European Partnership

DRIVING URBAN TRANSITIONS TOWARDS A SUSTAINABLE FUTURE

Roadmap Draft, 22 April 2021

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The Driving Urban Transitions to a Sustainable Future Vision

The Driving urban transitions to a sustainable future (DUT) vision:

The DUT partnership steps up the game to tackle urban challenges. It enables local authorities and municipalities, business and citizens to translate global strategies into local action. It develops the skills and tools to make urban change happen and boost the urgently needed urban transformations.

1. Introduction: what grand challenge will be addressed by the DUT partnership?

"If we want to have a chance of achieving the SDGs, we need to get our cities right. " $_1$

It stands without question that the challenges in urban areas are crucial to solve the overarching grand societal and planetary challenges in the contemporary world. These challenges revolve around the transformation to cities, towns, and urban areas that are inclusive, safe, resilient, and sustainable. The wide variety of urban forms of life and how our societal cohesion to a large part have to be sustained by attractive and just urban built environs are crucial concerns: over 70% of the EU population lives and works in urban areas, and nearly a quarter (22.5%) of the EU population is still at risk of poverty and/or marginalisation.² Although urban areas generate about 85% of European GDP, they also account for 60-80% of the EU energy use and face common challenges

¹Maimunah Mohd Sharif, Executive Director of UN-Habitat in her opening speech at the World Urban Forum #9, Kuala Lumpur in February 2018

² EC (2019) 'Towards a sustainable Europe by 2030: Reflection paper', COM(2019)22

<https://ec.europa.eu/commission/sites/beta-political/files/rp_sustainable_europe_30-01_en_web.pdf >, pp. 11, 21, 52, 99.



in e.g. congestion, shortage of adequate housing, air pollution, declining infrastructures, and migratory pressures.³

Furthermore, these sectoral transitions require increased capacities in local public life and urban governance to drive the innovation needed. This can be achieved through a strong sense of built environment qualities ('baukultur'), a people-centric sustainable approach, and increasing the capacities to keep cities and urban areas within the critical zone of planetary boundaries and liveability. In turn, this is to support thriving urban places in and through the built environment that anticipates trends in terms of construction and maintenance, and not the least suitable and well-functioning urban design, basic service provisions, urban manufacturing, and common political and democratic life in local government.⁴

All these efforts have to be made in an integrated fashion from urban neighbourhoods over functional urban areas to transnational collaborations including the urban-rural continuum and taking into account urban effects across continents.

1.1 The grand challenge / overarching ambition

The transformation of our urban systems is needed to tackle pressing societal challenges. In particular just transitions toward sustainable mobility, urban climate neutrality and circular economies in terms of resource use; working, inclusive, gender equity standardised, and fair urban economies for SMEs and labour markets; suitable and empowering urban digitalisation; inclusive and safe urban commons and robust urban public spheres; increased internal and external European collaboration; and increasing democratic dynamics in urban governance.⁵

1.2 How will the DUT partnership address the grand challenge?

These areas are to be addressed by the DUT transition pathways to tackle climate change and societal resource use while ensuring quality of life and economic prosperity for all. In turn, these efforts require concerted action and support to urban research and innovation communities, urban policy making on all levels, and local urban governance to co-create the way forward.

On the short-term and medium-term, the DUT will promote urban research and innovation which already effervescently experiment with mobility innovation,⁶ urban farming, water security, green roofs, ecosystem services and increasing circularity that renders the built environment potentially into a regenerative capacity for global and societal processes – rather than the currently more wasteful modes. Urban policy, particularly on urban accessibility and housing, needs to pace these types of innovations to tackle gentrification, segregation, and secure affordability and inclusiveness; and urban local governance requires capacities and means for coordination and planning in the coming times of substantial change.

On the longer-term, looking at 2030 and beyond, the DUT partner member states' cities and urban areas will represent a critical mass in how to develop pathways for regenerative urbanism in that *at least 50 per cent of their urban administrations will have strategic plans and implementation capacity for city doughnuts*.

While there is a common agreement on the challenges for sustainable urban development globally, we need to act locally and consider the particular European urban context to identify and develop appropriate processes and solutions. The dense urban pattern, with a large share of smaller and mid-sized cities, the historically diverse and contrasting urban structures' morphologies of organic and various design paradigms, and European social

³EC (2019) 'Towards a sustainable Europe by 2030: Reflection paper', COM(2019)22, <https://ec.europa.eu/commission/sites/beta-political/files/rp_sustainable_europe_30-01_en_web.pdf >, p. 21.

⁴ Cf. Raworth, K. (2017), 'A Doughnut for the Anthropocene: humanity's compass in the 21st Century', The Lancet, 1 (May 2017), pp. 48–49, https://www.thelancet.com/pdfs/journals/lanplh/PIIS2542-5196(17)30028-1.pdf.

⁵Von der Leyen, U. (2019) 'A Union that strives for more: My agenda for Europe', Political guidelines for the next European Commission 2019–2024, https://ec.europa.eu/commission/sites/beta-political/files/political-guidelines-next-commission_en.pdf



and cultural characteristics define the urban systems we need to address and advance. Anticipating the UN Agenda 2030 in the European context, the model for integrated urban development needs to be reinforced. This is taken up in the *New Leipzig Charter* and consequently considered the next phase of the Urban Agenda for the EU.⁷ While the New Leipzig Charter continues to promote integrated urban planning and development, the requirement to follow place-based approaches from neighbourhood scale up to functional urban areas, consider multi-level governance, foster participation and co-creation as well as create inclusive, affordable and accessible infrastructures and services as common goods is highlighted.

Summarizing all these strategies and ongoing discussions, it can be concluded that a more comprehensively integrated, interdisciplinary and cross-sectoral approach is needed that:

- (1) creates evidence for urban transitions, through inter- and transdisciplinary research and innovation, involving all stakeholder groups and considering technological, social, economic, cultural, planning and governance aspects;
- (2) addresses urban dilemma interrelationships between various goals, strategies and interests as they define key policy areas critical for achieving SDGs and urban strategies;
- (3) offers an environment for urban experimentation, capitalising knowledge and science-policy cooperation beyond joint calls to more effectively achieve city authorities' strategies and strengthen exploitation and scaling-up of research and innovation actors' results aligned towards urban transformations.

To address these three challenges, DUT has defined its intervention logic and objectives (Figure 1).



Figure 1: DUT objectives

General Objective 1: Shape a quadruple-helix innovation eco-system on urban transitions

The urban innovation eco-system should offer different ways of interaction between science, policy, business and society to ensure that research efforts better meet the needs of urban actors and society. This not only by mobilising urban stakeholders to join research projects, but to start with jointly identifying the issues at hand, letting urban stakeholders have a stronger say in the specification of research and innovation needs. In addition, formats are needed to strengthen the role of urban actors in research and innovation projects and offer settings to engage in all phases of the innovation cycle.

General Objective 2: Increase effectiveness of urban solutions, approaches and processes

From the point of city administration, integrated approaches and planning is seen as one of the key elements towards urban transformation and sustainable urban development. This is why the SRIA has taken up the ambition to connect the dots and address in particular those issues that are created by conflicting or competing strategies, interests or policies. The research and innovation issues put forward for calls will be selected to ensure that various perspectives across disciplines, sectors or stakeholder needs are considered and connected.

⁷The process to update the Leipzig Charter was coordinated by Germany in view of the German Presidency to the European Council in 2020. The new Leipzig Charter was signed by the Ministers responsible for Urban Matters in Dec 2020.



Conditions for such projects will be specified in a way to give room for the required collaboration across sectors and types of actors.

General Objective 3: Create benefits for neighbourhoods and urban areas across Europe

The partnership aims to bring results, good practice and evidence to urban actors across Europe and support dissemination, exploitation, uptake, and replication of solutions and approaches. With this, a contribution to a strong European Research Area is expected, creating benefits for city authorities and municipalities of cities of different sizes and situations. Furthermore, the partnership wants to position as the European hub for international cooperation on sustainable urbanisation.

The partnership's objectives will be addressed through a comprehensive programme management approach that invests in challenge-driven research and innovation activities along an agreed Strategic Research and Innovation Agenda (SRIA). It will, in tandem implement a portfolio of accompanying measures to create and manage a wider innovation eco-system involving all relevant stakeholder groups and strengthen impact creation.⁸

The role of research and innovation actors and systems to achieve these objectives, impacts and the overall ambition related to global and European policies, lies not only in creating new technological solutions, but also in creating capacities and co-creation processes to implement these in full scale. This requires research and science-policy cooperation in the fields of new governance models, public sector innovation, social, socio-economic and socio-technical innovations and new kinds of business models, to ensure sustainable investments and a substantial transformation of urban systems.

To achieve these objectives and impacts the DUT partnership builds upon the *SRIA 2.0* developed by JPI Urban Europe and published in February 2019⁹. The SRIA 2.0 responds to the urgent need for ambitious, sustained and truly inter- and transdisciplinary research and innovation to create knowledge- and evidence-based policies, methods, tools and technologies for sustainable urbanisation. It aims to support Europe's cities and urban areas in their transition towards a future that maximizes their sustainability and their liveability in this era of global competition for commerce, industry, tourism, labour and investment; to take highest use of technological solutions and drive urban innovation. It has been developed in a comprehensive co-creative process, involving manifold stakeholders across Europe (see Annex 1). In this sense, the SRIA 2.0 priorities highlight the needs voiced by city authorities, urban municipalities, public authorities, local initiatives and research.

In addition, the SRIA 2.0 does not only indicate key areas for action. It offers a framework to identify key issues for research and innovation for sustainable urban development. Following the call for a much stronger consideration of interlinkages across the three dimensions of sustainability and the various urban related goals and strategies, ¹⁰ the SRIA 2.0 proposes an approach to identify such critical issues for urban transition pathways and for achieving sustainability targets ¹¹ To this end, it proposes a methodological approach towards a continued debate on urban transitions and helps to prioritize key issues to be addressed by the partnership.

⁸ This approach corresponds strongly with the concept for missions as proposed by Marianna Mazzucato. JPI Urban Europe has already established several elements of such a programme management. The DUT partnership will offer the framework for widening the portfolio of activities and instruments.

⁹ JPI Urban Europe (2019) 'Strategic Research and Innovation Agenda 2.0'. <u>https://jpi-urbaneurope.eu/wp-</u>content/uploads/2019/02/SRIA2.0.pdf

¹⁰Independent Group of Scientists appointed by the Secretary-General, Global Sustainable Development Report 2019: The Future is Now — Science for Achieving Sustainable Development, United Nations, New York, 2019, page xxi

¹¹The SRIA 2.0 is available at< https://jpi-urbaneurope.eu/app/uploads/2019/02/SRIA2.0.pdf >



2. Policy roadmap for the DUT partnership

2.1 Policy aspects

Urban areas are the nexus for the required transitions. The role and importance of sustainable urbanisation for our national and global development is acknowledged in the UN-Habitat *New Urban Agenda* and by the United Nations by including an urban goal (SDG 11) in the *UN Agenda 2030* Sustainable Development Goals (SDGs) as well as by the *Urban Agenda for the EU* (UAEU). Furthermore, urban-related goals and issues are cross-cutting the 17 SDGs and clearly underline the importance of sustainable urban areas. While this on the one hand demonstrates the pertinent role urban areas – from villages and towns up to cities and metropolitan areas – play for our future development, it results, on the other hand, in an interrelated set of challenges and dilemmas urban areas have to face. The localization of large-scale strategies to different urban contexts will determine if the transformative change outlined by the New Urban Agenda, the UN Agenda 2030 with its SDGs will be achieved.¹²

When dealing with urban transformations it becomes quite clear that the interrelatedness of sectors, systems, strategies, goals, rights, and interests has to be considered. In particular as the plurality of urban goals and related strategies leads to an interrelated set of ambitions and actions which might be in conflict with each other, where achieving one goal or strategy might hamper achieving another (Figure 2).

"Transformational change will be local or will simply not be."13



Figure 2: left: relations between SDG 11 and urban-related goals of other SDGs (based on analysis of the JPI Urban Europe Scientific Advisory Board); right: example of interrelated targets across SDGs (Source: International Science Council: SDGs Guide to Interactions, 2018).

The DUT partnership with its vision, objectives, thematic priorities and the portfolio of activities, strongly contributes to the European Green Deal. In Annex 2 the contributions of DUT to this European ambition are elaborated in more detail. While the thematic priorities chosen in the DUT partnership proposal match widely with the European Green Deal objective of designing transformative policies in various sectors, the other DUT objectives and the planned additional activities correspond to the European Green Deal objectives of mainstreaming such policies, positioning the EU as a global leader of urban liveability and sustainability knowhow and inspiration in acting together. This demonstrates that it is not only about setting the right thematic priorities, but equally about the portfolio of measures to fully achieve the ambitions.

¹²UCLG (2019) The Localization of the Global Agendas. How local action is transforming territories and communities. ¹³United Cities and Local Governments (2019:2) The Durban Political Declaration.



Complementary, the New European Bauhaus highlights the role of design and culture. From the perspective of the urban dimension and the built environment, green and digital transitions are inextricably intertwined with questions around liveability and quality of life, urban design governance and architectural development, urban robustness and regeneration, public space dynamics and placemaking, diversity and democracy, urban consumption and climate change, to list a few areas. Put simply, if these ambitions are to succeed, integrated approaches that 'fuse' and can accommodate a broad diversity of practices (across sectors, across societal groups, etc.) are required. Not least when fostering evidence-based policy making and co-creative experimental approaches in cities and urban areas.

2.2 Governance aspects

By now (2021), more than a third of the implementation time of the UN Agenda 2030 and its Sustainable Development Goals (SDGs) have passed. Yet the global efforts and progress to meet the ambitions and targets laid out in Agenda 2030 are insufficient to bring the needed transformations.¹⁴ The years from 2020 to 2030 are of essence to drive transition pathways and make the global ambition which the SDGs illustrate, a reality. It is *The Decade for Action*, ten years in which governments, national as well as local, commercial actors and civil society <u>must</u> accelerate responses and the driving transformations to achieve the shared vision and tackle the world's biggest challenges.¹

Urban areas are central to driving this change and transformations in the Decade for Action and research and innovation contributes to the co-creation of evidence based knowledge and approaches in cities. As the recent World Cities Report¹⁵ states as a key message:

Fostering collaborative networks to drive research and development: Cities should foster strong research and development institutions and collaborative networks between levels of government to build the research, data and regulatory capacities to ensure that new technologies address urban problems rather than exacerbate them or create new challenges. Finding pathways towards global cooperation to confront these challenges and opportunities is critical, including through city networks that share innovative ideas.

While the challenges for sustainable urban development globally are commonly acknowledged, we need to act locally and consider the particular European urban context to identify and develop appropriate processes and solutions. The dense urban pattern, with a large share of smaller and mid-sized cities, the historically grown urban structures and our European social and cultural characteristics define the urban systems we need to address and advance. Anticipating the UN Agenda 2030 in the European context, the model for integrated urban development needs to be reinforced. This is taken up in the *New Leipzig Charter* and consequently in the preparation process of the Urban Agenda for the EU for the next phase.¹⁶ While the Leipzig Charter 2020 continues to promote integrated urban planning and development, the requirement to follow place-based approaches from neighbourhood scale up to functional urban areas, consider multi-level governance, foster participation and co-creation as well as create inclusive, affordable and accessible infrastructures and services as common goods is highlighted.

Complementing this, the new strategic priorities of the European Commission including achieving climateneutrality by 2050. Horizon Europe establishes urbanisation as a possible driver for strengthening the role of cities and urban areas as centres for innovation to improve quality of life for its inhabitants and including them in the process. Due to its resources and organisation, Europe is seen as a possible global driver for change. This includes transitions of the energy and mobility sector, realising circular economy and utilising nature-based solutions.

¹⁴United Nations (2020) The Sustainable Development Goals Report 2020.

¹⁵UN-Habitat (2020:xxx) World Cities Report 2020.

¹⁶ The process to update the Leipzig Charter was coordinated by Germany in view of the German Presidency to the European Council in 2020. The new Leipzig Charter was signed by the Ministers responsible for Urban Matters in December 2020.



2.3 Learning and capacity building aspects

It is not a matter of merely providing solutions. Transformative efforts are strengthened throughout all sectors and industries with the aim to create new solutions. However, to achieve urban sustainability, individual sectoral solutions in the fields of energy, mobility, circular economy, greening of cities, etc. will shape benign impact along how these solutions integrate into the urban system and how they affect each other. These challenges require different approaches in how they are tackled in terms of processes and co-creative implementation where integrative sensibilities are required.

While many technologies have been tested, it has been shown that the application of novel approaches must be coupled with institutional innovation instead of being perceived as a substitute for innovative governance. Innovative approaches to meet the targets of the SDGs, especially SDG 11, have to be people-driven to drive transitions.¹⁷ Research and innovation actors across the urban innovation ecosystems have an important role to drive the urgently needed change towards 2030.

Accordingly all these policies create various demands for the urban related research and innovation system which are summarised in Figure 3:

- While research and innovation are called to continue co-creating knowledge, technologies and solutions for the various urban challenges at hand, this work has to be conducted with a sufficient collaborative (inter- and transdisciplinary) approach to strengthen relevance and impact of scientific results.³⁸ All forms of innovation socio-technical, organisational, systemic, policy, etc. will be covered to strengthen the potential of the innovation eco-system.
- In this sense, challenge-driven formats are needed to align research and innovation with everyday-life problems and opportunities which calls for a strong role of problem owners in research and innovation projects from the beginning and requires improved framework conditions to support science-policy-society cooperation. This issue has also been taken up by the recently started *Cities Science Initiative*¹⁹ which explicitly addresses the gap between research and policy and aims at taking better use of scientific achievements for urban policy making.
- In support of such co-design of solutions and approaches, local experimentation is an important element. Urban Living Labs and similar formats have shown promising results but have to advance to allow a wider uptake of such experiences in urban practice and daily business of city administration. However, such experiments need to be well embedded in the local governance and shall inspire and ultimately drive urban transformations.
- Finally, an understanding of and appropriate conditions for learning and knowledge utilisation are needed to support replication, scaling up and across and mainstreaming. According to the plurality of urban situations there is no simple transfer from one neighbourhood, municipality or city to another. Nevertheless, we need to take more advantage of research and innovation results across Europe and globally by facilitating the internalization into the different local contexts. In other words capacity building in urban public administrations as well as in urban innovation ecosystems. Making research results available, transparent and accessible for all actors and creating learning formats that fit the various stakeholder needs is key to ensure that European and national R&I investments are boosting urban transformation.

¹⁷United Nations (2020) The Sustainable Development Goals Report 2020.

¹⁸ The necessity for inter- and transdisciplinary co-create knowledge to support urban transitions has been widely recognized by city and municipality networks and the R&I community, e.g. in: IPCC. (2019) Global Research and Action Agenda on Cities and Climate Change Science; JPI Urban Europe (2019) Strategic Research and Innovation Agenda 2.0; ICLEI (2018) The ICLEI Montréal Commitment and Strategic Vision 2018-2024; United Cities and Local Governments (2019) The Durban Political Declaration.

¹⁹ The City Science Initiative is coordinated by JRC and the City of Amsterdam with more than 20 cities participating until now. For more details see https://ec.europa.eu/jrc/communities/en/community/city-science-initiative >.



"Municipalities must commit to a new kind of partnership with the scientific community – a partnership based on data, research and innovation – to guide investment and policy decisions."²⁰



Figure 3: Conclusions on what principles a research and innovation programme must entail to drive change and deliver impact

3. Missions and transition pathways

The DUT transition pathways will be embedded in the doughnut economy model which aims to ensure that our societal needs are met within the planetary boundaries. This approach is adopted by an increasing number of city authorities to guide their planning and decision making. It thus seems appropriate to anchor the DUT transition areas in this wider context of sustainable development.

These so-called city doughnuts hold two circles, one within the other. The circles represent, on the one hand, the outer ring of the nine planetary boundaries²¹ and serves to indicate the degree of a city's contribution to overshooting the 'safe space' of planetary resource use and environmental health. On the other hand, the inner ring represents nine sectors²² that together comprise societal limits to well-being and prosperity and the degree of a city's shortfall.²³ To downsize city doughnuts is to support the safe and just space with regenerative cities in between these two circles.

The doughnut is thus a principle to address the challenge of keeping urban areas within resource use and liveability and foster operative local integrated models. In turn this requires broad co-creative innovation and co-design in both urban sociotechnical systems and experimental approaches on a community and neighbourhood level. Hence, a strong experimental ethos is fostered across urban levels. Activities, projects, and initiatives to make districts thrive and keep in-between the limits of planetary boundaries and human liveability will also be crucial for cohesion and trust building through co-creation and the open innovation required with a strong public engagement component.

²⁰ Don Iverson, Mayor of Edmonton in: World Climate Research Programme (2019). Global Research and Action Agenda on Cities and Climate Change Science - Full Version.

²¹ Climate change, ocean acidification, chemical pollution, nitrogen and phosphorus loading, freshwater withdrawals, land conversion, biodiversity loss, air pollution, ozone layer depletion.

²² Food, health, education, income and work, peace and justice, political voice, social equality, gender equality, housing, networks, energy, water.

²³ The doughnut principle, see e.g. Raworth, K. (2017), 'A Doughnut for the Anthropocene: humanity's compass in the 21st Century', *The Lancet*, 1 (May 2017), pp. 48–49, https://www.thelancet.com/pdfs/journals/lanplh/PIIS2542-5196(17)30028-1.pdf>. See also the pilot activities by the City of Amsterdam to launch a city doughnut approach, https://www.kateraworth.com/wp/wp-content/uploads/2020/04/20200406-AMS-portrait-EN-Single-page-web-420x210mm.pdf>.



Downsizing city doughnuts hinges on the three Rs of reduction, regeneration, redistribution across all three transition pathways in order to break the unsustainable linear economies of make-sell-waste. Increased efficiency in resource use alone comes with risks of rebound effects, hence reuse is not enough and a reduction of consumption is needed to keep within the ecological ceiling. In turn, this means that transition pathways towards regenerative cities and urban areas are needed, in order to be active upcyclists and drive a planetary economy. As boundaries and operational limits are set, this furthers redistribution among practices and actors to foster sustainable urbanisation.

The three priority areas impact each other as well as most of all the other urban grand challenges. In between the three, their interlinkage can be generalized something like this: neighbourhoods cannot produce more energy than they consume without new mobility solutions and more circular use of resources. New mobility solutions necessitate innovative energy technology and design thinking. Sustainable energy systems and smart mobility solutions are mandatory, should cities obtain circularity.

For the partnership to maximize impact for the European and global policies (The EU Green Deal, Urban Agenda for the EU, The New European Bauhaus, The Paris Agreement and the UN Agenda 2030), these three priority areas have to be approached in an integrated manner and with a firm commitment to urban regional and city authority capacity building in terms of ambitious policy-making and implementation.

To address these domains and the challenges identified within each sectoral concern, the partnership will foster challenge-driven R&I and technological development to address the specific issues related to the four cross-cutting key areas. This will allow to shape thematic innovation eco-systems that take the particularities of the respective domain into account. The efforts towards co-creating integrated transition pathways and strategies will be pursued to tackle the wicked issues of sustainable urbanization. Evidence will be created with and for city administrations, municipalities, business and society, aiming at all kinds of innovation and capacity building needed to transform our neighbourhoods and urban areas. The partnership will offer a framework for innovation, demonstration and preparing larger scale implementation of solutions.

The bold vision to be accomplished by this support is not merely sustainable urbanisation but transformations to regenerative urban areas which supports and replenishes as far as possible the planetary resources they consume and enhance the various ecosystems they are part of and live by.²⁴



Figure 4: The doughnut economy²⁵

²⁴ Cf. UN Habitat (2014) 'The city we need', <http://mirror.unhabitat.org/downloads/docs/The%20City%20We%20Need.pdf>

²⁵ Kate Raworth and Doughnut Economics Action Lab, CCA-SA4.0 International License, https://doughnuteconomics.org/license>



Positive Energy Districts Transition Pathway Roadmap

1. Urban energy transitions through Positive Energy Districts

Urban areas are key actors in achieving climate change mitigation targets, decarbonisation and the energy transition. They consume more than two-thirds of the world's energy and account for more than 70% of global CO₂ emissions – moreover, cities as the hubs of communication, commerce and culture also provide the key resources for sustainable solution pathways. Positive Energy Districts (PEDs) are key tools to urban energy transition. PEDs are a subsystem within cities that aim towards energy efficiency and generation of an energy surplus. As an integral part of comprehensive sustainable urbanisation strategies, PEDs shift the focus from the individual positive energy building towards neighbourhoods and thus a comprehensive level of impact on sustainable urban development and the energy transition process.

The focus on the urban neighbourhood as the "nucleus" for urban sustainability creates opportunities and requires systemic approaches regarding technological, social and economic innovation. Neighbourhoods offer a manageable size in terms of integrating urban planning and energy planning, including technological, spatial, regulatory, financial, legal, environmental, social and economic perspectives. Resulting in a network of sustainable urban neighbourhoods, PEDs will substantially contribute to a sustainable urban future in general. PED implementation serves as a tool to bring forward overall strategies for innovative development of the energy system in urban neighbourhoods, cities and the regional context. Integrated approaches support reconsideration of planning procedures and governance structures, thus influencing policies on different levels. Need for behavioural changes and new forms of energy consumption, energy flexibility (e.g. sharing, trading) and energy production will have impact on the organization of daily life and therefore have an impact on society. New technologies and system integration require new business models and support green business.

2. The PED mission

2.1 Where are we?

The DUT urban energy transition pillar builds on existing initiatives:

ERA-NET Smart Cities and Communities: The outcome of this ERA-NET Co-fund revealed the need to address the urban energy transition in a place-based rationale and suggested the conclusion that a "Smart Cities" narrative would not lead to a broad take-up on urban level. Therefore, the concept of a place-based programme on Positive Energy Districts was developed together with SET Plan Action 3.2. Based on this insight, the consortium decided to fund the administrative and structural set-up of the trans-national programme on Positive Energy Transition.

SET Plan Action 3.2 on Positive Energy Districts: The PED programme is being set up as a trans-national R&I programme organised by JPI Urban Europe since October 2018. After building a programme management structure and a Europe-wide consultation process on the theme of PED in 2019, the programme will publish its first joint call in early 2020. The programme is unique in its mission to establish 100 positive urban energy districts in Europe by 2025 and in its pledge to do this by working with cities and the real-estate sector on eye-level. It is following the place-based rationale developed in the JPI Urban Europe.

The PED Programme as a joint initiative of SET Plan Action 3.2 and JPI Urban Europe has been kicked off in October 2018. It has developed a PED Framework Definition as the outcome of broad consultation processes with stakeholders. PEDs are defined as

energy-efficient and energy-flexible urban areas or groups of connected buildings which produce net zero greenhouse gas emissions and actively manage an annual local or regional surplus production of renewable energy. They require integration of different systems and infrastructures and interaction between



buildings, the users and the regional energy, mobility and ICT systems, while securing the energy supply and a good life for all in line with social, economic and environmental sustainability.²⁶

2.2 What do we want to achieve?

2.2.1 Long-term objectives and targets

With the SET Plan Action 3.2 Implementation Plan²⁷, the PED Programme commits to a clear vision:

Positive Energy Districts raise the quality of life in European cities, contribute to achieve the COP21 targets and enhance European capacities and knowledge to become a global role model. The TWG 3.2 "Smart Cities and Communities" has developed an integrative approach including technology, spatial, regulatory, legal, financial, environmental, social and economic perspectives, to support the planning, deployment and replication of PEDs for sustainable urbanisation.

Europe is a global role model in integrated, innovative solutions for the **planning**, **deployment and** replication of Positive Energy Districts with the aim by 2025 to have at least 100 Positive Energy Districts, synergistically connected to the energy system in Europe.²⁸

With the PED Programme being integrated as an innovation pillar of the DUT Partnership, through PED implementation the partnership aims to

- Implementing Positive Energy Districts on large scale with at least 100 PEDs across Europe by 2025
- Mainstreaming integration of planning on neighbourhood-, city-and regional levels with energy planning and climate-neutrality
- Optimising the essential energy transition functions: energy efficiency, energy production and energy flexibility
- Adapting governance structures through cross-sectoral approaches, integration of top-down and bottom-up approaches and innovative stakeholder engagement strategies.

2.3 How are we going to get there?

The mission of a large-scale implementation of 100 PEDs by 2025 shall be achieved through a circular pathway (see Figure 5)²⁹.

²⁶ https://jpi-urbaneurope.eu/wp-content/uploads/2020/04/White-Paper-PED-Framework-Definition-2020323-final.pdf
²⁷ European Commission (2018): SET Plan Action 3.2 Implementation Plan;

https://setis.ec.europa.eu/system/files/setplan_smartcities_implementationplan.pdf

²⁸ European Commission (2018): 5

²⁹ European Commission (2018): 10





Figure 5: Pathways to Positive Energy Districts in Europe

- Module 1 European Positive Energy Cities: Set-up a dialogue among cities or national city networks on the planning, financing, deploying and replication of PEDs; ensure an integrated open innovation process on PED development.
- Module 2 PED Labs: Develop city-driven PED Labs according to individual cities' needs and approaches towards PED, in Europe and globally.
- Module 3 PED Guides and Tools: On the needs of the PED stakeholders and the learning experience from PED Labs as a basis for successful planning and designing, implementation and operation, as well as replication and mainstreaming of PEDs.
- *Module 4 Replication and Mainstreaming of PED:* Support European cities in replication and mainstreaming to have 100 Positive Energy Districts in Europe committed by 2025.

2.3.1 Short-term (2022-2024)

Short term goals focus on developing a transnational joint understanding of PEDs, awareness-raising, support of key stakeholders and development of guides and tools for process design. This includes:

- Mapping and analysing of existing projects and approaches, identification of key challenges and success factors
- Alignment and cooperation with existing national and transnational initiatives towards PEDs
- Awareness building and capacity building among policy-makers and practitioners
- Mobilization of stakeholder ecosystems and ignition of dialogue between R&I, policy makers and practitioners
- Developing a joint PED Framework Definition, including qualitative and quantitative indicators towards standardization and certification schemes
- Identification and elaboration of roadmaps towards PED development
- Support of implementation of testing beds and PED Labs



2.3.2 Medium-term (2024-2027)

- Synthesizing first project results
- Further implementation of ULLs/PED Labs through annual calls addressing PED development
- Individual cases gradually building up to PED portfolios and robust evidence
- Further development of standardization and certification schemes

2.3.3 Long-term (2027-2030)

- Synthesizing final project results
- Portfolio extension and integration into the EU Mission on Climate-neutral and Smart Cities
- Established standardization and certification schemes for large-scale PED implementation

3. Enabling systems: the PED European innovation ecosystem / landscape

The PED pillar of the DUT Partnership both aims to contribute to the EU initiatives and networks supporting urban transformation, energy transition and climate-neutrality and refers to them as enabling innovation ecosystems on transnational level.

Among existing initiatives, the PED Programme has already established cooperation with the **Smart Cities Marketplace and European Lighthouse Projects**³⁰ on both programme and project levels, aiming at a joint learning from different approaches and implementation strategies. The Lighthouse Projects since 2018 have a particular focus on developing PEDs. European city networks, such as **Eurocities, ERRIN, Energy Cities** and the **Covenant of Mayors** have been involved in the PED Programme and support its ambition of large-scale PED development.

With the **European Green Deal**³³, the EU has set ambitious targets for becoming climate neutral by 2050. The DUT PED pillar aims to contribute to the **Renovation Wave Initiative**³², as the task of transforming the existing urban structure is of particular relevance for PED development, as well as to the **New European Bauhaus Initiative**³³ with its ambition of innovatively connecting sustainability, inclusiveness, functionality and aesthetics. The **Urban Agenda for the EU**³⁴, launched in 2016, involves 14 partnerships of which the partnership on Energy Transition and Climate Adaptation are of particular relevance for the DUT PED pillar.

The European Mission on Climate-neutral and Smart Cities³⁵ aims at implementing 100 climate-neutral cities by 2030. The PED pillar will establish strong links to that mission, with PED development as a key element for achieving it. The people-centred approach of the mission ("by and for the citizens") will be a fundamental enabling factor for broad ownership of the transformation process. Among the partnerships under Horizon Europe, the European Partnership for Clean Energy Transition³⁶ and People-centric sustainable built environment (Built4People)³⁷ Partnership will be strong partners in developing the strategies for the DUT PED pillar. As they build on existing initiatives, such as the European Construction, built environment and energy efficient building Technology Platform (ECTP)³⁸, the Strategic Energy Technology Plan (SET Plan)³⁹ with

³⁰ https://eu-smartcities.eu/

³¹https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

³² https://ec.europa.eu/energy/topics/energy-efficiency/energy-efficient-buildings/renovation-wave_en#a-renovation-wave-for-europe ³³ https://europa.eu/new-european-bauhaus/index_en

³⁴ https://ec.europa.eu/futurium/en/urban-agenda

³⁵https://ec.europa.eu/info/publications/100-climate-neutral-cities-2030-and-citizens_en

³⁶ https://ec.europa.eu/info/sites/info/files/research_and_innovation/funding/documents/ec_rtd_he-partnerships-clean-energy-transition.pdf

³⁷ https://ec.europa.eu/info/sites/info/files/research_and_innovation/funding/documents/ec_rtd_he-partnerships-built4people.pdf ³⁸ http://www.ectp.org/

³⁹ https://setis.ec.europa.eu/



SET Plan Action 4 (on Energy Systems) and SET Plan Action 5 (on Buildings), cooperation links have already been established and will be further developed.

3.1 Where are we?

For driving the implementation process, the DUT PED pillar strongly builds on a **stakeholder ecosystem** that is very much defined by national and local frameworks, regarding policies, regulations, culture etc. (Figure 6).





The PED Programme has established formats of involving the key stakeholders from cities, real estate industry and utilities, specifically by establishing a **PED City Panel** and a **PED Mobilization and Replication Group.** The **AGORA** format, involving a wider group of urban stakeholders, will be used to create a joint ambition towards PED development.

There are basic structural dilemmas to be considered: for example, cost and benefits do not necessarily come to the same stakeholders; different stakeholder groups work with different time horizons.

Therefore, identifying the different interests, developing strategies for facilitating and balancing them and defining processes towards a joint vision are key. This needs to touch different levels:

- Addressing stakeholder-specific language and culture, trust-building and creating safe spaces for transparency and open discussion
- Focusing on and mobilizing for a shared vision and the awareness of societal benefit
- Regulatory conditions need to address the future and not the past and be common for all stakeholders regulatory framework to establish fairness!

Tackling complex land ownership structures – specifically in existing urban neighbourhoods – requires special attention. For the PED pillar and the operationalisation of the PED Reference Framework, this finding indicates the need to dig deeper into concrete local conditions and locally suitable strategies.

3.2 What do we want to achieve?

A roadmap for PED implementation must build on

• the basic interaction between technological solutions, process innovation and social innovation,



• the mobilization of stakeholder ecosystems enabling PED development

Aiming at a comprehensive urban transformation process towards ecological, social and economic sustainability, it is therefore not only a matter of technical sciences, energy planning and urban planning, but decisively so for humanities, economics and social sciences. Building on the established network of JPI Urban Europe, the links to other initiatives will be fostered and further developed.



Figure 7: Enabling system for PED development

3.3 How are we going to get there?

3.3.1 Short-term (2–3 years ahead) + Medium-term (5–6 years ahead)

- Elaborating and fostering of the links to European ambitions, identifying shared tasks
- Establishing an innovation network of R&I, public authorities/city administrations, developers and utilities
- Establishing framework and formats for public involvement (civic society)
- Formats for alignment and synthesizing
- Monitoring and evaluation in place from the beginning

3.3.2 Long-term (2030 and beyond)

- Innovation network developing strategies building on evaluation loops and lessons learnt
- Focus on replication and mainstreaming in European and global context

4. Key areas of action

4.1 Where are we?

The PED Programme and neighbouring initiatives have developed key areas of action (KA) and themes (TH) based on requirements of city authorities and consolidated through consultation processes with R&I organisations and stakeholder networks. This needs to be considered as a flexible framework for bringing forward PED implementation (Figure 8).





Figure 8: Overview of key areas of action for PED development

4.2 What do we want to achieve?

A roadmap for PED implementation aims at consolidating a framework of addressing the key areas of action, developing joint calls involving R&I and joint actions and their re-evaluation and result in a set of guides and tools supporting hands-on PED implementation in different national and local framework conditions.

PEDs shall be integrated in a broad urban transformation process towards climate-neutrality based on the optimisation of energy production, energy flexibility and energy efficiency, with a special focus on transforming the existing built environment.

4.3 How are we going to get there?

4.3.1 Short-term (2–3 years ahead) + Medium-term (5–6 years ahead)

- Fostering of a joint vision of PED development among policy makers, practitioners
- Integrating PED strategies into broader policies on national and EU level
- Supporting the implementation of projects through joint calls and joint actions, addressing technology relevance and social innovation through tailored R&I activities
- Consolidation of key areas of action through re-evaluation loops
- Learning from and evaluating project results and identify further R&I requirements in an iterative process, involving stakeholders and policy makers

4.3.2 Long-term (2030 and beyond)

• Mainstreamed PED implementation, integrated in sustainable urban development strategies supporting climate-neutrality

KA 1 – Preparing the energy system for PEDs

Adapting the current energy system through **optimisation of the basic energy functions, securing energy supply and preventing energy poverty** while considering **social, ecological and economic sustainability** is the key area of action for paving the way towards PED implementation. PEDs are considered as integral elements of the regional energy system (Figure 9).





Figure 9: PED Reference Framework: Functions of PED/PENs in the regional energy system

TH 1:1 – Strategies for PED energy functions (efficiency, flexibility and production)

Energy Efficiency Function: The aim is an optimal reduction of energy consumption within the PED/PENs, balancing out the needs of the different sectors, building infrastructure, the use of energy, settlement typology, as well as transport and mobility. Due to its relevance, not only new urban development areas but also the existing building stock needs to be addressed. As an example, mixed use settlements could be an effective instrument towards minimizing transportation needs. "Grey energy" will be considered via a life cycle approach and by assessing the energetic and ecological footprint of goods and services. Resource efficiency will be another important focus. Developing strategies towards increased energy efficiency need to consider building technologies and materials as well as the adaptation of existing infrastructure and user behaviour.

Energy Flexibility Function: The main roles and functions of PEDs regarding energy flexibility are

- to actively contribute to the resilience and balancing of the regional energy system with the optimal benefit for the regional energy system in mind. With urban districts/neighbourhoods being among the main consumers of energy in the energy system, demand side management, sector coupling, active management for balancing and optimisation, peak shaving, load shifting and storage are among the main instruments to achieve this goal.
- to manage any interactions between the urban district/neighbourhood and the regional energy system such as to enable carbon neutrality and 100% renewable energy in the local consumption and an additional surplus of renewable energy over the year. Decentralization strategies and interconnection between PEDs, consideration of Functional Urban Areas (FUA) are therefore key.

Energy Production Function (locally and regionally): Locally and regionally produced renewable energy will enable a substantial reduction of greenhouse gas emissions and ensure economic viability. Nevertheless, the local production of renewable energy is highly dependent on local and regional conditions and additionally on the chosen transformation paths for the transition of the regional and European energy system. In particular, the use of waste heat is encouraged. Therefore, strategies towards renewable and local energy production need to consider local/regional availability of RES (climate zones, industrial waste heat, etc.) and the integration of energy production into urban structure (buildings, public spaces).

TH 1:2 – Urban resilience and robustness / Security of energy supply

Securing the energy supply, thus supporting urban resilience and robustness is a key aspect in all phases; long-term strategies including the transformation phase, need to be well elaborated. Applying a systems perspective furthermore includes the consideration of:

- Life cycle analysis (LCA) principles and approaches in all phases and business models
- Innovative sector coupling strategies



- Digitalization and data management
- Strategies for CO₂ balancing (hourly/annual basis)

TH 1:3 – Life cycle analysis (LCA) principles and approaches and strategies for CO2 balancing

Short-term investment logic bears the risk of excluding impact on long-term sustainability. With the overall sustainability ambition of PED development, business models need to apply a life-cycle approach – including all stages of planning, investing, operating and disposal – and include externalities – including long-term ecological, economic and social impact. This requires not only adapted regulatory frameworks, but also awareness building and adapted mind-sets and culture when it comes to applying business models based on a life-cycle approach. The PED Framework operationalisation strategy aims to specifically address utilities and the real estate sector in order to include these stakeholders in co-creating feasible business models addressing life circle assessment and circularity as a basic prerequisite for long-term and economically sustainable PED solutions.

TH 1:4 - Sector coupling strategies

Sector coupling strategies aim at the integration of end-use sectors (heating, cooling, electricity, mobility) and supply-side coupling, involving innovative district heating and cooling as well as all-electric strategies.



Figure 10: Sector coupling. Source: European Parliament (2018). Sector coupling: how can it be enhanced in the EU to foster grid stability and decarbonise? <u>https://www.europarl.europa.eu/RegData/etudes/STUD/2018/626091/IPOL_STU(2018)626091_EN.pdf</u>

KA 2 – Integrated urban planning, implementation and operation of PEDs

PED development needs to be integrated in an urban planning and design process that ensures that PEDs **not only focus on positive energy balance, but are also attractive places for living and working with a high environmental quality**. PEDs need an integrated and holistic approach with consideration of a systems perspective in all planning phases. This requires the understanding of the system boundaries and definition of district and neighbourhood sizes, legal frameworks, local planning cultures and procedures, climate conditions, etc. Cities must be prepared and equipped with appropriate technological solutions, legal instruments and digital planning and optimisation tools for the development of PEDs. Consequences of climate change for planning and operation of green and blue infrastructure need to be taken into account on the neighbourhood level, which is also valid for the crucial role of mobility and sustainable mobility concepts.

For large-scale impact of PED implementation regarding sustainable urban transformation, ambitions need to **focus on existing urban structures and neighbourhoods, connecting them with urban retrofitting and** revitalisation strategies regarding the mobility system or the quality of public spaces. Achieving an energy



surplus is significantly more challenging in such existing urban areas and might therefore hinder a full-scale PED ambition due to increased complexity and less room for manoeuvre in existing structures. For example, large-scale PV instalment is obviously a limited option and therefore more of a challenge in existing neighbourhoods, while developing the DH system seems to be more applicable in different urban contexts. Therefore, the **regional context** becomes all the more important and a smart mix of different energy typologies used key. Including the important aspect of retrofitting and revitalization into the PED concept is an obvious challenge and needs to be addressed in further operationalisation strategies.

TH 2:1 – Consideration of a systems perspective in all planning phases

- Ecological, social and economic sustainability: securing high quality urban environments, high quality of life and inclusiveness
 - o Functions
 - Urban structure / buildings
 - Public spaces
 - Integration of urban planning and energy planning
 - Zoning and building code
- Consideration of the specifics of neighbourhoods, cities and countries

TH 2:2 – PED development contributing to climate change adaptation

- Development of green-blue infrastructure (on neighbourhood level), building on existing infrastructures
- Greening strategies and nature-based solutions (NBS)
- Transformation of existing building stock retrofitting and revitalization strategies of neighbourhoods
- Integration of mobility and strengthen the role of mobility in neighbourhood concepts

TH 2:3 – Definition of system boundaries

Again, the definition of system boundaries is highly dependent on local conditions regarding urban morphology and the energy system and will therefore not only refer to physical boundaries, but also include virtual boundaries (contractual interaction with regional energy system).

- Definition of circles:
 - Heating, cooling, electricity
 - o Mobility
 - o Grey Energy
- Regional interaction
- Interconnection of PEDs

KA 3 – PED Governance and PEDs for people

A PED is not just an energy standard, it is rather an innovative concept to promote sustainable urban energy system development at neighbourhood scale.

For the implementation of these concepts a close cooperation between citizens, businesses and the public sector is needed, as well as advancements in energy policy and regulation, urban governance and decisionmaking processes, changes in consumer behaviour and sharing services, digitalisation and technological innovation and new business models. Innovative business models which provide economic feasibility and innovative governance concepts that build upon participation of civil society are essential to achieve economic and social sustainability of PED concepts.



Stimulating innovations in the face of the above challenges and proposing and validating new 'governance' approaches considering the dynamic interactions between multiple domains, actors and needs across scales and policy spheres are key assets for PED development. Stakeholder-oriented processes should **focus on key actors for PED implementation** that lay the basic conditions, invest and are the future users: city administrations, utilities, real estate developers and the inhabitants/users. SME's bringing in innovative solutions need to be involved in the process. Public-private cooperation, e.g. in the form of contracts, are essential attributes to PED development.

"Leaving no one behind" must not be an empty slogan, **inclusiveness as a guiding principle** is an imperative for a transformation task that needs the active support of all actors and people involved. An innovative governance structure needs innovative pathways of **integrating top-down and bottom-up approaches** and **actively involve community-based initiatives**. Decentralization strategies in general with e.g. Local Energy Communities will play a decisive role. In the end, benefits need to be visible for all groups involved.

Regulatory sandboxes and other novel solutions on PEDs such as **living labs and testing environments** should provide testing frameworks for the process complexity needed for successful implementation.

TH 3:1 – Policy frameworks on different political levels

- Vertical (EU national regional local) collaboration
- Horizontal (cross-departmental) collaboration
- Public-private cooperation
- Regulatory sandboxes, living labs and testing environments

TH 3:2 – Tackling affordability of housing and fighting energy poverty:

- Affordability of housing
- Overcoming energy poverty

TH 3:3 - Stakeholder engagement and communication strategies

- Capacity building among stakeholders and participatory planning
- Cooperation of public sector with private sector and civic society, esp. city administrations utilities real estate developers citizens
- Behavioural and lifestyle aspects
- Integration of top-down and bottom-up approaches
- Active involvement of grass root initiatives, esp. "citizen energy communities" (CEC) and "renewable energy communities" (REC)

KA 4 – Preparing Mainstreaming and Replication

TH 4:1 - Components for PEDs in different contexts

Identification of the key components such as building structure/density, functional mix, availability of RES and developing measurable outputs/KPI's for PED development is substantial for developing standardization schemes.

TH 4:2 – Standardization, certification and monitoring

As a transnational ambition, the PED pillar of the DUT Partnership aims to elaborate a **European-wide framework for PED implementation**. The PED Reference Framework with its focus on energy functions and overall sustainability goals provides an open framework. However, the vastly different conditions on national



and local levels regarding regulatory frameworks, natural resources, energy systems or planning culture hamper a "one-fits-all"-solution for PED implementation. Considering these different pre-conditions, developing a common European basis towards a joint certification scheme is a challenging task, aiming at:

- Identifying a set of minimum criteria/KPI's allowing for solutions based on local conditions, specifically
 defining a framework that balances the challenge imposed on PED development in different urban
 morphologies, i.e. density, greenfield developments/brownfield developments/existing urban
 structures etc.
- Integrating the PED ambition into existing certification schemes⁴⁰ for sustainable neighbourhoodoriented development.

Supporting Urban Living Labs/PED Labs as on the ground areas for experiment are therefore a significant tool for testing different process designs and overall feasibility.

TH 4:3 – Overcoming legal barriers

Regulatory frameworks serve as both enabling factors and barriers for PED development. To support replication, identification of these factors and elaboration of policy recommendations for adapting the regulatory framework accordingly is key. This specifically involves urban planning regulations (zoning), building codes and regulation for energy communities.

TH 4:4 – New business cases and financing models

Financing and the development of feasible business models are top challenges for PED implementation. This firstly implies the need for tailored funding options that address the challenges of the problem-owners, providing also support for capacity-building and process innovation. It is therefore an imperative for the PED pillar to stay in close contact with problem-owners in order to develop both a suitable call agenda and additional activities supporting PED implementation. In the long run, feasible business model are essential. Regulatory frameworks or certification schemes may serve as incentives to trigger interest of insurances, pension funds and generally draw focus of investors to PEDs. Therefore, the development of business models involving public authorities, developers and utilities, based on LCA, fitting into national and European (regulatory) frameworks and integrated into broad strategies for transformation processes towards climate neutrality are key assets for replication and mainstreaming.

5. PED mission and the DUT key transition pathways

5.1 The PED pillar and the DUT key issues for urban transition

Digital Transitions and Urban Governance

PEDs require cross-sectoral approaches and innovative stakeholder involvement. Integrated developments require cross-sectoral perspectives and approaches in planning, implementation and operation respectively. This poses challenges for governance structures on regional, city and local (neighbourhood) levels and a reconsideration of integration top-down and bottom-up approaches. Digitalization of administrative procedures, planning fundamentals and planning processes is an imperative for a state-of-the-art integrated planning approach. A process set-up including relevant stakeholders and citizens from early planning stages needs to be developed. To make PED implementation feasible in the long run, fitting business models, including PuP and PPP strategies, need to be developed.

From Resilience to Urban Robustness

⁴⁰ E.g. 2000 Watt Quartiere (CH), Écoquartiers (FR), klima:aktiv (AT), ZEN programme (NO), DGNB certification (DE)



PEDs can be transformative elements leading to urban robustness if developed in a substantially integrated way. PED implementation processes and actions must contribute to technical resilience and urban robustness in a wide sense, by ensuring an integrated strategy, combining innovative technological solutions with social and economic innovation policies. Putting the urban neighbourhood in the focus allows for a diversity of applied approaches and therefore increases abilities to adapt and robust change management.

Sustainable Land Use and Urban Infrastructures

PEDs need to be adapted to different urban contexts and redevelop existing urban structures towards sustainability. While many European cities face challenges of growth and urban expansion, all of them are confronted with the challenges of refurbishment and retrofitting. PED implementation aims at developing a framework suitable for different urban contexts (greenfield developments, brownfield developments, retrofitting and refurbishment). Different pre-conditions require applied approaches, both regarding strategies and technological solutions, and might lead to considering wider urban/regional/national contexts, to achieve a positive energy balance. Strategies need to consider aspects of density, greening, protection of buildings/cityscape, quality of life and affordability. To provide feasible economic implementation, strategies need to build on and develop existing urban structures and infrastructures (built environment, energy systems, mobility systems, waste management etc.).

Inclusive Public Spaces

PEDs are hubs for integration of quality of life, inclusiveness, sustainability and cityscape. Public spaces play an essential part to urban life – most importantly in their ability to provide opportunities for interaction, integration and mobility. Public spaces very much define the way we experience a city, the way we behave (including energy consumption behaviours), interact, live in our cities. While technology, renewable energy sources, energy grids, materials and buildings play important parts in the cityscapes, we are still dealing with living urban structures that need to be carefully transformed, keeping in mind the people who live in them, with their needs and abilities. Public spaces must play an integral part in the PEDs: Energy efficiency, energy production and energy flexibility are all supporting the "green city", influencing interaction and behaviour of users and defining the quality of urban life.

5.2 PED links to other key transition pathways (pillars)

PED and 15-minute City

- Integration of energy and mobility planning
- Sector coupling strategies
- Fossil-free modes of mobility (both private and public transport) for reducing GHG emissions: emobility for cars & buses, e-bikes, e-scooters etc.
- Reduction of traffic volume for decreasing use of energy through strategies towards reduced need for commuting: Mixed urban neighbourhoods housing, work places, services and recreation
- Shared mobility for increased energy efficiency: mobility hubs etc.

PED and Regenerative Green Neighbourhoods

- Sector coupling strategies
- Greening strategies and NBS for reducing use of energy and increasing energy efficiency; integration of green-blue infrastructure
- Circularity for supporting local/regional energy circles and using local energy sources (e.g. industrial waste heat)
- Economic impact of PEDs: boosting of local economy and green jobs



15-Minute City Transition Pathway Roadmap

1. Urban mobility transitions through the key transition pathway 15-minute city

The Driving Urban Transition Partnership builds up on the 15-minute city concept to pursue the aim of fostering urban mobility transitions through creating accessibility and connectivity. Adding up on existing principles of the city of short distances, compact cities and polycentric development, this concept evolves around the idea that the vast majority of daily needs of city dwellers should be covered within a 15-minute radius, by walking and cycling, while connecting to other 15-minute neighbourhoods and covering larger distances by public and regional transport⁴¹. As the mobility sector plays a decisive role in combating climate change as well as in guaranteeing healthy living conditions for citizens, establishing such mixed-use and integrated neighbourhoods will support the necessary mobility transition by lowering the need for physical mobility and shorten travel distances, focussing on active and shared mobility as well as public transport, thus, making the mobility system as a whole more efficient and sustainable.

To achieve this transformation an integrated planning approach is needed that thinks together and connects 1) the urban mobility system, 2) city planning and design of public space as well as 3) logistics and production – which is represented in the three (+1) key areas of the 15-minute city pillar of DUT. It emphasises the need of a dense, diverse and polycentric cityscape, rethinking of the current distribution of public space across transport modes and connecting urban services, production and logistics to create attractive and human-centred streets within vibrant neighbourhoods.

Although being widely self-sufficient by covering the majority of citizens' daily needs locally, these neighbourhoods cannot work disconnected from the rest of the city, but must be in flow for specialised services and individual opportunities, guaranteed by sustainable transport modes. Inclusiveness has to be at the core of the approach: impacts on affordability and accessibility of new technologies and solutions for all groups of society have to be addressed in the transformation. This will have to be represented in overarching principles for urban government, focusing on local participation and co-creation, which will substantially determine the implementation and thus the depth of the transformation.

All in all, the focus of the 15-minute city pillar is set on rethinking the existing mobility system and urban morphology to encourage sustainable mobility choices, redistribute urban space and reorganise our daily activities in a way that reduces the need for physical mobility, while creating attractive and integrated neighbourhoods.



⁴¹One perspective of how the 15-minute city concept could look like, can be found in Duany, Steuteville (2021), see also Figure 12.



Figure 11: Giving priority to active and public transport in the urban mobility system by turning around the mobility pyramid; Source: Paris en commun (2020)

2. The 15-minute city mission

2.1 Where are we?

As future development is uncertain, getting less and less predictable the more we think into the future and underlined by the global disruption of the COVID-pandemic, DUT proposes to follow the vision of the 15-minute city as a way towards a holistic, people-oriented and challenge-driven perspective for the redesign of urban mobility and planning. Additionally, facing the upcoming climate crisis, we need to take action now and cannot wait longer to find "perfect solutions". Instead, taking measures into implementation and practice has to be at the top of the list.

Although many technological solutions to drastically lower GHG-emissions already exist, the institutional and regulatory surrounding is often lagging behind or simply not in place yet, thus blocking an encompassing shift towards sustainable individual behaviour. Therefore, **DUT supports stakeholder and public engagement across the quadruple-helix innovation eco-system to envision transformative activities for urban areas through co-design processes.** It focuses on delivering evidence for such transformation mechanisms, tools, and solutions to develop and test tailored concepts and ensure a mutual learning process for best practice exchange and transfer.

The 15-minute city concept offers an attractive, motivating and holistic approach, but is always considered a means to the end of driving transformation of the urban mobility system towards climate neutrality. It gives a direction and at the same time provides space for critique that can be built up on to shape challenges and raise questions. As such, it is a narrative that should always consider and involve other approaches and concepts that push this transformation.



Figure 12: A perspective on the 15-minute city concept: City with different radii depending on the mode of transport; Source: Duany, Steuteville (2021)



2.2 What do we want to achieve?

2.2.1 Long-term objectives and targets

As the **concept of the 15-minute city is highly context dependent** and will have to take varying forms in different neighbourhoods, according to their morphology, their spatial and institutional setup or the socioeconomic structure of the local population. Therefore, DUT sets the focus on innovating (or introducing international good practice into the local context) and implementing measures in co-creative processes with all relevant stakeholders. Thus, we opt for Investing in diversity and pluralism of approaches. This proposition is represented in the **mission of the 15-minute city pillar**.

Mission: At the end of the partnership's activities, we will have created a portfolio of X number of solutions for 15-minute city concepts for varying key functional areas and local contexts to drive transformation to climate neutrality and liveable and inclusive cities.

This mission of the 15-minute city pillar is described in more detail and temporal phases in the next section. These phases are not thought to be strictly linear, but will much rather adapt to the level of a city's preliminary work and ambition.

2.3 How are we going to get there?

2.3.1 Short-term (2022-2024)

In the short-term, it will be key to get into implementation quickly and start learning circles, together with relevant stakeholders, to set the scene, connect to networks and collaborative platforms and make way to urban mobility transition as a topic of discussion and reflection. Key elements and building blocks for 15-minute city approaches have to be identified, focussing on quick wins, and "low hanging fruits". This can be initiated by experimental settings, living labs and other co-creative methods that involve multi-actor partnerships. Here, the emphasis is set on application, implementation and validation of existing knowledge, concepts and solutions for specific challenges of the 15-minute city approach in practice, in order to generate abstract, scalable learnings on integrated and sustainable urban mobility:

"X number of existing key elements and solutions of approaches for the 15-minute city were tested and implemented in X number of cities."

2.3.2 Medium-term (2024-2027)

In the mid-term, first project results will be available and existing experience will be disseminated that help building up on the learnings from practice in first-mover cities. The next step involves the development of holistic, radical, new concepts and solutions for the 15-minute city in order to prepare next generation systems, models and processes for sustainable urban mobility. Part of this will be scaling up, both within a city – replicating solutions from one to numerous neighbourhoods – and at an inter-city learning level, as well as adapting the concept for different city sizes and bigger contexts:

"X number of new approaches were developed and experimented with, not only in test-beds, but also in the field of the 'real' city."

2.3.3 Long-term (2027-2030)

Towards the end of the partnership, the learnings will be made available broadly, describing adaptation and necessary local capacity building processes for the 15-minute city, accompanied by a dissemination strategy. Elaborated next generation models will be tested, replicated and scaled up. At the core, this stage is about identifying and generalising what worked and what should be followed-up on. By collection examples and



grouping them according to topic and context, an overview of the colourful mosaic of 15-minute city solutions can be given:

"A portfolio of X number of solutions for 15-minute city concepts was created, for varying focus topics and local contexts to drive transformation to climate neutrality and liveable and inclusive cities."

3. Enabling systems: the 15-minute city European innovation ecosystem/landscape

With its focus on avoiding traffic, inclusive and diverse neighbourhoods and active modes of transport, the 15minuty city pillar is well embedded in established urban development goals. The pillar directly addresses numerous **SDGs** (3, 5, 8, 9, 11 and 13) and "sustainable use of land", the top-priority layer of the **New Urban Agenda for Europe**.

Owing to the bottom-up dynamic already at place when establishing the partnership, the 15-minute city pillar is designed to contribute to the high-level agreements mentioned above and especially the **Climate-neutral Cities Mission** of the European Commission. The pillar establishes a robust bottom-up network of projects and knowledge throughout the transnational partnership. Projects funded in the 15-minute pillar will share strong commitment to new and diverse end-user roles that originate in neighbourhoods with high quality of life. They will promote the exchange and testing of comprehensive and strategic urban mobility planning where citizens will have their just stake. Technologies used in this pillar, will have to directly address to mobility needs of the citizens. The involvement of the **Polis Network, the European Research Alliance** (UERA) and **local funding agencies** (see above), will be of special importance to the 15-minute cities pillar, as highly context specific solutions are both desired and expected.

3.1 Where are we?

A board spectrum of stakeholder events was conducted, to establish a stable alliance (see above). Both the content of the pillars and the stakeholder network were incrementally elaborated throughout the process.

We found that the concept of the 15-minute city, has large popularity and support within the stakeholder-groups we met throughout the process. Although many different names are currently used in the discourse – from "complete neighbourhoods", the "one-minute street" to the "20-minute neighbourhood" – the core of the concept is shared by varieties. It is also agreed, that the service-shift both in personal and freight transport, can contribute to the concept of the 15-minute city.

3.2 What do we want to achieve?

By bringing together local (planning) communities, working on real-world solutions to real-world problems, the 15-minute city pillar aspires to be a transnational bottom-up network of change. Local projects works as the knowledge hubs and sites where the qualities of the 15-minute city are experienced by residents and visitors. By the end of the partnership, we hope that the bottom-up network of change has stabilized to outlive the timeline of the partnership

3.3 How are we going to get there?

3.3.1 Short-term (2-3 years ahead) + Medium-term (5-6 years ahead)

The process of stakeholder-engagement will be continued. Strengths and weakness of planning and governance approaches are elaborated in participatory formats. Starting from international best-practice examples and we aim to gradually shift to the exchange of hands-on experience and knowledge about local context.



The **steering committee** will further increase the cooperation with high-level missions and institutions and secure the knowledge vertical knowledge transfer within the partnership.

3.3.2 Long-term (2030 and beyond)

By 2030 the bottom-up network of the 15-minute city pillar has stabilized. Knowledge on starting the transition processes, overcome barriers experienced during the way, is shared within the network and beyond. The partnership has taken an important role in making high-level agendas a reality and has the capability to trigger new missions (beyond to the 15-minute city), relaying on the local expertise of its members and the established connections to the relevant national and transnational institutions.

4. Key areas of action

4.1 Where are we?

DUT is a co-created and co-developed partnership that is developed together with national partners and agencies funding JPI Urban Europe, researchers and practitioners of city administrations. Especially the latter were central for elaborating key areas (KA) and topics (TH) for the 15-minute city pillar, which happened in three focus group meetings in the second half of 2020. These inputs were reflected further in stakeholder events, such as the AGORA dialogue or the JPI Urban Europe Policy Conference. This way, the programme made sure to consistently focus "real-world" problems that have to be considered and addressed in order to drive the transition of the urban mobility and planning system.

The 15-minute city is a generalised vision that brings urban mobility and transport together with urban morphology and public space, production and logistics. Thus, it is a resourceful concept that offers a holistic endeavour, connecting sectors and crossing administrative limits with the aim to contribute to making the sustainable transformation of city life possible, while raising urban quality of living at the same time. The key areas for the 15-minute city pillar can be generically divided into three functional areas that collect key activities on mobility, urban morphology, production and logistics and one process-related building block – being essential to build up capacities for change or involve a wider range of urban stakeholders in decisions.





Figure 13: The 3+1 key areas of the 15-minute city pillar

4.2 How are we going to get there?

This prioritisation and the question "what do we want to start with?" will be a result of the AGORA-stakeholder event in May 2021 and the ongoing process.

- 4.2.1 Short-term (2–3 years ahead) + Medium-term (5–6 years ahead)
- 4.2.2 Long-term (2030 and beyond)





KA 1 – Multi-modal and sustainable urban mobility

With the 15-minute city concept, DUT proposes a vision for urban mobility transformation, where traffic planning is integrated into comprehensive and strategic urban planning and considers different mobility needs, supply and opportunities from a neighbourhood up to the metropolitan scale, also comprising inter-city mobility. However, at the core it advocates that **people must have the possibility to fulfil their daily needs through active mobility within their neighbourhoods, added up by sustainable multi-modal transportation for longer distances** – which can be public transport as well as sharing and micro mobility options – thus reducing the need for private car-based mobility to a minimum. Therefore, the 15-minute city is essentially based and built up on the walkability (and bike-ability) of neighbourhoods, where the quality of the pedestrian experience defines a big part of the 15-minute city concept. This requires a fair distribution of public space, prioritising active mobility modes. With good infrastructure, green environment and attractive destinations in public space, people will be inclined to walk more frequently and farther. Apart from the benefits on the urban environment, a main aspect lies in supporting healthy urban societies, as this topic is fundamentally linked to the form of how we move within our daily activities.

Driving will still be an option, but should neither be the first, nor the default choice. For making urban mobility sustainable, it is needed to reduce the total urban fleet, mainly by using it more efficiently through carsharing, and to establish a mobility system that is completely powered by regenerative resources. Here, **needs-oriented and interoperable digital services**, like Mobility as a Service (MaaS), come into play and bring different individual, shared and collective mobility options together, which has the potential to widen mobility choices.

Digitalisation is a main driver of this mobility transition because digital communication technology helps us to **rethink the organisation of daily activities through virtual mobility**. While the COVID pandemic has been a very disruptive crisis in many ways, it also gives way to a new understanding of the digital instruments at hand to facilitate personal and professional exchange, online learning, sports and leisure as well as online commerce. By intelligently interlinking our analogue with the virtual world, many trips could be replaced digitally, giving us more time and a possibly easier reach of essential services.

Nevertheless, the **15-minute city is not a technological exercise, but focusses on how we want to shape our urban environment**. All of these elements have to come together within the institutional and regulatory framework of planning. There, holistic, evidence-based and people-centred tools, such as sustainable urban mobility planning (SUMP), are needed and call for new cooperation in urban governance across administrative boundaries in functional urban areas. **One key challenge for European cities lies in peri-urban and suburban areas** as well as in urban fringes and other zones of low density, where it will be specifically hard to bring low-carbon mobility and urbanism solutions into practice. Similarly, in the future the combination of electric mobility, automated systems and digital services has the potential to effectively integrate peri-urban areas by extending public transport lines to networks. Special attention has to be invested in the connection of the city and its hinterland.



TH 1:1 - Secure reliable, comfort- and affordable public transport as a mobility backbone

TH 1:2 – **Prioritise active mobility** in public space and emphasise its importance for emission reduction, accessibility, health and active lifestyles

TH 1:3 – Support connecting multi-modal and shared mobility options as well as modern, interoperable, needs-oriented services (e.g. MaaS)

TH 1:4 – **Create incentives to change mobility behaviour and routines** for climate neutrality, oriented towards people's needs (e.g. school mobility)

TH 1:5 – **Rethink the organisation of daily activities through virtual mobility**: Support the reduction of the need for physical mobility through virtual and digital technologies and to replace trips (esp. business)

TH 1:6 - Take up new technologies in transport: Electric mobility, automated systems, digital services

TH 1:7 – Experiment with new mobility solutions for sub- and peri-urban areas (take the entire functional urban area as sphere of action) and respond to the need and externalities of commuting.

TH 1:8 – Work with people-centred, cross-sectoral and evidence-based planning instruments, such as sustainable urban mobility planning (SUMP)

KA 2 – Human-centred urban spaces and morphology

Set the framework for sustainable transport and land use in **holistic and strategic urban planning** Aim at compact, highly self-sufficient and locally sustainable neighbourhoods Rethink and reshape the distribution of public space for a more human urban scale

The 15-minute city pillar wants to encourage to think mobility behaviour, planning, logistics and technology together with spatial planning and design of public space. This portrays the fact that the **built environment fundamentally predetermines mobility options**: all urban movement takes place within the streetscape, which in turn is shaped and defined by buildings and the urban morphology as a whole. **Therefore, urban planning and design are focal points for rethinking mobility in cities**. The 15-minute city approach puts forward a new interpretation of the concepts of the polycentric city and the city of short distances and emphasises the need for combining accessibility with high quality public spaces in and around lively and functionally mixed neighbourhoods. It wants to boost urban liveability, making urban life healthier, more pleasant and flexible, while staying within the planetary boundaries. Urban density and diversity are essential factors, as they lay the foundation for offering urban services and mobility options. These topics are fundamental parts of public policy, urban governance and management practices.

Public space is essential for well-being, health and social life in a city and serves as a second living room – all of which has become even more essential and visible in times of a global pandemic. (Non-commercial) **urban space is scarce**. Nevertheless, we decide to give vast amounts of it to movement and – by far more important – parking of unsustainable and spatially inefficient vehicles. Parallel to how political goals and social behaviour will need to change towards climate neutrality within the next years, so must the distribution of public space, as its layout and design enforces the way how we live and move. The 15-minute city concept proposes that **every m² of public space should be usable in various ways**: It should be flexible and adaptive enough to accommodate different functions or urban services depending on the time of the day. It should be safe open and attractive for all age groups, shared and centred on the modes of active mobility. Such a form of place making will help creating a feeling of identification with the neighbourhood, which in turn leads to citizens taking more care of their spaces, it increases the feeling of security and subjective quality of life. All in all, the transformation towards urban sustainability will not be possible without rethinking and redistributing the use of public space.



TH 2:1 – Integrate and anchor the concept of the 15-minute city in **holistic and strategic urban planning**, setting the framework for sustainable transport and land use.

TH 2:2 – Aim at compact, highly self-sufficient and locally sustainable neighbourhoods, focus on functionally mixed land-use, diversity and polycentric development (city as combination of several 15-minute cities)

TH 2:3 – **Rethink and reshape the distribution of public space** for a more human urban scale: Create high quality, safe (for all ages) and green spaces for active mobility, leisure and climate change mitigation. Slow down street traffic (aside from main streets) to raise quality of stay and security further. **Strengthen the social function of streets, squares and parks** and demonstrate the potential of the 15-minute city-concept for community building and societal cohesion





For making climate neutral cities a reality, we will not only have to transform personal mobility towards urban sustainability, there will also be a massive coordinated effort necessary to reorganise city logistics in the form of a sustainable urban metabolism. Urban freight transport is key to a smooth running of a city and encompasses transport of all goods, from delivery of parcels, to building materials and waste disposal. The underlying goal of sustainable urban logistics is to find ways to lower the burden on urban infrastructures while at the same time increasing economic and ecologic efficiency and raising quality of life for residents. To address these challenges, new solutions and cooperation are needed that help reducing the number of trips through better integration, coordination and sharing of infrastructure among shippers. As most products consumed in a city are brought in from beyond the administrative city boundaries, the scope has to be widened to at least the whole functional urban area, if not to a regional or even global level, when talking about sustainable supply or logistic chains.

Within the last years, e-commerce has disrupted – or, depending on the perspective, complemented – the business model of traditional street stores. Instead of only bringing goods to shops, transporting goods to people grows dynamically as a service expected by the customer. This is drastically changing the scale of last-mile logistics. Therefore, solutions for green logistics are needed that go together with the decentralised approach of the 15-minute city, are efficient in their use of public space and **focus on sustainable transport modes for last mile logistics**. These could include consolidation centres and neighbourhood hubs (also offering other social services), last mile delivery with cargo bikes or Click and Collect stations, solutions for managing loading and unloading as well as optimising routes dynamically.

Dense, mixed-use neighbourhoods that accommodate many different functions offer a bustling economic dynamic that makes it possible to satisfy local needs within a close perimeter as well as a vibrant street life and a wider diversity of local lifestyles. Adding up to traditional urban office spaces, co-working infrastructures for creative professionals and teleworking, (small) manufacturing and production companies in the city essentially contribute to this aim as they often synergise with commerce, services or educational institutions



and training opportunities. A broad urban mix keeps the distances between home, work place and local suppliers, **rendering modes of active mobility the first choice**.

As not all productive activities are destined to be combined with residential functions, but are necessary for thriving urban economies, it is central to preserve industrial zones as working hubs within the city boundaries as well as to integrate logistic and industrial areas into early stages of urban planning. To **diversify mobility choices for commuting, reducing the prevailing car-dependency and offer incentives for sustainable company fleets**, increased cooperation and new partnerships are necessary. This way urban logistics, production and services can deliver their share for a transition to sustainable urban mobility.

TH 3:1 – Improve integration of **neighbourhoods with short distances to key urban services and functions**. Utilise urban services strategically to create and offer vibrant urban environments – from the city to the suburbs

TH 3:2 – **Bring back (small) manufacturing and production to the city (centres)** for functionally mixed neighbourhoods and lower need for commuting

TH 3:3 – Cooperate with companies to **diversify the mobility choices for commuting** (towards less cardependency) **and set incentives for sustainable fleets**.

TH 3:4 – Support the creation of sustainable supply chains and green last-mile logistics

TH 3:5 – Base urban strategies and activities in integrative and sustainable urban logistics planning (SULP)

TH 3:6 – **Focus on resilient supply chains** in times of crisis by analysing and responding to bottlenecks and changes in consumption patterns

KA 4 (+1) – Urban government and governance for transition



This last key area addresses overarching process-related principles and activities for realising 15-minute neighbourhoods and considers ways of how a city administration can demonstrate openness and pursue change within its strategic operations to daily tasks. The support and ambition of the local political and administrative system largely affects and influences the depth of the urban mobility transformation.

The first three topics collect internal processes within a city administration and encompass elements from municipal visioneering of the transition, to building up capacities for change processes, offering a framework to allow for testing and experimentation of approaches – such as in temporary uses or demonstration of pilots in urban space – to institutional learning as well as monitoring and impact evaluation. The other four topics focus



on ways of interaction with external stakeholders. Here, strong partnerships and citizen participation – both content-related and financial – as well as effective coordination of policy and strategies with all levels of government are essential elements of the process.

- TH 4:1 Create a positive and activating **narrative for change**
- TH 4:2 Foster change processes and provide adequate capacities
- TH 4:3 Allow for testing and experimentation
- TH 4:4 Establish strong partnerships and cross-sectoral collaboration (Quadruple Helix)
- TH 4:5 Take citizens on board at an early stage
- TH 4:6 Encourage actors to invest in the mobility transition
- TH 4:7 Connect to all levels of government effectively

5. The 15-minute city mission and the DUT key transition pathways

5.1 The 15-minute city pillar and the DUT key issues for urban transition

DC 1 – Governance and digitalisation

Effective Urban Mobility needs adequate, digital, support systems and must interact with digital connectivity. Digital transitions and urban governance are closely interrelated with developments in mobility and transport. New mobility and logistics technologies, like automation and energy provisions, and services like MaaS and TaaS, rely heavily on efficient digital systems. These technologies and services also introduce new actors in the urban and mobility setting and may even result in shifting paradigms – from vehicle ownership to use, blurring boundaries between public and private transport and between the roles and tasks of public authorities and private companies. Challenges lie in the effective, but at the same time responsible use of 'big data' and potentially sensitive personal information. It is vital to find a sustainable and attractive 'balance' between physical mobility and digital connectivity. This entails a new balance in power positions between actors in the public sector, private sector and citizens, including new ways to secure the rights of individual citizens as set against the power position of very large international companies.

DC 2 – Resource management and consumption

Resilience and urban robustness is an essential aspect of the increasing complexity of the mobility and logistics system as such, as well as in the increasing interwoven relationship with energy, ICT and spatial systems. Without pro-active measures, this interplay becomes increasingly more vulnerable to system failures, may they be within or across systems or from disturbances caused by extreme weather conditions and disasters, including manmade, intentional disruptions resulting from cyber-crime and terrorist attacks. Challenges lie in finding sufficiently robust solutions for reliable and effective mobility and transport, able to withstand disruptions and limit expenditures at the same time. To attain this, there is a need to avoid creating too much over capacity, but at the same time retain flexibility, agility and development opportunities.

DC 3 – Density and urbanity

Mobility and transport have very direct and strong interactions with the City and its spatial proximity. This is strongly linked to sustainable land use and urban Infrastructure. The mobility and goods transport 'system'



interrelates with the urban systems, both from a physical perspective (built facilities, built environment) and from a functional perspective (proximity; urban spaces and provisions inviting to use sustainable transport modes). The challenge is to ensure mobility fairness and inclusiveness, which means that the sustainable mobility and transport options must be accessible and affordable for all. Another challenge is to make high density urban space solutions (including housing) that are both attractive and affordable, to avoid the rise of new societal divisions and segregation between dense metropolitan, suburban and rural areas.

DC 4 – Economy and liveability

Urban Mobility and Accessibility has a strong interrelation with inclusive public spaces – especially on the neighbourhood and street level: Multiple-usage of available space for transport, as well as for other activities, including leisure and social contacts, would be efficient but should be attractive. The challenges in this realm lie in designing and developing attractive urban spaces that provide room for social contacts and leisure activities, but at the same time offer effective, safe and useable transport.

5.2 15-minute city links to other key transition pathways

Links to Positive Energy Districts pillar:

- Energy demand of (e-)mobility and transport, production and urban services
- Combining neighbourhood-based multi-modal mobility hubs with local energy production
- Strategies for increasing energy efficiency: Planning dense, mixed-use neighbourhoods, focus on sharing etc.
- Addressing the use of public space of charging infrastructure for e-mobility and energy production in general
- Issues of data privacy and data management connected to new digital services.
- Mobility data as foundation for transition
- Virtual mobility and energy consumption
- Thinking energy and mobility communities together

Links to Circular Urban Economies pillar:

- Multi-functional public space and conflicting interests of use of urban space
- Adapting streets and squares for climate change
- Logistics for the circular economy
- Connecting city with surrounding sub-urban and rural area
- Improvements in healthy urban lifestyles air quality, healthy environments
- Mobility system to stay within sustainable boundaries of resource use
- Repurposing underused buildings and infrastructures
- Waste disposal and transport

Affecting all pillars:

- Holistic planning for energy, mobility and green and blue infrastructure.
- Differentiation of approaches in newly built districts vs. urban retrofitting
- Participatory process include stakeholders in processes, mobilise and create consciousness for the topics



Circular Urban Economies Transition Pathway Roadmap

1. Regenerative urbanism supported through the key transition pathway Circular Urban Economies

Urban liveability and cities' global footprints are two sides of the challenge for sustainable urbanisation. Although European urban areas nourish a relatively high degree of biodiversity (sometimes higher than in surrounding, non-urban landscapes; cf. EC 2020: 7), from a regenerative point of view they are still fragile and not nearly as 'green' as needed to support human and planetary well-being including climate action. Contemporary cities and urban areas in Europe and beyond are vulnerable to disruptions of various kinds, be it through heat waves or other extreme weather events, by food scarcities, financial turbulence, mobility and transport disruptions, as well as other infrastructure inefficiencies, etc. Furthermore, as 75% of global natural resources are consumed in cities and urban areas, and as increasing scarcity of resources – such as fertile land, nutrients, clean water and air, as well as raw materials (metals, wood and plastics) – is expected (EMF, 2012), they exert high pressure on human and planetary well-being. Added to this is the emissions of GHGs and generation of waste (e.g., plastics, chemical pollution, particles).



A key component of the sustainable city is a 'circular metabolism' which assures the most efficient possible use of resources @ Herbert Girardet / Rick lawrence

By developing and improving blue-green infrastructure (BGI) and nature-based solutions (NBS), overall urban liveability, public health, and robustness may be considerably improved with support by integrated and cutting-edge approaches to clean technology, impact finance, and entrepreneurial creativity.

With increased circularity and inclusiveness in urban economies, mainstreaming nature-based solutions and blue-green infrastructure represents a crucial transition pathway to drive urban transformation to facilitate healthy and attractive places for all. Hence, cities and urban areas are crucial starting points for making the global transformation to liveable societies, and planetary health. Through targeted governance measures, city authorities have great potential to define and implement measures and regulations for public procurement, for business activities, for consumption and resource management. Most of today's industrial production needs to be reshaped at all levels for it to become more circular: from uptake and use of resources, design and production processes to logistics and distribution – the focus needs to be on circularity and long-term sustainability. This is particularly evident from an urban robustness perspective on current European urban systems, e.g., around food security.

Figure 14: The figure above is a placeholder for DUT visualisations and graphics. Source: https://www.worldfuturecouncil.org/regenerative-cities/





Figure 15: The figure above is a placeholder for DUT visualisations and graphics. Source: https://www.ellenmacarthurfoundation.org/

Simplified, regenerative urbanism means doing 'more good' rather than 'less bad' (UN HABITAT 2014; Brown 2021) when taking into account both urban liveability and robustness, as well as negative footprints on other places around the world. By anticipating and building capacities for cities and urban areas to develop 'city doughnuts' (Raworth, 2017) – an approach to address the challenge of developing urbanization within resource limits, while fostering liveability through operative local integrated models – this transition pathway supports implementation and driving issues to realise regenerative neighbourhoods, cities, and functional urban areas. City doughnuts' assessments and the actions set up, on district levels, to address the challenge of implementing doughnut economies – a concrete strategy currently explored by a number of European cities, such as Amsterdam and Brussels, to support human and planetary health (including climate action) – will effectively guide and shape interfaces between urban greening approaches, circular economies, and integrated approaches to both.



Figure 16: The figure above is a placeholder for DUT visualisations and graphics.⁴²

⁴² Kate Raworth and Doughnut Economics Action Lab, CCA-SA4.0 International License, https://doughnuteconomics.org/licenses



2. The Circular Urban Economies mission

2.1 Where are we?

The problem

The problem is that cities and urban areas drain and use way much more resources (both human and natural, and particularly water and energy resources) than they generate, seen across the board of built environments, distributed among all in urban societies, and on a planetary scale.

2.2 What do we want to achieve?

To relieve urbanization pressure on the global ecosystem and become more resilient and robust towards the effects of climate changes.

The mission should incentivise urban transitions towards:

- Circular economy at different scales (resources, materials, buildings, districts, neighbourhoods, city ...)
- Community support ('sharing economy')
- Just transitions, landscape democracy, equity (e.g., in resources accessibility) and social inclusion
- Innovation in governance, funding, and business models

2.2.1 Long-term objectives and targets

To mainstream regenerative urbanism, and on the longer term achieve 'doughnut' urban economies, it is crucial to (re-)develop multiscale nature-based solutions and blue-green infrastructure on a broad front, while promoting evidence-based decision making and multi stakeholder capacity-building.

The aim is to drive urban transformation to facilitate regenerative urbanism at different spatial scales to support human and planetary resilience, including climate action, while improving ecosystem robustness, liveability, public health and well-being.

Crucial to complete the mission is the development and improvement of:

- Urban greening strategies, including blue-green infrastructure (BGI) and nature-based solutions (NBS) at various spatial scales;
- Cutting-edge approaches to clean technology and entrepreneurial creativity;
- Increased circularity in urban economies, including sharing approaches, job creation, and enlargement of the 'urban common' concept;
- Capacity building for cities and urban areas to develop 'city doughnuts' to address the challenge of keeping urban areas within resource limits and liveable, and to foster operative local integrated governance and business models. It entails supporting/fostering/innovating the role of public administration towards process enabler. Towards a transition to knowledge-based and citizen centric implementation, new public/private/people roles and relationships.

2.3 How are we going to get there?

Cities and urban areas are to increase their circularity, restore natural capital and increase the use of naturebased solutions. Regenerative urban design and inclusive governance principles are needed, as well as inhabitants willing to engage and change their ways.



The Mission is to have accomplished by 2030 at least two (2) longer term innovation platforms (or transition pathway arena) in each country delivering at least three (3) of the following goals:

- High quality, liveable urban environments ('Bio-cultural diversity')
- Robust Social Infrastructures (based on Grey to Green transformative approach and Natural Capital restoration/regeneration; NBS)
- Zero emissions (through NBS/BGI and increased circular metabolism to help cutting all-round anthropogenic emissions, no to carbon credits, yes to Payments for Ecosystem Services and other Incentive-based mechanisms)
- Zero Risk (by 'safe-to-fail' principles, rainproof, healthy, safe, attractive, inclusive environments)
- Zero waste (by resource recovery; landscape democracy)
- Energy circular self-sufficiency at building, district and city scale ([elaborate distinction to PEDs NBS through the improvement of indoor thermal comfort (evapotranspiration and shading) reduce energy demand; reducing water demand for irrigation (e.g., xeriscaping) helps reducing energy demand, and anthropogenic emissions, too])
- Thriving and robust local Economy (Private-Public-People model; multiple values, e.g. account for/integrate social and environmental return on investment; incentive-based mechanisms)

2.3.1 Short-term (2–3 years ahead)

• Climate-adaptive transformations through NBS and UGBI (greywater collection, treatment and reuse; run-off management; thermal comfort, ...).

2.3.2 Medium-term (5–6 years ahead)

- Ecological, socio-economic, and environmental benefits in relation to Water and Energy demand reduction
- Socio-Economic benefits (e.g., job creation; development of new microeconomic activities; operative costs reduction)

2.3.3 Long-term (2030 and beyond)

- Climate mitigation targets achieved
- Systemic robustness
- Conversion to circular urban metabolism
- Attractive safe and inclusive ecosystems

3. Enabling systems: the Circular Urban Economies European innovation ecosystem landscape

3.1 Where are we?

3.1.1 International policy

UN Agenda 2030 SDG 11 addressed by the transition pathway:

- 11.3 By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries
- 11.4 Strengthen efforts to protect and safeguard the world's cultural and natural heritage



- 11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water related disasters, with a focus on protecting the poor and people in vulnerable situations
- 11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management
- 11.7 By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities
- 11.a Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning
- 11.b By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015–2030, holistic disaster risk management at all levels.

The Paris Climate Agreement implementation supported in that the multi-functionality and ecosystem services provided by urban nature-based solutions and blue-green infrastructure can potentially decrease energy consumption through reduced heat-island effects, and through developed urban circular economies to support more efficient resource use and sharing approaches to decrease consumption in e.g. food, water, and energy.

UN-Habitat *New Urban Agenda* goals addressed:

- Environmentally sustainable and resilient urban development overall supported by the transition pathway
- Building the urban governance structure: establishing a supportive framework through doughnut economy capacity building
- Planning and managing urban spatial development through the greening and urban design aspects.

Leipzig Charter aspects addressed are integrated urban development regarding sectoral and systemic aspects, neighbourhood and community anchoring while following through across district, city, and functional areas; productive cities; the urban-rural continuum; the just city and common good.

EU Green Deal objectives addressed by Regenerative Green Neighbourhoods:

- Increase the EU's climate ambition for 2030 and 2050 by (DUT) strengthening cities and municipalities capacities to transform neighbourhoods and urban areas into sustainable places. NBS/BGI as well as Circular Economies are directly related to climate change mitigation and adaptation in urban areas.
- Mobilising industry for a clean and circular economy by encouraging and catalyse markets towards circular economy and nature-based solutions addressing e.g. urban small-scale manufacturing, urban agriculture and circularity in the urban built environment
- From 'Farm to Fork': designing a fair, healthy and environmentally friendly food system; to some extent the DUT pillar on circular economy and nature-based solutions with continuing R&I on food-water-energy nexus and urban agriculture
- Preserving and restoring ecosystems and biodiversity circular economy and nature-based solutions by investigating urban biodiversity and fostering nature-based solutions in urban settings
- Zero pollution ambition for a toxic free environment by circular economy and nature-based solutions by focusing on solutions that have co-benefits regarding air and other environmental pollutions.



3.2 How are we going to get there?

3.2.1 Short-term (2–3 years ahead) + Medium-term (5–6 years ahead)

- Holistic Life Cycle Performance criteria to be adopted (Performance evaluation based on sets of multiscale systemic and tactical measures towards multidimensional quality in altre cycle approach; Trade-offs and synergies assessment; Shared prioritization of Objectives/Strategies/Solutions)
- Investment in data Infrastructures as supporting tools

3.2.2 Long-term (2030 and beyond)

- Long- term co-designed plans and open commitment
- Adaptive monitoring of long-term vision and goals

4. Key areas of action



The key areas (KA), themes (TH), and topics are mainly drawn from focus groups and stakeholder dialogues and exchange in 2020, elaborated by JPI Urban Europe funding agencies. The key areas of action's top components are:

- Circular management, production and consumption
- New business models enable the transition to circularity
- Nature-based solutions, including green and blue infrastructures, are used for urban regeneration, for climate adaptation and for healthy urban environment
- Inclusiveness is a key principle in development
- Circularity as principle is incorporated in the PED and the 15-minute city

4.1 Where are we?

Key area 1 focus on urban design and land use aspects related to nature-based solutions and blue-green infrastructure, promotes more engineering and large technical system approaches. Key area 3 on local communities and urban innovation actions for circular economies focus more on social innovation type of



activism, on tactical urbanism approaches, 'doers', and SME business. Key area 2 gathers topics around governance aspects that ties key area 1 and 3 together/supporting their developments as well as supporting actions to prepare the ground for doughnut economies, including (public admin) capacity building for liveability and robustness.

4.2 How are we going to get there?

While some topics or themes are suitable for conventional joint calls for R&I projects, other may be more suitable to programme with other types of actions. These other types may be in project form, e.g. strategic synthesis through knowledge hubs; related to AGORA events, e.g. capacity building and impact creation; or to European and international cooperation.

KA 1 – Urban design and sustainable land-use for nature-based solutions and blue-green infrastructure



The key area focuses on urban and metropolitan region functional areas' built environment systems and nexi. This includes urban design and public space as societal cohesion infrastructure.

TH 1:1 - NBS transcalarity - neighbourhoods to functional urban areas

- Across urban scales, neighbourhoods to FUA
- land use change through NBS/BGI
- Liveability and 'social issues' (urban and regional gentrification and segregation dilemmas, inclusive neighbourhoods)

TH 1:2 – NBS multi-functionality – built environment adaptability and flexibility

- Building materials and technologies development
- Water-human interaction planning and design, societal issues
- Greywater reuse
- Run-off risk reduction
- Urban biodiversity governance

TH 1:3 – Integrated models for NBS and BGI

- Operative local modelling and digitalisation
- For (physiological and mental) health and liveability



- Supporting/enabling tools, e.g. building information modelling (BIM), city information modelling (CIM), landscape information modelling (LIM), and public participatory geographic information systems (PPGIS)
- Understanding and integrating human and non-human aspects

TH 1:4 – Evidence-based urban design for regeneration

- NBS / BGI for emission mitigation and reducing energy demand in urban areas
- Strategic synthesis approaches for quality in the built environment and attractive/quality of life oriented

KA 2 – Capacity building for regenerative urbanism and downsizing city doughnuts



The key area themes and topics revolve around leadership, vision, governance, and mobilisation of people for change.

It aims to support downsizing city doughnuts (often with starting points in local communities, urban neighbourhoods). The intention is to support elements and aspects around nature-based solutions, blue-green infrastructure, and urban circular economies as well as 'targeted' capacity and governance issues anticipated to enable downsizing city doughnuts.

TH 2:1 – Capacity building in public administrations and local communities

• Enabling transitions to circularity for businesses: adaptation of regulations for NBS/BGI, urban agriculture, circular economy, funding and incentive mechanisms

TH 2:2 – Communication models, evidence synthesis, and awareness

- Show immediate positive effects and benefits of applying new economic models and practices
- New services and new kinds of support to mobilise humans towards sustainable behaviour and practices
- Models proofing the economic and social benefit to work in circular way to 'convince' decision makers
- Illustrating the effects of implementing the doughnut principles on life in the city



TH 2:3 – Community of practice and collaboration

- Multi-actor collaboration among urban officials, experts, business, and civil society towards thriving urban areas
- Rethinking housing, office, and retail space (flexibility needed in times of increased online activities) for vibrant circular neighbourhoods

TH 2:4 – Doughnut economy life-cycle assessment includes social and environmental return on investment, and adoption of adaptive monitoring approaches

• Blockchain for tracking and certification to shape/improve KPIs

KA 3 – Urban communities and innovation ecosystems for circular economies



The key area is aimed at increasing urban circularity, mainly across but not limited to business activities ' since it requires e.g. community and social innovation, innovation ecosystems, and various sociocultural changes in order to beget substantial urban reduction, reuse, restore, regeneration, and redistribution.

TH 3:1 - Challenge-driven clean tech

- Entrepreneurial creativity and pick-up from proof-of-concept and public funded innovation
- Industry realignment, public procurement, and business model/practice development / Translating local cultural and industrial traditions into new circular economic models
- IoT & AI How does it impact society?
- Effects of 3D printing using recycled materials for addressing short term needs
- Climate-adaptive and flexible design to prevent soil sealing and restore permeability in urban areas

TH 3:2 – Design activism and community actions

- Circular small-scale approaches, building a critical mass of urban acupuncture actions
- Reuse of non-conventional resources
- Food productive cities and regenerative urban manufacturing
- Value of local production, urban manufacturing, and self-sufficiency for robust functional urban areas, stimulating regional resource and product flows



TH 3:3 – Circular consumption and resource management

- Job creation and cost reduction alongside doughnut principles
- Digital marketplaces and blockchain
- Data infrastructures and information exchange on demand/supply
- Circular economy to reduce consumption-based climate change-related emissions, consumer and citizen/public participatory approaches
- Non-toxic waste (landscape democracy)

TH 3:4 – Urban foods

- Nutrients collection and reuse
- Urban agriculture logistics and distribution
- Urban agriculture and zoning regulations
- Larger scale production in urban environment





Annex 1: The DUT intervention logic

Figure 17: DUT intervention logic



Annex 2: The DUT contributions to the European Green Deal

Table 1: Connecting DUT objectives and activities to the Green Deal priorities

Green Deal object		tives	DUT objectives	DUT activities
TRANSFORM ING THE EU'S ECONOMY FOR A SUSTAINABL E FUTURE	Designing a set of deeply transforma- tive policies	Increasing the EU's climate ambition for 2030 and 2050	Take up cities role in sustainable transformation; vision of DUT - enable local authorities and municipalities, business and citizens to make global strategies into local action	Strengthen cities and municipalities capacities to transform neighbourhoods and urban areas into sustainable places
		Supplying clean, affordable and secure energy	SO2.1 Address key domains / areas for urban transitions to support European goals	Pillar on energy transitions through Positive Energy Districts, including efforts to prepare the energy system for PEDs, integrated urban and energy planning as well as governance issues
		Mobilising industry for a clean and circular economy	SO2.1 Address key domains / areas for urban transitions to support European goals	Pillar on downsizing district doughnuts e.g. urban small- scale manufacturing, urban agriculture and circularity in the urban built environment
		Building and renovating in an energy and resource efficient way	SO2.1 Address key domains / areas for urban transitions to support European goals	Pillar on energy transitions through Positive Energy Districts and Neighbourhoods addressing the design, construction and maintenance of energy systems of buildings and building compounds, including aspects regarding materials, energy technologies, energy planning, management and monitoring of buildings, etc. associated to Positive Energy Districts
		Accelerating the shift to sustainable	SO2.1 Address key domains / areas for urban transitions to	Pillar on sustainable mobility transitions through 15- minute cities tackling integrated mobility systems



Green Deal object	tives	DUT objectives	DUT activities
	and smart mobility	support European goals	that consider active modes, new technologies, digitalisation of the transport sector and create evidence and recommendations for policy making.
	From 'Farm to Fork': designing a fair, healthy and environment ally-friendly food system	SO2.1 Address key domains / areas for urban transitions to support European goals	To some extent Pillar on downsizing district doughnuts with continuing R&I on food-water-energy nexus and urban agriculture
	Preserving and restoring ecosystems and biodiversity	SO2.1 Address key domains / areas for urban transitions to support European goals	Pillar on downsizing district doughnuts by investigating urban biodiversity and fostering nature-based solutions in urban settings
	zero pollution ambition for a toxic-free environment	SO2.1 Address key domains / areas for urban transitions to support European goals	To some extent Pillar on 15- minute cities as well as on downsizing district doughnuts by focusing on solutions that have co- benefits regarding air and other environmental pollutions.
Mainstream ing sustainabilit y-ty in all EU policies	Pursuing green finance and investment and ensuring a just transition	SO3.3 Support replication, mainstreaming and scaling up	Providing evidence and recommendations for sectoral policy making, creating interfaces to investment programmes to foster large scale implementation of urban transition pathways; connecting to regional strategies and structural funds



Green Deal object	ives	DUT objectives	DUT activities
	Greening national budgets and sending the right price signals	SO1.2 Target R&I efforts to actual needs (challenge- driven) of cities and municipalities	AlignmentofR&Iprogrammesandmobilisationofnationalfundsforjointactions,strengtheningnationalcapacitiestowardssustainableurbandevelopment;nationalcoordinationto strengthendisseminationand uptake insectoral policymaking
	Mobilising research and fostering innovation	SO2.2 Strengthen trans- and interdisciplinary R&I to achieve integrated pathways SO2.3 Address critical issues and interdependencies across domains, sectors and interests	Shaping and strengthening R&I for urban transformation, connecting national and transnational / international levels, implementing a challenge- driven R&I programme
	Activating education and training	SO3.1 Make research and innovation results widely available for urban authorities, municipalities, business, local initiatives	Mobilising all stakeholder groups and supporting capacity building through different formats – e.g. stakeholder dialogues, training modules, seminars, webinars, synthesis
	A green oath: 'do no harm'	SO1.1 Foster co- design of approaches and solutions with all stakeholder groups SO1.3 Mobilise city authorities, business, societal actors, and researchers for urban R&I	Co-design of transition pathways with all stakeholders, including citizen participation; fostering urban living labs as formats for experimentation and co-creation
THE EU AS A GLOBAL LEADER		SO3.2 Unleash the full potential of the urban dimension in the ERA	International outreach to position DUT as the European hub for urban transitions and establish international cooperation



TIME TO ACTSO3.1MakeShapeaninnovation- TOGETHER:researchandecosystemtocreateA EUROPEANinnovationresultsevidence for policy making,CLIMATEwidely available forprovide results and evidencePACTurbanauthorities,for decision makers to act,business,localR&I programme to address	Green Deal objectives	DUT objectives	DUT activities
initiatives challenges of cities and citizens	TIME TO ACT - TOGETHER: A EUROPEAN CLIMATE PACT	SO3.1 Make research and innovation results widely available for urban authorities, municipalities, business, local initiatives	Shape an innovation ecosystem to create evidence for policy making, provide results and evidence for decision makers to act, design a challenge driven R&I programme to address challenges of cities and citizens



Annex 3: The COVID-19 pandemic and its implications for urban transitions

Starting in early 2020, Covid-19 changed the world in previously unimaginable ways when the worst pandemic outbreak since the Spanish flu in 1918 spread globally. Within days, measures to limit further outbreak and put a halt to infection chains resulted in new urban realities, where a high population density and frequency of physical and face-to-face interactions, what some might consider the essence of urban life, had to be limited, or even prevented at all. Urban life as it was known across Europe and the world was challenged at least, if not transformed almost overnight.

The pandemic was (and in the time of writing this chapter, still is) a stress test for urban societies. It highlights the weaknesses and vulnerabilities of how urban areas are currently designed, managed and developed, e.g., accessibility of safe and quality public space, decentralized urban services and functions fulfilling the daily needs of the population and the (de-)localization of (food-)production and manufacturing, just to name a few.

Local public administrations were confronted with the immense task to implement national protective measures, readapting urban space and infrastructures for safe use by the public.

Therefore, changes and (temporary) transformations of urban areas, which might have taken years before, were introduced almost over-night. Examples include expanded bike lanes in Bogotá⁴³, car-free zones in London⁴⁴ and adaptations in Bucharest to allow safe movement and exercising⁴⁵.

Besides the dramatic speed of change of urban life, the pandemic caused and amplified multiple crises including health, economic, socio-economic, political, biodiversity etc. of which many are interlinked. These amounted to a number of crises that added vulnerability to the already increasingly turbulent Anthropocene.

The long-term effects and trends triggered by are still evolving and can only be adumbrated at the time of writing this section (February 2021). However, effects and societal transformations can be observed which are expected to change urban areas and urban life in the long(er) term. Expected trends include the widened acceptance of remote working where possible, thus generating changes in commuting and housing patterns as well as zoning regulations, enhanced sensibility for high quality public spaces in neighbourhood vicinities, dramatically lowering rates of urban tourism, just to name a few. Regarding sustainable urbanisation, commentators stated that they expect a shift from high-technology driven smart city concept of large corporations towards a sensibility to make a meaningful change in the communities "whether that's using technology, whether that's reinventing processes."⁴⁶ The effects of Covid-19 onto urban societies created an awareness of eco-dependency and inclusivity. It will take years until the trends unfold and manifest in urban space fully – recognising the shifts and transformations and shaping the processes along principles of sustainability and liveability is key for urban futures.

Rebuilding from Covid-19: a chance to do things differently

The Covid-19 pandemic results in multiple, interlinked disruptive crises. Efforts for rebuilding from "the great reset"⁴⁷ provide a once-in-a-generation chance⁴⁸ to accelerate transitions towards sustainable and liveable urban

⁴⁴ Mayor of London (2020) Car-free zones in London as Congestion Charge and ULEZ reinstated. https://www.london.gov.uk/pressreleases/mayoral/car-free-zones-in-london-as-cc-and-ulez-reinstated?fbclid=lwAR1KMgV595zKuBnlPbt-IZKYQPMB5HnfY-E1_ZjcHrim1Nx1SjifR15glRM.

⁴⁷ Schwab, K., & Malleret, T. (2020) COVID-19 : The Great Reset. Cologny/Geneva Switzerland: World Economic Forum.

⁴⁸ Mazzucato, M. (2020, December 28). Covid exposes capitalism's flaws. Financial Times. https://www.ft.com/content/9e7b2630-2f67-4923-aa76-of240a80a9b3. Retrieved: 3rd of March 2021.

⁴³ Wray, S. (2020) Bogotá expands bike lanes to curb coronavirus spread. *SmartCitiesWorld*.

https://www.smartcitiesworld.net/news/news/bogota-expands-bike-lanes-overnight-to-curb-coronavirus-spread-5127

⁴⁵ Romania-Insider Newsroom (2020) Several streets in downtown Bucharest will be closed to cars on weekends. *Romania Insider*. https://www.romania-insider.com/downtown-bucharest-streets-closed-cars

⁴⁶ Mathis, S., & Kanik, A. (2021) Why you'll be hearing a lot less about 'smart cities'. *City Monitor*. <u>https://citymonitor.ai/government/why-youll-be-hearing-a-lot-less-about-smart-cities</u>. Retrieved: 3rd of March 2021.



futures by doing things differently, sorting out what urban practices seem reasonable to keep on doing and what to stop doing, sustainability is to be a priority, should be done very well without.

"The biggest opportunity for cities from this pandemic is to build back better with the planned fiscal stimulus: more climate resilient infrastructure, green initiatives such as increasing public spaces, creating vehicle free streets, making bike lanes, refurbishing buildings to multiple uses and thereby doing more with less. (...) The COVID-19 crisis inclusive and sustainable cities. We cannot afford to squander away this opportunity."

"We cannot go back to business as usual. Cities and communities are demanding that those in authority take the opportunity to build back better. To emerge stronger, we need a sustainable, inclusive and green recovery for people and the planet. That means dealing with the existing challenges of how cities are planned, managed and financed, and ensuring their development is compatible with the goal of net zero emissions by 2050."50

The pandemic has been causing a multiplicity of crises. It required local, national and subnational governments to step in and thus, change the game. Governments have the opportunity to go beyond the "simple" solution of fixing markets, but shaping and creating markets that contribute to sustainable and inclusive growth.⁵¹

Global urbanisation and the transmission of zoonotic diseases

Scientists have been warning about the likeliness of the outbreak of a global pandemic for years⁵² which urged former US President Barack Obama to warn about the risks of a deadly, air-borne disease spreading the earth in a speech in 2014.⁵³ Three quarters of new human diseases started in animals before spilling over to humankind⁵⁴. Global urbanisation has created conditions which support the transmission of zoonotic diseases.⁵⁵ With multiple new viral threats over the last 20 years, such as Ebola, Swine Flu, SARS and MERS, Covid-19 will not be the last pandemic.⁵⁶ Urbanisation and expansion into ecosystems bear great risks for initial transmission of zoonotic diseases. The way how urban areas are expanding and land is converted globally, how human and non-human processes are in, or out of balance, matter greatly in building robust societies and prevent disruptive pandemic shocks. Transitioning urban areas towards sustainability can contribute to preventing spill over of zoonotic diseases and thus, minimise the risk of future pandemics.

Driving Urban Transitions' contribution to urban robustness

In the current moment of the Covid-19 pandemic and in the future, it is crucial to support the transformation of urban areas towards sustainable and liveable futures. The global pandemic changed the priorities and highlighted the vulnerabilities and weaknesses in (urban) systems. The trends and consequential crises for urban

 ⁴⁹ Joshi-Ghani, A. (2020 November 20) How COVID-19 will impact our cities in the long term. World Economic Forum.
 https://www.weforum.org/agenda/2020/11/what-will-our-cities-look-like-after-covid-19/ Retrieved: 28th of February 2021.
 ⁵⁰ UN-Habitat (2020:iii) World Cities Report 2020.

⁵¹Mazzucato, M. (2020, March 9). The COVID-19 crisis is a chance to do capitalism differently. The Guardian.

https://www.theguardian.com/commentisfree/2020/mar/18/the-covid-19-crisis-is-a-chance-to-do-capitalism-different. Retrieved: 17th of February 2021.

⁵² Global Preparedness Monitoring Board (2019) A World At Risk.

https://apps.who.int/gpmb/assets/annual_report/GPMB_Annual_Report_English.pdf . Retrieved: 26th of February 2021.

⁵³Now This (2020) Obama Warned The U.S. To Prepare For A Pandemic Back In 2014.

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⁵⁴ Keim, B. (2020) A memo from the year 2050. https://www.anthropocenemagazine.org/2020/08/a-memo-from-the-year-2050/. Retrieved: 25th of February 2021.

⁵⁵ Keil, R.; Kaika, M.; Mandler, T.; Tzaninis, Y. (2020) Global urbanization created the conditions for the current coronavirus pandemic. The Conversation. https://theconversation.com/global-urbanization-created-the-conditions-for-the-current-coronavirus-pandemic-137738. Retrieved: 3rd of March 2021

⁵⁶ Sou-Jie Brunnersum, M. (2020) COVID-19 will not be last pandemic: WHO. Deutsche Welle. https://www.dw.com/en/covid-19-will-notbe-last-pandemic-who/a-56065483. Retrieved: 26th of February 2021



areas led to as shift in priorities and an increased understanding that urban transitions pathways should sustainable and robust futures.

In the development process of the Driving Urban Transitions' partnership, the new or changed need for urban research and innovation resulting from the pandemic have been discussed with a wide range of urban stakeholders. Hence, the trends, requirements and needs for research and innovation and the vulnerabilities and weaknesses which came to a fore due to the pandemic have been respected in the co-design process.

Driving Urban Transitions aims to co-create approaches to 'build back better' and address emerging trends and dilemmas caused by the growing set of crises in the Anthropocene and the particular articulation of it through the Covid-19 pandemic. Thematic key areas across all of the DUT partnership pillars are designed to create robust urban areas which are resilient against shocks, yet flexible to adapt to immediate emergencies, crises and catastrophes caused by pandemics, effects of climate change, economic disruptions, insufficient biodiversity, etc. Securing robustness and resilience, understood in the wide sense, does not come without dilemmas. Dilemmas which DUT is addressing in its programme.



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