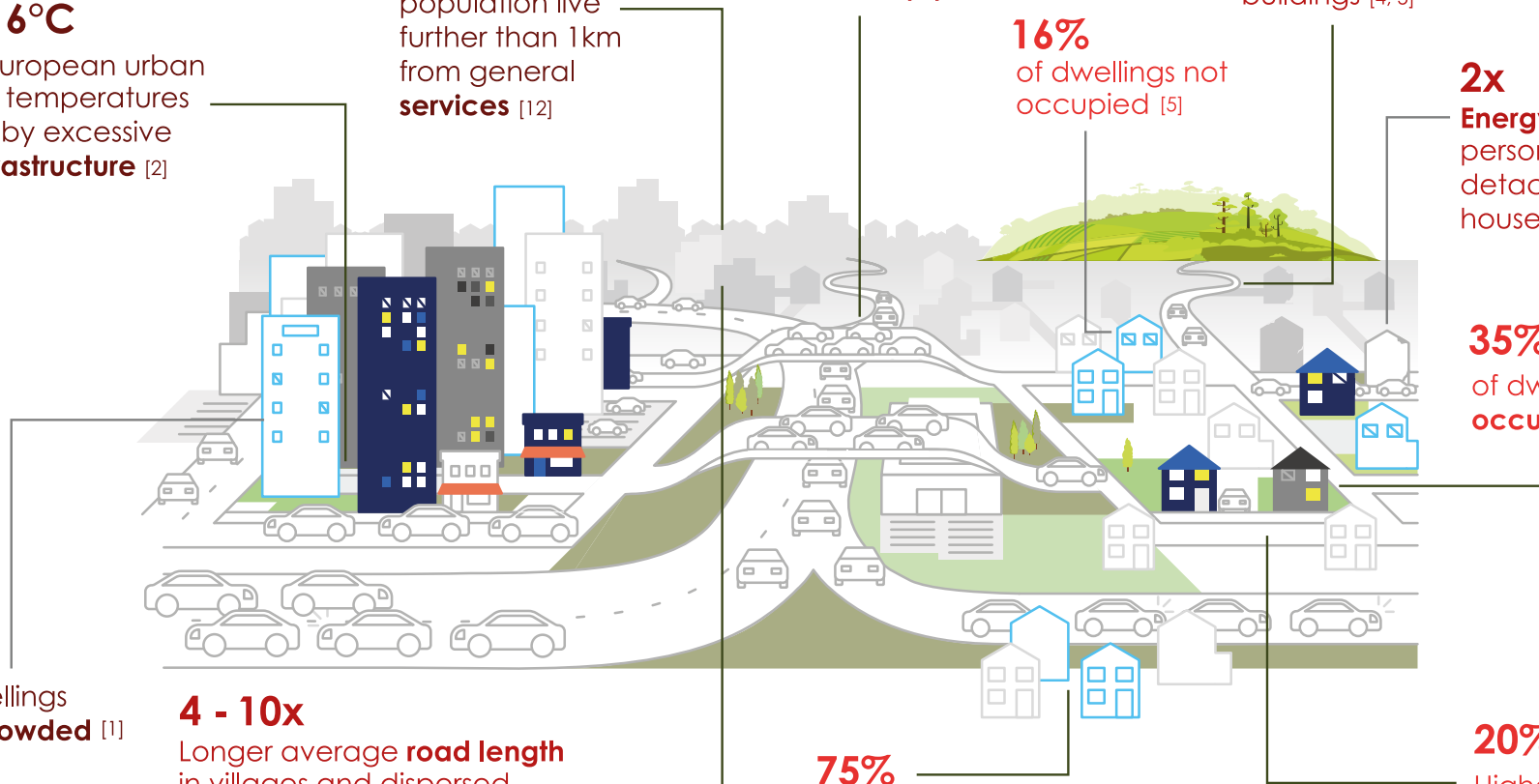


Illustration of inefficiencies and imbalances in urban space use- illustrative only, usually not all challenges contained in one single city
Sources: : [1] Eurostat, 'Eurostat - European Statistics'. [2] Intergovernmental Panel on Climate Change, 'IPCC Sixth Assessment Report - Mitigation of Climate Change'. 2022. [4] International Resource Panel, 'Resource Efficiency and Climate Change: Material Efficiency Strategies for a Low-Carbon Future', 2020.; [5] Eurostat, 'Eurostat - European Statistics'; [6] Lewis Dijkstra, Hugo Poelman, and Linde Ackermans, 'ROAD TRANSPORT PERFORMANCE IN EUROPE', WP 01/2019 (European Commission, 2019), [9] London School of Economics and Political and EIFER, 'Cities and Energy', London School of Economics and Political Science, 2014.; [10] Johansson et al., Global Energy Assessment (GEA), 2012.; [11] Munoz et al - The impact of urbanization on Austria's carbon footprint, 2020.; [12] Kompil et al - Mapping accessibility to generic services in Europe: A market-potential based approach, 2019.; [13] Mueller et al - Health impact assessment of cycling network expansions in European cities, 2018. [15] Gies et al - Parking standards as a steering instrument in urban and mobility planning, 2021.; [16] Joint Research Centre (European Commission), 'What Drives Car Use in Europe?', JRC Publications Repository, 2017.[17] Example Finland, excluding parking, based on Kurvinen & Saarti - "Urban Housing Density and Infrastructure Costs", 2020.

Europe's trends in space use are not improving fast enough and are worsening in many respects.

One important indicator is the land use of settlements, which is strongly correlated with their material and energy consumption in buildings and infrastructure, and influences the viability of low- or high-carbon transport options.

Trends in European land use are pulling against the positive changes we need to see for environmental and social wellbeing.

- Europe's urban land consumption is still growing. In just six years between 2012 and 2018, its urban areas grew by 4,646 km² – the equivalent of adding the whole of greater Paris and the Île de France region, nearly four times over.
- Urban land use efficiency – how much space the urban built environment takes up *per person* – has very marginally improved over the past decade, by 1.3% (because population in functional urban areas has grown slightly more than the additional land consumption).⁸ But this comes after 50 years of efficiency stagnation, at relatively inefficient levels compared to global averages.⁹
- Around 60% of Europeans live in low-density areas¹⁰ (mostly in suburbs, small towns and rural areas), which are much more infrastructure- and material-intensive. And around 53% of Europeans live in single-family homes,¹¹ which are more material- and energy-intensive. Both trends have been growing.¹²

8 European Environment Agency et al., Land Take and Land Degradation in Functional Urban Areas.

9 UN Habitat, "World Cities Report 2022 - Envisaging the Future of Cities."

10 Eurostat, "Archive."

11 Eurostat.

12 (between 2012 – 2018)

- In addition to material use and related emissions, these trends make Europe's urban areas, and the people who live there, more vulnerable to changes in our climate and environment. Over the past 10 years, urban land-take caused a loss of 4.2 million tonnes in carbon sequestration capacity, negatively affected biodiversity, but more significantly reduced our heat and flooding resilience.¹³
- Space use at the level of individual buildings is also increasingly inefficient: between 2011 and 2020, 15 million homes were built¹⁴ while around 30 million stood empty¹⁵ and 35% of buildings were under-occupied.¹⁶ Data are more scarce here, but indicate a worsening trend. See a summary of problematic trends in Figure 6.

So, Europe is improving overall land-use on the one hand, while expanding low-density, under-occupied living on the other hand. This implies that inequalities are growing. There is a danger that current trends will further cram people into already-dense neighbourhoods and small flats, while space-inefficient houses and sprawling areas become even more inefficient. This tendency is already clear in England, which is facing the most acute inequality in housing space in over 50 years.¹⁷

In fact, space-use imbalances are rising not only within urban areas, but across Europe. Many, particularly larger, urban centres in Northern Europe face a mounting housing crisis, yet 23% of urban areas are shrinking – this is predicted to become 50% by 2050 due mainly to economic imbalances and extreme heat.¹⁸

13 European Environment Agency et al., Land Take and Land Degradation in Functional Urban Areas.

14 European Mortgage Foundation et al., "HYPOSTAT 2021."

15 Eurostat, "Archive."

16 Eurostat, Share of People Living in Under-Occupied Dwellings. 'Under-occupied' relates to rooms that are not in regular use.

17 Sophus O.S.E. zu Ermgassen, Michal P. Drewniak, Joseph W. Bull, Christine M. Corlet Walker, Mattia Mancini, Josh Ryan-Collins, André Cabrera Serrenho, "A Home for All within Planetary Boundaries: Pathways for Meeting England's Housing Needs without Transgressing National Climate and Biodiversity Goals."

18 European Commission et al., "Shrinking Cities."

Figure 6: Current Trends in Europe's Built Environment will Aggravate Inefficiencies and Imbalances

		Pattern today	Trend
MACRO DIMENSION	Land-utilisation by building patterns	418 m² Urban land use per-capita across Europe [6]	-1.3%^[6] between 2012 - 2018
		61% Of people live in low density settlements [1]	+5.6%^[1] between 2011 - 2020
		23% of cities are shrinking (in population) – leading to unused built environment, if not managed strategically [4]	50%^[3] will be shrinking by 2050
MICRO DIMENSION	Building-utilisation by people	53% live in single-family houses (SFH) [1]	+ 2.2%^[1] between 2011 - 2020
		35% live in under-occupied dwellings , while 18% are over-crowded [1]	+ 1.8%^[1] between 2011 - 2020
		16% of dwellings are not occupied (2011) [5], while 15 million were newly built from 2011-2020 [2] between 2011 - 2020	No data since 2011

Sources: [1] Eurostat, 'Eurostat - European Statistics'. [2] European Mortgage foundation- Hypostat 2021, 2021. [3] European Commission and Joint Research Centre, 'The Future of Cities', 2019. [4] European Commission et al., 'Shrinking Cities', JRC Publications Repository, 11 January 2022. [5] Rupert Neate, 'Scandal of Europe's 11m Empty Homes', The Guardian, 23 February 2014, [6] European Environment Agency et al., Land Take and Land Degradation in Functional Urban Areas., 2022.

Footnotes: SYSTEMIQ analysis based on 1) Estimation based on the total number of EU households (192 million); Note that the expansion of industrial and commercial sites is an equally significant in terms of land-use growth in Europe, but will warrant a separate, dedicated study.

These systemic challenges are currently overlooked by almost all European Green Deal strategies, almost all national climate and energy efficiency plans, and most cities' climate plans. Some European activity points into the right direction, such as the increasing urban action by the European Investment Bank, the Commission's 'Mission Cities'¹⁹ and 'NetZeroCities'²⁰ and its Green Capitals Award.²¹ There are also transformation success stories from the Regional Development Funds,²² awareness in the Environmental Action Programme,²³ good ambition in the Leipzig Charter

¹⁹ European Commission, "EU Mission: Climate-Neutral and Smart Cities."

²⁰ Net Zero Cities, "Net Zero Cities: Towards Climate Neutral Cities by 2030."

²¹ "European Green Capital Award."

²² European Commission, Directorate-General for Regional and Urban Policy, "European Structural and Investment Funds."

²³ "Environment Action Programme to 2020."

on Sustainable Cities,²⁴ and wide momentum around the New European Bauhaus initiative.²⁵ But all of these initiatives need to become more explicit and strategic in how they seek to improve urban space use.

Europe's growing city coalitions are not yet explicit about their goals or pathways for sustainable urban space use; nor are most standards or guidance documents for sustainable built environments or circular cities. The concept of 'the 15-minute city' is gaining momentum²⁶, but must be unpacked in a structured way for different city types, and as part of an overall European ambition.

²⁴ European Commission, "LEIPZIG CHARTER on Sustainable European Cities."

²⁵ European Commission, "New European Bauhaus."

²⁶ ARUP, C40, "Green and Thriving Neighbourhoods Guidebook."

3. THE EFFICIENT, BALANCED USE OF SPACE IS AN INDISPENSABLE LEVER TO REACH ENVIRONMENTAL AND SOCIAL GOALS

At a moment where Europe is under pressure to improve its energy and material import resilience, all urban and built-environment-related strategies – across policymakers, investors and designers – must make better space use an explicit priority.

I. GLOBAL SCIENCE IS CLEAR ON THE BENEFITS OF BALANCED EFFICIENCY

Science is clear about the systemic benefits of 'good density' or 'balanced compactness' or the '15-minute city' (many terms are used to refer to very similar concepts).

According to the IPCC, globally, 25% of urban greenhouse gas emissions could be saved by making cities compact and walkable,²⁷ reducing the need for roads, increasing efficiency in blocks and neighbourhoods of buildings as well as in individual buildings, and reducing transport needs. At building level, the International Resource Panel has calculated that 24% of residential building emissions could be reduced by 2050, through slight improvements to floor space in G7 countries.²⁸ Logic also suggests that better spatial designs have important synergies with other required sustainability transitions, such as clean energy provision and circular material use.²⁹ For example, clean heating is more efficient when heat pumps can be shared in multi-unit building blocks³⁰ (but at the same time have the balanced space to install clean-energy infrastructure).

27 IPCC, "Sixth Assessment Report - Climate Change 2021: The Physical Science Basis."

28 International Resource Panel, "Resource Efficiency and Climate Change: Material Efficiency Strategies for a Low-Carbon Future."

29 Coalition for Urban Transitions, "Climate Emergency, Urban Opportunity."

30 Rogers, "Gentle Densification of Suburbs Could Help Meet London's Housing Needs."

Efficient, balanced spatial designs demonstrably reduce infrastructure cost, while increasing productivity and innovation potential.³¹ They have also been shown, globally, to perform better during the COVID pandemic by offering a combination of access to green space while ensuring proximity to medical services.³² More fundamentally, efficient yet balanced building, or re-building and regeneration, in urban neighbourhoods outside city centres will deliver more high-quality homes with fair space, and with easy access to services and green spaces, for more people. It is essential to tackle housing crises while avoiding stark discrepancies between hyper-densities and under-used spaces.

For a structured application to Europe, this White Paper synthesises the concepts from across literature into the working term of 'efficient and balanced space use'. This has a macro dimension: how efficiently land is used by neighbourhoods and their required infrastructure. It also has a micro-dimension: how efficiently floor space is used within buildings. Figure 7 illustrates the concept.

It is essential to combine efficiency and balance, and not pursue them in isolation. Using space *efficiently* saves natural resources for buildings and infrastructure. It shortens commuting distances, and allows for a population density at which shared transport links, essential services and shared amenities become viable. Using space in a *balanced* way is essential to allow for open space and green spaces, but also diversity – for example, a mix of community space and flexible spaces for local business and social organisations. This combination can enable social interactions,

31 Urban Land Institute, "Supporting Smart Urban Development."

32 UN Habitat, "World Cities Report 2022 - Envisaging the Future of Cities."

productivity, healthier air quality, and resilience to flooding and extreme heat. It supports our overall quality of urban life. Using space in smarter ways, to minimise new land sealed by excess roads, parking, under-utilised houses – or even free up land – to promote nature-based solutions across urban areas is indispensable for Europe's public health. From extreme heat, to flooding, air quality, mental health and biodiversity – space for nature

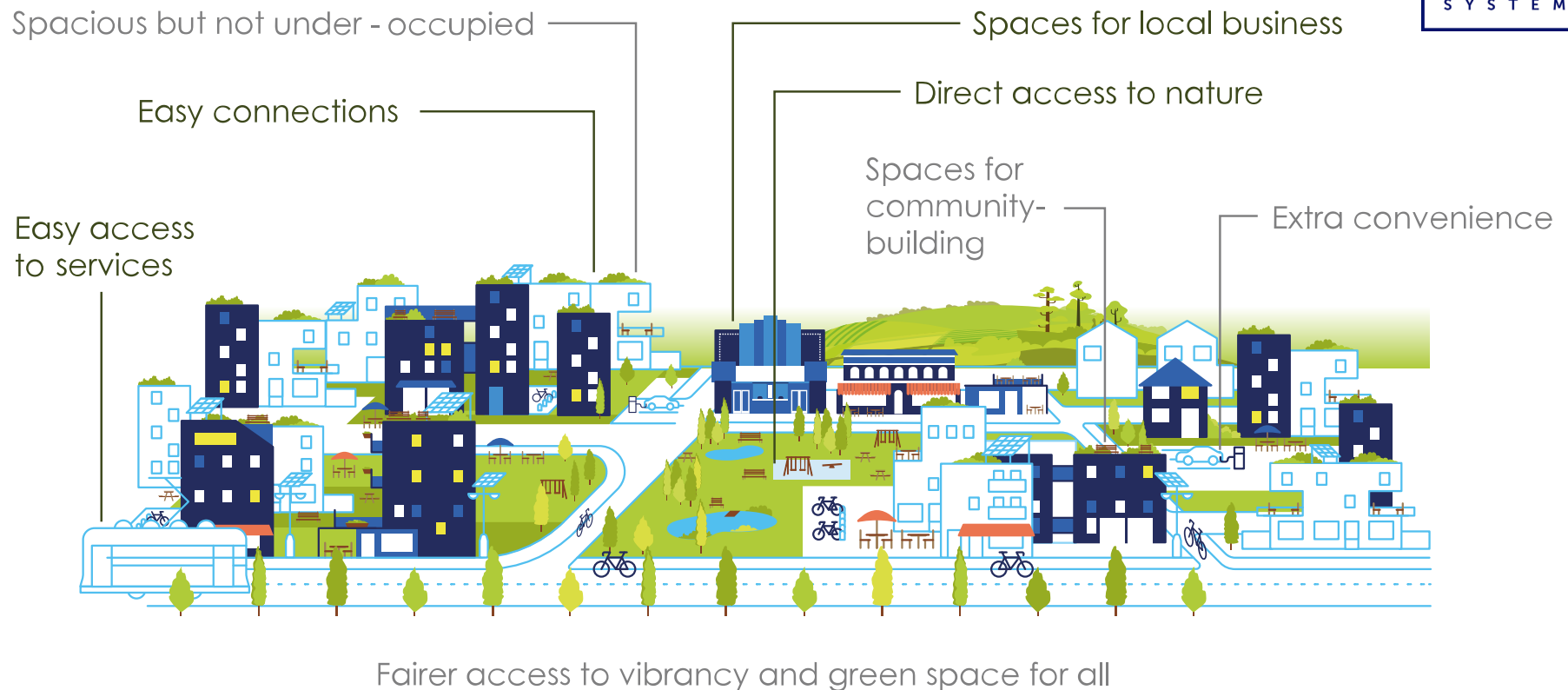
in cities is fundamental to resilience.^{33, 34, 35} Importantly, such space must be balanced across the city – avoiding hyper-densities in city centres and a waste of space in outskirts and connected rural settlements.

33 UNEP, "Smart, Sustainable and Resilient Cities: The Power of Nature-Based Solutions."

34 Maher et al., "Impact of Roadside Tree Lines on Indoor Concentrations of Traffic-Derived Particulate Matter."

35 Marselle et al., "Urban Street Tree Biodiversity and Antidepressant Prescriptions."

Figure 7: The concept of efficient, balanced space use for vibrant neighbourhoods and resource efficient cities



The approach of this White Paper is born out of the research for the 2020 report “A System Change Compass: Implementing the European Green Deal in Times of Recovery”³⁶ and work with the UN International Resource Panel, and inspired by the logic of Raworth’s Doughnut Economics.^{37,38}

While there has been extensive *qualitative* global research on related concepts such as ‘urban compactness’, quantitative evaluations are

36 SYSTEMIQ and Club of Rome, “A System Change Compass. Implementing the European Green Deal in a Time of Recovery.”

37 Raworth, Doughnut Economics: Seven Ways to Think Like a 21st-Century Economist.

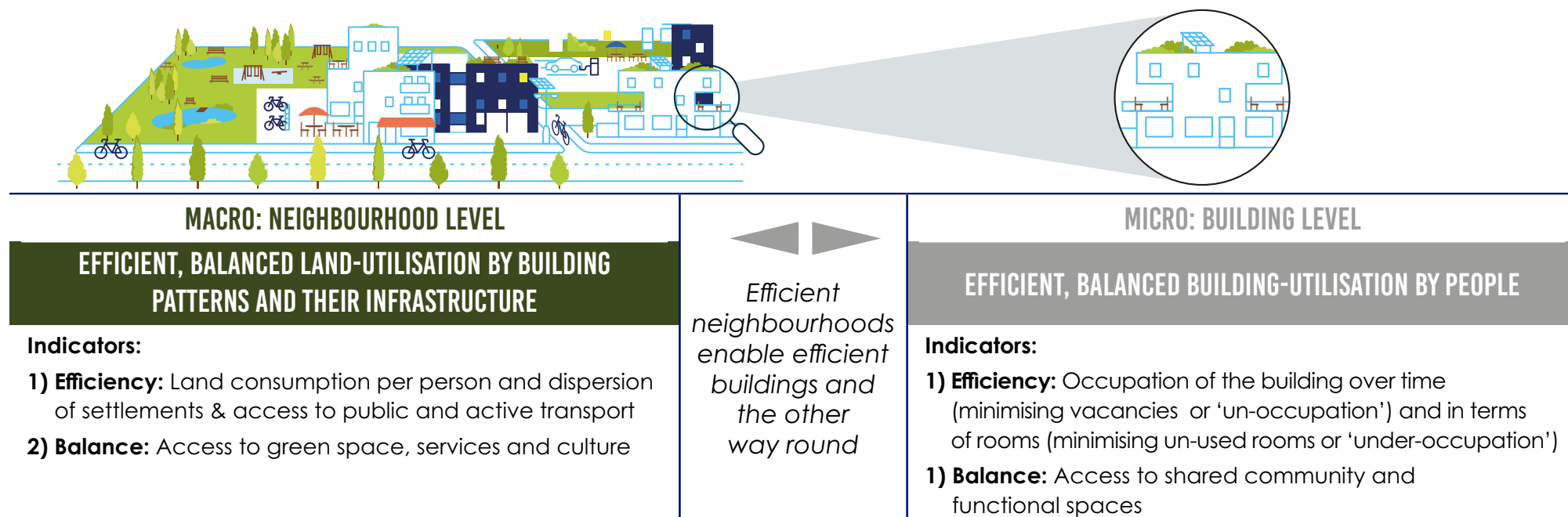
38 Burbano, Lucia, “WHAT IS THE THEORY OF DOUGHNUT ECONOMICS AND HOW CAN IT MOLD CITIES?”

scarce. We found no integrated quantitative analysis of European patterns. This White Paper aims to provide a first structured, integrated analysis of European patterns, to stimulate a structured debate and monitoring at EU level in future.

Figure 8 summarises the key indicators used by this White Paper, based on seminal literature and indicators used by different sources of European institutional data analysis – see more in Analysis Deep Dive B.

Box 1 reflects on the state of the research and what would be required to fill the knowledge gap, building on this White Paper.

Figure 8: Efficient, Balanced Space-Use has a Macro and Micro Dimension that enable each other



Source: SYSTSEMIQ working framework, based on seminal literature including World Cities Report 2022, Coalition for Urban Transitions, New Climate Economy, International Resource Panel ‘Weight of Cities’ and EU Leipzig Charter, New Urban Agenda in 2016; Note: European discussion needed to consolidate best indicators

Box 1: Reflection on the state of research and possible way forward to improve the knowledge base, building on this White Paper

Global and European literature – and the discussion on 15-minute cities – give extensive insight into the elements of balanced density. However, clear, quantifiable benchmarks and frameworks for monitoring progress are missing. Such a framework should be consolidated at European level.

The diversity of European cities – for example, the needs of smaller versus larger cities, and different historical set-ups – must naturally be respected, but this must not hinder the development of clear guidance and benchmarks.

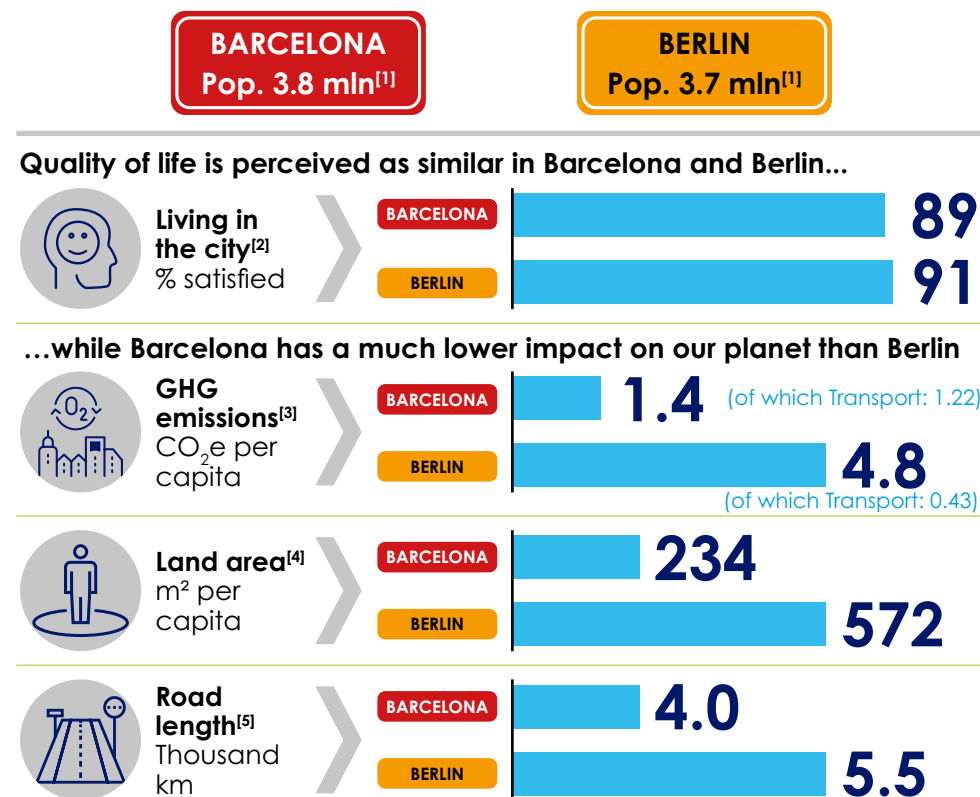
This paper suggests a first framework to build on.

II. THE OPPORTUNITY FOR EUROPE IS SIGNIFICANT – AND CAN BUILD ON EUROPEAN SUCCESS STORIES

Despite worrying space-use trends in Europe's built environment, **examples from across Europe show how well efficiency and balance can go together**, and these can inspire action across the continent. What can we learn from these examples?

Barcelona's super-block structure, for example, (locally known as *super-illes*) is world-renowned for its efficiency in delivering easy access to services for its citizens, great public transport connections, and balanced economic and cultural vibrancy. Barcelona records satisfaction ratings among its citizens that are equivalent to those of Berlin. But it achieves these while using less than half of the land, using much less material for roads, and emitting less than 1/3 of greenhouse gas emissions – see Figure 9.

Figure 9: Examples illustrate how Efficient, Balanced Space enables significant resource savings (Indicative, not all effects directly caused by Space utilisation)



Sources: SYSTEMIQ analysis based on [1] Eurostat, 'Eurostat - European Statistics', [2] European Commission, Directorate General for Regional and Urban Policy., [2] Report on the Quality of Life in European Cities, 2020, [3] C40 Knowledge Hub - Greenhouse gas emissions interactive dashboard (2022), [4] European Environment Agency et al., Land Take and Land Degradation in Functional Urban Areas, 2022, [5] CityTransit Data, 'A Global Analysis of Transit Data', n.d.
Note that there is no consolidated methodology for emissions accounting on city level; per-capita emissions might differ using bottom-up methodologies

However, success is not restricted to Barcelona, or to European capitals. Inspiration can be found in the popular neighbourhoods of smaller cities: such as Vauban in Freiburg, Germany, or in Zürich (see Figure 10) – and in many other places, including Utrecht, Grenoble, Leipzig and Cambridge (see Analysis Deep Dive D).

Figure 10: Illustrative examples of popular neighbourhoods or cities with efficient, balanced space-use

● Very good ● Good ● Moderate

VAUBAN, Freiburg, Germany

MACRO	LAND EFFICIENCY	●
	GREEN SPACES	●
	TRANSPORT & SERVICES	●
MICRO	EFFICIENT BUILDING OCCUPATION	●
	VIRBANCY & MULTI-USE	●



Photo: Claire7373, Wikimedia Commons

BARCELONA, Spain

MACRO	LAND EFFICIENCY	●
	GREEN SPACES	●
	TRANSPORT & SERVICES	●
MICRO	EFFICIENT BUILDING OCCUPATION	●
	VIRBANCY & MULTI-USE	●



Photo: Martin Abegglen, Wikimedia Commons

ZURICH, Switzerland

MACRO	LAND EFFICIENCY	●
	GREEN SPACES	●
	TRANSPORT & SERVICES	●
MICRO	EFFICIENT BUILDING OCCUPATION	●
	VIRBANCY & MULTI-USE	●



Photo: Andrea Helbling, Allgemeine Baugenossenschaft Zürich (ABZ), published on shelterforce.org 2021

SYSTEMIQ analysis based on (1) Jan Scheurer and Peter Newman, 'Vauban: A European Model Bridging the Green and Brown Agendas', UN-Habitat, no. Revisiting Urban Planning: Global Report on Human Settlements 2009 (2008) (2) Quartiersarbeit Vauban, 'VAUBAN IN ZAHLEN |', 2012

What makes these neighbourhoods successful? Their high quality of life is determined not so much by the efficiency and balance in space use itself, but by what those factors enable: proximity to local services, public and active transport, community spaces, green spaces, clean air and cultural diversity. These elements prove to be essential to life satisfaction across larger and smaller cities in Europe, as shown by extensive surveys.³⁹ Each urban area has to shape the form and character that fits their context, there is not one perfect neighbourhood design for all. But there are clear elements that make them efficient as well as liveable.

It is often asserted that European cities are largely already built – which raises the question of how much potential there is to reshape Europe's built environment. This may be true when comparing them to cities in Africa and South Asia experiencing hypergrowth, but it underestimates the extent to which European cities are constantly reshaping themselves. There is an accelerating trend in migration into Europe; within Europe, mainly from South to North; and within countries, from rural regions to large cities and their suburban areas. Both population growth and shrinkage dynamics can be leveraged to reshape for efficiency.

In the absence of comprehensive European modelling, this White Paper makes a first attempt at quantifying the improvement potential in terms of greenhouse gas emission, looking at new-building over the course of one year. This alone shows **the massive benefit and urgency of including space efficiency in any climate strategy.**

Emissions from the construction of buildings and roads, as well as from operational energy use, could be reduced by 45% if all new housing demand was met in the form of efficient neighbourhoods with multi-unit houses and the need for new streets was consequently reduced (in comparison to following current trends) – see Figure 11. To contextualise this number, this is equivalent to eliminating 1% of EU's total annual emissions, or all of France's annual manufacturing and construction emissions.⁴⁰ This also

means a boost in resilience to volatile energy and material prices. (Detailed Europe-level modelling must apply such estimations across new-building and existing stocks, to determine the potential to 2030 – see Box 2).



Photo: Simdaperce

³⁹ European Commission, Directorate General for Regional and Urban Policy., Report on the Quality of Life in European Cities, 2020.

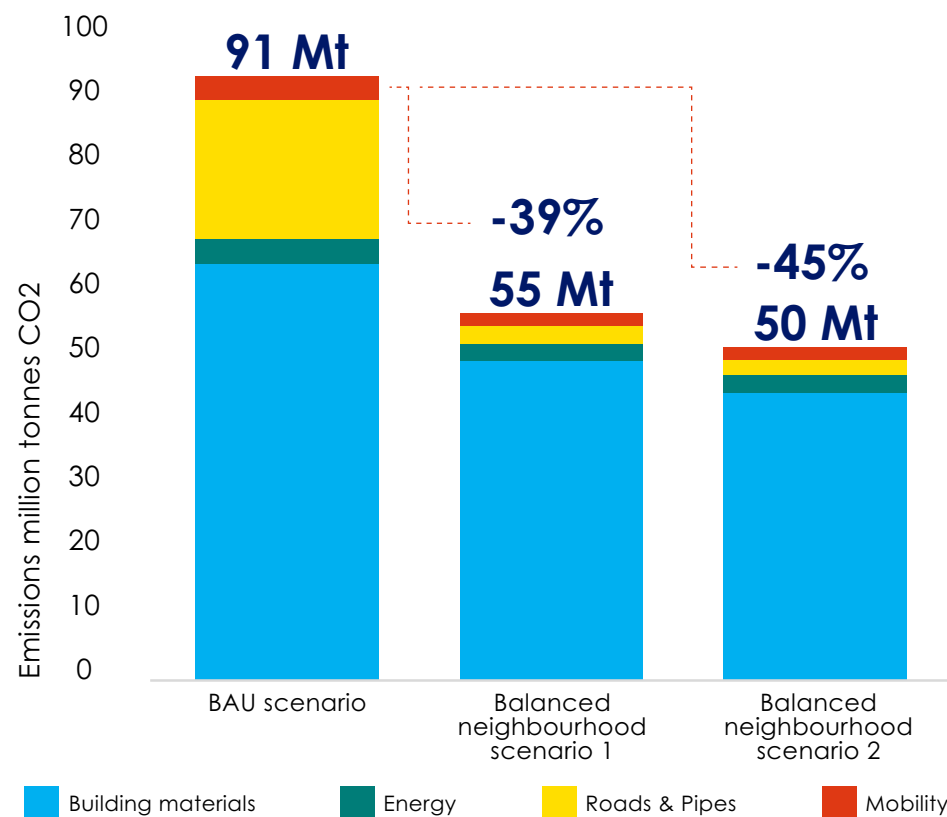
⁴⁰ H. Ritchie and M. Roser, "Our World in Data - CO₂ and Greenhouse Gas Emissions."

Figure 11: Estimation of GHG savings potential from efficient spatial design in EU residential developments



BAU Scenario: 50% of new developments are single-unit houses in expanding low-density settlements (requiring new roads and utilities). 50% are multi-unit houses. 25% of newbuilds are infill.

Emissions saving potential of space efficiency in new-building during one year, compared to BAU



Balanced neighbourhood scenario 1 – better new building: All new developments are spacious multi-unit houses and 75% infill (no new roads or utilities required).

Balanced neighbourhood scenario 2 better new building + better use of existing buildings: Scenario 1 assumptions + better use of un(der)-occupied buildings, avoiding 10% of newbuild.

Sources: SYSTEMIQ analysis

based on: Eurostat, 'Eurostat - European Statistics'; European Mortgage Foundation et al., 'HYPOSTAT 2021, 2021'; International Resource Panel, 'Resource Efficiency and Climate Change: Material Efficiency Strategies for a Low-Carbon Future', 2020; Dijkstra, Poelman, and Ackermans, 'ROAD TRANSPORT PERFORMANCE IN EUROPE', 2019; Gabarrell and et al., 'Life Cycle Management Applied to Urban Fabric Planning | SpringerLink', 2015; G. P. Hammond and C. I. Jones, 'Embodied Energy and Carbon in Construction Materials', Proceedings of the Institution of Civil Engineers - Energy 161, no. 2 (May 2008); European Environment Agency, 'Greenhouse Gas Emission Intensity of Electricity Generation', Data Visualization, 2022; C40 Knowledge Hub - Greenhouse gas emissions interactive dashboard (2022)

In addition to GHG emissions mitigation, the benefit for adaptation is significant – and indispensable. Europe's cities increasingly suffer from extreme summer temperatures. These could be reduced by between 2.5°C and 6°C in urban areas, by making space for urban nature through efficient space use, and locating such green space in a balanced way across denser centres.⁴¹ This is vital in our new reality, where Europe's extremes of summer heat already reach 49°C (2021 in Sicily⁴²), trend rising.

Taking the lens of investors for a moment, the market potential for providing more balanced spaces is likely to increase. Most millennials – the renters and buyers of tomorrow – show signs of prioritising public transport and active transport connections when choosing where to live.⁴³ Car dependency is a major worry for them, as are heating and maintenance costs brought on by increasingly volatile energy and material prices. Already, 8.2% of Europeans are struggling with energy and fuel costs.⁴⁴ A reduced need for parking spaces also means more space for residential or commercial space with higher rent returns than streets or parking space. In addition, neighbourhoods that support community interactions should have a growing appeal to both younger and older Europeans - if designed well. Around 25% of Europeans currently suffer from extreme loneliness,⁴⁵ with massive health impacts. Many European housing cooperatives are reporting long waiting lists, beyond their current capacity to extend supply.⁴⁶ Freeing land through efficient designs of connected hubs frees up land for nature-based solutions, such as tree canopies for shade in extreme summer temperatures, stormwater management and of course social health – which will soon be indispensable to maintain property value.

41 IPCC, "Sixth Assessment Report - Climate Change 2021: The Physical Science Basis."

42 Le Page, Michael, "Sicily Hits 48.8°C, the Highest Temperature Ever Recorded in Europe."

43 The Rockefeller Foundation, "Access to Public Transportation a Top Criterion for Millennials When Deciding Where to Live, New Survey Shows."

44 Lloyd, "Turning up the Heat on Europe's Fuel Poverty Crisis."

45 European Commission, Joint Research Centre, and Cassio, L., d'Hombres, B., Tintori, G., et al., "Loneliness in the EU: Insights from Surveys and Online Media Data."

46 Gerads, "Für Wen Sich Eine Genossenschaftswohnung Lohnt - Wirtschaft - SZ.De."

For public infrastructure budgets, the opportunity is even more immediate. A Finnish study shows that up to 75% of costs can be saved in roads and other infrastructure when settlements are built in a compact, connected manner instead of a sprawled settlement dominated by detached houses⁴⁷.

Transitions to create such connected, vibrant neighbourhoods could also considerably ease Europe's housing crises (see chapter 5). The Centre for London found that by densifying its suburbs only gently, 20,000 new homes could be created while still leaving plenty of green space.⁴⁸

To be clear, providing socially just cities will take an array of regulatory and private sector measures that are out of scope for this White Paper. Efficient, balanced built-environment space is not a silver bullet for fairness, as can be seen in many dense neighbourhoods that are very expensive and non-inclusive. However, in a context of absolute limits to land-take and material consumption, a fair basis for providing high-quality living space and easy access to essential services (such as education, health services) to all citizens is clearly only possible when land in cities and space within buildings is not being wasted, or else retained for the exclusive benefit of a privileged group.

Figure 12 summarises the benefit potential for different stakeholders

Balanced, efficient cities can be highly liveable, structurally sustainable and contribute to citizens' sense of satisfaction and purpose – and there is much dormant demand.

47 Kurvinen and Saari, "Urban Housing Density and Infrastructure Costs."

48 Rogers, "Gentle Densification of Suburbs Could Help Meet London's Housing Needs."

Figure 12: Qualitative summary of benefits from efficient, balanced space use for different actors

Citizens	Public authorities – city, national, EU	Developers/ real estate investors	Industry and businesses investors
<ul style="list-style-type: none"> • Convenience and vibrancy through better access to more diverse services, greater walkability/ cyclability, access to public transport • Health and climate- more space for green within neighbourhoods, shorter total distance to out-of-city nature; more space for nature-based solutions reduce heat island effects • Cost and time savings thanks to shorter commutes, lower energy cost, material – and house maintenance cost 	<ul style="list-style-type: none"> • Citizen satisfaction: higher quality of life and benefits for tackling housing crises • Reputation of vibrancy and attractiveness • More likely reaching of local and national climate goals, resource-resilience and biodiversity goals • Public cost savings: mainly from infrastructure but also public health costs • Increased local productivity and tax income: balanced efficiency correlates with higher business activity and less time wasted in commute 	<ul style="list-style-type: none"> • Higher investment returns through further improvements in balanced efficiency in cities show • Increasing efficiency in towns and sub-urbs, if designed well, will increase attractiveness for next generation of home owners and renters given rising desires of community and lowering car dependency • Participation in integrated neighbourhood plans with public orchestration de-risks investments and facilitates stable long-term returns 	<ul style="list-style-type: none"> • Increased innovation potential of a city with denser businesses activity and social idea exchange • Increased productivity with a high-skilled work force attracted by a vibrant location

Box 2: Reflection on the state of research and possible way forward to improve the knowledge base, building on this White Paper

Research by the European Environment Agency⁴⁹ and DG Regio⁵⁰, and urban literature by the University of Utrecht’s Urban Futures Studio⁵¹ among others, offers great insights into the in-principle benefits of sufficiently dense neighbourhood designs for resource efficiency in European cities.

But it’s still necessary to model just how large the emissions and material reduction benefits could be over the next 10-30 years, and thus what precise role transitions of urban space use must play in Europe’s energy efficiency, resource decoupling, land protection and resilience pathways.

This paper’s calculation is a first step towards quantifying the potential that should be extended.

49 “Enabling Resource-Efficient Cities.”

50 Dijkstra, Poelman, and Ackermans, “ROAD TRANSPORT PERFORMANCE IN EUROPE.”

51 Hajer et al., *Neighbourhoods for the Future*.

4. WE NEED A BETTER UNDERSTANDING OF EUROPE'S PATTERNS OF BUILT ENVIRONMENT SPACE USE

In order to realise these benefits, action plans must be strategic in tackling the most urgent challenges, nuanced in finding the right fit to the local context, and efficient by learning from other cities and replicating proven approaches. European cities are highly diverse; nevertheless, no trend is exclusive to a particular city or region.

In this chapter we describe 15 profiles of urban challenges to help policymakers identify best practices that might fit their context.

Regional challenges, and challenges by city size, have been well researched by the European Environment Agency and European Commission reports, at least for the macro dimension of how building patterns use land:

- Built environment land use, in almost all European suburbs, is less efficient than in cities, but more efficient than in rural areas. There are slow improvements – but also particularly inefficient land use – in the suburbs of medium-sized and smaller towns.
- Larger cities are generally growing and becoming more efficient, with the exception of some cities, mostly in Eastern Europe, which are undergoing rapid sprawl (here defined as expansion while decreasing efficiency, i.e. increasing land-use per person).

- Most medium and larger cities in Northern Europe are improving, but often from very inefficient levels.⁵²
- In terms of space-use balance: Southern European cities are the most land-efficient, but mostly lack a good balance of green space.
- Public transport access is decent in most larger cities across Europe, but only few have high-frequency public transport serving most citizens (as in Barcelona or Vienna). Lower-density areas and towns in Southern and Eastern Europe lack access to frequent services.
- In terms of balance, green space is particularly lacking in Southern European cities, both large and small, and more generally in lower-income neighbourhoods, but also in many dense city centres.

On the micro level, data is more scarce, but still informative:

- Un-occupation (empty housing) is a particular issue in Southern Europe, but exists in all countries.
- Under-occupation (unused rooms) is particularly prevalent in Spain, Netherlands and Ireland, but affects every country.⁵³

Figure 13 summarises Europe's space-use patterns per region and city size. Note that this is a simplified synthesis of different European studies and databases – more detail can be found in Analysis Deep Dive C.

⁵² European Environment Agency et al., Land Take and Land Degradation in Functional Urban Areas.

⁵³ Eurostat, "Archive."

Figure 13: Overview of Space-Use challenges per urban Area size and Region

Colour legend | **Building-use inefficiency**
Land-use inefficiency



Cities with growing populations

[See urban area profiles 1-10]



Cities with shrinking (future) populations

[See urban area profiles 11-14]

	Inefficient Growth (Macro & Micro)		Inefficient Shrinking (Macro & Micro)	
	Large urban areas	Small-to-Medium urban areas	Larger, compact urban areas (future shrinking)	Medium and smaller urban areas
Key challenges	High land consumption in suburbs across Europe , little improvement		Many compact, popular Southern European cities at risk of shrinking- insufficient climate adaptation likely to increase vacancies (e.g. Barcelona, Madrid, Naples)	Cities emptying across Europe, (e.g. Porto, Riga)
	Negative trends in land-take mainly in Eastern Europe (e.g. Warsaw, Prague)	Negative trends in land-take in small/medium urban areas across Europe (e.g. Aarhus, Toledo, Brno)		Some cities emptying in centre, and expanding into suburbs. Across Europe, concentrated in Eastern Europe (e.g. Kaunas, Ostrava)
	Vacancies mainly in Southern Europe , across growing and shrinking cities. More city-level data needed.			
	Un-used rooms mainly in Spain, Netherlands and Ireland – but existent across Europe. More city-level data needed			
Relevant urban profiles	Public transport: Lacking in most smaller low-density areas, more generally in Southern and Eastern Europe			
	1. Persistent urban dispersion 2. Extensive urban-rural expansion 3. Moderate regional scattering	6. Persistent town sprawl 7. Pressured town expansion 8. Worsening moderate town sprawl 9. Improving moderate town sprawl	12. Compact (future) emptying (often link to climate)	13. Moderately compact emptying 14. Emptying center sprawl
	Imbalances			
Key challenges	Lack of green space particularly in hyper-dense centres or low-income suburbs, especially in Southern Europe (e.g. Paris, Athens)			
	Under-sized/unattractive flats in older-design hyper-dense hubs, particularly in Eastern Europe			
Relevant urban profiles	4. Pressured (hyper) compact expansion 10. Low pressure and compact expansion			

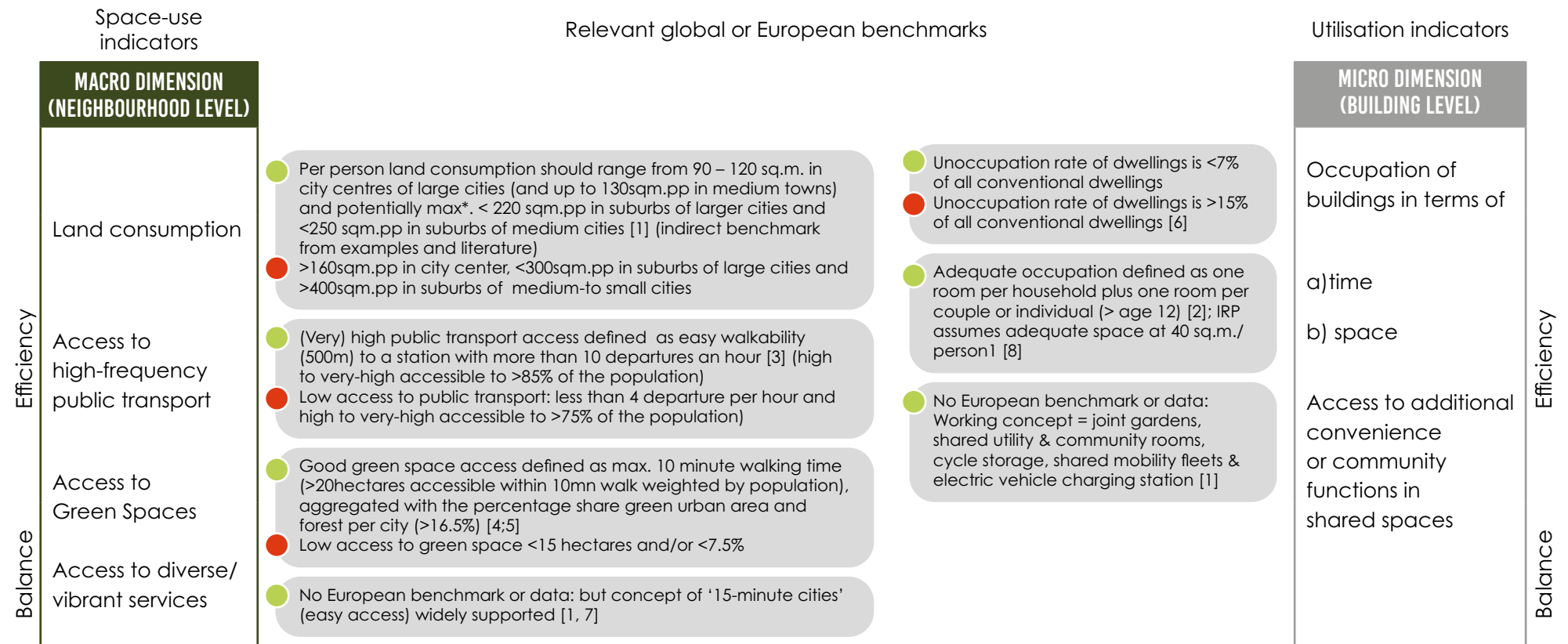
Source: SYSTEMIQ analysis

I. A NEW FRAMEWORK OF 15 URBAN PROFILES OFFERS A NUANCED YET PRAGMATIC UNDERSTANDING OF PRIORITY SPACE-USE CHALLENGES TO TACKLE

A regional understanding of challenges is useful but not sufficient to develop strategies that tackle different cities' specific challenges. Therefore, the White Paper offers a novel analysis of 15 urban profiles that share a similar combination of challenges.

In order to show the challenges and trends in space-use, this paper has developed an initial benchmark for good space-use performance, based on previous evaluations by the European Commission, Eurostat, the European Environment Agency, literature and high-performing European city examples. It will need a discussion with scientists and practitioners on European level to consolidate the most appropriate benchmarks for different city sizes and types.

Figure 14: Overview over the benchmarks used in the analysis of the 15 Urban Profiles



Source: SYSTEMIQ synthesis, based on [1] SYSTEMIQ analysis of high-performing European cases – see details in following [2] Eurostat, 'Glossary: Under-Occupied Dwellings', 2021, [3] Hugo Poelman and Lewis Dijkstra, 'Measuring Access to Public Transport in European Cities', European Commission WP 01/2015, no. Regional Working Paper 2015 (2015)[4] Hugo Poelman, 'A Walk to the Park? Assessing Access to Green Areas in Europe's Cities', European Commission, no. WP 01/2018 (2018)[5] European Environment Agency, 'Who Benefits from Nature in Cities? Social Inequalities in Access to Urban Green and Blue Spaces across Europe — European Environment Agency', Briefing, 2022, ; [6] Eurostat, 'Share of People Living in Under-Occupied Dwellings'[7] European Commission and Joint Research Centre, 'The Future of Cities', European Commission, 2019 [8] International Resource Panel, 'Resource Efficiency and Climate Change: Material Efficiency Strategies for a Low-Carbon Future, 2018

Figure 15: Each Urban Area has to Tackle its Specific combination of challenges – 15 Profiles

Disclaimer: Profiles provide a starting point for location-specific analysis and development of solutions; working benchmarks are directional to be refined through European debate; Profile-names are for structuring of discussion only – they are not comprehensively defining categories.

Colour legend:

Status inefficient - Distant from benchmark
Status medium – insufficient against benchmark
Status or trend medium- to- good (close to benchmark)
Within benchmark

Population	Utilisation Profiles ^[1]	Macro utilisation indicators					Micro utilisation indicators				
		Efficiency		Balancing			Efficiency		Balancing		
		Land consumption per person ^[1]	Land take trend ^[1]	Access to transport ^[3]	Access to green spaces ^[4]	Access to services + vibrancy	Occupation (vacancy) level today ^[5]	Occupation trend + manifestation	Multi-function		
POPULATION GROWING	Large urban areas	1. Persistent urban dispersion e.g. Prague, Warsaw, Budapest, Krakow, Dublin	High land-take in center and suburb	Stable to worsening land-take per person; High level of absolute land take	Medium-to Good	Varied performance (location specific)	Data on service-access or vibrancy are not yet available on a per-city or per-neighbourhood level	Medium-to-Good	Data on building occupation over time and on city-level are not yet accessible on a comprehensive level for Europe	Data on building quality and function are not yet accessible on a comprehensive level for Europe	
		2. Extensive urban-rural expansion e.g. Munich, Hamburg, Helsinki, Stockholm, Copenhagen, Berlin	High land-take especially in suburb + rural/urban fragmentation	Improving land-take per person; High level of absolute land take	Medium-to Good	Varied performance (location specific)		Medium-to-Good			
		3. Regional scattering e.g. Amsterdam area (Rotterdam...);	Medium land-take in city center & suburbs Fragmentation in region	Fast improving land-take per person; High level of absolute land take	Medium	Alert		Medium-to-Good			
		4. Pressured (hyper) compact expansion e.g. Paris, Athens, Milan	Efficient Alert: hyper dense center	Stable to improving per person; High level of absolute land take	Medium-to Good	Alert		Varied performance (location specific)			
		5. Fairly compact urban expansion e.g. Vienna	Efficient land-take overall, medium in suburb	Stable-to-improving per person; Low-to-medium level of absolute land take	Good	Balanced		Medium			
POPULATION GROWING	Medium urban areas	6. Persistent town sprawl e.g. Toledo, Arhus, Brugge, Brno, Le Havre, Galway, Aalborg, Helsingborg, Cherbourg	High land take per person both in center and suburbs	Worsening per person; High level of absolute land take	Alert	Alert	Data on service-access or vibrancy are not yet available on a per-city or per-neighbourhood level		Data on building occupation over time and on city-level are not yet accessible on a comprehensive level for Europe	Data on building quality and function are not yet accessible on a comprehensive level for Europe	
		7. Pressured town expansion e.g. Bordeaux, Leipzig, Cambridge, Montpellier, Gothenburg, Trento	High land take per person in the suburb Medium land take in the city center	Improving per person; High level of absolute land take in the suburb	Alert	Varied performance (location specific)		Varied performance within group – needs analysis on per-city level			
		8. Worsening moderate town expansion e.g. Nice, Cluj-Napoca	Land-take medium in the suburb	Slightly worsening per person Medium level of absolute land take	Alert	Medium-to-Good					
		9. Improving moderate town expansion e.g. Ljubljana, Linz, Graz, Middelburg, Colmar	Land-take medium in the suburb	Slightly Improving per person	Medium	Medium					
		10. Low pressure and compact expansion e.g. Maastricht, Florence, Bilbao, Turin, Southampton, Aachen	Efficient	Improving per person; Low level of absolute land take	Medium-to-Good	Alert [excl. Bilbao, Aachen with good green space]					
	Rural	11. [Rural Expansion]*	[Alert high land-take per person & high fragmentation]	[Slightly worsening per person]	[Very limited if existent]	[Private green space]	[Very Limited]	Varied			
POPULATION SHRINKING	NOT-YET-SHRINKING	Large	12. Compact (future) emptying (often link to climate) e.g. Barcelona, Madrid, Naples	Efficient	Stable-to-improving per person; Medium level of absolute land take	Good	Varied performance (location specific)	Data on service-access or vibrancy are not yet available on a per-city or per-neighbourhood level	Medium	Data on building occupation over time and on city-level are not yet accessible on a comprehensive level for Europe	Data on building quality and function are not yet accessible on a comprehensive level for Europe
			13. Moderately compact emptying e.g. Porto, Bacau, Braga, Calarasi, Valladolid	Medium land consumption	Worsening per person because population migration; Medium level of absolute land take	Alert	Varied performance (location specific)		Inefficient		
	Large – Medium	14. Emptying centre sprawl e.g. Vilnius, Riga, Ostrava, Kaunas, Debrecen, Blackpool, Lens, Lublin, Bourges, Banská Bystrica, Szeged, Pila, Olsztyn, Altena	High land-take per person	Worsening per person because of suburbanization + migration; High level of absolute land take	Alert	Medium-to-Good		Varied performance and lack of data (location specific)			
		Rural	15. [Rural emptying]	[Alert high land-take per person]	[Worsening per person]	[Very limited if existent]	[Highly unequal]	[Very limited]	[Alert : low occupation]		

Sources: SYSTEMIQ analysis based on [1] EEA (2022) "Land take and land degradation in functional urban areas"; [3] European Commission (2020) "How many people can you reach by public transport, bicycle or on foot in European cities? Measuring urban accessibility for low-carbon modes"; [4] European Commission (2018) "A walk to the park? Assessing access to green areas in Europe's cities"; [5] Eurostat (2011), interpreted from regional averages, see details in Technical Annex

Please note that, naturally, not all cities in one group share all characteristics to the same extent. Also, profile names are working terms for easy reference in the discussion only, not aiming to determine a city's full character.

The analysis of the 15 profiles shows:

- Only two profiles are doing well overall for macro-efficiency, including cities like Vienna (profile 5 "Fairly compact urban expansion") and Barcelona, Madrid and Naples (profile 12 "Low pressure and compact expansion").
- On the micro-utilisation level, empty properties are a challenge in many of these cities, often due to empty second homes or tourism apartments. For the (mostly Southern European) cities in profile 12, however, the shortage of green space is bound to become a fast-increasing problem with rising temperatures.
- Some profiles (e.g. profile 4 "Pressured (hyper) compact expansion", including cities like Paris, Athens and Milan, and profile 10 "Low pressure and compact expansion" including cities like Maastricht, Florence, Bilbao, Aachen and Turin) are land-efficient but do not offer good enough transport links overall; nor do they have enough green space.
- The remaining profiles have to improve on most fronts, with particular urgency in those profiles where land-efficiency is poor and quickly getting worse, combined with lack of high-quality public transport links (Profile 1 "Persistent (large) urban dispersion", including cities like Prague, Warsaw, Budapest or Dublin, profile 6 "Persistent town sprawl" including Toledo, Aarhus, Bruges, Galway or Helsingborg, and profile 14 "Emptying centre sprawl" including Vilnius, Rīga, Ostrava, Kaunas, Debrecen, Blackpool, Lens).

In cities which use land efficiently (that is, with higher density), there is often a shortage of green space. However, this is not necessarily a causal relationship. Some of the most space-efficient cities also offer good or great access to green space – take Vienna, Bilbao or Aachen – showing that it is possible to combine efficiency with balance, with the right, purposeful design.

We fully recognise that different city types might need different benchmarks, given that, for some, their historical set-up will not allow them to reach the land-use efficiency of a Barcelona or Vienna (for large cities) or a Maastricht or Bilbao (for medium-sized ones). A monitoring framework used in regular evaluation should consider this. However, the directional benchmarks used here indicate the priority challenges for the development of targeted strategies.

Each challenge also means a great opportunity for improvement, with previously overlooked potential to boost climate mitigation and adaptation, as well as the productivity of an urban area.

For example, many large cities are growing more land-efficient, but this often comes at the cost of hyper-densities and imbalance in the centre. If efficiency and balance were to be applied across the urban area, including potential regional 'commuter' towns, this hyper-pressure on the centre could be eased and more neighbourhoods of the area could become hubs of exchange and productivity. Many small-to-medium-size cities and towns currently use land rather inefficiently; however, their size makes active transport highly viable, and it would still be relatively easy to make areas available for green spaces. Hence, with a gentle densification and diversification in space for services and public/shared transport, there could be a massive opportunity to achieve a brilliantly efficient balance and a high quality of life⁵⁴ – inspiring examples exist in large parts of Freiburg and Leipzig.

54 Breach, Anthony, "Sleepy Suburbs: The Role of the Suburbs in Solving the Housing Crisis."

Box 3: Reflection on the state of research and possible way forward to improve the knowledge base, building on this White Paper

Land-use efficiency and sprawl: urban land use is well researched by the European Environment Agency, as well as the OECD and other institutions. However, the methodologies of different EEA reports and OECD analyses were difficult to compare, partly offering different conclusions in terms of efficiency trends. Europe would benefit from a consolidation of how to measure urban sprawl and its impacts into a clear monitoring framework for European and city actors to use jointly.

Efficiency in the use of buildings: Recent data are not available, and only on national or regional level – indicating that this dimension needs more regular and more granular monitoring.

Balance: The European Commission cohesion reports provide great first insights. Access to green space and public transport is regularly assessed, access to services and vibrancy less so. There is no data on the micro-level, e.g. how many people have access to shared amenities, such as gardens or community rooms.

Currently, all aspects of urban space use are monitored in different formats, and we strongly recommend the establishment of an integrated system for monitoring efficient, balanced space use.

This paper offers a first framework to build on, refining adequate benchmarks, potentially adding categories like active transport, and connect to better data monitoring, especially in terms of fair service access.

Monitoring of space use should be directly combined with a monitoring of resource use and emissions at city level, or even neighbourhood level, as well as citizen satisfaction. This will help refine benchmarks for good space use in different contexts over time.

Also note that industrial and commercial sites have caused as much additional land consumption since 2012 as residential and public built environment. Causes and solutions will be different to residential space use, which will warrant a separate analysis out of scope for this White Paper.

II. SEVERAL SOCIO-ECONOMIC DRIVERS CAUSE INEFFICIENCIES TODAY

It is not enough simply to map the challenges of a city's physical geography. To develop effective strategies, it is equally important to understand the socio-economic drivers that still cause inefficiencies and imbalances in many parts of Europe, despite the great examples of high quality of life in well-designed, efficient neighbourhoods.

It will take a dedicated study to analyse the nuanced differences in drivers per city profile, but literature and cases show that the general categories of drivers are cross-cutting:

- **Culture and norms:** Not enough people understand the possibilities of balanced space efficiency. Societal norms still shape a widespread preference for low-density, single-family housing with private gardens. In large part, this can be traced back to a public narrative promoting the alleged benefits of this model in the 1960s and 70s. This is often combined with perceptions – sometimes outdated, sometimes fact-based – of city centres as less clean or safe. With limited exposure to good examples, most people are less aware of the benefits of more efficient yet balanced living: too often, space efficiency is wrongly equated with hyper-density and noise. Attractive housing alternatives are still scarce in most regions: too many buyers and renters find themselves limited to a choice between a flat with good connections, but which is too small or too noisy, or an inefficient single-family house on the outskirts.
- **Economic conditions:** public and private financial incentives often favour low-density living, despite the lower material and energy cost of more space-efficient living and, ultimately, a lower cost to society. This can be due to often uncontrolled market pressure in inner cities, making reasonably spacious living there unaffordable, or due to public subsidies for low-density living. This is often combined with a limited awareness of the commuting cost of suburban – or rural – living and the operational and maintenance costs of detached homes.

- **Policies:** Influenced by certain norms of what constitutes 'good living standards', many urban areas have policies which not only fail to support space efficiency, but stand in outright contradiction to it. Zoning regulations, limits on building height or on multi-functionality, road-focused infrastructure investment priorities, and counterproductive subsidies too often prevent the (re)shaping of efficient, connected hubs; outdated safety regulations and bureaucratic processes hinder repurposing and renovation. Most of these policies, and underlying norms, have been shaped in good faith – with the aim of improve societal wellbeing – and should be recognised as well-intentioned. However, insights into what shapes good quality of life, health and resource-sustainability have developed – and so must policies.
- **Fragmented ownership with siloed objectives:** Even where cities are keen to improve efficiency, fragmented private ownership often limits the options for re-shaping, whether at macro level through infilling, or on the micro level through serial building renovation. Imbalances, such as a lack of green space or of diverse space for vibrancy, are also often a result of fragmentation. Dispersed private capital holders are frequently unable to invest in the integrated value of a neighbourhood which would increase with balance – or are unaware of the case for doing so. Fragmented land ownership makes it harder to apply integrated neighbourhood plans across residential, commercial and infrastructure investors.

- **Hyper-concentration of housing demand:** Between now and 2050, current migration patterns into and within Europe will cause about half of Europe's cities to shrink and the other half to grow (Analysis Deep Dive C). Population growth is often beneficial for efficiency, for example when used strategically to infill hubs for better connectedness and functional diversity. But if inflow or outflow of residents is too concentrated, it can overwhelm cities and prevent them from upsizing or downsizing in a balanced way. Also, too high a concentration of economic and cultural vibrancy can damage regions – and Europe. It may therefore be beneficial for cities and communities to cooperate as a region. Rather than concentrating investment in a few large cities, this can allow them to (re-)develop attractive places to live and work in hubs of different size and character across the region – especially where existing low-carbon infrastructure, such as railways, could be better used.

Box 4: Reflection on the state of research and possible way forward to improve the knowledge base, building on this White Paper

There is extensive research on the drivers of urban sprawl, and some on the drivers of empty housing, for example by the European Environment Agency.⁵⁵ However, it remains unclear which factors have what level of effect across Europe: for example, how many adverse zoning policies or subsidies are still in operation.

Structured monitoring of adverse policies would be of great use, as well as a mapping of where cities managed to turn around adverse policies and investment strategies, and with what effect.

This paper provides a synthesis of key factors to monitor.

⁵⁵ "Enabling Resource-Efficient Cities"

5. SOLUTIONS MUST TACKLE THE PHYSICAL CHALLENGES AND SOCIO-ECONOMIC DRIVERS: 10 PHYSICAL TRANSITIONS AND 5 MULTI-STAKEHOLDER APPROACHES

Successfully transforming Europe's urban areas, and the experience of living there, will require physical transitions to improve the physical challenges in space use. However, it will also take joint policy, private and community approaches to overcome the socio-economic barriers still hindering efficiency and balances in many parts of Europe.

I. 10 PHYSICAL TRANSITIONS CAN IMPROVE EFFICIENCY AND BALANCE IN SPACE USE TOWARDS VIBRANT NEIGHBOURHOODS

Based on a synthesis of literature, case studies and expert interviews, this paper suggests the following 10 physical transitions to improve efficient, balanced space use for vibrant neighbourhoods - see list and illustrative examples in Figure 16. These are technologically proven, safe and can be applied today.

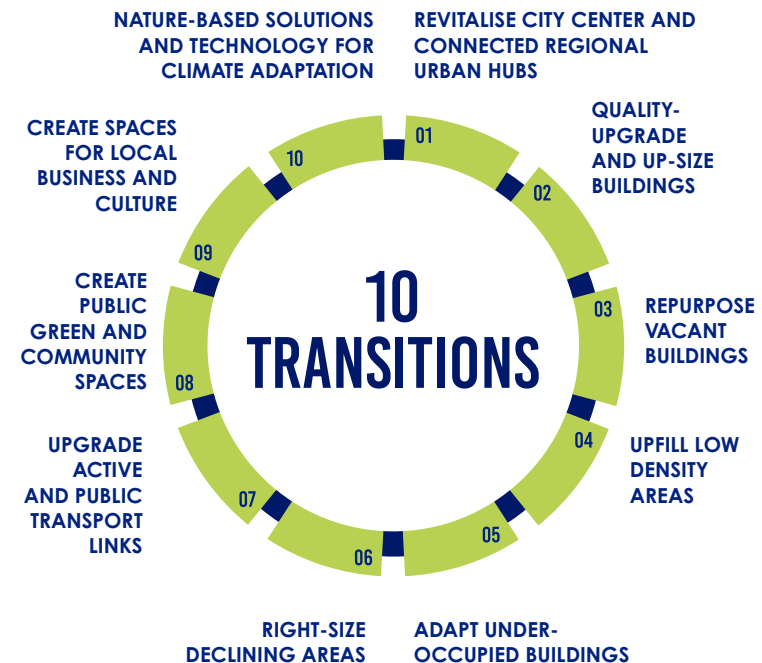


Figure 16: 10 Physical transitions to better space utilisation - with illustrative examples



Lisbon (PT)

- As part of Lisbon Strategy for Adaptation to Climate Change, Lisbon committed through nature-based solutions and funding to tackle drought and seasonal floods by improving drainage, supporting urban agriculture, renaturing (green corridors and Life Lungs tree planting programme)



Bilbao (ES)

- City industrial decline led to an integrated package of economic and cultural measures to revive the city.
- This included the development of a recycling center to stimulate sustainability employment as well as the construction of the Guggenheim to increase tourism and tax income.



Norway Zero-Growth goal (NO)

- Target of zero-growth for cars set in 2018 should be achieved by promoting public transport, cycling and walking in cities, This has led to: 1) reallocation of street/parking space into bike lanes/parking, public and community spaces; 2) large investments in multimodal transports; 3) restrictive car and parking policy



Brownfield deconstruction and renaturing: Leipzig and Lene-Voigt Park (DE)

- Decline and de-industrialisation led to a massive right-size and demolition programmes of vacant houses and unused brownfields during the 1990s. The main purpose was to improve vibrancy, attractiveness, and reduce the feeling of decay
- One of the key transformation in the city center was the re-naturing into a multifunctional park of an old railway site



Revitalization: Ljubljana city center (SI)

- "Ljubljana 2025" Vision provided a detailed plan to revitalise the city through densification and renovation to make the city more liveable, sustainable, and more economically attractive.
- Measures in place: sustainable mobility, construction on already urbanized land and along public transport lines, densification and revitalization of sprawled suburbs, and protection and expansion of green areas.
- Ljubljana won the European Green Capital Award in 2016

NATURE-BASED SOLUTIONS AND TECHNOLOGY FOR CLIMATE ADAPTATION **REVITALISE CITY CENTER AND CONNECTED REGIONAL URBAN HUBS**



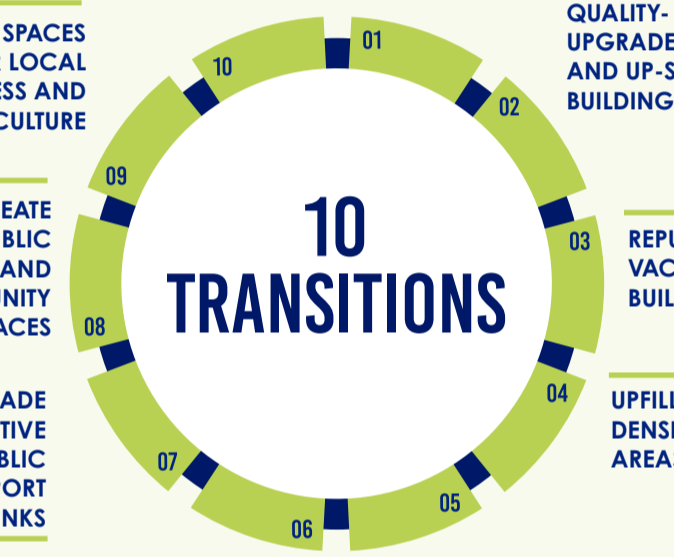
Quality upgrade: Bordeaux (FR)

- Three blocks of a 1960s slab estate in Bordeaux upgraded for attractiveness – including up-sizing of some apartments – and energy efficiency, by Lacaton & Vassal
- with the addition of an outer skin of winter gardens
- At lower cost than new-building, while maintaining unique views



Factory in housing: Home Silk Road, Lyon (FR)

- Renovate emblematic buildings to provide diverse housing solutions for vulnerable groups.
- In addition of repurposing unused built area, the site will be a catalyst for a set of social and economic integration and circular economy activities.

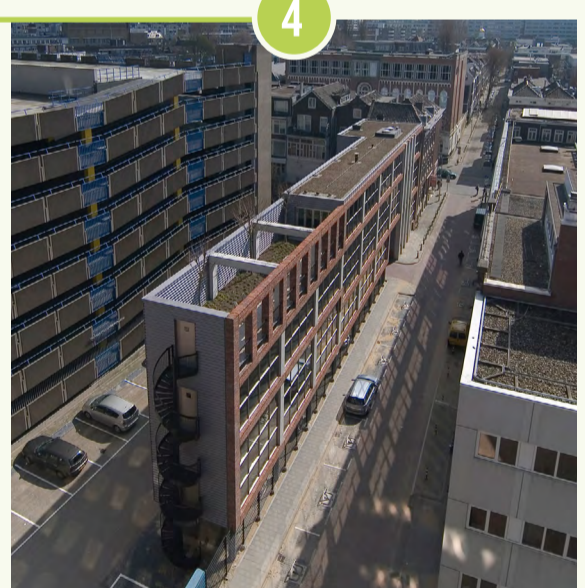


RIGHT-SIZE DECLINING AREAS **ADAPT UNDER-OCCUPIED BUILDINGS**



Modularity and easy-switch: Cooperative housing River Spreefeld, Berlin (DE)

- Building made of a mix of various size individual apartments, co-living spaces, and large communal spaces.
- Apartment size is adjusted to the household size to prevent under-occupation and joint cooperative ownership ensures long-term affordable rents and diversity



Infill: Rotterdam (NL)

- Rotterdam strategically identifies neighbourhood gaps for infill
- It used creative architecture to infill the city with eclectic buildings

- Photo credits:
- 1 Eugene Kuznetsov on Unsplash
 - 2 architectsjournal.co.uk
 - 3 City of Lyon; Home Silk Road Project Report 2020
 - 4 Guiding Architects, Edwin Prins
 - 5 Ute Zscharnt, published in archdaily
 - 6 8 Annegret Haase and Stefan Heiland
 - 7 Photo de Boris K on pexels.com
 - 9 Jorge Fernández Salas on Unsplash
 - 10 Wikimedia Commons, David Holt

While the differentiation between the macro dimension (neighbourhood level) and micro dimension (building level) is useful for the analysis of Europe's patterns, and will be necessary to monitor improvements in the future, solutions must be integrated across both for maximum effect. For example, balanced infilling of a low-density area with multi-functional, mixed-rise buildings (transition 4) will improve the macro/neighbourhood dimension by shortening distances to services, but will also improve the micro/building dimension by reducing under-occupation – see, for example, Rotterdam's strategic infill of declining central areas (Case Studies in Deep Dive D). To give another example, repurposing and

renovating a decaying industrial building for affordable, efficient residential space (transition 3) will primarily improve the micro dimension by reducing un-occupied space, but will also make the whole neighbourhood more attractive and help counteract a trend to the suburbs – see Lyon, Ljubljana (Figure 16), Utrecht or Grenoble (Deep Dive D) as examples.

The 10 transitions have no hierarchy, but they do enable each other and are best applied in combinations of several transitions. The most relevant combination depends on the respective city profile – see Figure 17.

Figure 17: Prioritisation of physical transitions per city profile

*All transitions are relevant to some extent for any area, but certain transitions will be particularly pivotal for certain profiles

		Efficiency							Balance			
		1. Revitalise		2. Quality-upgrade and up-size buildings	3. Repurpose vacant buildings (in city centre and hubs)	4. Infill / Uphill low density areas towards functional hubs	5. Adapt under-occupied buildings	6. Right-size declining areas (deconstruct)	7. Upgrade active and public transport links	8. Create public green and community spaces	9. Create spaces for local business and culture	10. NbS and technology for climate adaptation
		a) city centres...	b) ...and regional hubs									
Population growing	Large	1. Persistent urban dispersion			x	x						
		2. Extensive urban-rural expansion	x	x			x					
		3. Regional scattering										
		4. Pressured (hyper) compact expansion		x	x	x					x	
		5. Fairly compact urban expansion				x	x					
	Medium	6. Persistent town sprawl		x								
		7. Pressured town expansion				x	x	x		x	x	
		8. Worsening moderate town expansion	x	x								
		9. Improving moderate town expansion		x								
		10. Low pressure and compact expansion			x	x			x	x		
		11. Growing small towns and rural areas				[x]		[x]		[x]		
Population shrinking	Large	12. Compact (future) emptying (often link to climate)		x	x					x		x
		13. Moderately compact emptying	x		x	x		x	x	x	x	
	Med	14. Emptying centre expansion	x									
		15. Small towns and rural areas										x

* Rural profiles 11 and 15 have been removed from this analysis due to the lack of data.. Out-of-scope for this project – requires further analysis. Source: SYSTEMIQ analysis

For **Profiles 1 to 3** (1 “Persistent urban dispersion”, 2 “Extensive urban-rural expansion”, 3 “Regional scattering” (all large cities)), it is most important to prevent further sprawl and even reverse some of the past sprawl.⁵⁶ To accommodate additional housing demand, the city should use all under-used buildings or brownfield sites in central areas, and in addition select some lower-density central areas or suburbs to be gently densified (infill/upfill) into more efficient, connected hubs with greater convenience and vibrancy.

Profiles 4 and 10 (4 “Large city - Pressured (hyper) compact expansion”, 10 “Medium city - Low pressure and compact expansion”) are fairly unique: they combine population increase with an already land-efficient urban form, potentially already too dense in parts. For large cities (profile 4), it can be very beneficial to co-invest in regional development, or even pan-European development, to alleviate future housing pressure. These profiles should also improve the balance in the city, to prevent any backlash against their efficient space use, by ‘re-greening’ the city and by potentially remodelling (even up-sizing) apartments in dense areas, to ensure citizens’ well-being.

Profile 5 (“Fairly compact urban expansion”) is the closest to good space utilisation: cities are growing, but relatively efficiently. The main task is to plan strategically for future housing demand, to ensure that current efficiency standards are also applied when extending settlements. It is also essential to maintain a balance to prevent hyper-density and backlash against efficient land use.

Profiles 6 to 9 (6 “Persistent town sprawl”, 7 “Pressured town expansion”, 8 “Worsening moderate town expansion”, 9 “Improving moderate town expansion”) are medium-sized urban areas which face challenges of suburban sprawl but often have considerable potential for improvement in low-density central areas. Gentle inner-city infill must be combined with renovation and repurposing for family-friendly housing (adapted size, noise

⁵⁶ To recap, urban expansion can be efficient if population is growing and expansion is built efficiently. Sprawl refers to decreasing efficiency in expansion, i.e. increasing space use per person.

insulation and affordability). It will be essential to make the hub vibrant, with easy access to services, culture and green spaces, in order to make balanced, efficient living an attractive alternative to suburban living.

Profile 12 (“Compact (future) emptying”) shows great efficiency, but there is a danger of emptying and ‘wasting’ that efficiency through lack of balance, especially in areas where temperature extremes are increasing. The main challenge will be to free up enough land throughout the city, including centres, for comprehensive nature-based solutions, as well as applying other climate adaptation technologies.

Profiles 13 and 14 (13 “Moderately compact emptying”, 14 “Emptying centre sprawl”) are urban areas shrinking in population. A revitalisation of the city centre and selected hubs will be essential to ensure the population does not shrink (too much) further, and may reverse the trend by making the city more attractive. Renovations and upsizing around the centre and the selected hubs will make buildings more appealing and will benefit families and other households, who have space to live in a vibrant hub with accessible services. Some strategically selected decaying areas will have to undergo rightsizing, i.e. purposeful deconstruction to be transformed into cultural, community or green spaces.

See examples of how these transitions were implemented in different city profiles in the Analysis Deep Dive D.

A detailed analysis of rural settlements is out of scope for this White Paper, as dynamics are different from those in urban areas. On average, space use – and related material use and emissions – is much more inefficient in rural settlements, given longer road distances and greater reliance on travel to basic services. It may be possible to (re)develop some rural areas into efficient, multi-functional hubs; for others, it is probably not beneficial for policies to encourage growth of such areas, and purposeful deconstruction might be beneficial in many emptying rural areas.

While this White Paper focuses on the beneficial spatial design of neighbourhoods, a few key principles must be mentioned that are not purely focused on, but closely related to, space-focused transitions:

- Attractive balance and efficiency in a given area will only help if people can afford to live there – so any transition plan must be combined with diverse affordability of housing.

- Any remodelling for better space use must be combined with remodelling for energy efficiency and clean energy-supply upgrades, and the other way round.
- Any remodelling, and new-building where necessary, should focus on using circular, local and nature-based materials – an example of this principle in practice is shown in Figure 18.

Figure 18: Illustrative examples for a transition to better space-use combining principles of circular materials use^{57, 58, 59}

57 "NREP - Resource Rows."

58 "Old into New: Recycled Bricks Form Facade of Copenhagen Housing Project."

59 NREP, "UPCYCLE STUDIOS & THE RESOURCE ROWS."

CASE STUDY: RESOURCE ROWS, COPENHAGEN (DK) – DEVELOPED BY THE NREP

- **Mixed mid-rise buildings in a multi-functional area:** Two rows of 3-level houses and two 5-level apartment blocks are arranged around a courtyard. A shared green rooftop terrace offers social space and recycled greenhouses for growing vegetables. Near public transport (5-10min walking time) and grocery shops, restaurants, cafes and public spaces on the harbour.
- **Reducing material use with circularity principles** addresses scarcity of building materials and reduces embodied emissions.
 - Upcycled bricks from Carlsberg Brewery used in panel modules for the facade.
 - Upcycled wood from the Copenhagen Metro for window frames, terraces and decking.
 - Interiors use off-cuts and waste wood from flooring manufacturers Dinesen.
 - Greenhouses made from recycled glass and window frames
 - A steel bridge between the two rooftops repurposes an unused roof truss.
- **Energy:** Solar panels and heat pumps
- **Cost:** per square metre, this scheme was cheaper to build than a non-upcycled equivalent.
- **Overall:** Strong focus on CO2 reduction, in the construction and operating phases. See savings in the graphic.



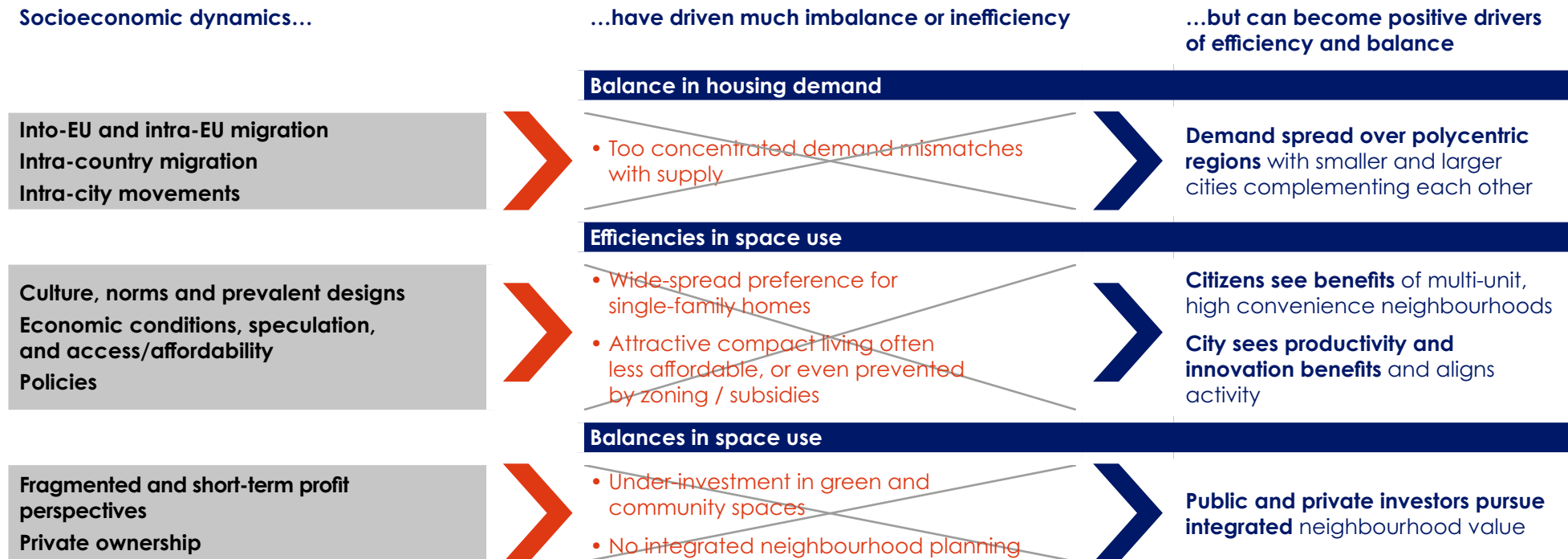
Photo: <https://stateofgreen.com/en/solutions/the-resource-rows/>

II. 5 MULTI-STAKEHOLDER APPROACHES CAN OVERCOME ADVERSE SOCIO-ECONOMIC DRIVERS, AS SHOWN BY REAL CASES

Given the great benefits of vibrant neighbourhoods and the availability of physical solutions, why are trends heading in the wrong direction? The answer is that we need to overcome the socio-economic barriers that are

still working against the purpose of vibrant, connected neighbourhoods. In order to make the transitions investable, the task for leaders is to create a stable demand from buyers and renters, the right zoning and economic policy, and the required orchestration of investment programmes to overcome the current barriers of fragmentation and short-termism – illustrated in Figure 19.

Figure 19: Adverse Socio-economic Drivers need to be turned into Positive Drivers of Efficiency and Balance



Case studies show that five approaches are central to overcoming socio-economic barriers and implementing relevant physical transitions – see Figure 20. Literature such as the LSE's and EEA's urban governance research underpins these.^{60,61,62} For details of the case studies, see Analysis Deep Dive D.

60 Bröchner et al., "Accelerated Planning for Urban Housing Infills."

61 "Coordinating Density; Working through Conviction, Suspicion and Pragmatism."

62 "Enabling Resource-Efficient Cities."

Figure 20: Five connected Multi-Stakeholder Approaches can implement the physical transitions



To overcome the adverse cultural norms and re-align economic incentives with efficiency, a **vision-building process must 'crowd in' citizens and investors. Only by focusing on a joint purpose** of enabling vibrancy and productivity can cities create the motivation to pursue transitions for efficiency and balance.

Efficiency is not a goal in itself: it must be used as a tool to develop a more connected, productive and resource-resilient city. Examples of inclusive vision-building processes that enabled transformative action can be found in the vision-setting of "Leipzig 2030", in Grenoble's vision for the De Bonne District, in Utrecht for the regeneration of Overvecht, in Győr for the

expansion of green spaces, or in Altena for its fundamental revitalisation – see one example in Figure 21, and further case studies in Analysis Deep Dive D.

Vision building also needs to happen beyond the individual neighbourhood or city, in regional or even pan-European cooperation. Especially in fast-growing and fast-shrinking cities, the problem of a serious mismatch between housing supply and demand is unlikely to be solved alone. Developing a joint regional vision, based on (re-)developing complementary, attractive, connected hubs of different sizes, can ease some of the housing crisis and increase overall productivity and prosperity.

Figure 21: Overvecht, Utrecht (NL) – making compact living more attractive through energy efficiency, mixed-use and green space

BACKGROUND AND CHALLENGE:

Overvecht is a modernist, high-rise development. While considered attractive and progressive in the 1970s, the ideal of single-family houses led to higher-income inhabitants leaving.

MULTI-STAKEHOLDER APPROACHES TAKEN:

VISION and MISSION BUILDING

- In 2017 the Mayor of Utrecht chose Overvecht as a **test-site for the energy transition** with the goal of using no natural gas by 2030, and of making this under-privileged neighbourhood an inspiration for others. Despite a great vision, poor communication initially left residents feeling objectified.
- Facing challenges and low engagement on their energy target, the government appointed a project team to start a **consultation process**, adjusting the vision to a more holistic, **social-ecological renovation** – tackling the neighbourhood's challenges and the climate crisis.

JOINT INVESTMENTS

- Housing associations owned two-thirds of the housing stock, making it more feasible to plan and organize.

DESIGN INNOVATION PROGRAMMES

- The first phases included a **building retrofit, inside and out**. Facades were swapped for well-insulated, wind-proof and watertight alternatives. Bathrooms, kitchens and radiators were replaced; gas connections were swapped for more efficient district heating.
- One building pilot: collaboration with Inside Out consortium for a unique renovation system combining multifunctional, modular construction elements, including a smart solar facade that heats apartments, supplies them with sustainable electricity and provides ventilation.

CULTURE and COMMUNITY (RE-) BUILDING

- To diversify the area and bring a greater sense of community, two new buildings were built: 1) The Cube: a large center for student life; 2) De Buurt, a multi-functional area with high-quality soundproofed housing, shared gardens, associations, shops and businesses to create jobs and encourage people to spend their time and money locally.

CITY PROFILE 7: GROWING MEDIUM CITY – PRESSURED TOWN EXPANSION (SUBURBS)



Main physical transitions employed:

- 1b) Strategic revitalization
- 2) Quality-upgrade of building
- 8) Create public green and community spaces
- 9) Create space for local business and culture

Results for efficient, balanced space use and quality of life:

- More vibrant, energy efficient, and diverse neighbourhood, yet still stigmatized
- Still undergoing transformation

Photo: Paul de Ruiter Architects, Robert Oosterveek

Sources: • Will Bradley, 'ACA-flats | Utrecht', Stedenbouw, 15 April 2019. • 'Faster towards Europe's First Positive Energy Apartment Building Thanks to Corona - News - Utrecht University', 2020. • 'Housing Europe Will Partner in a New Project for Climate Positive Circular Communities, Funded by EU's Green Deal Grant | Housing Europe', 2021. • - Maarten A. Hajer, *Neighbourhoods for the Future: A Plea for a Social and Ecological*, 2020. • - Paul de Ruiter Architects, 'Officiële Start Bouw DeBuurt in Utrecht Overvecht', 2022. • 'Utrecht Science Park', Utrecht Science Park, 2021.

The **building of public capacity (i.e. the right institutional set-up and expertise) for zoning, master-planning, public investments, potentially combined with expanding public land ownership, and for orchestrating diverse private and public investments** is essential. This is a direct reversal of adverse policies that have driven inefficiencies in the past. Naturally, the vision should be based on a systemic understanding of sustainability and prosperity, including the spatial dimension. Examples of this integrated

public capacity can be found in Cambridge, which is developing medium-dense, multi-functional and mixed-income neighbourhoods through suburban infill on public land. Examples can also be found in Grenoble, where clear planning and sustainability criteria led an integrated revitalisation; or in Hamburg, Munich and Gothenburg, where city governments are orchestrating infill projects with a clear steer towards multi-functionality and balance.

While a detailed analysis is out of scope for this paper, expanding public ownership, working with cooperatives and regulating affordability seem to be key elements in securing the vibrancy benefits of balanced efficiency. These elements allow for integrated planning and a clear orchestration mandate across investors. Moreover, ensuring affordability for different income levels allows for more diverse professions and types of local business and culture to enrich the vibrancy and productivity of the neighbourhood.

Public-private and cooperative investment set-ups are a recurring element in large-scale transformations, overcoming the adverse driver of short-term and fragmented economic incentives. Almost all our case studies show elements of this. For example, Munich's regeneration plans for its former 'Bayernkaserne' include a detailed plan for orchestrating private investors, many of them cooperatives, to secure the long-term, integrated value of the neighbourhood, including IT connectivity, diversity, and access to green spaces. More often than not, national or EU funds are combined with local investments and private investors, and often cooperatives play an important role.

As with vision-building, for fast-growing or fast-shrinking cities, investing in the city in isolation is unlikely to be sufficient. Instead, a cooperative investment plan for the region is required. A formal joining of forces can also help to draw in national and EU funds. The European Investment Bank, for example, needs strong 'counterparts' of reliable public-private investors and orchestrators, and a certain scale of project, before it can invest. Smaller-scale national and EU innovation funds should be used to develop such larger-scale projects.

Culture and community engagement has further proven successful in overcoming adverse social norms and revitalising denser hubs. A famous example is Bilbao with its major cooperation with the Guggenheim Museum, but other examples, such as that of Leipzig, focus on smaller-scale artists and community organisations.

In addition, **design innovation** must mainstream awareness and demand for highly attractive efficient living models – giving residents something

better than the choice of a flat that is too small or a single-family house that is under-occupied. Leadership can be taken by architects, developers or individuals coming together for their own pilots. Plenty of examples of proactive private actors can be found in larger cities, such as London's Elephant and Castle regeneration, Copenhagen's UN17 village, or many of Berlin's cooperatives. Examples in smaller towns and suburbs are scarce – or at least less visible – and must urgently be ramped up, taking inspiration from examples like the Collectif La Salière (see Box 5).

Box 5: Illustrative example of design and investment innovation by private actors

Collectif La Salière, Grenoble – example of design and joint investment innovation through small-scale investment



Five families came together to build a joint, space-efficient building with individual sections to minimize their environmental footprint, land consumption, and reduce the cost of

individual houses. Located within a 10 minute walk of transport and services, the result is a high-quality building with sustainable materials. Families complement their individual living spaces with the use of shared amenities, a garden, rooftops and terraces.⁶³

Photo: tekne-architectes.com

While large and small cities differ in many aspects, not least budgets and population pressure, it is interesting to note that the five approaches hold true for different city sizes and types – Analysis Deep Dive D presents an analysis of the application of these approaches for different city profiles, see an overview in Figure 22.

⁶³ "Ville & Aménagement Durable."

Figure 22: Overview of Case Studies: applications of Multi-stakeholder approaches implementing physical transitions in different city Profiles

Urban space-use profile

Case studies analysed for multi-stakeholder  approaches and **physical transitions** 

Population growing	Large urban areas	1. Persistent urban dispersion	HAFENCITY, HAMBURG (DE) 1, 3, 4	ROTTERDAM (NL) 2, 4, 5	LISBON (PT) 8, 10	
		Medium and Small areas	5. Fairly compact urban expansion	GYÖR (HU) 8, 10	CAMBRIDGE (UK) 4, 8	GOTHENBURG (SE) 4, 8, 9
			6. Persistent town sprawl	OVERVECHT, UTRECHT (NL) 1, 2, 8, 9		
			7. Pressured town expansion			
	8. Worsening moderate town expansion	CLUJ NAPOCA (RO) 1, 8, 9	TREVISO (IT) 3, 4	DE BONNE, GRENOBLE (FR) 1, 2, 3, 4, 8, 9, 10		
	9. Improving moderate town expansion	LEIPZIG (DE) 1, 2, 3, 6, 8, 9	ALTENA (DE) 1, 6, 8, 9			
	10. Low pressure and compact expansion					
	Rural	11. [Rural Expansion]*	For full photo credits see full case studies in analysis deep dive			
	Population shrinking	Large	For full photo credits see full case studies in analysis deep dive			
		Medium - Small	12. Compact (future) emptying (often link to climate)	For full photo credits see full case studies in analysis deep dive		
			13. Moderately compact emptying	For full photo credits see full case studies in analysis deep dive		
	14. Emptying centre expansion	For full photo credits see full case studies in analysis deep dive				
	15. [Rural emptying]	For full photo credits see full case studies in analysis deep dive				

Unsurprisingly, the case studies show that capital for investment has been more readily available for transitions that created space-efficient housing supply in pressured, high-value markets such as Hamburg or London. Success cases in smaller cities more often than not show strong engagement with national and EU funds. Many case studies were found in Germany, the Netherlands, France, the UK, Italy, Spain and Switzerland, and generally in larger city centres. This might well be due to the language limitations of the authors, and communications budgets by the relevant cities, but might also point to an important action gap in areas of particular urgency, such as Eastern Europe and smaller towns in general.

While the case studies are inspiring, in no case has a city reached perfect efficiency and balance through a single initiative. Those city profiles, or neighbourhoods, that achieve good performance - like Barcelona or Vauban – have been shaped over decades or centuries.

However, Europe does not have centuries to transform its cities into sustainable urban systems and better places to live. It must move jointly – and swiftly – towards the goal to reach a fundamental transformation. In order to scale transition to a close-to-sufficient level, multi-stakeholder strategies will be crucial – but must be combined with stringent targets, regulations and fiscal policies. The next chapter dives into the role of different key actors in boosting and complementing multi-stakeholder approaches to implement the 10 physical transitions.

Box 6: Reflection on the state of research and possible way forward to improve the knowledge base, building on this White Paper

In terms of the physical transitions, literature is scattered. Circular economy studies look into repurposing and renovation, some into deconstruction. Urban planning literature offers insights into infilling and revitalisation. This paper offers a synthesis based on a thorough literature and case study analysis, but the list of transitions should be further refined into clear guidance for cities.

In terms of multi-stakeholder approaches, urban literature mainly offers general insights into effective urban governance; research – for example, by the LSE, University of Utrecht, and again, by the European Environment Agency – offers great case illustrations⁶⁴, many of which inspired the case selection in this White Paper. However, there is a gap in bringing case studies together with an analysis of the actual improvements in space use across a city, and the resource-efficiency improvement thus achieved. This paper offers a starting point for analysing governance transitions and physical transitions achieved in an integrated manner.

Particular attention should be paid to aspects of public and cooperative ownership, possibilities for and effects of affordability regulations and strategies for mainstreaming social awareness and demand desire for vibrant, connected neighbourhoods, especially in smaller towns and regions or locations with particularly urgent challenges.

⁶⁴ "Urban Sustainability Issues - Resource-Efficient Cities: Good Practice."

6. VIBRANT, SUSTAINABLE NEIGHBOURHOODS ARE OF CORE INTEREST FOR CITIES, THE EUROPEAN PROJECT AND PRIVATE ACTORS ALIKE. ALL MUST TAKE TRANSFORMATIVE ACTION

This paper shows that transformation is urgent, beneficial – and, while not easy, certainly possible. City, regional and municipal governments must be at the forefront of all multi-stakeholder approaches, orchestrating all the required actors and investments to implement the most relevant physical transitions. This must be supported by building the right capacity – i.e. institutional structures and personnel training – to align all relevant regulations and economic incentives, such as subsidies – see more below in Figure 24.





However, local governments cannot solve these challenges alone. National and EU strategies and funds must be strategic enablers of local leadership, and private actors – from commercial investors to individual house-buyers and renters – can do a lot to trigger and scale transitions, by supporting local governments in their multi-stakeholder approaches and piloting physical transitions.

See Figure 23 for an overview of recommendations by actor.



Photo: David Butler & TOWN

Figure 23: Key Actors must play their part In Scaling Multi-Stakeholder Approaches

City governments: leaders at the heart of it all	National and EU policies: essential as enablers	Public and private investors: needed as drivers of the momentum	Individuals, associations and small businesses: essential as innovators
			
<ol style="list-style-type: none"> 1. Orchestrate multi-stakeholder strategies <ul style="list-style-type: none"> Inclusive vision building, with systemic sustainability and resilience understanding Public capacity building and regulation: zoning, master-planning, pricing, infrastructure investments Orchestrate integrated investment models crowding in private and community investments – also ensuring diverse affordability Encourage design as well as culture and social innovation 2. Pursue public land and housing ownership, and support cooperative models 	<ol style="list-style-type: none"> 1. Set targets for material, land and energy use in the built environment system Define clear progress metrics for urban areas, aligned across EU institutions and initiatives – and investment taxonomies Integrate efficient and balanced space use as a top strategic goal in energy, industrial, soil and social strategies Dedicate more funds to scaling 10 transitions beyond pilots Remove economic incentives to sprawl e.g. subsidies, cheap land price Support affordability of compact, balanced housing 	<ol style="list-style-type: none"> 1. Set clear sustainability standards for portfolio, incl. spatial dimension Prioritise investments in 10 physical transitions in relevant cities for better space use Prioritise (re-)developing in collaboration with local authorities or with housing cooperatives Pilot (joint) investments in new locations with particular improvement need Public banks to kick-start investments into 10 transitions through concessional loans and de-risking, through support to local public capacity building and proactively crowding-in private investors 	<ol style="list-style-type: none"> Citizens and home-owners: join or create citizen associations to advance a shared vision for the city Developers and architects: pilot efficient and balanced building blocks (as part of a neighbourhood vision), locally and in new areas of strong need Local business and investors: Sponsor local green spaces and local culture, to attract skilled workforce

Given the **essential role of local governments**, we have summarised what the literature and cases studies tell us about the essential policy shifts at local level, that must be taken in combination with assuming an orchestrator role for multi-level public and private investments – see Figure 24. This is certainly not exhaustive, but provides solid orientation for priority setting, for example, by city coalitions or national programmes to strengthen urban transformation governance.



Photo: Matt Kieffer

Figure 24: Essential actions for municipal and regional governments to enable better space use



Zoning and master-planning of land-use

- Set stringent **limits on building zones**, minimizing building on greenfield
- Set **targets for minimum density and mix-use** to encourage functional hub - balanced with targets for maximum density and green space
- **Masterplan multi-functional, vibrant neighbourhood designs** with efficient transport and energy infrastructure links, in cooperation with citizens and architects

Regulation, taxing and pricing

- **Regulate affordability of good compact living** to ensure productive diversity across neighbourhoods
- **Tax avoidable* housing vacancies** and second homes (*while allowing for adequate size, and not unfairly burdening on low-income households with limited possibility to downsize)
- **Price externalities of car use**, incl. congestion charges and parking charges (therefore discouraging sprawled living)

Infrastructure investments and subsidies

- **Subsidise renovation and repurposing in compact hubs**, de-subsidise single-family home building
- **Channel all public infrastructure investment into compact, connected and green infrastructure** (incl. multi-modal transport links; public green spaces), e.g. by repurposing investments into purely car-focused infrastructure

Public land ownership

- Increase municipality's **ownership of land and buildings** to enable integrated transitions
- Support development of **shared and community ownership models** that facilitate neighbourhood cooperation, and integrated planning for long-term value (e.g. cooperatives, public leaseholds...)

To give just a few examples:

- In terms of zoning, Geneva managed the reversal of building zones and achieved a 33% reduction in sprawl between 1980 and 2010.⁷² In Hamburg, Germany, some of the Northern boroughs have recently re-zoned to make any new buildings multi-family homes.⁷³
- In terms of subsidies and investments, the "Stadtumbau Ost" in East Germany managed to phase out a state-initiated tax policy that effectively subsidised single-family houses, and has significantly slowed

65 Litman, "Analysis of Public Policies That Unintentionally Encourage and Subsidize Urban Sprawl."

66 European Environment Agency, Urban Sprawl in Europe. economic and social effects. Some of these relate to people's desires, for example, to live in single-family homes with gardens. However, urban sprawl has detrimental and long-lasting effects. For example, urban sprawl contributes significantly to the loss of fertile farmland, to soil sealing and to the loss of ecological soil functions. The increase in built-up areas reduces the size of wildlife habitats and increases landscape fragmentation and the spread of invasive species. Urban sprawl leads to higher greenhouse gas emissions, higher infrastructure costs for transport, water and electrical power, the loss of open landscapes, and the degradation of various ecosystem services. Despite various efforts to address this problem, urban sprawl has increased rapidly in Europe in recent decades. Thus, urban sprawl presents a major challenge with regard to sustainable land use, as the International Year of Soils 2015 highlighted. Sprawl is a result not only of population growth but also of lifestyles that take up more space. Accordingly, urban sprawl has increased even in regions with a declining human population. Many more urban development and transport infrastructure projects are planned for the future, in particular in the European Union (EU)

67 Wolff, Haase, and Haase, "Compact or Spread?"

68 Housing2030, "Taxing Vacant Housing Based on Potential Rental Income in France."

69 ARUP, "The Road to New Funding."

70 Foncière de la Ville de Paris, "Foncière de la Ville de Paris."

71 Sophus O.S.E. zu Ermgassen, Michal P. Drewniok, Joseph W. Bull, Christine M. Corlet Walker, Mattia Mancini, Josh Ryan-Collins, André Cabrera Serrenho, "A Home for All within Planetary Boundaries: Pathways for Meeting England's Housing Needs without Transgressing National Climate and Biodiversity Goals."

72 European Environment Agency, Urban Sprawl in Europe. economic and social effects. Some of these relate to people's desires, for example, to live in single-family homes with gardens. However, urban sprawl has detrimental and long-lasting effects. For example, urban sprawl contributes significantly to the loss of fertile farmland, to soil sealing and to the loss of ecological soil functions. The increase in built-up areas reduces the size of wildlife habitats and increases landscape fragmentation and the spread of invasive species. Urban sprawl leads to higher greenhouse gas emissions, higher infrastructure costs for transport, water and electrical power, the loss of open landscapes, and the degradation of various ecosystem services. Despite various efforts to address this problem, urban sprawl has increased rapidly in Europe in recent decades. Thus, urban sprawl presents a major challenge with regard to sustainable land use, as the International Year of Soils 2015 highlighted. Sprawl is a result not only of population growth but also of lifestyles that take up more space. Accordingly, urban sprawl has increased even in regions with a declining human population. Many more urban development and transport infrastructure projects are planned for the future, in particular in the European Union (EU)

73 Neubacher, "Hamburg - Grüne verbieten Einfamilienhäuser."

down urban sprawl since 2016, in combination with investments in inner-city revitalisation.

- In terms of regulation, Munich, Germany, is planning a law whereby houses subdivided as apartments may not be demolished unless the rental units are replaced by the same amount of units, at the local rent level, to avoid the construction of luxury apartments at the expense of affordable homes.⁷⁴
- Exemplifying zoning and integrated master-planning, the city of Munich is regenerating its former military area, the 'Bayernkaserne', with a strong orchestration of public, cooperative and private investors, as a mixed-used, balanced neighbourhood. In a further example of master-planning and orchestration, the borough of Southwark in London is in the final stages of regenerating Elephant & Castle, a formerly decaying residential area, in close cooperation with developers and architects.

Many larger cities with pressured housing markets are already quite active in integrated planning. However, smaller cities and towns which are currently most inefficient often lack a driving ambition, or the understanding of how balanced efficiency could benefit them, especially when cooperating in cross-municipality regional programmes.














Analysing the required fundamental shifts in fiscal policies and renter protection is out of scope for this White Paper, but certainly essential. Some good thought-starters can be found, for example, in the research by the UCL Institute for Innovation & Public Purpose⁷⁵.

Private actors – from banks to developers to local business – are unlikely to achieve sufficient change on their own without local public leadership, but they can and must play an important role in pushing the momentum towards vibrant neighbourhoods and creating the proof cases of efficient yet balanced high-quality living. The importance of diverse pilots, and support for such, can hardly be overstated. Figure 25 summarises actions for different private actors.

74 Loerzer, "München."

75 Ryan-Collins and Murray, "When Homes Earn More than Jobs: The Rentierization of the Australian Housing Market."

Figure 25: Focus action for Public and Private Capital Holders

National public budgets and EU recovery funds	National Development Banks	EU Investment Banks (e.g. EIB, EBRD)	Private Banks	Investors and developers
 Join forces to develop and set clear guidelines to sustainability criteria/ taxonomy for a sustainable built environment , including systemic aspects of per-person, per-neighbourhoods and across-city efficiencies and balances based on good space utilisation (10 transitions) and in line with planetary boundaries				
 Adjust all infrastructure and social funds for compatibility with efficient space-use	 Provide concessional loans to public and private developers pursuing better space-utilisation transitions, combined with insulation and retrofitting	 Set clear strategic ambition for better space utilisation Expand funds for projects implementing (some of) the 10 transitions	 Offer more attractive mortgage conditions for multi-unit houses, infill developments and proximity to public transport – given the long-term value (and climate benefits)	 Commercial developers to test balanced neighborhood designs beyond large cities , in proactive cooperation with local planners
 Allocate social/cultural/innovation budgets to support urban vision building and planning, esp. for small-to-medium towns	 Encourage public investors and cooperatives	Proactively help build the project pipeline by mobilising 'counterparts' incl. local investors and city governments	 Engage in multi-stakeholder and multi-level projects (e.g. with EIB)	 Individual home-builders to join forces for multi-unit, multi-purpose blocks
 Create large-scale innovation funds for multi-unit and community-enhancing designs				
 Join forces to calculate the concrete investment case for boosting productivity through space-utilisation transitions				
 Develop next-level public-private-community investment set-ups that allow for fair participation in the long-term value gains of vibrant neighbourhoods and cities (incl. approaches of land-value capture, community co-funding...)				

Source: SYSTEMIQ analysis, based on case studies and expert interviews






Last, but definitely not least, **European institutions** have an essential enabling and agenda-setting role to play. While European institutions have little direct mandate on land-use and building-use regulations, they do have considerable influence in European urban and regional developments – directly through regional and European investment bank funds, or indirectly through energy efficiency directives or simply through awareness raising. Such promotion and enabling action is particularly important where trends are currently going in the wrong direction. This must include clear standards and regulation – for example, for minimum density and public transport links – but, even more, it must positively promote the benefits of balanced efficiency beyond (but in cooperation with) large urban centres.

This White Paper urges European institutions, particularly agenda-setting financial institutions (such as the European Investment Bank) and cultural initiatives (such as the New European Bauhaus, Green Capitals Award or EU's Climate Neutral and Smart Cities Mission/NetZeroCities), to become lead agenda-setters for the mission of efficient, balanced space use for vibrant, sustainable neighbourhoods. Regional development funds have had great success in enabling urban transformations, but will need an explicit ambition and clear strategy regarding space use. See a summary of policies and programmes that can be leveraged on the European level in Figure 26.



Photo: Hans Peter Schaefer

Figure 26: Focus Action for EU and National policymakers

 <p>Climate and Green Deal Strategies</p>	 <p>Urban innovation programmes, including city coalitions</p>	 <p>Regional development and cohesion programmes</p>
<p>Integrate efficient, balanced space utilisation as a top strategic goal in all</p> <ul style="list-style-type: none"> Integrate efficient, balanced space utilisation as a top strategic goal in all built environment related policies, e.g. national building plans or EU's (potentially) upcoming sustainable Built Environment Strategy [1] energy efficiency and climate strategies, including EU's 'Repower EU' and Energy Efficiency guidance, and national energy efficiency plans [2] material resource use strategies, e.g. implementation of the EU Circular Economy Action Plan, Industrial Strategy, and national Resource Efficiency/Circular Economy plans land, soil, carbon sequestration and biodiversity plans, e.g. implementation of EU Soil Strategy Climate adaptation plans, exp. for extreme heat and flooding <p>Set clear targets and pathways for material-, land and energy use for the built environment system, in line with Green Deal and planetary boundaries.</p> <p>Develop support strategy to public and cooperative land ownership, and fair housing affordability.</p>	<p>Massively up-scale vision-building and financing support with clear objective for space-utilisation, especially in high risk cities (see 15 profiles), through</p> <ul style="list-style-type: none"> Mission Cities [3]/ NetZeroCities.eu [4] Circular Cities and Regions Initiative [5] Any national programmes for urban innovation City coalitions, e.g. Covenant of Mayors <p>Multiply leverage of space-utilisation factors for cultural vibrancy through, e.g.</p> <ul style="list-style-type: none"> UNESCO creative cities network [7] New European Bauhaus initiatives [8] 	<p>Widely expand success cases from</p> <ul style="list-style-type: none"> EU cohesion funds and DG Regio programmes [6] National-regional development/regeneration programmes [9] especially for high-risk cities (see 15 profiles), with clear strategy for space-utilisation <p>Include explicit 'vibrant neighbourhoods' and 'good space-utilisation' objective and clear strategies in</p> <ul style="list-style-type: none"> EU's Just Transition Fund guidance [10] National social development strategies/funds
	 <p>Cultural strategies and programmes</p>	 <p>Social and Just Transition policies</p>

Sources: SYSTEMIQ Analysis, informed by [1] European Environmental Bureau (EEB), 'A Blueprint to Deliver a Healthy, Affordable, and Sustainable Built Environment for All', 2021. [2] European Commission, 'REPowerEU: Joint European Action for More Affordable, Secure and Sustainable Energy', European Commission, 2022. [3] European Commission, 'EU Mission: Climate-Neutral and Smart Cities', 2022. [4] Net Zero Cities, 'NetZeroCities.Eu'. [5] European Commission, 'Circular Cities and Regions Initiative', 2022. [6] European Commission, 'Cohesion Policy 2021-2027', 2021. [6] UNESCO, 'Creative Cities | Creative Cities Network', 2022. [7] European Commission, 'New European Bauhaus', 2022. [8] Federal Ministry for Housing, Urban Development and Building, 'Städtebauförderung (Urban Development Funding Germany)', 2022. [9] European Commission, 'Just Transition Fund', 2021.

Across actors it is beneficial to further improve already well-functioning, comparatively efficient cities and city areas – as these are often also places of migratory population growth. However, the real challenge, and urgency, lies in supporting the most challenged city profiles threatened by inefficiency trends or slow progress from very inefficient levels, and those threatened most by climate change.

In times of dire pressure, this is our opportunity **to pursue the original European project of improving prosperity and fairness through cooperation.** Europe is world-renowned for its quality of life in vibrant cities; it is high time it secured and widened the benefits of vibrant neighbourhoods through strategically pursuing efficient, balanced space use. European, national and city-level actors must take committed action now to scale up the urban momentum, including a clear space-use ambition.

ANALYSIS DEEP DIVES UNDERPINNING THIS WHITE PAPER

Overview:

A. Analyses of the problem context (underpinning Chapter 2)

Explanation of the methodology and overview over the key literature used in the White Paper

Analysis of how relevant European policies (dis-)regard space-use aspects

Synthesis of how European built environment policies will not currently reach Green Deal targets – the urgency for additional levers

B. Analyses of the opportunity of efficient, balanced space use (underpinning Chapter 3)

Global climate context – synthesis of science on the role of compact cities for reaching global climate targets

European climate opportunity – details on this paper's novel analysis of the European GHG reduction potential through better space use

Synthesis of key literature on the economic benefits of efficient space use – cost, productivity, market potential

C. Analyses of the space-use patterns in Europe (underpinning Chapter 4)

Details on this paper's definition of the directional working benchmarks of good space use

Details on this paper's quantitative evaluation behind the 15 urban profiles

A more detailed literature summary of the socio-economic drivers of inefficient and imbalanced space use

D. Analyses behind the solutions and action suggestions (underpinning Chapter 5)

Detailed analysis of 9 cases of applied multi-stakeholder approaches in different city profiles

For the deep dives, see separate document.

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