TRANS-URBAN-EU-CHINA

Transition towards urban sustainability through socially integrative cities in the EU and in China

Deliverable

D 2.3 Set of practical tools and mechanisms tested and validated in the Living Labs for the development of sustainable cities, integrative planning and implementation

WP 2 Bridging the planning-implementation gap in eco- and smart cities

Deliverable type: Report

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No. 770141. The material reflects only the authors' views and the European Union is not liable for any use that may be made of the information contained therein.

WP number and title:	WP 2: Bridging the planning-implementation gap in eco- and smart cities
Dissemination level:	Public
Due date:	Month 34 – 31 January 2021
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EXECUTIVE SUMMARY

In the past decades cities in Europe and in in China went through considerable – albeit different - processes of transformation, encompassing specific social and economic dynamics and producing significant spatial and environmental imprints and effects. While most European cities experience moderate levels of urban growth and are focused on the processes of urban renewal and innovation, the urban development in China advances at a high speed, intensity and scale. The development of Smart and Eco city is one approach in China and Europe to steering urban development and make cities socially integrative.

In China as well as Europe there exists several gaps when putting Smart and Eco City planning into implementation. This is a challenge for both. This report outlines tools and mechanisms to narrow planning and implementation gaps in smart and eco city development in China and Europe. It identifies and describes ten tools and mechanisms and provides validated concrete examples for implementation from city case studies in China and Europe.

1. Aligned funding structure and financing mechanisms
2. Multi-actor governance
3. Citizen participation and actor involvement
4. Living lab approach
5. Capacity development
6. Agile project management
7. Monitoring and evaluation
8. Awareness raising
9. Setting up replication mechanism
10. Digital planning tool

Furthermore, a validation tool for the upscaling and replication of smart city solutions developed for the European context is tested for its applicability in the context of Chinese Smart and Ecocity projects.

As an outlook and recommendation, transformative capacities need to be build and participatory transformative learning needs to be stimulated in the future to maximise the potential of the identified tools and mechanisms for the use of cities.

1 INTRODUCTION

1.1 INTRODUCTION AND AIM

For a common understanding of socially integrative cities, twelve characteristics based on UN-HABITAT 2013 and United Nations 2017 were identified and grouped into five topics: collaborative urban planning and design, urban environment and living conditions, the local economy and labour market, socio-cultural development and social capital, and institutional development and urban finance. This definition is the common base for further research.

In this context a **socially integrative city** is defined as socially mixed, cohesive, liveable and vibrant communities. Compactness, functional mix, and intra-urban connectivity play an important role. Environmental quality, the quality of public spaces and the quality of life contribute to the well-being of the population. Strengthening a sense of community and fostering a sense of place as well as preserving cultural heritage shape the city's in- and outward-bound image. Investments into neighbourhood improvement, service delivery, infrastructure and the quality of housing are important supportive measures. Empowerment and participation of the population, as well as social capital, are indispensable. More details about the characteristics are outlined in Deliverable D 6.6 (Müller et al. 2019).

The aim of this report is to **identify and validate practical tools and mechanisms** for the development of sustainable cities, integrative planning and implementation which aim at closing the gap between strategic development and implementation, while supporting the development of socially integrative cities.
Our hypothesis is that the fact whether urban transition emerges or accelerates to close the planning-implementation gap, depends to some extent on the urban transformative capacity as a prerequisite for long-term transformative change (Meyer et al. 2021).
Wolfram et al. (2019) indicated that further research is needed to obtain complementary insights into how such multi-agency and co-production processes emerge and unfold in different global contexts, urban domains, and places. This research addresses Wolframs call for empirical research and the identification of activities, **tools and mechanisms** that build transformative capacities (Meyer et al. 2021).

The preliminary categories of tools and mechanisms identified in Report D2.1 were the basis and have been supported to some extent by case study data where information has been accessible and available to date. However, the toolbox concept as well as the categories of tools and mechanisms has been further discussed and elaborated in the context of the overall project and the living labs in China.

1.2 STRUCTURE OF THE REPORT

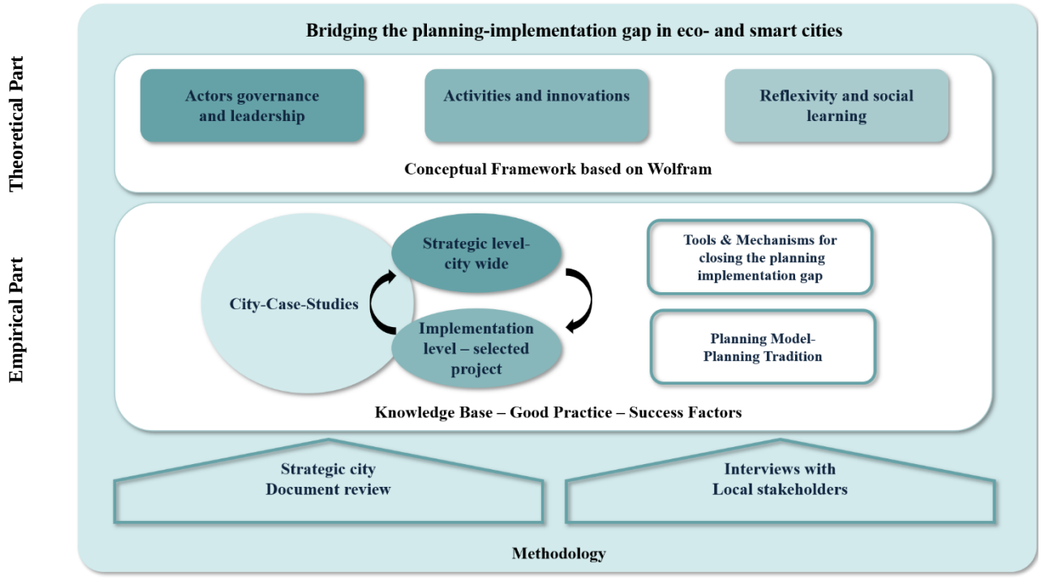
This report consists of four main sections

- Methodology section describing the approach, conceptual framing and the logic behind the initial concept for the tools and mechanisms,
- Section on the tools and mechanisms,
- Section on the validation process of the tools and mechanisms and
- Concluding sections with an outlook.

2 METHODOLOGICAL APPROACH

To close the planning-implementation gap of socially integrative cities a range of methodologies was selected and applied to gather empirical information on activities, tools and mechanisms that build transformative capacities in Eco-and Smart Cities. The methodological approach consists of two part: scientific literature review and an empirical part (case studies) (see Figure 1).

Figure 1: Theoretical and empirical base of the practical tools and mechanisms for the development of sustainable cities, integrative planning and implementation.



2.1 FRAMEWORK TO MEASURE TRANSFORMATIVE CAPACITIES OF CITIES TO ADDRESS THE PLANNING-IMPLEMENTATION GAP

To measure transformative capacities of cities and identify transition pathways to address the planning-implementation gap, the concept of Wolfram (2016) (see Section 2.2) has been applied and contextualised in the context of smart and eco city development in China and Europe. We have followed the methodological approach of Ziervogel at al. (2016) and applied the transformative capacity framework with the aim identify and map innovative activities and tools towards the dimensions and key components and aspects. The identification of activities should support the detection of transition pathways to close the planning-implementation gap in smart cities (Neumann et al. 2019). Based on the three dimensions and the key components, key aspects have been derived to identify activities that build transformative capacity to narrow the planning implementation gap.

A framework has been developed to identify activities transformative capacities for change in strategic planning, neighbourhood planning and implementation to close the planning implementation gap in Smart Cities. Based on the three dimensions and the key components, key aspects (Neumann et al. 2019) have been derived to measure transformative capacity in the context of narrowing the planning implementation gap in China and Europe (Table 1). In an exemplified manner, the development of the key aspects will be illustrated. Transformative Leadership as a component of 'Agency and interaction forms' has been put into the context of Chinese and European smart city development.

The following aspects and activities have been identified to be covered in the city case studies:

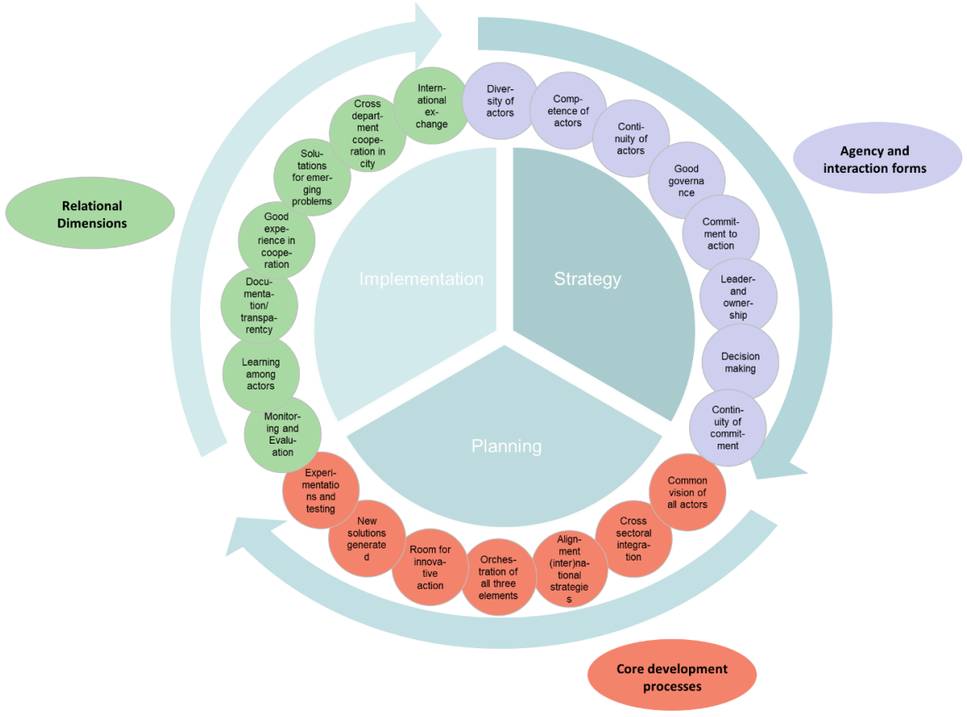
- What were involved key actors in the smart city planning and implementation process? Who has taken leadership and ownership for smart city strategy making, planning and implementation?
- What has been the personal and functional competences of key actors?
- How has decision making for strategy, planning and implementation taken place and how transparent was the process?

Table 1: Operationalisation of transformative capacity for identifying transition pathways to close the planning-implementation gap in China and Europe.

Agency and interaction forms
Inclusive and multiform urban governance • Diversity of actors involved, resources of actors to become active and benefits of actor • governance structure, involved bodies and strategic alignment • Continuity of active actors across multi-level governance/bodies • Commitment for action and decision
Transformative Leadership • key actors, leadership and ownership • Personal and functional competences of key actors • Decision making and transparency of decisions
Empowered and autonomous communities of practice • Continuity of commitment towards implementation by actors/community involved
Core development processes
System(s) awareness and memory • Cross sectoral integration in Strategy/Planning/Implementation
Urban sustainability and foresight • Common vision of all actors at the beginning of the strategy process or the strategy itself as a reaction to existing problems/symptoms • Alignment and orchestration of vision, strategies, planning and implementation • Alignment of strategy with national and international strategies
Diverse community-based experimentation with disruptive solutions • Opportunities for experimentations and testing • New solutions generated in the implementation phase
Innovation embedding and coupling • Innovative action and its embeddedness in strategy/planning/implementation
Relational Dimensions
Reflexivity and social learning • Evaluation and Monitoring from strategy to implementation • Learnings (positive and negative) among the active actors, integration of learnings in future processes/activities • Information/Documentation of processes from strategy to implementation (transparency and process-oriented)
Working across agency levels • Experience/history of already existing cooperation • Solutions for emerging problems/conflicts through cross-sectoral activities
Working across political-administrative levels and geographical scales • City/actors experience and exchange of know-how at national and/or international level • Working across various departments in the city administration

At this stage, it has been assumed that all identified key aspects are relevant along the entire policy cycle for integrative planning spanning from (1) urban strategic planning, (2) neighbourhood planning, and (3) implementation (Figure 2). In order to generate empirical evidence on innovative activities and tools to build transformative capacities, interview guidelines for city case studies have been developed based on the key aspects.

Figure 2: Analytical framework to assess transformative capacities in smart cities



2.2 CASE STUDY APPROACH

The case study approach includes the identification and sampling of cities for case studies in China and Europe and the implementation of the case studies. The selection approach for city cases considers successfully funded smart innovation and implementation projects in China and Europe. All these projects aiming towards the implementation of city strategies in an innovative way. These projects successfully passed a project selection procedure (Meyer et al. 2021), which was based on different criteria like the planning family for European cities or the city cluster for Chinese cities, the urban population and the number of smart city projects. Further details about the methodology can be found in the report D2.1. An overview of the selected European and Chinese cities is shown in (Table 3). These cities have been selected to conduct empirical case studies to identify innovative activities, tools and mechanisms to close the planning implementation gap in Smart and Eco cities.

Table 2: Overview of city sample for European case studies

City	Planning Family	City Population	Projects
Amsterdam	Napoleonic	500.001 -1 Mio.	3
Budapest	Eastern	> 1 Mio.	2
London	Anglo	> 1 Mio.	9
Madrid	Napoleonic	> 1 Mio.	8
Rijeka	Eastern	100.001-250.000	2
Santander	Napoleonic	100.001-250.000	3
Stockholm	Scan	500.001 -1 Mio.	3
Vienna	Germanic	> 1 Mio.	4

Table 3: Overview of city sample for Chinese case studies

City	City Cluster	Urban district population	Projects
Shanghai	Yangtze River Delta	20 Mio. - 30 Mio.	*11*
Chongqing	Chengdu-Chongqing	20 Mio. - 30 Mio.	16
Beijing	Beijing-Tianjin-Hebei	20 Mio. - 30 Mio.	16
Wuhan	Middle-Yangtze River	5 Mio. - 10 Mio.	9
Dalian	Harbin-Changchun city cluster	2.5 Mio. - 5 Mio.	11
Suzhou	Yangtze River Delta	2.5 Mio. - 5 Mio.	19
Shenzhen	Pearl River Delta	10 Mio. - 20 Mio.	6
Tianjin	Beijing-Tianjin-Hebei	10 Mio. - 20 Mio	12

City case studies have been conducted to gather empirical information from a variety of stakeholders involved in the individual city cases. The city case studies included:

- Scientific literature research on tools and mechanisms
- Desktop research on strategic and planning documents and potential implementation areas, this included also research reports, policy documents, strategic plans and other grey literature obtained online.
- Development of a guiding questions related to each key aspect of the analytical framework to be followed during the empirical data collection for each city case study,
- interviews with selected stakeholders from the strategy, planning and implementation phase and
- analysis of empirical data and development of a city case study according to a template oriented towards the analysis framework.

Eight case studies in Europe and China have been aimed for. Two case studies could not be realised in Europe (Amsterdam, Rijeka). The main reasons for not realising the case studies are no access to or response of adequate interview partners, interview partner rejected interview due to limited English language capabilities and limited information on city strategy/implementation in English language available.

The research outcomes available to date grant insights into achievements and shortcomings concerning available tools in the context of sustainable urban development, integrative planning and implementation on the city level as well as implementation in specific local projects. The individual case studies display different and diverse development tendencies and attributes, specific to the local planning and development context.

2.3 COMBINATION FROM CASE STUDY & LITERATURE

With a focus on the research, to close the planning implementation gap in socially integrative cities, the following key findings from the literature search can be clustered in the following 10 categories:

Figure 3: Research framework

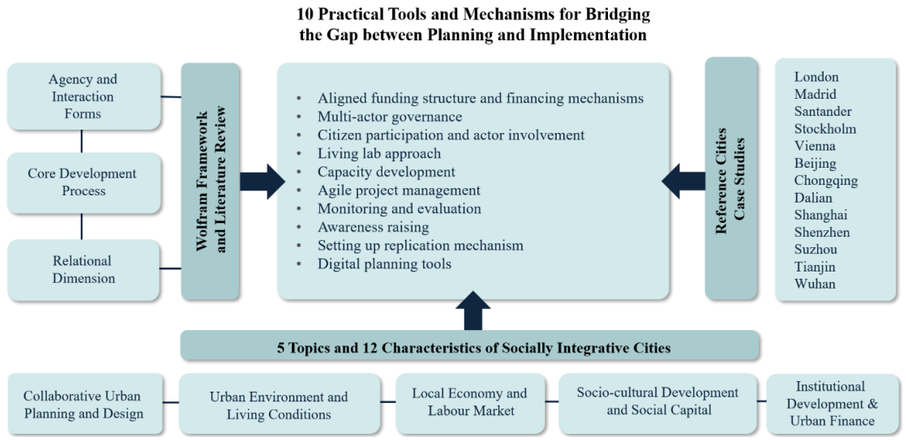
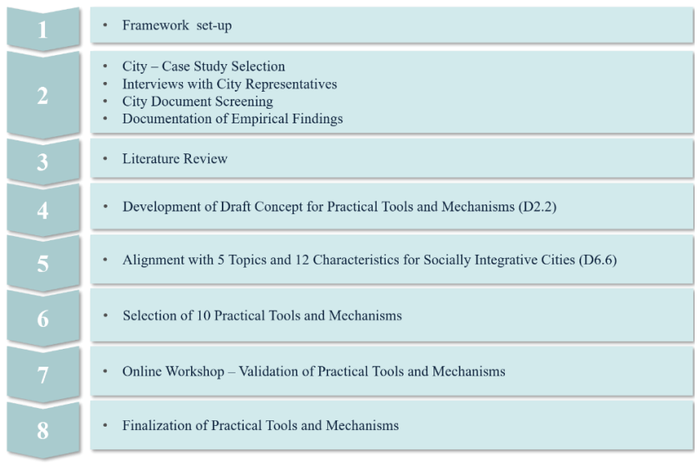


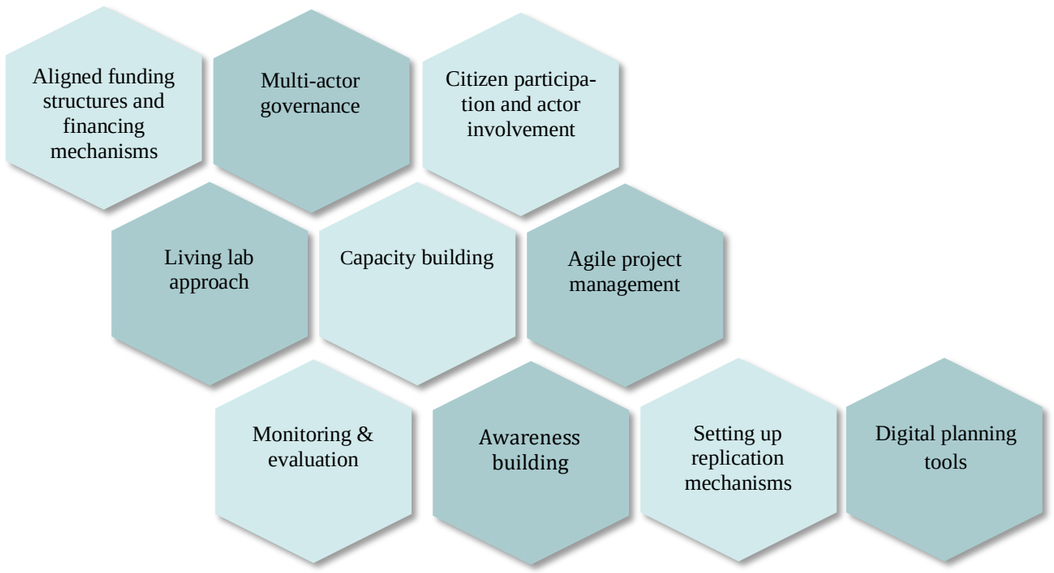
Figure 4: Methodology



3 SET OF TOOLS AND MECHANISMS FOR BRIDGING THE GAP BETWEEN SMART CITY STRATEGIES AND SMART CITY IMPLEMENTATION

The tools and mechanisms described here haven been identified in the scientific literature fall into two overarching categories. First, tools for closing the gap between urban planning and project implementation and second, tools related to closing the gap between projects that experiment with socially integrative urban development practices and the replication and upscaling of those practices beyond single projects.

Figure 5: Overview of the tools and mechanisms



In the given context, it is important to note that the gap between strategic planning and implementation should be understood within the frame of the locally differentiated and specific contexts. Strategic Smart City planning is – in urban development terms- a relatively recent phenomenon, which gained momentum within past 10 years. Thus, related implementation projects naturally require time in order to bring the strategic aims to the ground. Furthermore, in some cases (e.g. Vienna, Stockholm) city-wide strategic development was already informed by the exemplary approaches and outcomes of implementation projects, which pioneered and opened-up the path for sustainable, integrative, socially inclusive and smart urban development, before city-wide Smart City Strategy was set-up and finalised (e.g. Aspern Seestadt in Vienna, Hammarby in Stockholm, etc). The set of tools and mechanisms compiled in this report have been successfully applied in a range of European and Chinese cities, exemplifying their potentials for closing of planning and implementation gap.

Each tool in this report is presented individually. First, the characteristics of the tool are described, highlighting their innovative character. This is supported through illustrative examples that represent best practice cases of the application of the tool. To this end, case examples are drawn from the Chinese as well as the European experiences and demonstrate the context specific interpretation and application of the tools. It was not within the scope of the deliverable to systematically compare these different applications. Rather, they should serve as inspiration to interested readers who want to find out more about the practical application of the tools in the Chinese and European context.

Importantly, not all tools were validated through an expert online workshop with the aim of reflecting on commonalties and differences in using these tools in China and Europe. While the validated tools are described in more detail in Chapter 4, this Chapter outlines their key characteristics.

In order to move from theory to implementation, it is helpful, especially for practices, to see what concrete actions are behind the categories. Therefore the **Fehler! Ungültiger Eigenverweis auf Textmarke.** provides an overview of tools which are used in the case study areas to develop more socially integrative cites. In this context its necessary to mention that within the scope of the project, only individual large-scale projects such as the "Royal Seaport" in Stockholm, the "Seestadt Aspern" in Vienna, the project area of Smarter Together called "Simmering" were analysed in detail. But of course, cities plan and implement more projects than those analysed, so this report doesn't present a complete picture of the tools and mechanisms that are used in the each of the cities. Rather, good practice examples on the application of the different tools and mechanisms are provided to stimulate the exchange of experience and foster mutual learning.

Table 4 provides an overview of all the tools described in this deliverable, briefly summarises them and highlights which case study they relate to.

3.1 OVERVIEW OF PRACTICAL TOOLS AND MECHANISMS

Multi-actor and community base Governance

Hudson et al (2019) identified inadequate collaborative policymaking as an important, broad factor in implementation difficulties. Even when decisions have far-reaching impacts, policymaking typically takes place in separate administrative "silos." Therefore, the authors emphasize that there needs to be a shift to a more integrated policy design with a vertically and horizontally aligned process of collaboration and joint deliberation rather than a series of separate and distinct phases. In this context, new key elements in strategic planning are becoming increasingly important, such as selectivity, dialogue, diversity, networking, contextuality, creating a vision and framework, mobilization, institution building, and action orientation.

Researchers like McFarlane and Söderström (2017) also mention a stronger use of cooperative working methods is important because in current smart governance practices the broad political commitment and expression of opinion is weak and the need of ordinary people receive little attention.

The implementation gap and to improve access to organizational aspects is theoretically well known. Another key point despite the cooperative working depends on how the actors implement their ideas in the plan. According to Nebojša et al. (2018) the implementation of the plan should include answers to the questions: How should something be done; who it should do; when it should be completed; what means should be used to do it; and so on. Spatial plans can support the implementation models but in practice the willingness of the municipality to implement planning objectives and policies are essential.

Schauber (2003) sees the planning and implementation deficit less in a scientific-technical kind but a sociological kind. Ignorance, reservations about new things and changes, lack of motivation, misunderstandings, communication problems between the actors and financial reasons as the cause of the planning and implementation deficits. She proposes that soft instruments will gain in importance in the future, such as new forms of cooperation and communication, qualification measures, municipal self-commitments, more flexible forms of administration, etc. *"In current administrative practice, cooperation is often unwelcome or difficult to integrate into administrative structures and processes. The dominant administrative structures or hierarchies are not designed for this."*

Citizen involvement

Collaboration does not only mean a horizontal process with involving different administrative departments, it is also a vertical process. In which local actors such as end users, frontline staff and a range of local service agencies are involved Hudson et al (2019).

The participatory planning processes should increase urban qualities and the effectiveness of planning proposals and create new perspectives that are usually not considered within the formal planning process. Through involvement of stakeholders. Sustainable developments must make use of this and involve participatory approaches for urban planning to organize and manage the continuous demand for efficient stocks and flows to regard the needs of future generations (Laws et al., 2004).

Living lab approach

Urban living labs are *"both an arena (…) and an approach for intentional collaborative experimentation of researchers, citizens, companies and local governments."* (Mc Cormick & Hartmann, 2017). In recent years, Urban Living Labs have been developed in many European cities to experiment with new technological and non-technological solutions and to drive the transition towards sustainable urban development.

Capacity building

Williams (2012) raised the question of whether policymakers are equipped with the requisite skills, competencies, capacities, and capabilities to address such systemic flaws and succeed in such an endeavor is another matter. Hudson et al. (2019) also identifies policy preparation as a key reason for a planning implementation gap. The causes of faulty policy design are diverse: a poor understanding of the problem; insufficient knowledge of the implementation context; unclear and even contradictory goals; poor quality evidence; and an absence of political backing.

Traditional planning tools need to be replaced by a new type of strategic planning in which one part is networking, mobilizing and institution-building. Informal arenas have the advantage that they bring together new people, new networks and new ideas. Reciprocal trust and understanding may provide an acceptable platform for stakeholders to discuss problems and to reflect on ways out of their problems. In this way, the power of dominant discourses may be challenged. *"Only when the issue at stake surpasses the capacity of the individual cities and a win–win situation can be provided, may cities be willing to consider delegating parts of their competence to another authority."* (Albrechts 2001: 743)

Another reason for an implantation gap is often missing skills in using (new) tools. An example for this is planning support systems. Planning organization often tend not to use them because they did not have knowledge and therefore feared the unpredictable and risky consequences in financial or organizational context (cf. Jiang et al. 2019).

Agile project management

Schauber (2003) proposes in her thesis that more flexible forms of administration will gain on importance in the future. "*In current administrative practice, cooperation is often unwelcome or difficult to integrate into administrative structures and processes. The dominant administrative structures or hierarchies are not designed for this. There is a lack of so-called "bridgeheads", "switching points" or contact persons in the administration who are competent and authorised to make decisions."* For Kunze et al (2011) more flexible planning approaches are necessary.

Monitoring and Evaluierung

Stefanović et al. (2018) argue that implementation is not a process that starts only after a plan has been adopted and that the implementation of spatial plans is the least developed field of planning *"it is insufficiently theoretically explored, methodologically unpositioned and in practice only partially carried out*". Allmendinger says that even if a plan is well

done, its **implementation is a constantly moving goal.** In this context, the understanding of monitoring as merely monitoring the degree of achievement of final planning decisions has lost its original meaning and shifted to an impact monitoring and implementation control, which regularly checks whether the planned goals are achieved with the measures set and whether the planning goals are still valid.

Awareness Building

Smart City is often seen only from a technical point of view, but there is much more to it than that, such as management and politics (cf. Jiang et al. 2019) therefore it isn't enough to take advantages of digital services, it's also important to build awareness that more elements must consider for a transformation. This also confirms the statement of Nebojša et al. (2018), who say that *"In the end, implementation depends on the willingness of the community*".

Technical Tools (digital planning tools)

Due to the increasing complexity of processes and outcomes of planning problems (cf. Rittel and Webber 1973), digital services can be used to better deal with this complexity. For example, planning support systems (PSS) can assist governance processes with correct design, development and use of the spatial constellation of a city or rural area and the increasing involvement of participants and stakeholders in their decision-making processes.

The smart city approach aims to take advantage of digital services, which involves not only the use of digital technologies but also a "new governance" (cf. Jiang et al. 2019). The literature on PSS (PSS) identifies the main causes for discrepancy between supply and demand of planning support tools in: The discrepancy of using exist because of the quality of the tools. They are often poorly funded, largely academic PSS that don't meet the needs of end users or whose added value is not apparent to practitioners (cf. Vonk and Geertman 2008). The lack of usability of the tools is another reason, and users fear the unpredictable and risky consequences (financial or organizational). By practitioners, many PSS are seen as black boxes where the variables underlying the model are not transparent to the user (cf. Te Bröommelstroet et al. 2014). The literature on planning support systems (PSS) identifies the **discrepancy between supply and demand of planning support tools** as the main cause of this phenomenon of underutilization (cf. Vonk et al. 2005; Te Brömmelströtn 2010a). The reasons why applications are not used lie with both potential users and developers. Planning practitioners are usually unfamiliar with the tools or, if familiar, quite inexperienced in their use and the potential of the tools is not recognized, resulting in low usage. Developers of planning support tools are hardly aware of the need in practice. As a result, developers produce planning tools based on abstract, impractical ideas - rather than on a clear, shared understanding of the needs and requirements of specific planning contexts. On the other hand, planners often have unrealistic expectations of what the tool-offer can do, and the inevitable disappointment with the support offered leads to antagonistic attitudes toward new knowledge technologies (cf. Meadows and Robinsons, 2002; Te Brömmelstroet, 2010b; Vonk et al., 2005). Bringing these two worlds together could help close the implementation gap and solve some of the most pressing dilemmas.

In order to move from theory to implementation, it is helpful, especially for practices, to see what concrete actions are behind the categories. Therefore the **Fehler! Ungültiger Eigenverweis auf Textmarke.** provides an overview of tools which are used in the case study areas to develop more socially integrative cites. In this context its necessary to mention that within the scope of the project, only individual large-scale projects such as the "Royal Seaport" in Stockholm, the "Seestadt Aspern" in Vienna, the project area of Smarter Together called "Simmering" were analysed in detail. But of course, cities plan and implement more projects than those analysed, so this report doesn't present a complete picture of the tools and mechanisms that are used in the each of the cities. Rather, good practice examples on the application of the different tools and mechanisms are provided to stimulate the exchange of experience and foster mutual learning.

Table 4: Overview tools and mechanisms to bridging the planning implementation gap

Tools and Mechanisms									
Aligned funding structure and financing mechanism	**Multi-actor governance**	**Citizen participation**	**Living Lab approach**	**Capacity development**	**Agile project management**	**Monitoring & evaluation**	**Awareness raising**	**Setting up replication mechanism**	**Digital planning tools**
Smart City Investment fund Funding for refurbishment of social housing Covernment-Bank cooperation for business district projects Special funding for Sponge City Projects Special funding for information infrastructure	Coordination of smart city activities between GLA Thematic working groups/ civil contracts as well as feedback loops Task decomposition approach for Sponge City pilot construction: from planning, implementation to institution Experts discussions to formulate a smart community construction plan; Involvement of Governments in pilot programs Combination of municipal urban renewal project and affordable housing project Thematic working groups for Eco-city construction Responsibility decomposition approach for short-term construction projects	Involvement of citizens throught "Reunions" (round tables). Multidisciplinary teams develop places and neidhborhoods Identifying ideas and needs of the citizens with (brainstorming) meetings Citizen Involvement through public display and online information campaign Citizen engagement throught events; exhibitions; questionnaires Participactory planning with professionals, residents, students, ... Establishment of Eco-city Green Industry Alliance	Urba Laboratory for testing technolgy Citylab as a modular, interdisciplinary dialogue platform to develop solutions Different stakeholders work together on public problems through an open working platform Mirco-center approach to provide resident-centered services in the neighborhood	Capacity Development Program with seminars/ forum etc. "3Yan" Application Innovation Park (AIP) to build a user-centered application innovation platform Building a comprehensive energy service platform (services for citizens) for an sustainable development Strengthening the management of the city through a common smart city construction project database and the use of technical aspects for standard specification and system integration	To monitor the progress in a transparent way the city uses a kanban board Agile communication with the different stakeholders and partners through digital tools and an agile process with feedback loops	Regular internal reporting Strategic plan defined monitoring metric and principal responsibility and monitoring responsibility; Annual Stockholm Development Administration report Urban grid management to monitor and evaluate urban dynamics through involvement of citizens and professional collection services	Communication strategy for the city Neighborhood support through a volunteer service team	Ensuring through own work package SITEE replicability tool	Several digital platforms are used within London's smart city ecosystem Santander Smart City Platform CITYIF - Cloud platform for planning Intelligent-Twins for urban safety guarantee

3.2 DETAILED DESCRIPTION OF PRACTICAL TOOLS AND MECHANISMS

3.2.1 ALIGNED FUNDING STRUCTURE AND FINANCING MECHANISMS

A special focus is given to the **importance of funding mechanisms in supporting plan implementation** and, more importantly, to understanding the main sources of funding in current planning practice. The literature suggests that the availability of funding mechanisms influences **the implementation of spatial strategies integrated in strategic plans** (cf. Buček 2016; Legacy and Leshinsky,2016). Baarveld et al. (2015) advocates that funding mechanisms are often framed through **private interest groups during negotiations**. If funding mechanisms are often the result of negotiations made ahead of plan implementation, Buček (2016) considers funding as **a backbone of plan implementation processes**. The role of funding mechanisms in spatial policymaking and plan implementation has been increasing, mainly due to a scarcity **of financial resources available** as the **result of financial and economic turbulence and uncertainty** (ibid 2016; 1995).

EXAMPLES

In Europe, the first wave of smart city projects in a city is typically financed by research and innovation grants in combination with public and private co-funding. A typical example of this approach are the above-mentioned Smart City Lighthouse projects, which are financed by the European research framework Horizon 2020. As public money is always scarce, the second wave of smart city projects should be financed mainly by private investors. A good example for this approach is London, where a Smart City Investment Fund was set up in 2016 to finance smart city projects (Colclough 2016).

In China, government financial appropriations are in terms of funding sources the main source of funding in traditional project management modes. However, it can be evidently witnessed that social capitals (private money) account for an increasing proportion. At present, EPC (Engineer-Purchase-Construct mode) and PPP (Public-Private Partnership) represent the mainstream of project management modes in Smart City construction of China, accounting for nearly 80% of total, mainly adopted in infrastructure and engineering construction projects. GPPS (Government's Purchase Public Service) is an emerging mode adopted in the construction and operation of comprehensive information platforms, usually in fields of transportation, energy and transaction.

Beijing: Government-Bank cooperation for financial business district projects

The investment promotion of Lize Financial Business District makes full use of the advantages of its functional positioning. In 2009, with the support of the Beijing Municipal Development and Reform Commission, the Financial Work Bureau, and the Fengtai District Government, the Development and Construction Headquarters Office of Beijing Lize Financial Business District signed a total of 60 billion RMB "Government-Bank Strategic Cooperation" agreement with 12 banks (12 National banks Beijing branches including China Construction Bank, Bank of China, Agricultural Bank of China, Industrial and Commercial Bank of China, and Bank of Communications). Lize Business District is located in Fengtai district in south Beijing and positioned as an "important part of the overall layout of the capital's financial industry development, emerging financial functional areas and new financial development spaces“ and is responsible for the city-level "expanding and upgrading the capital's financial service functions and driving the industrial upgrading of the capital's southern city". It mainly gathers financial industry headquarters such as banks, insurance, securities, venture capital, private equity, funds and other emerging financial institutions, exchanges, financial futures markets and other financial factor markets. With Beijing government’s ability to mobilize resources as a guarantee for implementation, financial entities can participate in the entire life cycle of the Central Business District to deepen

the cooperation between the government and financial institutions and form a marketing effect on the Central Business District externally, further promoting resource gathering and the promotion of brand effect.

Shanghai: Project management mode of government franchised business

Take an example of **market-oriented utilization of data**, the Shanghai Data Exchange Center (SDEC, Corp.), established in 2016, is a mixed-ownership enterprise approved by the government. Different from other domestic data transaction centers that are either privately owned or dominated by state-owned assets, SDEC is jointly participated by state-owned and private-owned assets, including state-owned enterprises such as Shanghai Information Investment Co., Ltd., China Unicom and China Electronics, as well as private enterprises such as Jingzan Technology, Wind and Wanda Information. All interested members need to apply and review procedures to obtain member accounts. Data suppliers and demanders need to bear corresponding rights and obligations.

Shanghai: special funding for projects on information infrastructure construction

In Shanghai, the municipal Commission of Economy and Information Technology (CEIT) has set up **special funding for projects on information infrastructure construction**. The operating process includes: i) According to the relevant development plans of the municipal information industry and in combination with the annual work priorities, guidelines and notices for project application in related fields shall be compiled and released to the public; ii) Enterprises directly submit application materials to local governments; iii) CEIT conducts duplicate checks and credit inquiries, as well as organizes expert reviews. iv) The list of approved projects shall be publicized, and CEIT shall propose the yearly funding plans in relevant fields to the local financial department; v) CEIT formally approves relevant projects, make the funding arrangement plan and signs agreements with project undertakers, and meanwhile the municipal financial department completes the allocation of funding based on the request report from CEIT. vi) CEIT is responsible for supervising and inspecting the implementation of projects, and the financial department for inspecting rationality of expenditure of funding.

3.2.2 MULTI-ACTOR GOVERNANCE

Current practice of strategic spatial plan implementation reflects a shift from government, as a single actor, towards a **multi-actor governance** (cf. Gonçalves and Ferreira 2015; Opdam et al. 2015). The literature highlights that strategic spatial plan implementation involves various governance arrangements, such as cooperation across levels of government, coordination between public entities and private actors in decision-making, negotiations, citizen participation and actor involvement (cf. Albrechts et al. 2017; Legacy and Nouwelant van den 2015; Walsh 2012; Healey et al. 2006). Investigating governance arrangements in planning practice requires an in-depth understanding of the power configurations involved (cf. Houghton, 2011).

Types of governance -arrangements:

- cooperation across levels of government
- coordination between public entities and private actors in decision-making
- negotiations
    - preparing a set of realistic expectations and a range of possible outcomes
    - behaving with honesty and transparency
    - communicating openly all issues at stake; and
    - being willing to compromise and adapt to circumstances.

This tool focus on the first type of arrangement, the horizontal involvement of different planning departments and relevant stakeholders. The approach prepares the ground for an adequate and aligned translation of the strategies into specific implementation actions, measures and projects, by involving relevant **stakeholders and actors** early on in the process and thus, **ensuring commitment and ownership** of the collectively agreed aims. This mechanism also brings to light **conflicting interests and provides space for an early on debate,** mediation and joint development of potential solutions that accommodate a multitude of expectations. This is the actual integrative characteristic of the given mechanism. Although multi-actor and community-based governance **is not a mandatory instrument, it has proven successful** and effective due to an early involvement and consideration of interested and relevant groups of public and private actors, taking into consideration their capacity to implement new and sustainable solutions and plans.

The mechanism applied by a multitude of European cities that aims to establish well-functioning **public-private coalitions** and processes that attempt to reach effective and well aligned strategic planning.

Due to the high level of complexity that is inherent to the urban strategic planning and implementation processes, multi-actor and community-based governance has proven to be an effective mechanism, capable to address different levels of the complexity, provided it is well orchestrated, moderated and managed:

- establish **links between different public and private stakeholder and actor groups**, making sure that their interests and available capacities to plan, transfer knowledge and implement are considered at an early stage
- ensure an early on establishment of strategic relationships between the public and private interest groups that allows involved actors to navigate the implementation processes in a more aligned and transparent set of processes.
- ensure an adequate level of transparency in the development of strategic plans and their subsequent translation into specific implementation actions, measures, etc.
- Address possible inconsistencies and shortcomings in the delivery processes

EXAMPLES

Stockholm: Early involvement and commitment of various stakeholders for the Royal Seaport Development

In the process of developing Stockholm's Royal Seaport, the city has established **thematic working groups**. These consist of different representatives from the city administration as well as representatives from companies involved in the implementation. This format created space for exchange between representatives of the city administration and of the private sector and is an instrument that is widely and successfully applied in many European cities. This instrument ensures consistency and regularity in the implementation process of a particular development. It facilitates the alignment and timely exchange of information among all relevant and involved parties, while at the same time enabling the integration of public and private concerns.

In addition, so-called **civil contracts** are used as a legal instrument to ensure the implementation of the set strategic planning goals. To ensure that the targets are always kept in mind **feedback loops** between the appointees overseeing the overall strategy on the city level and experts from the thematic working groups are essential. Developer performance is monitored through the regular public goal achievement report. This tool helps establish early commitment to goal achievement and allows for simultaneous monitoring of the intervening implementation steps.

Source: http://www.stockholmroyalseaport.com/

Stockholm: Involvement of various stakeholder groups and collective definition of municipal programme

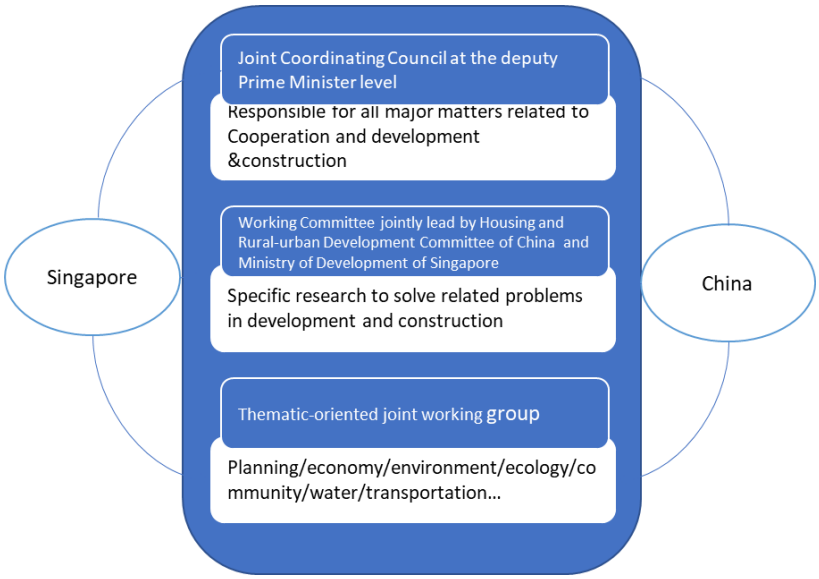
Stockholm has a long history regarding the continuity of active actors in a multi-level governance process for strategy, planning, implementation, replication and up-scaling. For the Stockholm Environment Programme (2016-2020) the city used a **multi-level governance** process for strategy, planning, implementation, replication and up-scaling. The programme encompasses six comprehensive environmental targets which were linked to informal instrument called **thematic groups**. Each of the six groups work through each target area in order to collectively define the programmes for each. Importantly, the group consists of **5-10 people from a very broad range of sectors and government levels** (e.g. different departments, businesses, interest groups, etc.). This shall ensure that different perspectives are heard that strategic relationships between key actors are built early in the process and that commitment is secured.

The responsibility for the main decisions about the specific elements of the program, however, lies with the city manager, who is leading the preparation. The city council approves the programme after a reviewing process. The different targets that are specified in the program have a **responsible administrative** board who is following up on the target. The “follow-up” of the sub-targets (and the indicators) is reported every four months, which is important for tracking progress. There is also an annual report about progress in reaching the sub-targets, which is prepared by the departments for the city hall.

Urban development in China is characterized by its top-down features. However, the tool “multi-actor and community-based governance” has been one of the most efficient and extensive tools for China’s Smart City construction. What makes a difference is that this tool has been endowed with brand new context under the background of China’s rapid urbanization. Generally, it is often used in **overall planning and construction activities at community level** (i.e., city complexes, new communities, and industrial parks). Through community-level projects in Smart City construction, various actors including policy makers, enterprises, universities, research institutions and the public can be mobilized to get involved and act in good alignment and orchestration. Also, the efficiency can be guaranteed by top-level design and intensive communication. The advantage of this tools lies in that it can minimize the communication cost between various actors in a specific

short term, give consideration to the efficiency and consistency of planning and implementation from the beginning, and form a comprehensive brand effect through short-term large-scale mobilization of social capitals (and even policy resources in some circumstances), promoting its visibility and vitality.

Tianjin: Sino-Singapore coordinated thematic working groups for Eco-city construction



Chongqing：Task decomposition approach for Sponge City pilot construction: from planning, implementation to institution

Type	Content	Coordinating unit	Responsible unit	Support unit
Plan-making	Strategic/Master/Specialized plans, Key project consultation, etc	municipal bureau for urban planning	Administrative Committee for Liangjiang New Area	Municipal departments for: urban planning/ Parks/ Water resources/ Finance/ Weather/ Environment/ Science&Technology, Yubei District government Constituent units of the Coordinating group of Liangjiang New Area
Policy and technology	Technical application	Municipal and Rural Construction Commission	Administrative Committee for Liangjiang New Area	
	Technical standard		Municipal and Rural Construction Commission + Civil Administration Commission	
	Policy and institution	Civil Administration Commission	Administrative Committee for Liangjiang New Area	

Biyun: GreenCity International Community

The government of Jinqiao Town organize **experts** (leader of Pudong New Area Economic and Information Committee, Shanghai Institute of Computing Technology Internet of Things expert, senior expert in the field of Singapore Internet of Things, technology executive of Microsoft, Zeyang Technology Personnel, etc.) conduct discussions to formulate **a smart community construction plan** and set up a **IoT company**(Zeyang) to undertake the specific construction, and play the role of integrating social intelligence and resources. With

Smart Biyun as the core, Governments of **different levels approved pilot programs to enhance a demonstrative effect.**

Shuiwei community, Shenzhen: the "marriage" of municipal urban renewal project and affordable housing project

The urban village is the historical product of "the duality of urban and rural land markets" in the process of "urbanization with Chinese characteristics". Similar to other urban villages, Shuiwei Village has become rental habitats of "urban new immigrants" due to its location in the downtown area of Shenzhen. However, it has hidden safety hazards such as illegal construction, poor ventilation, insufficient fire protection facilities, and aging lines, which are not in line with Shenzhen's urban strategic goal of pursuing high-quality development.

This urban renewal project goes through **four implementation steps**: i) Under the guidance of **Shenzhen's housing guarantee strategy for talents**, the joint-stock company owned by all the villagers negotiates with its shareholders (that is, the villagers) and finally obtains the renovation of 29 buildings. (2) Shenye Group, a development business wholly owned by the municipal government, obtains the right to use and renovate these 29 buildings within ten years, and updates them into more than 500 high-quality apartments; (3) **Shenye Group sublet the apartments at an agreed price to the government of Futian District**, who leases them as welfare housings for young immigrant talents.

Highlights of the Shuiwei urban renewal projects mainly include: (1) Improved facilities such as electricity, gas, and firefighting, thereby solving the hidden safety hazards in the villagers' buildings; (2) With the participation of government, companies, villagers and internationally renowned design teams, the quality of the community has been greatly improved and goals of multiple actors are fully considered. Such as, the innovative design of gardens, sky corridors, public kitchens, gyms and other public spaces provides habitants with a convenient, comfortable, innovative and easy-to-communicate environment. (3) the management mode of Smart communities is adopted, where integrates functions of consumption, property service, access control, public event release, talent communication and entrepreneurial services.

3.2.3 CITIZEN PARTICIPATION

Strategic plan implementation processes are highly influenced by negotiations between private interest groups and entities of the public sphere such as regional councils and municipalities. The finding underlining negotiation as central to strategic spatial plan implementation processes is consistent with the literature suggesting that in a neoliberal environment, where private and public sectors are increasingly dependent on each other, **negotiation remains a central component of planning** (Ruming, 2012). To discuss negotiations from a more critical point of view, mainly due to the **complex power configurations in which they are embedded** (cf. Van Assche et al., 2014; Flyvbjerg, 1998). The literature also suggests that negotiations can help to **overcome implementation conflicts** that often emerge among interest groups and between interest groups and governmental institutions (Baarveld et al., 2015; Shmueli et al., 2008). It is important to underline that governance arrangements are affected by **power**, but also explore deeply who holds more **bargaining capacity** at the negotiation table and thus 'imposes' their interests.

The implementation of strategic plans must also involve vision development and **consensus building** among citizens and interest groups (Kunzmann 2010).

Healey (2006) underlines that in order for spatial planning to be successful, spatial planners must explore who has a 'stake' in a territorial issue and conduct an analysis to **identify interest groups** and to make sure that planning efforts grow out of the specific concerns of those groups. Depending on the context and definition adopted, **interest groups can vary from a formal entity with authority to a loose, informal,** ad hoc set of individuals dealing with specific land-use issues, such as development of new roads, new tramlines or new primary schools (Foster and Barnes 2012).

Burby (2003) highlight that when interest groups are able to submit planning proposals and claim land uses, **the strength of the plans and the degree of success of the implementation improves markedly.**

It is important to consider the power configurations involving the participation of interest groups in plan implementation mainly during negotiations (Flyvbjerg 2002, 2004).

EXAMPLES

Madrid: "Reunions" - round tables for strategic planning actions

Against the background of little tradition of citizens' participation and lack of participatory culture in Spain, Madrid applied a **series of "reunions" in the 21 districts**. The city follows a decentralized, but top-down initiated approach. Each district has his own process called reunions. These participatory processes (every district has his own process) are meant to support the city-wide strategic planning efforts. The reunions consist of a **thematic input** by the planners and city administration, followed by **round table discussion**. These discussions result in a list of actions which are then prioritised by every district. The claims by the citizens are then reviewed by the project/planning team and evaluated. A final list of actions is given to the neighbourhoods for final feedback, only after that it is incorporated in the final strategy. However, it is not a "full bottom up decision" because the final say still is with the city council (it approves the list of what the stakeholders want). A downside of this tool is that it is a long procedure and the information gets outdated rather quickly. As Madrid has little tradition or experience regarding a "culture of participation", this process also helped to gain trust of citizens in urban planners.

Source: https://decide.madrid.es/

Madrid: Competitions for development of local places and neighbourhoods

The main objective of the competition is the recovery of abandoned or dismissed spaces to promote innovative urban projects, focused on decarbonization, resilience, job creation and the generation of activity and sustainable services for communities.

"Meet-Up Madrid" is organised by **Madrid City Council** with the support of the **C40 network**. This initiative aims a promoting the meeting between companies from different sectors to catalyse the formation of multidisciplinary teams; architects, urban designers, investors, managers of innovative activities. The innovative aspect is twofold: on the one hand, the collaboration was designed as a competition in order to foster new actor constellations; on the other hand, the urban development activities had been targeted towards the recovery of abandoned or brown fields in order to strengthen the nexus between decarbonization, resilience as well as economic and social services.

Source: https://www.c40reinventingcities.org/en/events/meet-up-madrid-1399.html´

Santander: Identifying ideas and needs of the citizens

As an element of the smart city strategy, the city uses the **community** to gather insights on a large scale, with which it may detect the needs of its citizens and ideas to satisfy them. At the beginning, the municipality requested information on how to best deploy technical infrastructure and sensors. The University of Cantabria held regular meetings with the local residents to address their concerns and for the brainstorming of eventual ideas 'Santander City Brain'. They looked for applications and services that may fit the priorities of the citizens and, consequently, those priorities were identified based on questionnaires. Ideas by the citizens are collected (interactive data base), prioritized by the puplic and then implemented by developing the necessary software or IT infrastructure. This means, that citizens' participation ensures identification of their needs and "hot topics" as well as a broad variety of innovative ideas. The city then provides the IT brainpower and resources to implement these ideas (e.g .developing an app or smart service), which would have not been possible to develop by the citizens on their own.

Since 2013, 'Santander City Brain' allows the City Council to deploy an element of collaborative intelligence in the city. Santander is spearheading the Smart City movement and uses the community to gather insights on a large scale, with which it may detect the needs of its citizens and ideas to satisfy them.

Source: https://www.ideas4allinnovation.com/case-study-ayto-santander-smart-city/?lang=en

Stockholm: Citizen Involvement through public display and participation in the master plan draft

Stockholm took a very proactive approach in the involvement of citizen as exemplified by the structured engagement process for the **Stockholm City Master Plan**. Citizen Engagement and participation was achieved by **publicly presenting the** draft version of the masterplan across 14 areas in the city. In particular, the draft was showcased at highly popular public places (for example Shopping Malls) while an **online information campaign** about this engagement opportunity was launched in parallel. The purpose was to gathering ideas from citizens and to explicitly seek for different views and input from the general public. Citizens who wanted to engage with the draft plan had the chance to ask questions about specific aspects of the plan and to leave comments and ideas. The process was very well received by the general public and the citizen engagement was considered a success. Through this engagement process the city was able to reach approximately 12 000 people collecting a range of different issue. While the most salient issues found their way into subsequent adaptations and refinements of the plan it was not possible to fulfil all the wishes and to follow up on every idea.

Source: https://www.academia.edu/19900873/Stockholm_Royal_Seaport_Redevelopment_Masterplan
https://vaxer.stockholm/globalassets/tema/oversiktplan-ny_light/english_stockholm_city_plan.pdf

In China, mainstream public participation methods mainly include development implementer-centered public participation (such as relying on industrial associations of industrial parks) and citizen-centered public participation (such as participatory planning and design) to promote influential subjects and citizen participation. In the construction of Smart City, active cooperation and dialogue with different stakeholders are carried out to explore a sustainable and people-oriented implementation solution and to promote the scientific education of urban development visions.

Beijing: Participatory planning project of Weigongcun community Cultural District

Under the background of Haidian District's promotion of the responsible division system of district planning, Zizhuyuan Street has introduced a **professional design team**, while attracting residents, students and other people from various fields to participate in the whole process of urban planning and governance. Weigong street in Weigongcun community, built in the 1990s, is 500-meter-long. The green space reconstruction part of its renewal project involves a thousand square meters of green space in front of the campus of two schools, which cannot be used because of the enclosed design for many years. Under the guidance of **professional teams**, **children** are invited to participate in the design and renovation of the plot throughout the entire process. Now it has become an open micro-park to meet the needs of landscaping, the waiting parents and other needs of students and surrounding residents. Now Zizhuyuan Street will also invite experts and college students from Beijing Foreign Studies University to regularly conduct planning and design courses for the children.

Tianjin：Establishment of Eco-city Green Industry Alliance

The **Green Industry Association** is China's first voluntary non-governmental organization in emission reduction established during the construction of the Sino-Singapore Eco-City. EGIA is composed of companies, other institutions and individuals that are passionate about environmental protection and public welfare at home and abroad, strictly implement relevant environmental protection policies and self-commit to reduce greenhouse gas emissions, have a good social public image and a strong sense of social responsibility.

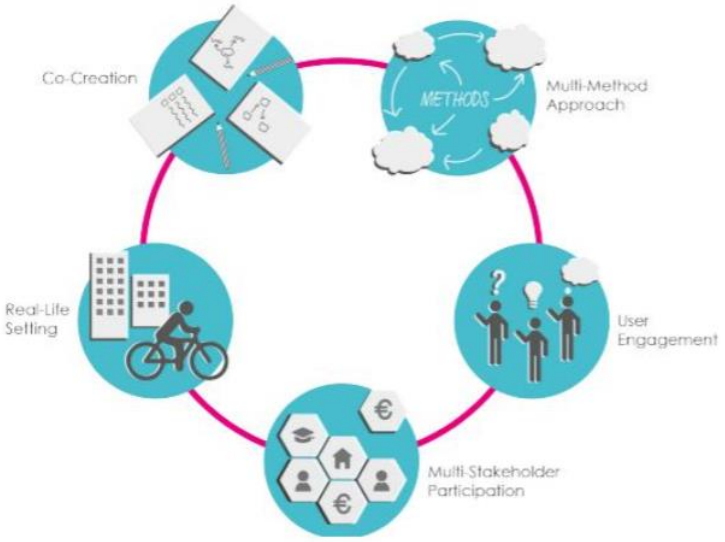
3.2.4 LIVING LAB APPROACH

"A living lab is a place where citizens, artists, technologist, businesses and public sector organisations can come together to co-create ideas, tools and technologies that will address local challenges. It's a place or innovation and exploring new possibilities but where reflection and evaluation are built into the working process to make sure the Living Lab can be flexible and responsive to the changing needs of stakeholders and communities." (Penny Evans et al. 2019:10).

Living Labs can be characterised in multiple ways and serve several purposes. The areas of application are varied and range from health and wellbeing, smart cities, and circular, economy, culture and creativity, energy to mobility. Despite the different areas of application and the multiple different implementations, the Living Lab Approach share certain common elements (ibid 2019:11):

- **Multi-method approach:** There is no single living lab methodology, but all combine and customize different user-centred, co-creation methodologies to best fit their purpose.
- **User engagement:** The key to success in any activity is to involve the users already at the beginning of the process.
- **Multi-stakeholder participation:** Even if the focus is on users, it is important to involve all relevant stakeholders: representatives of public and private sector, academia and people.
- **Real-life setting**: A characteristic of Living Labs is that the activities take place in real-life settings to gain a thorough overview of the context.
- **Co-Creation**: In this approach users become equal contributors and cocreators rather than subjects of studies.

Figure 6: Common elements of Living Labs, Source: Penny Evans et al. 2019:11



To anchor the individual user involvement activities with a methodological framework Schuurman et al. (2013) describe living labs as a quasi-experiment with consists of three blocks: pre-measurement, an intervention in the real -life environment and a pre-measurement.

1. **Exploration / pre-measurement:** The first step is to understand the users, the current problems and the specific context. Methods for this phase are *observation, participation and in-depth interviews*. After this the needs and want of the users are discovered. Therefore are sensitizing techniques suitable, which are used to discover the users deeper levels of knowledge, uncovering needs and wants. To find out opportunities how the current state can be improved possible methods are *brainstorming, ideation and co-creation techniques*. The ideas and options are materialized into concrete concepts than can be

co-designed through exchange and dialogue with local people, national and international networks, organisations, academics and individuals with expertise in relevant fields.

2. **Experimentation / Intervention in the real-life context:** The second building block is to test the designed solutions from step one. This step explores and experiments with a prototype in the real-life context. There are many forms for the prototypes like *tangible MVPs (minimum viable products)* to intangible services or experience design prototypes. In this step the innovative is the new solution for the problem in the form of a prototype, which potentially triggers new habits and new contexts of use. The goal of the intervention is to understand the reactions of the users and the attitudes to the solutions. Depends on the maturity, the interventions can be labelled as *proxy technology, assessments, user experience testing or actual field trials*. After the test in real-life context it is possible to decide to head back to the exploration state to modify the solution or to proceed to the evaluation stage.
3. **Evaluation:** The last stage consists of evaluation the innovation. The value of pre-measurement and the post-measurement of the intervention is quantified and compared. The goal is to launch the innovation therefore it is important to understand the potential market (*market research, user toolkits for customization or conjoint analysis for defining a concrete offering*) and involves a marketing communication and strategy.

An early involvement of future residents, local companies as well as planning experts facilitates an exchange of ideas that tresspass one theme and opens space for innovation, integration and timely ‚anchoring' of the joint solutions in the local context. The big advantage in working closely together with end-users is that you get an **immediate reality check** and can learn from it what works and what doesn't. Furthermore, these instruments allow planners and experts to **access locally embedded knowledge** and **competences** and to build on the diverse community intelligence. This new approach to planning and implementation helps to bridge the gap between the conceptual plan and implementation early in the process and it secures an early on integration of specific local needs and requirements.

EXAMPLES

Santander: Urban Laboratory

Santander designed an Urban Laboratory for testing technology. The focus was on deploying a lot of **devices how to foster further interactions** with all the stakeholders that eventually have not yet be considered digital transformation (by different reasons). There is a physical room with which the city tried to attract companies and stakeholders for testing new technologies, services and by doing so, enrich a lot of assets of the city and the university in a continuous manner. The municipality has **collaborated with the university** since the beginning of the Santander Smart City idea and the city departments were very open for the ideas, whereby cooperation among them was easy because of the small-scale of the city. An important success factor for the Santander Living Lab is the **flexibility of the concept** (even though not covering every topic, it is open enough for scaling- up and fitting in as many technologies as they needed). The Santander living lab is a project-based approach which was strongly supported and back up by the very clear strategic alignment and image building of a rather small city.

Source: https://www.urbantechnologyalliance.org/portfolio/santander-spain/

Aspern Seestadt, Vienna: Citylab

For a new urban development project Seestadt Aspern in Vienna, the so-called Aspern Seestadt Citylab was established as a modular, interdisciplinary dialogue platform to promote forward-looking solutions the exchange between different stakeholders. In the Citylab people work on concrete questions of the planning processes like the framework conditions and instruments for the development of space will be explored. Interested

people and experts are invited to engage in discussion. The findings serve to concretize and expand urban development strategies and measures.

Source: https://www.mobillab.wien/pop-up-lab/; https://www.wien.gv.at/stadtentwicklung/projekte/aspern-seestadt/urban-lab.html
Strategic document: https://www.aspern-seestadt.at/jart/prj3/aspern/data/downloads/2011-citylab-report-2-2-die-instrumente-des-staedtebaus_2017-07-10_1607746.pdf p. 124-126

Currently, living lab cases in China mostly appear in large cities with a higher level of openness and are generally initiated by agencies such as urban planning institutes, universities and research institutions, and this is because these agencies have a great advantage on their knowledge backgrounds to closely following the international frontier in urban development and information technology. By introducing advanced planning theories, public participation mechanisms and technical methods into various projects, participatory urban planning and design are greatly promoted, and significant progress has been achieved especially in the fields of placemaking of historic and cultural blocks, the integration of tradition and technology, public participation awareness and planning science education.

Beijing: Dashilar Renewal Project

Taking the Dashilar Renewal Plan as an opportunity, the **project implementation company** established an open working platform with multiple participants - Dashilar Interprofessional Center. Through cooperation with **urban planners, architects, artists, curators and merchants,** a new model of urban organic renewal in historical and cultural blocks is explored and practiced.

Based on this platform, with support by the Beijing International Design Week organized by Ministry of Culture and Tourism, a pilot program of Dashilar Navigator was launched, and it was tried by inviting and recruiting architects, designers, artists, local residents and businesses to solve a series of **public problems in the process of spatial transformation;** form practical pilots; mobilize creative thinking. At present, through the platform of Beijing International Design Week held for years, more than ten design groups have entered the long-term Hutong protection work.

The Dashilar renewal plan is to gather more forces through wide outsourcing, so that more different spatial nodes will be transformed into targeted clusters and generate a network trigger effect to promoting the revival of Hutong. During the renewal activity, the existing hutong style and texture will be respected and the space-use will be more flexible, so as to actively transform Dashilar into a community where new and old residents, traditional and emerging businesses are well mixed and coexisting with constant upgrading.

Suzhou: “Mirco-center” approach in the renewal project of Xuanqiao Historical and Cultural District

Located in the Yangtze River Delta, Suzhou is an ancient city with relatively complete traditional settlements and a modern tourist destination with preeminent natural conditions. After a large-scale urban reconstruction in the 1980s, the development mode of "protecting the ancient city and building a new city" was formed and practiced in Suzhou. As fundamental part of Suzhou's historical and cultural blocks, the Xuanqiao Alley Historical Zone retains the texture and lifestyle of traditional settlement relatively completely, with distinctive architectural appearances, abundant cultural accumulations and many historical celebrities once living there.

In the process of urbanization, urban historical and cultural blocks are faced with the **problem of balancing protection and redevelopment**, as well as global and local power. Not surprisingly, the Xuanqiao Alley Historical Zone is confronted with problems such as loss of vitality of public space and cultural recession. Then, the **"micro-center" approach** is adopted in the renewal of the Xuanqiao Alley Historical Zone. The main content of the approach is a resident-centered service mode with a variety of “micro centers” as anchors, relying on advanced information technologies. By distributing several small-scale "micro centers" that constitute

the basic nodes of the network-like grid of public services in the zone. Physically, a "micro centre" is usually a spatial node with an area of less than 240 square meters. In this way, old and new buildings are combined into a vibrant "living history and culture museum" in the city. Functionally, the "micro centre" involves different functions in terms of culture, learning, amusement, and display, etc. Furthermore, special attention is paid to the consistency of its appearance and its surrounding environment in the construction. The "micro centre" approach belongs to the intersection **of two strategies of urban cultural block renewal and Smart City**. By implanting a number of "micro-centre" as public spaces with different functions and a technical support system based on Smart City construction, the expected goals include respecting the lifestyles of the folk, building friendly neighbourhood relations, fostering the vitality of the old city, and upgrading the spatial quality of the neighbourhood as well.

3.2.5 CAPACITY DEVELOPMENT

In the context of socially integrative cities and integrative urban planning, capacity and competence development take up the place of an enabling instrument supporting all other tools and mechanisms. Sustainable, transformative, and socially inclusive urban development requires acquisition of **new mindsets, skills and capacities on different levels** including urban government and administration, different institutions and agencies, experts, academia, NGO's, communal networks, educational systems and individuals. "It is intrinsically linked to the ability to understand problems and design solutions to resolve them, to deliver and sustain development programs over time. It has been widely recognized by international development cooperation agencies and national and local governments that it is a fundamental condition for achieving development".[1]

Furthermore, **capacity development** is fundamental to increasing quality of life and unlocking local development potentials that take full account of social and economic resources as well as needs.

Definition

Most definitions of capacity building outline capacity development as a combination between a process and an ability:

1. "Capacity building is a transformative engine for creating and maintaining development change. It is strongly associated with effectiveness of organizations and individuals."[2]
2. "According to OEDC DAC capacity is the ability of people, organizations and society as a whole to manage their affairs successfully. Capacity Development is the process whereby people, organizations and society as a whole unleash, strengthen, create, adapt and maintain capacity over time."[3]
3. "Capacity building (or capacity development) is the process by which individuals and organizations **obtain, improve, and retain the skills, knowledge, tools, equipment**, and other resources needed to do their jobs competently. It allows individuals and organizations to perform at a greater capacity (larger scale, larger audience, larger impact, etc). **"Capacity building" and "Capacity development"** are often used interchangeably. This term indexes a series of initiatives from the 1950s in which the active participation of local communities' members in social and economic development was encouraged via national and subnational plans."[4]

Three main scales/levels of capacity building have been identified by UNDP:

[1] CAPACITY BUILDING AND KNOWLEDGE FORM THE FOUNDATION OF THE NEW URBAN AGENDA: a position paper (2015/06)
[2] Davidson, Forbes; Peltenburg, Monique; Teerlink, Hans and Patrick Wakely (1996). Building Capacities for Better Cities: CASES. Paper prepared for the round table Human Resources Development for Better Cities, Rotterdam, Netherlands, Oct/1995 and the Habitat II Conference, June 1996. Paper produced with the support from the Directorate General of Development Cooperation, Ministry of Foreign Affairs of the Netherlands, the Overseas Development Admnistration of the United Kingdom, in cooperation with the United Nations Centre for Human Settlements
[3] https://uni.unhabitat.org/wp-content/uploads/2015/06/Capacity-Building-in-New-Urban-Agenda-HABITAT-III.pdf
[4] Wikipedia

- Community (enabling environment)
- Organisational/institutional
- Individual[5]

In the context of Smart and Eco-City development it is important to address all three scales/levels of capacity development to ensure a successful implementation process and to narrow the gap between strategic planning and implementation.

Although a **one-suit-all approach** to one specific capacity development framework suitable for all contexts is **neither feasible, nor realistic** to achieve successful outcomes, some general principles and guiding steps can be recommended. Such principles and steps have been outlined in 'The Fano Guidelines. Building Capacity for Local Sustainability'[6].

The guidelines compile following ten factors and conditions, based on the outcomes of DISCUS Project. These guidelines have been derived from field research in 40 cities and towns across Europe. **The ten identified factors** are as follows:

1. Learning as an organisation.
2. Moving away from 'policy silos' within local government.
3. Making alliances with people and organisations.
4. Facilitating the process and developing credible leadership.
5. Encouraging creativity and innovation in policymaking.
6. Communicating to make a difference.
7. Catalysing action through raising environmental awareness.
8. Maintaining commitment to achieving the long-term vision.
9. Sharing experience with peers.
10. Influencing all levels of government

Capacity development aims at strengthening the existing skills, capacities and knowledge of diverse stakeholders involved in urban planning and implementation process. Capacity development process enables a range of urban public and private stakeholders and actors to acquire new skills necessary for the planning and implementation of integrated and sustainable urban projects. Inherently complex nature of urban planning and implementation require capacity development on different levels, including but not limited to adaptive capacity, leadership and coordination capacity, management capacity, technical capacity, engagement capacity etc.

Capacity development is a long-term development process that requires adequate resources, investment, ongoing attention, coordination and commitment. There is no one-suit-all solution for capacity development. Different cities usually develop tailormade solutions and approaches that best suit their current state of planning and development culture.

Capacity development enables individuals, organisations, companies and citizens to obtain, improve, and retain the skills, knowledge, tools, equipment, and other resources needed to perform their tasks – individually and collectively competently, to exchange the know-how and to integrate the knowledge and skills into practice.

Integrated planning and implementation of urban development projects requires involvement, know-how, skills, and alignment between a wide range of stakeholders: city administration, developers, experts, academia, communities as well as individuals. Improving and continuously evolving capacity development within and among different stakeholder groups can assure more effective implementation processes and serve integrated planning, while narrowing the gap between planning and implementation.

[5] https://uni.unhabitat.org/wp-content/uploads/2015/06/Capacity-Building-in-New-Urban-Agenda-HABITAT-III.pdf
[6] ICLEI 2004

EXAMPLES

Stockholm: Forum for Sustainable Urban Solutions

One of the best practice examples for the application of this tool and mechanism is the ongoing Capacity Development Programme of the City of Stockholm, which is active since 2010. This programme is compiled of a wide range of capacity building activities including seminars for developers and consultants, city representatives and city personnel involved in urban planning. An important building block of this capacity development programme is a Forum for Sustainable Urban Solutions. The Forum provides space for 'matchmaking seminars' that enable different stakeholders to meet and exchange their know-how on different sustainable solutions, services and products. The Forum was launched in 2012. More than 25 meeting took place since its launch, enabling participation of more than 1900 people and 100 companies.

Source: https://www.norradjurgardsstaden2030.se/en/our-way-of-working/capacity-development/

As for China's Smart City construction, capacity building is often utilized to foster multi-actor involvement in innovation (refers to innovative activities that aims at facilitating applying S&T achievements to production). Those capacities to be built mainly include: i) Inter-organizational capabilities, that is, to **promote knowledge sharing** and **peer exchanges through cooperative network construction**, **collaborative learning, field trips,** etc., and this is closely related to stimulating disruptive innovation in the field of technology. In the context of China, **inter-organizational communication often needs to overcome fairly high transaction costs**. One exception but a common situation is that the "axis power" (i.e., the government or a big enterprise) as a coordinator can effectively reduce transaction costs. ii) Intra-organizational capacity, that is, to internalize the transaction process through setting a permanent institution (often supported by the government) involving users, technicians, and city managers, and this is closely related to application innovation. In China, this is a more effective implementation tool, for it can effectively reduce transaction costs and agilely update its products according to the feedback from the market.

Beijing: "3Yan" Application Innovation Park mode (AIP)

The 3Yan Application Innovation Park (AIP) is an open non-profit organization under the leadership/support of the Beijing Municipal Management Commission, the Municipal Science and Technology Commission and the relevant government agencies, sponsored by the Beijing Urban Management Technology Association and co-organized by various industry associations and research institutions. The content of this mode is to **build a user-centered application innovation platform** that closely interacts with technological innovation. "3Yan" refers to three functions of AIP: **multi-actor interactive experience; new products testing; and new technology application and scaling-up services**. The highlight of AIP is to bridge the gap between new technological innovation and application innovation through the establishment of interactive platforms for scientific and technological talents, users, enterprises, and government agencies to work together. Also, new technological innovation incubated in technological innovation park (i.e., the Zhongguancun Science and Technology Park) can be seamlessly transferred into the AIP.

Dalian: The Energy Interconnection: urban governance approach in pursuit of institutional reform and sustainable development of the old industry city

According to the regional development strategy, Dalian is supposed to play a key role in revitalizing the old heavy industrial base in Northeast China and comprehensively contributing to the institutional reform. Correspondingly, Dalian's Smart City construction is committed to better integrating and expanding applications in the intersect of technological information, energy governance, industrial and sustainable development.

The Energy Interconnection project, one of the representatives of Dalian's Smart City achievements, is a **comprehensive energy service platform** constructed based on existing energy infrastructure network and advanced information technologies by the municipal power supply company. Its major contents include: i) business expansion of power supply services to provide customers with a one-stop online service menu; ii) in-depth exploring and efficient use of power system data, such as for organization of emergency repairs, and provision of customized services based on electricity consumption analysis and demand forecasting of major clients; iii) provision with electric vehicle charging facilities, online payment channel, repairs and other services to facilitate citizens in an more environmentally-friendly way (Dalian is selected into the first batch of national pilot cities for scaling-up of new energy vehicles).

On the one hand, the construction of Energy Internet through a light on breaking inter-departmental barriers and reconstructing the urban operation system; on the other hand, it promotes innovation as well as the leapfrog upgrade of urban sustainable development.

Shenzhen: Application Agency Complex + Technological Agency Complex

Policy makers in Shenzhen believe that the overall contracting model of traditional informatization construction is difficult to adapt to the requirements of smart city construction in mega-cities. Therefore, an **integrated construction model** of “Application Agency Complex + Technological Agency Complex" is proposed:

"Application Agency Complex" includes the Municipal Economic and Trade Information Commission and the leading departments of various industries. i) The Municipal Economic and Trade Information Commission specifically undertakes the functions of smart city overall planning, overall coordination, project management, etc., and guides various departments to prepare industry plans, project plans and organize reviews to form a smart city construction project database. ii) The leading department of the industry is responsible for preparing the overall planning, top-level design, and standard specifications of the industry, and strengthening the overall management of the city and district of the industry.

"Technological Agency Complex" includes the city's overall technology units and industry technology units, which are respectively selected by the Municipal Economic and Trade Information Commission and the leading departments of various industries in accordance with government procurement procedures. i) The city’s overall technology unit undertakes the top-level design, standard specification, system integration and verification of the city’s smart city to ensure that various industry information systems build business applications on a unified information support system, avoid separate and repeated construction, and focus on improving the overall construction Effectiveness. ii) The overall technical unit of the industry specifically promotes the implementation of smart city construction projects in the industry based on the city's top-level design and public platform. All districts and units shall implement e-government project bidding in accordance with laws and regulations to ensure fairness, justice, openness, and transparency.

3.2.6 AGILE PROJECT MANAGEMENT

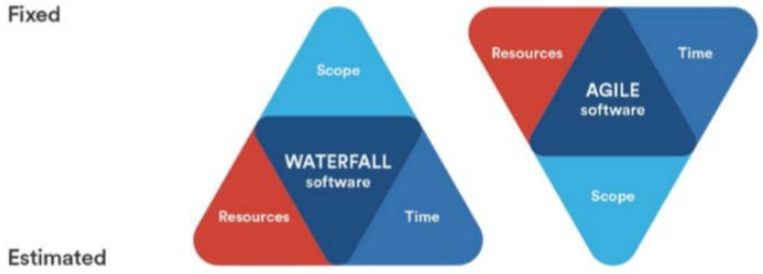
*"Municipal developmental projects are typically embedded in complex, dynamic environments involving many unpredictable components with diverse stakeholders and are characterised by a high degree of uncertainty. Most projects fail - **largely because conventional project management methodology cannot adequately adjust to a dynamic environment**. In a rapidly changing environment, a highly adaptive model for planning and managing projects is required"* (Van der Waldt 2011: 2).

Karlesky and Vander Voord (2008:1) also see the need for a flexible project management in the constantly changing project environment. For example, **budgets, resources, schedules, competition or customer needs** changes and thus influence projects. Over time developers, users, customers and managers discover the limitations, capabilities and what is needed and how users desire to interact and this lead to project change. In traditional project management, the design, implementation and testing phases follow each other in a linear flow, which is called the waterfall approach. Due to complexity and uncertain challenges, the approach needs to be more creative and adaptable (agile project management), which requires a shift in thinking about projects and how they should be organized (Van der Waldt 2011: 2).

There are four principles that are typically used to highlight the difference between agile and traditional (waterfall) approaches to project management.

- Customer collaboration over contract negotiation
- Individuals and interaction over process and tools
- Responding to change over following a structured plan
- Prototyping/working solutions over comprehensive documentation

Figure 7: Fixed and estimated resources of traditional project management and agile project management, Source: Association for Project Management 2017:3

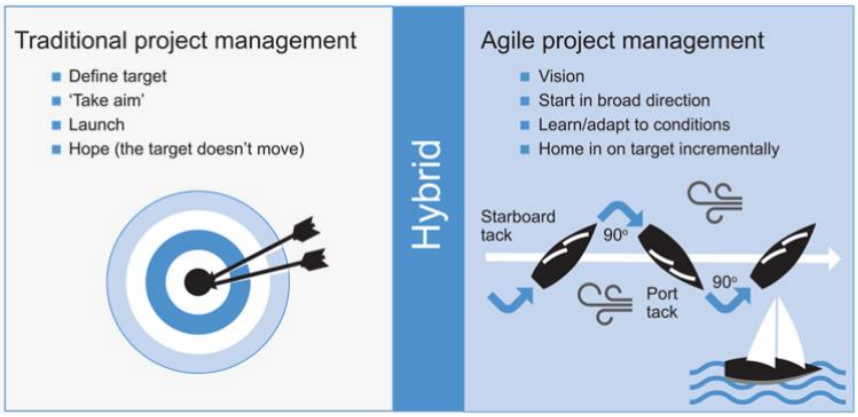


In comparison to traditional project management agile project **management learns and adjusts at regular intervals the process to ensure that the final result satisfied,** and this allows organization to create a working mindset that helps to respond effectively if a change is necessary. Agile project management suits for tasks which are complex and require a high degree of control. The use of this methodology is not always suitable for the entire process but for some work packages depends on the content. Agile tools are only effective if the philosophies and mindsets of the organizational culture are also agile *(*Association for Project Management 2017:5). Agile approaches **empower the involved, build accountability, encourage diversity of ideas, allowing the early release of benefits and promotion of continuous improvement**. The **feedback loops** can help with decision-making at a portfolio level, because through the feedback ideas can be tested and rejected early. Challenges often are that the bigger picture can become lost because agile management focuses on small incremental changes. Resources cost can be higher for example for building consensus.

*"Traditional project management may determine 'what' the project should deliver, while agile techniques may determine 'how' it is delivered" (*Association for Project Management 2017:5).

Agile project management facilitates a dynamic, non-linear, and adaptive project implementation process. This process generally entails a sequence of structured and iterative steps such as visioning phase, project start in a broad direction, continuous adaptation to the context and conditions of the project and an incremental implementation. Agile project management enables timely response to issues as these arise flexible and dynamic nature of this approach to project management provides space for adjustments when necessary throughout the project implementation process (cf. association for project management).

Figure 8: Different between traditional project management and agile project management, Source: Association for Project Management)



Agile project management approach/mechanism contains a risk of being reduced to technical tools, such as scrum, etc., which can but do not have to be applied in the process of project implementation. Agile project management matches well the non-linear nature of urban development and implementation projects that require multiple feedback loops and alignment steps among diverse stakeholders, actors and citizens involved to a varying degree in the project implementation. This approach to project management enables a continuous improvement and adjustment of implementation process throughout the project life cycle and promotes an ongoing release of innovative ideas for solving of potentially arising issues.

Agile project management increases the level of ownership and commitment of different actors involved in the project implementation process, at the same time contributing to socially integrative and dialogue-based practice in project development and implementation.

EXAMPLES

District Simmering, Vienna: Smarter Together - Sustainable development through people integrated, inclusive societies that develop in partnership and foster dialogue among all parties

Agile project management has been successfully applied in the planning and implementation of 'Smarter Together' Project in the City of Vienna, Simmering district. This EU Lighthouse Project enabled collaborative and innovative partnership between the Cities of Vienna, Lyon, and Munich. Each city designated a specific area that implemented and demonstrated a range of integrated measures, such as sustainable mobility, building refurbishment, data platform development, citizen involvement and community building measures and actions. The project team in Vienna has applied agile project management from the very start of the project in two different way. On the one hand, digital technical project management tools were used for an agile communication with the different group of stakeholders and partners. On the other hand, the process itself was also agile. This was expressed in the Continuous Quality Improvement (CQI). That means that after each implementation step feedback loops were drawn and these insights were incorporated into the next steps, also known as PDCA cycle – Plan-Do-Check-Act.

Source: https://smarter-together.eu/cities/vienna#
https://www.smartertogether.at/wissensmanagement-peer-to-peer/

3.2.7 MONITORING AND EVALUATION

Spatial planning is a continuous process where visions are implemented through plans. Although there are many spatial plans, they **often do not include enough details and provisions** regarding basic monitoring and evaluation procedures. **To enhance the effectiveness of plans evaluation and monitoring are needed**.

The evaluation process defines the tools which are needed to measure in the monitoring process if the goals and objectives are reached with the defined solutions. Evaluation can be carried out at any time of the planning process and, unlike monitoring, it can be performed by external agents that are not part of the team in charge of the plan (see Figure 9) (cf. Segura; Pedregal 2017:2f).

Figure 9 Differences between evaluation and monitoring of spatial plans, Source: Segura; Pedregal:2017: 3 based on Benabent 2014:130

Aspects	Evaluation	Monitoring
Purpose	Accountability, information, improvement of the design and implementation of the plan	To ensure that what is planned and regulated is actually enforced
When it is performed	Before, during, and after implementation of the plan	During implementation of the plan
Who performs it	External or internal evaluators	Team in charge of the plan
Content of the process	Assess relevance, usefulness, effectiveness and efficiency	Measure the performance and results
Aim of the process	Assess the adequacy of the plan	Correct deviations
Notion of public action	Allows questioning the plan	Does not question the plan

If well done, **monitoring and evaluation serve a corrective function during the process** enabling timely adjustments where necessary and a guide to structuring future planning activities **more effectively and efficiently**. It also **allows the identification of new research and information needs** that can improve the next round. Effective monitoring and evaluation rely on the use of indicators that allow decision-makers to determine whether their interventions through are achieving the intended objectives. Therefore, indicators are necessary which determine the effectiveness of measures and that general goals are concretized clear, measurable objectives and outcomes in plans (Ehler 2011:311).

The measurement of the effectiveness and outcomes of planning is a challenging task due to the complexity involved in spatial planning activities and the limitation of any single method as a means of effectively measuring the outcome and impact of these activities, some outcomes can only measure indirectly (Centre for Urban Policy Studies 2008: 59). Without a clear responsibility for achieving the social and environmental components in the project plan, goals and targets might be downscaled, e.g. because of financial constraints. This mainly concerns stating the actor(s) responsible for monitoring the progress towards these goals in written agreements during the early stages of the project. The institutions responsible for monitoring, should ideally be involved before the overall goals and targets are formulated to ensure their quantify-ability and achievability. By doing so, it is made sure that social and sustainability considerations are fully integrated into the smart city project.

EXAMPLES

Stockholm: Frequent & collaborative monitoring as central part of the development process of the Royal Seaport Project

An interesting example for this tool category is the process of designing a monitoring and evaluation strategy at the Royal Seaport development in the city of Stockholm. The Stockholm Royal Seaport development is Sweden's largest urban development area. It is a brownfield development in which 12 000 new homes and 35 000 workplaces are being developed. The land itself is owned by the City of Stockholm and for the development it is partly sold and partly leased.

The monitoring is already included in the strategic plan in form of a monitoring metric und principal responsibility and monitoring responsibility are defined. Through the land ownership by the city of Stockholm a condition of the **civil contract** was that the developers are part of an interactive **working group** and are required to report back on how they are tracking against the development targets. This frequent reporting creates a **direct feedback** on how the sustainability requirements work in practice.

The continuous feedback mechanism that this creates provides significant input on how the sustainability specifications could be adapted and improved moving forward. Working group participants are also required to share experiences within their administrations and companies and with other City of Stockholm projects (strong connection to the capacity development tool). Used this way, monitoring and evaluation in the form of a structured dialogue becomes a central part of the development process which enables learning and the transfer and documentation of experience gained from the project as the implementation proceeds.
Each year, the Stockholm Development Administration reports the results of the property developers and how the project contributes to the city´s overall planning and implementation framework. With a wide dissemination of the sustainability report and monitoring reports, external stakeholders should also have access to the lessons learned.

At the beginning of the monitoring and evaluation strategy is the setting of **strict and specific environmental, social, and economic targets**. Those targets are elaborated and translated into development requirements in **thematic working groups** that consist of experts from different city administration units and private sector companies. The use of such forums creates a space and process for working across city departments and sectors in an interactive way. It also provides an opportunity to breaking down targets into binding requirements as the basis for monitoring and evaluation as the development progresses. The process of regular monitoring and evaluation is also structured through **interactive working groups**. In these working groups, the **developers** are required to report back on how they are tracking against the development targets.

Source: https://www.norradjurgardsstaden2030.se/en/our-way-of-working/how-we-work/
https://vaxer.stockholm/globalassets/omraden/-stadsutvecklingsomraden/ostermalm-norra-djurgardsstaden/royal-seaport/media/sustainable_urban-development-programme.pdf page 50-56

In recent years, with the slowdown of China's urbanization process, the national strategic direction has gradually shifted from the pursuit of high-speed economic growth to the **pursuit of a green, high-quality, and sustainable development model.** Therefore, greater attention has been paid to the monitoring and evaluation of planning implementation from the policy level.

In China, the commonly used evaluation and monitoring tool is to evaluate the construction results by using an **indicator system** involving various fields of **people's livelihood**. This method mainly exists at the national or provincial level to facilitate the horizontal comparison of the development level of various cities. This method mostly focuses on the **construction of information infrastructure and public service systems**. Although this method has some controversies, such as focusing on workload rather than effectiveness evaluation, yet, on the other hand, a clear indicator system is also closely related to government performance, which helps to enhance the enthusiasm of local governments to develop smart cities and promotes the leap-forward development of information infrastructure construction in economically underdeveloped regions.

Dalian: Information collector and participatory urban management mode

Urban grid management is a common method for monitoring and evaluation of urban dynamics. In terms of urban management in Dalian, the area of 208 square kilometres has been divided into 192 grid units, and this platform has **connected administrative agents at various levels**, i.e., the municipal urban construction department, district governments and industrial park management committees. Two main approaches of public involvement have been innovatively adopted: i) **Citizens reflect problems by calling the hotline or commenting on the App "Smart Urban Management**", so as to have those problems entering the system; ii)

Professional information collecting services are provided by specific outsourcing agencies through the mode of government's purchasing public services. A team of information collectors are built to conduct 24-hour inspection of the city. Problems are reported online via the APP, classified by their types and locations, and communicated to relevant department for processing.

Upon receipt of the notification from responsible departments, staff will be dispatched to conduct survey, and the repair work will be completed and afterwards publicized within 10 working days.

Compared with the traditional mode of urban management, which is relatively lagging and passive, the **speed, efficiency and accuracy of the problem-solving process in urban management have been greatly improved**, not only promoting inter-department coordination, but also ensuring the prevention of severe urban problems.

3.2.8 AWARENESS RAISING

Awareness-raising is a process **that seeks to inform and educate people** about a topic or issue with the intention of influencing their attitudes, behaviours, and beliefs towards the achievement of a defined purpose or goal. Awareness raising instrument usually combines a **variety of campaigns, applying diverse channels for communication**. The conveyed information and the type of messages are usually tailored depending on the audience that is to be reached. Awareness raising mechanism may be applied on **strategic as well as implementation levels.**

For example, the city of Vienna uses a variety of media channels, including newspapers, radio, internet, etc. to raise awareness of citizens on the importance and impact of sustainable, multi-modal urban transportation. This awareness raising campaign employs a **range of communication methods** and means that are specifically tailored to 'bring across' the understanding of the topic at hand in line with the level of receptivity of the targeted audience. The types of the messages and the means of communication may be different if the target group consists of students or school pupils, or the elderly citizens.

Different cities entertain different approaches to shaping a particular awareness raising campaign, depending on the urban context, related prevalent agenda and strategy or an implementation step to be communicated. Due to this fact it is not meaningful to outline one-suit-all application of awareness raising instrument or a rigid sequence of individual steps. However, there are some basic principles that are advisable to be considered and followed as outlined by the TAP Network, focusing on the Sustainable Development Goals. The basic structure and steps for the forming of a successful awareness raising campaign recommended by TAP are outlined below.

The design and preparation of an awareness raising campaign may consist of the following key elements and steps:

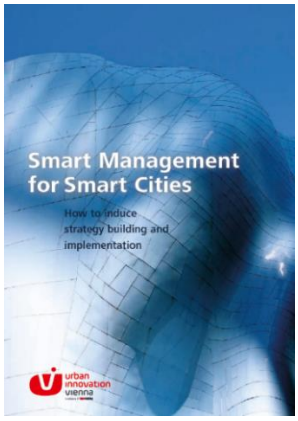
- Setting of objectives and outcomes that awareness raising aims to achieve.
- Defining target groups that awareness raising messages should reach.
- Formulating effective key messages that need to be conveyed.
- Identifying most effective methods, activities, and channels to raise awareness and to bring the messages to the defined target groups. Different target groups may require different methods and means to reach the desired outcomes.
- Determine partners and networks to help spread the message.
- Identify the sources of funding and according required budget.
- Setting up a monitoring and evaluation plan to assess the progress and to make according adjustments if necessary.

The range of channels, methods and materials to achieve effective awareness raising, may include but not be limited to:

- Studies and infographics
- A variety of events such as thematic discussions, seminars, workshops, conferences, debates, exhibitions, and demonstrations
- Community radio and television to spread information and raise awareness
- Internet, including online forums and interactive websites, as well as social media platforms
- Wireless communication such as mobile phones and text messaging
- Exhibitions and arts-events addressing the topics at hand

EXAMPLES

Vienna: Overall communication strategy



Communication – to create powerful messages

A crucial prerequisite for a successful smart city is a solid communication and involvement approach aligned with the organisational and management setup as described above.
An integrated, innovative and forward-thinking smart city development can be successfully established on the base of broad acceptance and commitment, understanding, interest, awareness and the recognition of benefits and responsibilities among various actors.
To achieve this, an effective communication strategy is needed. This step may include:

- Adoption of a short- and long-term cross-media communication strategies
- Website operation, social media presence, offline events, advertising etc.
- PR and media coaching for experts at all relevant and leading units
- Event and participation management

For a forward-thinking development a base of broad acceptance and commitment, understanding, interest, awareness and the recognition of benefits and responsivities among various actors are important. Therefore, Vienna has an own strategy in which the on communication and involvement approach in form from adoption of a short- and long-term cross-media communication strategies, Website operation, social media presence, offline events, advertising etc., PR and media coaching for experts at all relevant and leading units, Event and participation management.

The core focus of awareness raising mechanism focused on Smart City development in Vienna is placed on ‘communication - to create powerful messages’ as stated in the ‘Smart Management for Smart Cities. How to induce strategy building and implementation’ Report: A crucial prerequisite for a successful smart city is a solid communication and involvement approach aligned with the organisational and management setup. An integrated, innovative, and forward-thinking smart city development can be successfully established on the base of broad acceptance and commitment, understanding, interest, awareness and the recognition of benefits and responsibilities among various actors. To achieve this, an effective communication strategy is needed. This step may include:

- Adoption of a short- and long-term cross-media communication strategies
- Website operation, social media presence, offline events, advertising etc.
- PR and media coaching for experts at all relevant and leading units
- Event and participation management ‘

Sources:
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https://sdgaccountability.org/working-with-informal-processes/raising-awareness-through-public-outreach-campaigns/

Suzhou: "Neighborhood Convention" +Volunteer Service Team

Midu Community is located in Gusu District, the ancient city of Suzhou. It faces problems such as many elderly people, lack of communication among neighbours, increasing floating population, poor management of corridors and pipes, and environmental cleanliness that needs to be improved.

The Midu Community launched "Community Neighbourhood Convention", which involve contents on neighbourhood relations, treatment of people, corridor construction, enthusiastic support and assistance to neighbours, etc., which regulate the daily behaviour of neighbours and the norms of living ethics.

In 2012, Midu **Little Bee Service team** was established by the Community, which contains a 100-person Little Bee Volunteer Service Team; according to the volunteers' expertise and abilities, they are divided into 5 "bee teams" to collect public opinions, taking care of elderly people, tutoring the children of teenagers and migrant workers, etc.

3.2.9 SETTING UP REPLICATION MECHANISM

"Smart city pilots involve developing and/or testing technologies and new approaches, which are geared towards improving the quality of life and efficiency of services offered to city inhabitants. To avoid the situation where pilot schemes are a "one-off" exercise, opportunities to scale-up or replicate successful and innovative pilots are often sought" (Ferrer; Taranic 2020: 8).

According to Ferrer et al. (2017) replication makes it possible to transport or copy results from a pilot case to other geographical areas with potentially different boundary condition. In other research projects like "smarter together" replication is defined as **a key activity for the success** and **scalability of every project**.

Replication and Upscaling mechanism are important that pilot projects are not a "one-off" exercise. For a successful implementation there is no one size fits all approach. Local conditions can have a strong impact on barriers and enablers. The number of technologies and approaches addressing city challenges is very large and defining a vision and roadmap is complex, but a small step compared to the challenge of finding the right approaches and combining technologies efficiently.

The number of technologies and approaches addressing city challenges is very large and defining a vision and roadmap is complex, but a small step compared to the **challenge of finding the right approaches** and combining technologies efficiently. It is not enough just buying an existing solution and implement it in a city (Ferrer, Taranic 2020: 13). The most important factor identified by experts for implementing solutions are: **Stakeholder Participation, sectoral leadership, sustainable business model, financing, citizen & community participation, personal sponsorship** (ibid 2020: 11).

Academics agree on four main dimensions shaping **the roll-out potential of solutions**: the technology dimension, the political dimension, the social/cultural dimension, and the economic dimension. The main elements for implement are listed in the table below.

Table 5: Replicability and Scalability indicators, Source: Consortium elaboration of May et al. 2015, Jiménez et al. 2010, Bosch et al. 2016

Dimensions	Replicability
Technology	Standardisation of the technology; Maturity of technology; Interoperability; Netting support
Socio-cultural	Social compatibility/ acceptance; Market demand/ Response to citizenry needs; IT Literacy level
Political-Institutional	Need to change in rules and regulations; Regulatory environment; Institutional support Ecosystem
Economic/ Business	Macro-economic factors; Business model; Market design

To analyse the roll-out potential additional analysis of the **local culture, infrastructure and institutional context are required**.

The European Commission (2016) report summarise a list of criteria that should be considered in implementation (see Table 6). The sets of criteria doesn't determine how successful the implementation of a project is instead **this criteria provide insight on how probable it is that the solution could be adapted to diversified environments.**

For a successful implementation there **is no one size fits all approach**. Local conditions can have a strong impact on barriers and enablers. Therefore, a **feasibility study** should include an analysis of similarities and differences between local conditions affecting the pilot project and the planned project for replication.

The report of the European Union shows that there is no single element that stands out above the others as an obstacle or an enabler to the roll-out solutions. It is rather the collective action of different elements that limits or catalyses the ability of a project to be successfully implemented at a higher scale or in other contexts. The existence of an ecosystem that can bring together political institutions, investors, economic actors, and citizens facilitates the implementation of projects that have been successful elsewhere (cf. European Commission, Directorate-General for Energy 2016: 67)

Table 6: Assessment criteria for roll-out potential, Source: European Commission 2016: 63

Dimension	Roll-out potential evaluation criteria
Technology	• Is the technology well-established? • Is the technology standardized and/or interoperable with different IT systems? • How big and complex is the netting support required to sustain the project from a technological perspective?
Socio-cultural	• How relevant is the involvement of the society for the solution to work? • Is the solution responding to a pressing need (general perspective)? • Would the solution require a radical change in the users' habit?
Political-institutional	• Is the project requiring strong political commitment to be developed (general perspective)? • Would the administration need to be directly involved?
Economic/ Business	• Is the project able to achieve economies of scale if its size is increased? • Can the project benefit economically from international implementation (e.g. standardization of technology/ equipment/ solutions, etc)? • Is the business model flexible to changes?

To identify the most replicable urban solutions for different cities a tool called **'SITEE'** was developed. SITEE is an experimental tool that was developed by ISINNOVA during the second year of the project TRANS URBAN EU CHINA. In order to validate the methodology, it was decided to test it in one of the Urban Living Labs of the project by engaging the city of Wuhan and CAS as local reference and contact point of the city. The scope of the work was to estimate the replication potential of a set of European Urban Solutions in the city of Wuhan. The results of this test was relevant for the validation of this new method and for the identification of areas for further improvement of the whole process with the ambition to build a solid and robust approach for estimating replicability that could be extended to other Chinese cities.

Chapter 4 discusses the replicability method in more detail.

3.2.10 DIGITAL PLANNING TOOL

"In connection with the growing complexity of the processes and results of planning problems (cf. Rittel and Webber 1973) it can be expected that there is a growing need for assistance, also in a technological sense, to be able to better cope with these complexities, in particular by PSSs" (Jiang et al. 2019).

Planning support systems (PSS) are computer-based technologies that can be used to support various aspects of spatial planning. For example, in problem diagnosis, data collection, mining and extraction, spatial and temporal analysis, data modelling, visualization, etc. (cf. Geertman and Stillwell, 2004: 292).

In Practice there has been less focus on which technology can add real value to the city by facilitating information and knowledge sharing among stakeholders and promoting co-production of strategies and decisions (cf. Jiang et al. 2019:11ff). Accordingly, only considering the technical constant is not enough to be successful in planning practice, which is why there is an implementation gap. Recently, the focus has been on what improvements add value to planning issues. Therefore interventions need to start with place rather than technology, as smart policies or smart approaches are socially constructed and deeply embedded in specific socio-spatial contexts (cf. McFarlane and Söderström 2017). The technology should be tailored to the desires and capabilities of the intended users and to the specifics of the tasks to be performed, considering the particularities of the context in which the technology is used. Only then can the technology add value to practice.

EXAMPLES

SANTANDER: SMART CITY PLATFORM

The Santander Smart City platform integrates heterogeneous data information of all the municipal services of the city, providing a flexible and agile environment that will facilitate the creation of a common repository in which the data belonging to the different services are stored (source: https://synchronicity-iot.eu/project/santander/). For the ownership of the database, a mutual agreement has been signed between the municipality and university. The data platform is designed to allow for sharing the data (real time data, like traffic, parking sensors, streetlights etc.) and statistical data. The setup of a data market place and the deployment of a lot of different services and app has been seen as the main priority from the beginning of the Smart Santander idea.

Digital planning is the product of the combination of traditional urban planning theories and modern information technology. In the information age, the rapid development of the Internet, IoT, and smart terminal equipment has laid a solid foundation for guaranteeing the availability of data. In recent years, the **application of big data technology in urban and rural planning has become a research hotspot** in research and practice in Chinese cities. Different from the traditional top-down urban planning pattern, digital planning can fully consider the needs of enterprises and residents with the help of technologies, and directly serve all those actors

of the city in a problem-oriented way. The main advantages of digital planning are: i) Taking big data integration as an opportunity to break through inter-department barriers as well as establish a collaborative system for Smart City planning; ii) Quantitative analysis of city dynamics and even forecasting, mainly based on big data conducted to optimize the spatial layouts of industry, transportation infrastructure and public services; iii) Use big data to fully excavate and integrate with the city's core resources and carry out characteristic design.; iv) Use big data as support to comprehensively explore and analyse data concerning urban residents, enterprises as well as the government, so as to propose innovative opinions on mechanisms and systems that are conducive to improving administrative efficiency.

Beijing CITYIF: Cloud platform for planning

Created by the team of Beijing Planning and Design Institute, **CITYIF** consists of **three types of sub-platforms**: data platform, smart platform (self-organizing group of planners), and implementation platform (bottom-up community governance force).

CITYIF functions mainly in the following aspects: i) Technical processing and integration of basic resources through quantitative urban research, geographic information systems, data visualization, etc.; ii) Public display and dissemination based on online/offline tools (such as websites, Weibo, WeChat, and exhibitions); iii) To provide application services for different user groups (through the government interface, planner interface and citizen interface).

Shenzhen: Intelligent-Twins for urban safeguard system by Huawei

Shenzhen Intelligent-Twins is a typical practice of **"Urban Intelligent Twins" vision** that was initially proposed as well as applied in Smart City construction of Shenzhen by Huawei.

The connotation of urban intelligence is to treat the **city as a life organism** that can think, perceive, evolve, and be warm. Basically, technologies of 5G, cloud computing, AI are adopted to promote data sharing and business collaboration among government departments, thereby breaking institutional barriers and constructing an urban safeguard system that can **provide services for various scenarios** such as urban governance, disaster prevention, emergency rescue, and epidemic prevention. Highlights of the system are listed as follows: i) the "trunk" and "nerves", that is, the **real-time perception** and intelligent interaction of urban space; ii) the "brain", that is, the urban intelligent operation center (IOC) serving city managers, characterized by its "self-awareness" and co-command functions; iii) cross-domain applications of data, that is, **to break "data islands"** through integrated applications based on scenarios. In general, the construction of Urban Intelligence Twins provides a solid technical foundation for refined urban management in the future.

4 VALIDATATION OF TOOLS

4.1 VALIDATION METHOD

Through the COVID19-Pandemic the planned living labs in China could not take place. In order to receive views and inputs from Chinese experts to the analysed tools and mechanisms two methods have been applied:

1. An **online workshop** on 26/8/2020 was with Chinese and European experts. At this workshop following experts attended:

   Table 7: Overview of the participants of the online workshop

Chinese Experts	European Experts
Feng Yuqiao (China Academy of Urban Planning and Design, CAUPD)	Brodnik Christoph (AIT) Meyer Susanne (AIT) Neumann Hans-Martin (AIT) Walangitang Daiva (AIT)
Jiang Mengfan (TU Dresden, Faculty of Environmental Science)	Korsnes Marius (NTNU) Wang Yu (NTNU)
Wenwen Jiang (Wuhan Planning and Design Institute)	Nikolaos Kontinakis (Eurocities)
Wu Jing (School of Urban Design, Wuhan University)	Müller Bernhard (TU Dresden) Schiappacasse Paulina (TU Dresden) Süring Julia (TU Dresden)
Zhang Qi (Wuhan Landuse and Spatial Planning and Research Center)	Marmora Loriana (Isinnova)

   Presented and discussed with the experts were four of the 10 tools.

   - Living lab approach
   - Agile project management
   - Monitoring & Evaluation
   - Citizen participation and actor involvement

2. Detailed **local feedback** to the advanced for replication and upscaling

The results of the validation loops are documented in the following chapter (4.2).

4.2 VALIDATED TOOLS: LIVING LABS, AGILE MANAGEMENT, MONITORING AND CITIZEN PARTICIPATION

"Implementation is very important. All 4 approaches presented are very constructive to bridging the gap between planning and implementation in China."

All experts confirmed that new methods are needed, to implement the strategic targets to create sustainable, inclusive and better cities - for all of us. They also saw **enormous potential** in the presented tools to focus stronger on urban qualities, the output of urban planning and on the needs of the citizen. One expert confirms that especially in the past decades more and more studies and urban planning practice focus on adjusting and participation of different stakeholder, which is a very bottom-up approach.

For the experts the term "social integrative cities" has a strong connection with **participation and involvement of citizen and stakeholders**. As examples the **living lab approach and neighbourhood planning** was mentioned in this context. The living lab approach is already used in china for example to make an existing park more children and residential friendly or to make the goals for renew an existing area clearer. On base of the outcome the involved experts see positive results. Especially the combination of different approaches has a huge potential in the planning practice, especially the combination with citizen involvement and actor involvement. This approach guarantees to figure out what goals they have and make them clearer. To adapting the approaches in china an important role for the implementation is the political support and the community sense. China is a huge country and the stronger developed regions need other approaches than the less developed ones.

For the **monitoring and evaluation** china has the 5-year plan to guide the development of the society and urban planning and the development of industrial commercial and every 2.5 years there is a mid-term inspection to evaluate the plan. There is more the question who approach the plan and who take charge of monitoring. The question who is responsible for the monitoring is important because when monitoring is set in the wrong way, the responsible person has an isolated role in the organization who would be blamed by the colleges for ask about information, because it slows down processes and cause extra work. Experience from Vienna show that if you set up monitoring you need political will, give the person specific rights specific competences to make the person visible and give him the right to request information and data form other people. Otherwise this can be very tedious job.

"The outcome always changes with the policy. In projects with citizen participation processes, the potential for conflict is identified early and scenarios for the district can be identified."

The topic of implementation has a strong political science orientation. Therefore, it makes a difference in which area the approach is applied and the planning context such as a city's interest, policy, stakeholders, target audience definition, etc. Due to the complexity of the planning context, there is no "one fits all" solution for successful implementation. Sometimes it is necessary to combine approaches. For example, Living Labs can be used in different project phases. In Vienna, the Living Lab approach is often used at an early stage of the project to absorb citizen knowledge and build on it to develop the best plan.

To support other urban stakeholders with knowledge, it is not possible to say which approach will lead to successful implementation. Cities with successfully implemented solutions can only provide recommendations on "what worked well" as there is no "one fits all" solution. And for a better understanding of the planning context, it is helpful to show concrete examples.

With view to the economical efficiencies is to say that some of the approaches like citizen participation **takes time**, it is not **always comfortable**, the process is not always without conflicting interests. The process forces constant balance between all involved stakeholders. And of course, the process of participation is sometimes chaotic and brings up issues which are not always plannable.

"Social integrative goes the other way, you have to go to the individual needs to the people with different or special needs, very small communities so there is a contradiction here. How we can go up in scale but at the same time go down to the specific problems if we really want to integrative cities?"

The workshop clarified the complex questions in connection with the implementation. And not all questions could be answered in this context. Further researches should focus on:

- How the European approaches can be implemented in the Chinese law/framework. And, how this will change the local government in the future.
- How the different political systems create opportunities with the implementation but also limits the options (some promote the implementation other hinder them).
- How we can engage the different stakeholder in urban planning process.

4.3 VALIDATED TOOLS FOR UPCALING AND REPLICATION OF SMART CITY SOLUTIONS

4.3.1 THE METHODOLOGY IN A NUTSHELL

An extensive study published by DG ENERGY[7], Directorate- General for Energy of the European Commission, connects the notion of replicability to the possibility of applying the same solution/technology implemented in a city to a different context with the aim to achieve the same objective. It states that replicability may address both:

- **scale:** the extent to which a solution can be increased in size without compromising its efficiency and effectiveness
- **context**: whether the solution can be replicated in a different environment

The same study points out that assessing the replication potential of smart solutions, or more in general of urban solutions, is complex and an exclusive focus on technical aspects is not sufficient to guarantee the effectiveness of replication. It is for these reasons that, beyond the technological dimension, socio-cultural as well as environmental, legal, institutional and economic aspects must be taken into account.

Based on these assumptions, ISINNOVA has developed a decision support tool able to determine the replication potential of different urban solutions in a specific place, taking into account the full range of local factors that could influence their applicability, with the ambition to support cities in the selection of the most suitable solutions for their local context.

The approach is based on the analysis of 5 dimensions: **S**ociocultural; **I**nstitutional; **T**echnological; **E**nvironmental and **E**conomic – **SITEE replicability tool**.

[7]EC DG ENERGY, *Analysing the potential for widescale roll out of integrated Smart Cities and Communities solutions*, June 2016

SITEE relies on a mathematical approach that can be easily represented through cartesian diagrams built on variables dependent on:

- factors that characterize the solution itself (horizontal axis)
- factors that are inherent to the local context (vertical axis).

According to those variables, every solution can be represented as a point in the diagram (See Figure 10).

The correlation with the replication potential, expressed on a scale 0-100%, is given by the intersection between the points representing the solutions and the iso-replicability lines (diagonal lines in the figure).
In SITEE, different Solution and Context variables are associated to every dimension (Table 8) and the general approach explained above is likewise applied to each of them.

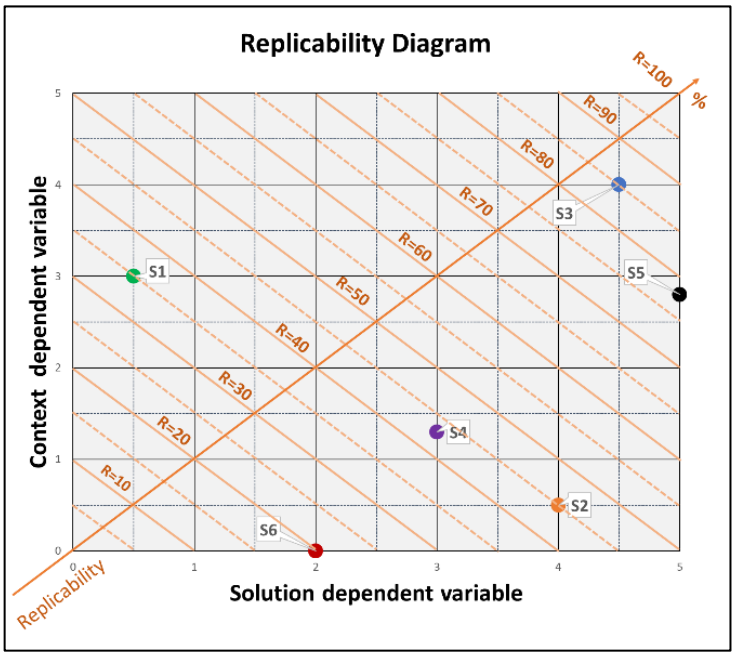


Figure 10: Replicability Diagram

Table 8: Solution and Context variables in SITEE

SITEE Dimension	SOLUTION Variables	CONTEXT Variables
Socio-cultural	• User Interaction Independence	• Population Acceptance • Responsiveness to population needs
Institutional	• Public-Private Cooperation	• Responsiveness to institutional priorities • Responsiveness to institutional needs
Technological	• TRL[8] (or SRL[9]) • Interoperability/Standardization Level	• Interest from Research/Industry/Private sectors to invest • Integrability in the existing infrastructure (hardware/software)
Environmental	• $CO2_{eq}$ reduction	• Legal viability
Economic	• Investment Costs • Operation Costs • Revenues/Savings	• Affordability of the solution by the city

The Context Variables are informed through questionnaires addressed to institutions, stakeholders, citizens from the city targeted for replication, while the Solution Variables should be elicited from the industrial/private entities and local administrations who implemented the solutions or, alternatively, can be obtained through desk research activities and experts' estimations.

Once all variables are calculated, a Replicability Diagram can be obtained for each dimension and the five values of replication obtained are then averaged to estimate the ***Overall Replication Potential*** of the selected urban solutions in the specific context under assessment (e.g. city, district, etc.) (Figure 11).

[8] Technology Readiness Level
[9] Solution Readiness Level

Figure 11: SITEE expected results – Overall Replicability Potential

	Socio-Cultural Replication	Institutional Replication	Technological Replication	Environmental Replication	Economic Replication	Overall Replication Potential
Solution 1	?	?	?	?	?	?
Solution 2	?	?	?	?	?	?
Solution 3	?	?	?	?	?	?
Solution 4	?	?	?	?	?	?
Solution 5	?	?	?	?	?	?
Solution 6	?	?	?	?	?	?

Besides the Overall Replication Potential, a ***Replication Priority Index*** has been defined to rank solutions from the most to the least replicable. The Replication Priority Index is calculated by expanding the measurement scale of the Overall Replication Potential while keeping proportions and ratios among the different replication values unchanged. It is thus possible to detect and better visualize even minimal differences among solutions, therefore facilitating the analysis (Figure 12).

Figure 12: Solutions Ranking in City X

To conclude, this multi-dimensional assessment allows for the identification of the most relevant factors that may limit or facilitate replication, supporting cities in the selection of those urban solutions that could be best replicated according to the socio-cultural, institutional, technological, environmental and economic aspects proper of their local context.

4.3.2 TESTING ACTVITIES IN WUHAN

SITEE is an experimental tool that was developed during the second year of the project. In order to validate the methodology, it was decided to test it in one of the Urban Living Labs of Trans Urban EU China, by engaging the city of Wuhan and CAS as local reference and contact point of the city.

Wuhan is the capital of Hubei province, and one of the nine National Central Cities of China, with a population of more than **10 million inhabitants**. Arising out of the conglomeration of three cities, Wuchang, Hankou, and Hanyang, Wuhan is known as 'China's Thoroughfare'; it is a **major transportation hub, with dozens of railways, roads and express-ways passing through the city and connecting to other major cities**. Holding sub-provincial status and currently comprising of 13 districts, Wuhan is recognized as the **political, economic, financial, cultural, educational and transportation centre** of central China.

Wuhan is one of the most competitive forces for domestic trade in China, rivalling the first-tier cities of Shanghai, Beijing, and Guangzhou in its volume of retail. Moreover, it is an important centre for economy, trade, finance, transportation, information technology, and education. Its **major industries** include optic-electronic, automobile manufacturing, iron and steel manufacturing, new pharmaceutical sector, biology engineering, new materials industry and environmental protection. Environmental sustainability is highlighted on Wuhan's list of emerging industries, which include **energy efficiency technology and renewable energy**.

In September 2010 **Wuhan metro** opened, and the city became the fifth Chinese town with a metro system. **Trams** were brought to the streets in the summer of 2017 with the first line opening that day. More lines have opened since then.
As one of the largest intermediate ports along the Yangtze River in China, Wuhan has **long history of ferry services**. There are passenger ships between Wuhan and Shanghai as well as Wuhan and Chongqing.

4.3.3 SCOPE AND ACTIVITIES

The scope of the work is to estimate the replication potential of a set of European Urban Solutions in the city of Wuhan. The results of this test will also be relevant for the validation of this new method and for the identification of areas for further improvement of the whole process with the ambition to build a solid and robust approach for estimating replicability that could be extended to other Chinese cities.

The testing activities carried out in this experimentation provided for:

- identification of criteria for selection of urban solutions
- selection of urban solutions
- calculation of the Solution Variables required
- preparation and distribution of the questionnaire for collecting the Context Variables
- running of the tool
- elaboration and analysis of results with a focus on Chinese context

In the following paragraphs, details on some of these activities will be provided followed by an in-depth analysis of results.

4.3.4 URBAN SOLUTIONS: SELECTION CRITERIA AND SHORT DESCRIPTION

4.3.4.1 SELECTION CRITERIA

The first step of this work was to identify a set of criteria for selecting urban solutions from a wide list of projects implemented in different European cities.

Two typologies of criteria have been adopted:

- The first group considers the twelve **characteristics of the social integrative city** identified in D 6.6 "Workshop Report on Theoretical aspects of transition towards urban sustainability and the role of socially integrative cities".
- The second group of criteria refers to **the five general themes** selected for a **student competition** launched by **UN-HABITAT** and **Wuhan Land Use and Spatial Planning Research Centre** (WLSP) during the 2018 Wuhan Placemaking Week (WPW) (see D5.2 "Report on the Living Lab knowledge base"):

Here below both lists of criteria are reported.

Fields of actions to promote **social integrative and inclusive cities** (D6.6):

1. Reducing urban sprawl and promoting well-balanced land conversion from "rural" to "urban" and appropriate access to urban land
2. Involving the different stakeholders in collaborative and participative planning and design processes on the different politico-administrative levels
3. Improving the environment and living conditions in urban areas
4. Upgrading the physical environment in distressed areas
5. Promoting efficient and affordable urban transport
6. Assuring equal access to municipal services
7. Strengthening the local economy and labour market
8. Strengthening (technical and social) innovation in cities and neighbourhoods opening up new possibilities for the local population

9. Fostering proactive education and training policies for children and young people in disadvantaged neighbourhoods
10. Preserving cultural heritage and fostering the identity of neighbourhoods and their inhabitants
11. Fostering social capital and engagement of local stakeholders
12. Supporting adequate institutional and financial conditions and mechanisms

Priority Areas identified for the UN-HABITAT and WLSP competition (D5.2):

A. Improving and innovating urban public spaces
B. Revitalization of waterfront spaces
C. Revalorizing industrial heritage
D. Socially inclusive and compact inner-city centres
E. Creating new tourism destinations

Relevant combinations of the above criteria have led to the selection of nine urban solutions, presented in Table 9. A short description of each solution is provided in the following.

Table 9: Urban Solutions selected according to the criteria identified

SOLUTION	SOCIAL INTEGRATIVE AND INCLUSIVE CITIES (D6.6)												PRIORITY AREAS (D5.2)					TOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	A	B	C	D	E	
S1 - Shared Mobility Agency																		10
S2 - Public e-bike system																		9
S3 - Citizen PV Power Plant																		9
S4 -Green credits scheme																		9
S5 - BigBelly																		10
S6 - UCO in urban waste collection truck																		6
S7 - Green Label Award																		5
S8 - Cold Ironing																		7
S9 - E-buses																		7
TOTAL	0	7	9	1	7	6	6	8	3	1	7	2	1	2	1	6	5	

4.3.4.2 SHORT DESCRIPTION OF THE SELECTED EUROPEAN URBAN SOLUTIONS

S1 - Shared Mobility Agency - ELBA, Italy

This solution aims to increase the attractiveness of Elba Island for tourists and improve the quality of life of residents with the provision of a wide range of mobility services able to comply with the needs arising from different demand segments. This measure also foresees the integration of sustainable and more inclusive transport modes with Public Transport and can lead to the reduction in the use of private vehicles, while ensuring access to different mobility services to a broader range of citizens and tourists.

The "Shared Mobility Agency" is the main element for planning, booking, providing, coordinating and controlling the different flexible mobility services based on demand and ride sharing approach for both tourists and residents. The shared mobility agency concept is not limited to transport and mobility services, but can be open, if desired, to a wider range of tourism services.

The Elba Sharing Mobility Agency (SUMA Agency) is designed as the entity for planning, managing and coordinating mobility in the territory. Its services are dedicated both to the management of the ride-sharing services as well as to the provision of information services to residents and tourists and to support the Local Authorities for mobility planning.

S2 - Public e-bike system – LAS PALMAS, Spain

This measure aims to increase the use of cycling by reducing the use of private vehicles and introduce innovative biking systems and green vehicles.

"**LPA by bike"[10],** implemented in Las Palmas, provided for the purchase of 20 e-bikes, 400 conventional smart bikes and 2 bikes accessible for the physically impaired. Moreover, 40 new stations are built with 520 anchor points. Five of these forty new stations are "smart totems" and will be placed at the main touristic hotspots of the city. The service is accessible through an integrated smart card and information on service available through digital kiosks and a Mobility App.

40 new stations (of which 5 smart totems placed at touristic areas)
520 anchor points
20 e-bikes
375 conventional smart bikes
2 bikes for impaired people
A **new software platform**

As part of its business plan to increase revenues, the public bike share operator Sagulpa begun to offer opportunities to private companies to sponsor the project putting their logos on bikes and totems.

In addition to promoting sustainable and affordable urban transport, this measure ensures equal access to e-bike services for all citizens categories, considering also the needs of physically impaired people, thereby fostering social inclusiveness.

S3 - Citizen PV Power Plant – VIENNA, Austria

In Vienna most citizens live in flats. There are many hurdles and burdens for tenants/flat owners to take part in renewable energy deployment. Problems could be multiple: complex ownership structures; approval procedures; poor availability of financial options; lack of technical expertise; conservation of ancient houses.

Citizens' Solar Power Plants marked the end of these problems and showed the city's clear commitment to developing renewable energy power plants.

[10] http://www.bybikelpa.com/

The participation model "Sale & Lease" proposed by Wien Energie has overcome these hurdles providing for a simple, profitable, and secure option for interested people to participate in renewable energy development. By investing in community-funded renewable energy power plants (solar, wind and potentially others), Viennese citizens can participate in the development of renewable energies.

The main concept is to sell solar panels to those citizens unable to install them due to their lack of rooftop space and let the electric company plan, build, and operate the solar power facilities. In this way consumers operate (with the support of the electric company) as an energy provider as they sell the power to the grid and earn revenues. This business model is profitable because the costs payed by the citizens largely cover, even without subsidised feed-in tariffs, the plants construction, operation and maintenance and the ground/roof renting, resulting in a solid win-win solution.

By supporting adequate institutional and financial conditions and mechanism and concurrently fostering social capital investments and engagement of local stakeholders, this solution is perfectly in line with the concept of social integrative and inclusive cities.

S4 - Green credits scheme – LAS PALMAS, Spain

In the wake of promoting social inclusiveness and increasingly engage the local community in the use of sustainable transport, the Municipality of Las Palmas de Gran Canary and Guaguas Municipales have introduced a ***Green credit scheme*** to encourage citizens to adopt more sustainable lifestyle patterns by providing tangible economic rewards.

Public transport users will accumulate points as rewards for using sustainable modes of transport. These points can be monetized to purchase products and services in several places: shops, museums, theatres, etc. This scheme will substantially contribute to the reduction of greenhouse gas emissions while strengthening the local economy and labour market

The green credit scheme will be supported by a website and a mobile App. The rationale for the users is clear**: the more journeys carried out with sustainable options; the more credits one can earn**. With this tool each daily mobility option counts for earning advantages.

Green Credit Scheme APP:

- **Provides Real time information** about the main events, shopping discounts and other highlights for residents and tourists
- contributes to **change mobility behaviour**
- promotes **local businesses**

This scheme could also integrate all the useful information resources needed for tourist and residents such as maps, directions, events, attractions and any other useful information

S5 – BigBelly[11] – DÚN LAOGHAIRE COUNTY[12] (DUBLIN), Ireland

The County, part of the Dublin Region, decided to change the approach to waste management and consequently chose to deploy the Bigbelly solution, an innovative approach to waste collection. BigBelly solutions deploy smart, solar-powered, sensor-equipped waste & recycling stations that communicate real-time status to collection crews to enable efficiencies.

The Bigbelly solution is made by three key elements:
- **Solar-powered compactors**, garbage bin equipped with PV panel producing energy for automatic compaction of waste
- **Recycling units**, attached to PV powered compactors to facilitate separation of trash
- **CLEAN software solution**, which sends signals to the waste department for notification that collection is imminent to reduce unnecessary collection journeys to non-fully garbage units.

Each unit communicates its real-time status and notifies crews when it is ready to be collected. This streamlines waste management operations, increases productivity, and keeps public areas clean and green.

The main benefits of BigBelly are:

- **Improved living conditions in urban areas**: this smart waste system eases logistics, declutters the streetscapes, and further **enhances the community experience with improved services**.
- **Reduced truck traffic**: avoiding the second or third collection trip each day, keeps collection vehicles off the streets and thereby reduces congestion
- **Reduced litter**: the compactors are enclosed, which decreases litter and improves the cleanliness and appearance of public spaces
- **Pest-resistant**: compactors' design prevents rodents, birds, and other pests from accessing the trash
- **Reduced C02 emissions**: reducing collection trips leads to reduced fuel consumption and associated greenhouse gas emissions
- **Discourage household dumping**: the limited size of the insertion hopper makes illegal dumping of household or commercial trash more difficult
- **Advertising revenue potential**: The County is considering potential revenue from selling advertising space on the compactors and recycling units.

S6 – Used Cooking Oil in urban waste collection truck – RETHYMNO (Crete), Greece

Rethymno aims to define an operational scheme for implementing the full Used Cooking Oil (UCO) to biodiesel chain. This measure foresees the expansion and improvement of the UCO collection system, therefore new collection points are introduced involving smart sensors at UCO collection containers, monitored through a web-based platform. The platform allows real-time monitoring of the oil filling level, optimisation of the collector's routes, and provides alerts for unauthorized incidents (e.g. theft, vandalism, reallocation of containers).

The pilot provides for the use of a small-scale autonomous production biodiesel unit for the transformation of collected UCO to biodiesel.

The acquisition of new collection bins is a result of successful cooperation between the University (Technical University of Crete) and the Intermunici-

Cost of the pilot **€30,000**
30 sensors
1 platform for monitoring
50 collection points
1 UCO production unit and auxiliary equipment
Annual operations and maintenance costs **€5,000**.

[11] https://bigbelly.com/platform/
[12] Case study in Ireland here: http://info.bigbelly.com/case-study/dun-laoghaire-rathdown-county-council?hsCtaTracking=8e04005a-2b28-4761-aa4b-721a0dbd41ed%7C34fe00c4-dee1-41cc-a581-628155d05310

pal Waste Management Company, which is studying further expansion of the system to include additional collection points and other cities in Crete. This potential extension would represent an opportunity to strengthen technical and social innovation in Crete opening up new possibilities for the local population (increase employment, establish a local-based fuel supply chain).

S7 - Green Label Award – LIMASSOL, Cyprus

According to this measure, a Green Label will be awarded to hotels that commit to encourage the use of sustainable mobility modes by their guests, share links with sustainable mobility information, offer sustainable mobility promotional material in their lobby, provide cooking oil for recycling as bio-diesel, offer bike rentals at hotel, promote the sustainable mobility application and require their front office employees to participate in sustainable mobility training sessions, organised by the Limassol Tourism Board.

- Encourage hotels to **support sustainable mobility**
- **Award hotels** for their support
- Enable visitors to buy **one ticket** for the duration of their stay **for all PT transfers** to earn discounts at tourist attractions
- **Promote tourist attractions** such as museums and theme parks through the **Tourist Mobility Card**
- **Integrate services** for tourism and mobility.
- Establish **cooperation between the tourism and mobility sectors**

The awarded hotels will be proud owners of the Green Label logo to use in their communication material and will demonstrate the Green Label logo on a crystal trophy placed on the Reception desk.

Moreover, a Tourist Mobility Card will be combined with this initiative and with the aim to enable visitors and residents to buy one ticket for the duration of their stay, for all their PT transfers (urban and rural) and at the same time be allowed to have discounted entrance to museums and other places of interest as well as on bike sharing.

Among the positive impacts brought by this solution there are : less **CO2 emissions; l**ess **traffic noise** in the city centre; less **energy consumption**; increase the total share of **citizens that use sustainable mobility modes;** more **attractive tourist** destination; c**hange habits** of local people and tourists; public **health** and **safety,** a more **inclusive, collaborative and open community** of citizens and local stakeholders supporting green and cultural initiatives in the city.

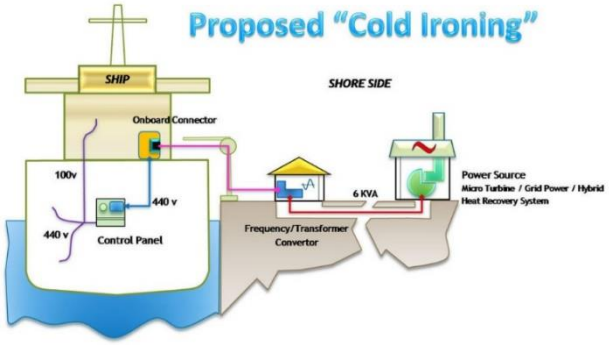
S8 – Cold Ironing[13] – ANTWERP[14], Belgium

With the shipping industry entering a new, environmentally friendly period, stakeholders in the maritime industry are seeking ways to reduce their ships' emissions. Apart from choosing green fuels and scrubbers, ports come to add another solution: Cold Ironing. This is the process of providing shoreside **electrical power** to a ship at berth, **while its main and auxiliary engines are turned off.**

Cold ironing goes way back into shipping's past, as it first appeared when all ships were using coal-fired engines. Specifically, when a ship was berthing at port, it did not have to continue to feed the fire, and the iron engines would cool down, going totally cold. This is from where this process took its name from.

[13]More information on cold ironing here
[14] More info on Antwerp case study here

The City of Antwerp has been at the forefront in the development of an innovative cold ironing system. Given its strong dependency from maritime commerce and the central role of the port in the socio-economic fabric of the city, Antwerp considered this solution of paramount importance and, thanks to this technology, significant emissions reductions have been achieved: Antwerp Port cut CO2 emissions by more than half and NOx emissions by 97%, while CO emissions are practically eliminated.



This technology **reduces the air pollution produced from diesel generators through the use of shore electric power as an alternative**.

During cold ironing, the ship turns off its engines while berthed and plugs into an onshore power source. The ship's power load is then transferred to the shore-side power supply without disrupting onboard services. With this process, emergency equipment, refrigeration, cooling, heating, lighting, and other equipment are still able to receive continuous electrical power, while the ship loads or unloads its cargo. In fact, studies have found that by using this method, many environmental and social benefits are generated.

S9 - E-buses – LONDON[15], UK

As a result of a pioneering work between Go-Ahead London, a local bus company in London, and Build Your Dreams (BYD) of Shenzhen (China), the first European all-electric bus garage has been built and today allows Londoners to travel on clean, silent and reliable electric buses.

Waterloo depot was converted from diesel to fully electric BYD buses in 2016. In comparison to the replaced diesel buses, these high capacity single decker vehicles are more efficient by 700 tonnes of CO2 per year and have improved London's air quality since their introduction. They can achieve a 16-hour service cycle without recharge and they also boast seat-back USB charging points and audio-visual digital screens that display maps and announce stops.

Routes 507 (Waterloo to Victoria) and 521 (Waterloo to London Bridge) predominantly serve commuters travelling to and from National Rail stations in the heart of the city.

Since their introduction in late 2016, two further services have been converted to electric bus operation. The first was route 360 (Elephant and Castle to Royal Albert Hall) in November 2017, followed by route 153 (Finsbury Park to Moorgate) in February 2018. As a result, the company has, to date, safely operated over **3.5 million emission-free electric bus miles**.

[15] More info on Waterloo Full Electric Depo project here

4.3.5 RESULTS AND ANALYSIS

Following the selection process, the work proceeded with the research and collection of the data needed to operate the tool. Therefore, desk research activities were carried out to calculate the Solution Variables and, in parallel, a questionnaire and detailed documentation material on the solutions were distributed to CAS with the purpose to obtain the data necessary to quantify the Context Variables for the city of Wuhan. This work led to the results shown in Figure 13 and Figure 14 below.

The identification and the quantification of the Context Variables in the city of Wuhan resulted from a sample size of 25 questionnaires and interviews distributed among the following types of stakeholders:

Number of questionnaires and interviews	Types of stakeholders
10	Universities
8	Local administrators
4	Private urban developers
3	Urban planners

In Table 10, the urban solutions are reported by order of Replicability Priority Index:

Table 10: Replication Priority Index of the selected urban solutions

Rank	Code	Solution	Replication Priority Index
1	S2	Public E-bike System	**93%**
2	S4	Green credits scheme	**71%**
	S5	BigBelly	**71%**
3	S9	E-buses	**37%**
4	S3	Citizen PV Power Plant	**26%**
5	S8	Cold Ironing	**17%**
6	S1	Shared Mobility Agency	**16%**
7	S6	UCO in urban waste collection truck	**7%**
8	S7	Green Label Award	**2%**

Figure 13: European Urban Solutions ranked according to their Replication Potential in Wuhan

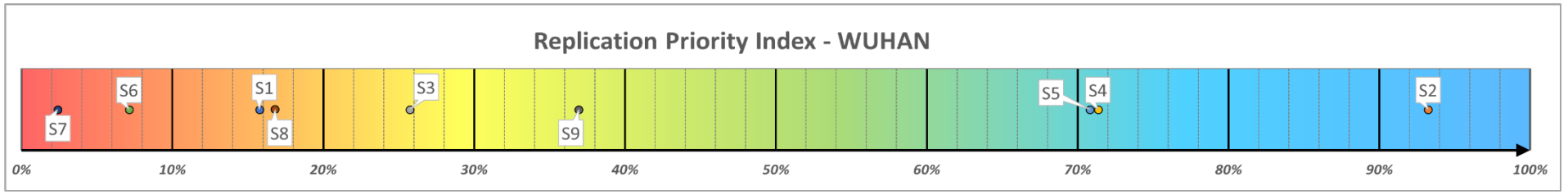


Figure 14: Replicability potential by dimension in Wuhan

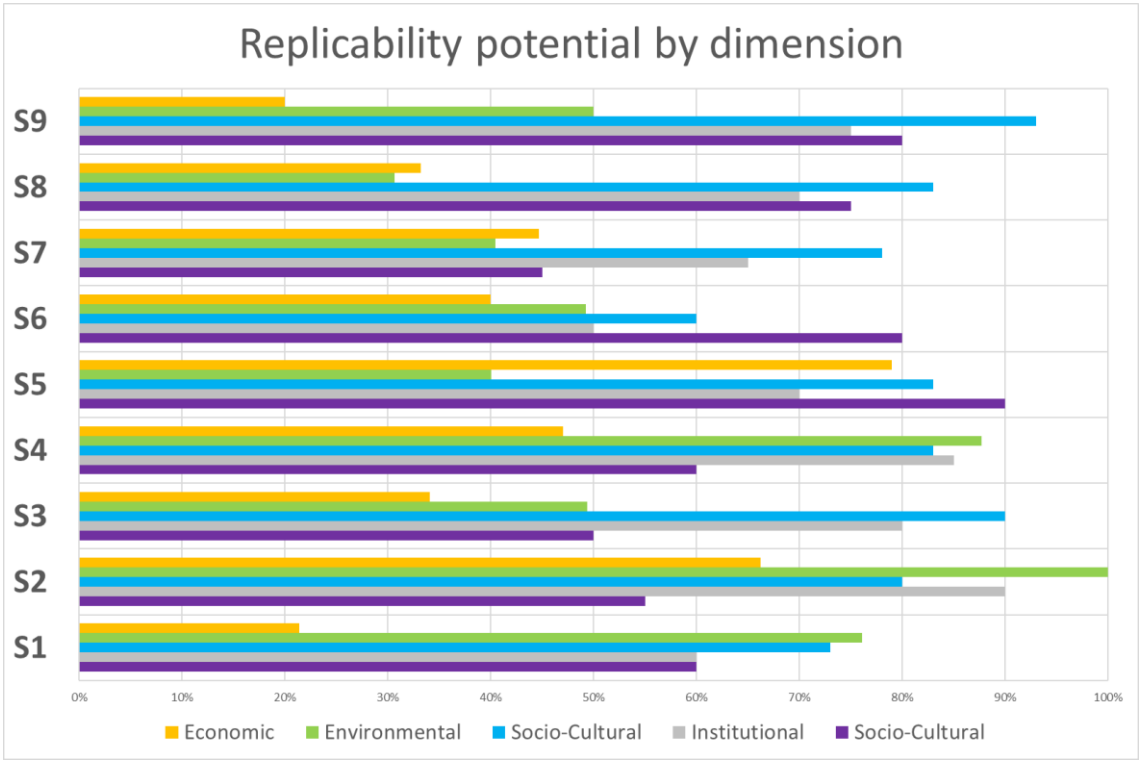


Figure 15: SITEE Replicability dimensions - Wuhan

4.3.5.1 DIMENSIONAL ANALYSIS

In the following, the three most and two least replicable solutions will be analysed dimension by dimension to better understand the reasons behind the results reported in the figures above.

- **First Ranked*: <u>Public E-bike System (S2)</u>***

The Public E-Bike System of Las Palmas ranked first in the replication priority scale. The reasons leading to this result are multiple and a short overview of the main factors that brought about this outcome is provided below.

Shifting from the use of private vehicles to cycling is a very effective measure that has a strong impact on emissions reduction. This solution, indeed, leads to high values of CO2 savings per user - the highest among the selected measures (Figure 14 and Figure 15) - and this is one of the determining factors that can significantly influence the choice of the solution over the others. In fact, as can be easily confirmed by the high value of environmental replicability, this aspect firmly contributes to increasing the overall replication potential.

From a technological point of view, the Public E-bike system is not that complex as it requires the use of hardware and software now well-established in the Chinese market. Thus, the high interoperability level of the e-bike technology allows easier integration of its components with the different existing systems of the city (electric infrastructure, charging points, plug-in, software, data, etc.). All these aspects favour technological replicability.

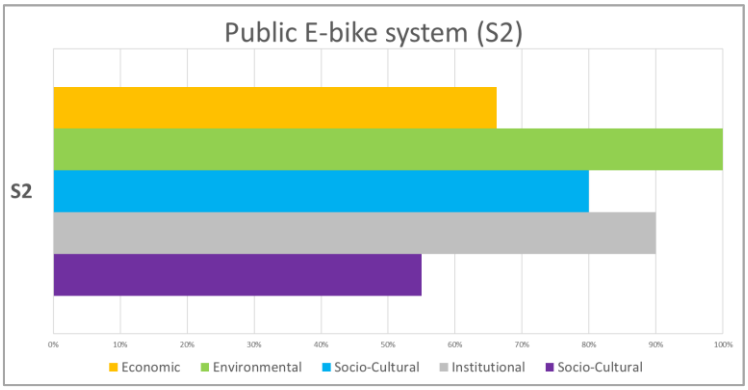


Figure 16: Public E-bike system

Besides, the fact that there are no barriers to obtaining permits to start deploying the public e-bike system in Wuhan is another important point to consider. The efforts required for obtaining the permit or the license for implementing a solution are not secondary factors in the analysis of replication along with any legal constraints that a city is often bound to respect and that might hinder the implementation of a solution in a specific area of the city or limit its use cases in compliance with the local laws and regulations in force. Differently from other solutions (e.g. S3- Citizens Power Plant), it seems that the public e-bike system would not encounter these kinds of problems, especially considering that similar solutions already exist in most of the biggest cities in China.

The Business Model of the solution adopted by Las Palmas foresees the involvement of public and private partners and this is a feature that makes the solution more replicable in contexts where this collaboration can easily take place. In Wuhan, it is believed that the interest of the private sector in investing in this solution is not so evident but, on the other hand, it is considered among the institutional top-priorities – first ranked (Figure 14 and Figure 15), – as it meets different needs of the local administration.

From an economic perspective, the solution is among the most cost-effective as it guarantees high revenues and short payback times (5-6 years), against important but still affordable investments for the city of Wuhan. Moreover, according to the responses received by CAS, the e-bike sharing system is considered to be a solution perfectly in line with the needs of the population of Wuhan and that would not

clash with social acceptance since soft mobility is widely spread among Wuhan citizens. However, it must be said that such solutions require strong involvement and high interaction of the final user, and this entails high risks of failure which is why the socio-cultural replicability value is low (Figure 16),

Despite this minor shortcoming and thanks to all the arguments mentioned above, the Public E-bike system deployed in the city of Las Palmas (Spain) proves to be the most replicable solution for the city of Wuhan.

- **Second Place Tied: *Green credits scheme (S4)* and *BigBelly (S5)***

It is interesting to see how two very different solutions could have the same replicability potential, but due to quite different factors. It is the case for the Green Credit Scheme, a solution aimed at encouraging people to adopt sustainable habits by providing tangible economic rewards, and BigBelly, a measure that seeks to improve the waste management and collection system of the city.

Wuhan has already experience in both these aspects. Concerning sustainable behaviours, a "ten actions" program is in place in the city and aims at encouraging industries and residents to adopt low-carbon and sustainable approaches to production and daily life. For what concerns waste management, the city has adopted a standardized system as required in other big cities in China and, recently, began to encourage collecting waste by categories in order to facilitate recycling and lower the negative impact on the environment. Incinerators applications are also present in the city's peri-urban sites to generate power from burning waste.

Therefore, the two solutions proposed well answer to some of the main challenges identified by the city, among which the identification and selection of suitable technologies for waste management and treatment and, on the other side, the need to introduce eco-friendly behaviours and raise awareness on issues related to waste reduction and creation of affordable and sustainable incentive instruments in support of these initiatives.

Coming back to the dimensional analysis, the Green Credit Scheme seems to be very promising for the city of Wuhan with regards to CO2 emissions reduction - second only to the Public E-bike system.

In Las Palmas, it is estimated that this measure can lead to an increase of 4 percentage points in the modal share of public transport and 1 percentage point in the active modes - walking and cycling - in the face of a simultaneous decrease in the use of private vehicles (-5 points). This change of habits could lead to an annual reduction of about 260 kg CO2 emissions per inhabitant; it is a relatively high value compared to other solutions such as, inter alia, BigBelly that is not particularly impactful in terms of local emissions reduction, even if it entails several benefits.

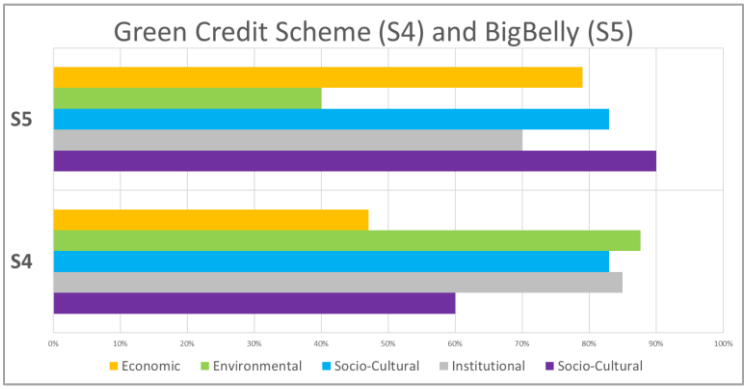


Figure 17: Green Credit Scheme and BigBelly

Although both measures are characterized by high values of technological replicability - as both technologies are quite ready on the market and easily interoperable with the existing systems and infrastructures of the city of Wuhan - evident differences can be found in the socio-cultural dimension. In fact, the waste management solution proves to be highly replicable from this point of view (the highest of all) as by its nature it does not require significant interaction with citizens to function. As already mentioned, this is a crucial factor that largely reduces the uncertainties about solution's potential success as

it is less dependent on users' behavior. On the other hand, for the Green Credit Scheme, the risk that it would not be used by several users high enough to ensure its correct operation is taken into account in the calculation. This leads to a reduced value of socio-cultural replicability (Figure 17), even though the answers to the questionnaire state that both solutions are highly needed by the population of Wuhan and would not present any particular problem from the social acceptance perspective. This is also well aligned with the current situation, indeed, because of the COVID 19, residents show higher acceptance in further improving city's environment, including innovative waste collection systems such as timely collection of medical waste from hospitals by volunteer's participation.

Minor differences are in the institutional sphere, where it is recognized that both solutions are highly needed by the local administration and therefore are among the priorities, especially the Green Credit Scheme (second ranked after S2) since it meets the need to increase the attractiveness of the city and boost the tourism sector[16].

Finally, it is worth mentioning the high economic replicability value of BigBelly, which holds the first place among all nine solutions. This is due to the high economic savings resulting from the substantial abatement of operation and maintenance costs, made possible thanks to the logistic optimization of the urban waste collection process.

- **Second-last and Last place: Used Cooking Oil in waste collection trucks (S6) and Green Label Award (S7)**

Solution S6, which provides for the reuse of cooking oil in the local diesel production chain, is an experimental measure currently underway in the Greek city of Rethymno. From the questionnaire distributed to the Chinese partner in Wuhan it emerged that there could be high interest of the research, industry and private sectors of Wuhan in investing in this technology. Indeed, the local cuisine makes intensive use of cooking oil, generating a good amount of resources to be potentially reused.

This aspect could enhance technological replicability; however, this value is kept low by the Technological Readiness Level (TRL). This measure, indeed, is neither yet ready on the market nor prepared to be developed on a larger scale.

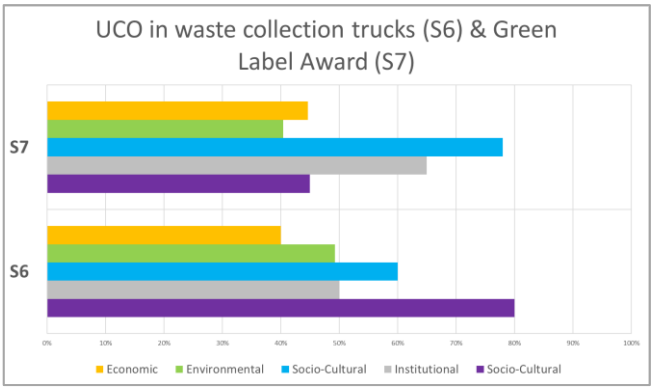


Figure 18: UCO in waste collection trucks and Green Label Award

The limited technological maturity is also reflected in the pessimistic business model that entails drawing from external financing to successfully implement and operate the solution. This negatively affects the value of economic replicability although, on the other hand, this reduction is partially offset by the clear intention of private Chinese stakeholders to invest in such technologies, meaning that they are open to experiment it in their local context.

The total replicability value of S6 is also brought down by the institutional component: although it is similar to BigBelly in some respects, it seems that the local authority is not much interested in this measure and, likely, it would rather focus more on solutions able to bring short-term benefits, also from an environmental point of view where S6 doesn't seem to provide significant contributions.

[16] Recently, Wuhan launched a set of programs to increase its attractiveness to residents and tourists. For example, more than 100 small scale public green spaces will be built within the next two years, which will double the number of small green parks by then and ensure that 90% of urban residents can access one of these parks within 5 minutes walking. (https://sustainabledevelopment.un.org/partnership/?p=30681)

Including this early-stage initiative in our basket of measures has provided a fruitful opportunity to test the sensitivity of the tool - and of the results - to the full range of criteria and dimensions.

While the Green Label Award (S7) turned out to be easily implementable from the technological side and quite affordable in economic terms, its efficiency is lowest when it comes to environmental impacts. On the other hand, it is evident that S7 partially meets the interest of the local administration, as the solution would aim to encourage and increase sustainable tourism.

From a socio-cultural point of view, although the answers to the questionnaire indicate that it can be well received by the population[17], the Green Label Award suffers from the uncertainty stemming from the strong dependence on the citizens and tourists' involvement to make it work, hence the low value of socio-cultural replicability (the lowest -Figure 15), This doesn't occur in S6 for which the population would benefit without having to actively intervene (similarly to BigBelly).

All these considerations explain why these two solutions are the lowest ranked in the replication priority scale.

4.3.6 KEY FINDINGS AND CONCLUSIONS

The analysis carried out provides a good basis for drawing general conclusions both on the method itself and on potential further applications in China.

A first important conclusion is that SITEE is not only a means of prioritization of urban measures in support of decision-making process but can provide valid suggestions for improvement whenever weaknesses that could hinder the application of potentially winning solutions are found in the local context. Furthermore, the application of this methodology is well suited to the comparison between cities, as crucial aspects for replication can emerge more clearly from comparative assessments. Figure 19 shows the diverse functionalities of SITEE, that are explained in more detail in the next paragraphs.

Figure 19: SITEE functionalities

[17] Green development approaches in Wuhan are widely accepted by local governments and residents since the eco-civilization program was introduced in China in 2012. After 2016, the eco-civilization concept became the national first priority for its pursuit of sustainable development. [Xing Lijuan, To judicialize the eco-civilization policy in china: a perspective of grasslands protection, 2017, http://law.ku.edu/sites/law.drupal.ku.edu/files/docs/law_journal/v26/12%20Xing%20-%20Eco-civilization%20Policy%20in%20China.pdf]

In Wuhan, **sustainable mobility solutions** such as the Public E-bike System (S2) and the Green Credit Scheme (S4) turned out to be the **most replicable** as they would be grounded in a local **context ready** to welcome them easily both in terms of **existing infrastructures**, able to embed such technologies without major difficulties, and from the social acceptance point of view, as they fully **meet the needs of citizens** and contribute to **improving the environment** and the quality of their lives.

Furthermore, making **waste collection and management processes more efficient** is another solution that could be **successful in Wuhan**. It must be said that BigBelly system is widely spread in many cities across the world, with well-established interoperable standards that make it highly replicable regardless of the specificities of the different urban contexts.

It is also important to note that, although the "UCO in waste collection trucks" and the " Green Label Award" may have interesting traits that make them rather suitable for Wuhan[18], the **comparison** with other solutions makes them **less adequate**, albeit, with the necessary precautions, **not entirely impossible to implement** nor totally to be ruled out. After all, it must be considered that the objective of this specific analysis was to identify the most replicable options starting from a portfolio of solutions that featured aspects of interest for the city of Wuhan at the outset – (see Table 9 on the criteria of selection). Hence the need to introduce a prioritization index - notably Replication Priority Index[19] - that allows to amplify the small differences among results making their distinction more visible and facilitating the assessment. Thus, while the relative figures of the Replication Priority Index vary from 2% to 93%, the absolute values of the Overall Replication Potential of the selected solutions ranges from 54 to 80%. **S6 and S7 have in fact a fair replication potential in absolute terms**, 55% and 54% respectively, even though being at the bottom of the relative scale of priorities. That's why their potential adoption in the city strategy could be still feasible, whether the administration would deem it necessary.

Prioritization

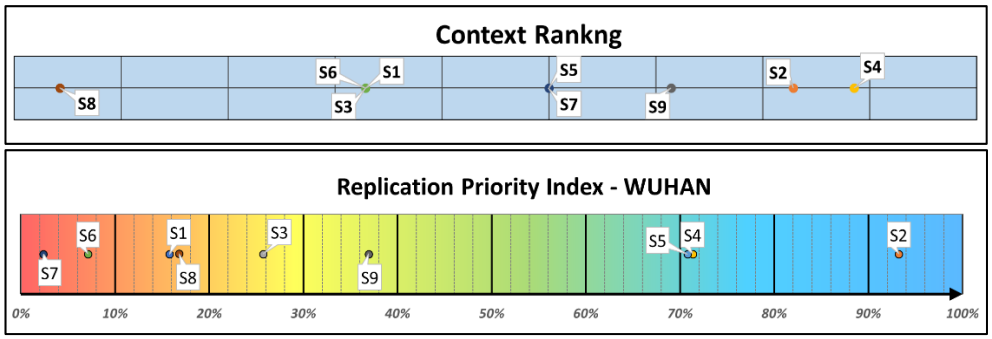
Finally, it must be stressed again that the context variables provided by the city of Wuhan were suitably combined with the intrinsic variables of the solutions analysed, therefore the **final replicability value** takes into account a wide variety of aspects that can strongly influence and even lead to **surprising final results partially in contrast with the initial expectations of the city** - as shown in the figure below where, in the Context Ranking graph, the classification is different from the final prioritization.

It all goes to prove how important it is that the replication analysis considers both **solution-specific and context-specific variables in combination,** making sure that the analysis is complete and reliable.

[18] i.e. responsiveness to population's needs (S6 and S7), attractive technology for the industry and private sectors that would be willing to invest, etc.

[19] It is a **relative index** that can be obtained by expanding the **absolute measurement scale** of the Overall Replication Potential, while keeping proportions and ratios among the different replication values unchanged.

Figure 20: Context Ranking and Replication Ranking - Comparison



Gaps Analysis

SITEE is also a useful tool to **detect any potential gap** in the implementation of measures and, in this sense, **could support the identification of further actions** to improve and strengthen the city in areas where it is weaker so as **to make it ready to take on new challenges** and implement more and more innovative measures. For example, understanding the reasons for a low social acceptance of a measure could inspire the implementation of accompanying measures aimed at raising awareness, communicating, and involving potential users (e.g. Green Label Awards, Public E-bike system, etc.). Or as further examples, in the case of low economic replicability, national/local financial support schemes could be envisaged for industries and companies willing to invest in research for a specific technology (e.g. UCO in urban waste trucks); in case of bureaucracy delays in obtaining the permits, procedures could be reviewed and converted in smarter and faster processes in order to facilitate implementation as much as possible (e.g. Citizens Power Plant). Likewise, many other corrective actions could be suggested following the replicability analysis.

Cities Comparison

The limited scope of this test did not allow to perform comparisons with other Chinese cities. However, it would be worthwhile and interesting to see how the assessment of the same group of solutions could lead to different results in other Chinese cities with diverse characteristics compared to Wuhan. This is possible and can be easily done in SITEE by varying the values of the context variables obtained from other Chinese cities, while keeping the solution variables unchanged.

In this way, an accurate comparison between the different possibilities and capacities to adopt, integrate and implement the same specific group of solution could be conducted and lead to valuable findings.

Potential future application in China

Additionally, the application of SITEE to the Chinese context might have interesting implications.

With its near-continental size, China is a country that is not easy to approach, especially because of the heterogeneity that characterizes it in many aspects, areas and sectors. Due to this complexity, Chinese cities are typically grouped into four tiers[20].

Traditionally, Tier 1 cities are the largest and wealthiest – often considered the megapolises of China. As the tiers progress, the cities decrease in size, affluence, and move further away from prime locations. This means also that cities belonging to tier 1 are directly controlled by the central government while tier 4 cities have greater autonomy as they are county level cities.

This categorization can be adapted to SITEE so as to broaden and maximize the results and the impacts that can be obtained for one city, leading to the identification

[20] https://multimedia.scmp.com/2016/cities/

of a group of solutions that can be a valid option for all the cities belonging to the same tier.

In addition, the criteria used in the tiers-classification offer an interesting starting point in the assignment of weights to the five dimensions of SITEE, not considered in this test. For example, since tier 4 cities have a greater political autonomy, a higher weight could be assigned to the Institutional Dimension; on the other hand, the technological dimension in tier 1 cities could be higher as they are more advanced and often host universities, important research centres and industries headquarters.

Currently another cluster classification is under development in China: the City Cluster Plan[21] aims at creating key areas for Chinese urbanization in which cities may play different roles according to their respective positioning in the region.

In this regard, SITEE approach may help urban planners and decision makers to well identify the comparative and competitive advantages of each city in each cluster region from a multi-dimensional perspective. By doing so, also the urban and rural integration in the city cluster region can be greatly enhanced and improved.

Twinning Cities

Furthermore, SITEE could prove to be a useful methodology also to connect with other European and non-Chinese cities and could lead to the identification of similar local realities with whom making twinning, opening a dialogue and discussing potential collaborations on issues related to sustainability and social integration. This exchange of knowledge and experiences is a fundamental step in the replication process and in the case of Wuhan, for example, the fact that two of the most replicable solutions have been implemented in the city of Las Palmas could offer ideas and inspiration on a potential twinning and lead to decisions that had never been considered before.

Upscaling and areas for further improvements

The analysis done was mainly focused on replicability. As for scalability, SITEE does not foresee a specific application but further developments are planned in that sense and could be made by adapting the multidimensional approach of SITEE to small-scale solutions to be upscaled to a wider area in the same city. Nevertheless, high value of overall replicability along with positive scores in the economic dimension could allegedly enable the identification of highly scalable solutions.

Another potential improvement that will be implemented in SITEE relates to the Environmental dimension. Currently, only CO2eq emissions reduction data are processed in the tool and the possibility to integrate other relevant variables, like air-quality and noise, is under assessment.

Finally, it should be stressed that SITEE is a very versatile method which, thanks to its modular nature, allows for additional adaptations and extensions to other dimensions whenever necessary. In this regard, future investigation on how to add the health dimension will be done.

[21] https://www.china-briefing.com/news/chinas-city-clusters-plan-to-transform-into-19-super-regions/

5 CONCLUSIONS

This report outlines tools and mechanisms to narrow planning and implementation gaps in smart and eco city development in China and Europe. It is the third of subsequent deliverables produced by Work Package 2 of the Trans-Urban-EU-China project. D2.1 presented a conceptual framework allowing to analyse the planning and implementation gap in smart and eco-city projects. D2.2 provided a virtual box of tools and mechanisms for narrowing the planning and implementation gap; this toolbox was derived from theoretical considerations and a review of relevant literature. The current deliverable D2.3 contains a validated set of tools for narrowing the planning-implementation box.

The validation was achieved by case studies of smart and eco-cities initiatives in Europe and China and in an online workshop with Chinese and European experts.

For the case studies, European and Chinese cities involved in major smart and eco-city funding initiatives were selected and interviews with key stakeholders in these cities were carried out to identify which tools and mechanisms are used by these cities to narrow the planning-implementation gap. The case studies showed that the following tools and mechanisms have been applied by cities in Europe as well as in China:

1. Aligned funding structure and financing mechanisms
2. Multi-actor governance
3. Citizen participation and actor involvement
4. Living lab approach
5. Capacity development
6. Agile project management
7. Monitoring and evaluation
8. Awareness raising
9. Setting up replication mechanism
10. Digital planning tool

As an additional step in the validation, an expert workshop with Chinese experts were held to discuss the applicability of the tools and mechanisms in the Chinese context. The empirical evidence collected on the several steps of the validation process suggests that the above tools and mechanisms are effective for closing the planning implementation gap.

Another important outcome of WP2 is a validation tool for the upscaling and replication of smart city solutions, the SITEE replicability tool. This tool had been originally developed for European Smart City projects, and now it was tested for its applicability in China. The analysis done was mainly focused on replicability. As for scalability, SITEE does not foresee a specific application but further developments are planned in that sense and could be made by adapting the multidimensional approach of SITEE to small-scale solutions to be upscaled to a wider area in the same city.

To summarize, the report shows that there are several tools for closing the planning implementation gap and for supporting the upscaling and replication of smart eco city solutions that have been successfully tested and applied in Europe as well as in China. Their application at large scale should be, therefore. promoted and they should be included in planning and funding guidelines in Europe as well as in China.

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7 ANNEX

7.1 INTERVIEW GUIDELINES

Date:

Name of interviewer:

Name of interviewed person:

Position of interviewed person:

Interviewee represents/has main knowledge in (tick):

Strategy	planning	Implementation	replication & upscaling

Interview questions pool *(most important ones to be picked/highlighted before the interview)***:**

Tell briefly about the background of TRANS-URBAN EU China

1. **To understand better the gap between planning and implementation, we'd like to know more about *strategy and the process/the project* '*project name*'and *its path towards implementation etc.* Can you please give a short overview on the current status and the background of "Smarter Together" Project?**

   1.1 What are the goals, time scope and spatial dimension/extent of "Smarter Together"?

   1.2 Is there a collective vision behind Smarter Together? What has triggered the development of Smarter Together project?

2. **Who are the key actors/main stakeholders for 'project name'and what is their specific role?**

   2.1 Who has initiated '*project name* '?

   2.2 Why are those stakeholders involved (what is their motivation/background)?

   2.3 Who takes the main decisions?

   2.4 How are the stakeholders organized (a platform, regular meetings, formalized or informalized activities etc.) and what resources (money, time etc.) do they have available?

   2.5 *If there is a platform:* who runs the platform, who is responsible? Is it a permanent or temporary platform?

3. **Has there been citizens' participation for 'project name'?**

   3.1 If so, how, when and why did it take place?

   3.2 *If not,* why?

4. **Is there a collaboration going on with any other city departments or other cities?**

   4.1 If so, in which way and how is it helpful?

   4.2 *If not,* why not?

5. **How does the communication internally and externally regarding ……. look like?**

   5.1 Are there any awareness building measures?

   5.2 Are there any feedback loops within the whole process?

6. **How is 'project name' documented? Is there an evaluation/monitoring of 'project name'?**

   6.1 If yes, for what purpose and how?

   6.2 *If not,* why not?

7. **Do you think that 'project name' is successful?**
   If yes, in which way?

   7.1 What did not work so well, what worked very well?

   7.2 From your personal view: what needs to happen/come true that you are satisfied with 'Project name'?

   7.3 From your experience/learning with 'Project name: What would be the most important message that you'd give someone new in your position?

Are additional material and/or documents available?

Recommendations for further interview partners*?*

7.2 POWER POINT PRESENTATION OF THE ONLINE WORKSHOP

Figure 21: Slides of the workshop presentation

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TRANS-URBAN-EU-CHINA

Transition towards urban sustainability through socially integrative cities in the EU and in China

Why does it matter?

- Rising complexity, problem size and level of detail make the development of new approaches necessary.
- Urban qualities are strongly influenced by social, environmental, technical changes and urbanization.
- Necessity for more flexible and integrative planning approaches.

Greatest regional urban challenges

Source: Word Economic Forum, Shaping the Future of Urban Development & Series Initiative, Global Survey on Urban Services (Oct.-Dec. 2015)

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TRANS-URBAN-EU-CHINA

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TRANS-URBAN-EU-CHINA

Transition towards urban sustainability through socially integrative cities in the EU and in China

Structure

Tools and mechanisms for bridging the planning-implementation gap

1. Methodology
2. Overview of tools and mechanisms to closing the gap
3. Introduction of selected tools and mechanisms
4. Open Discussion

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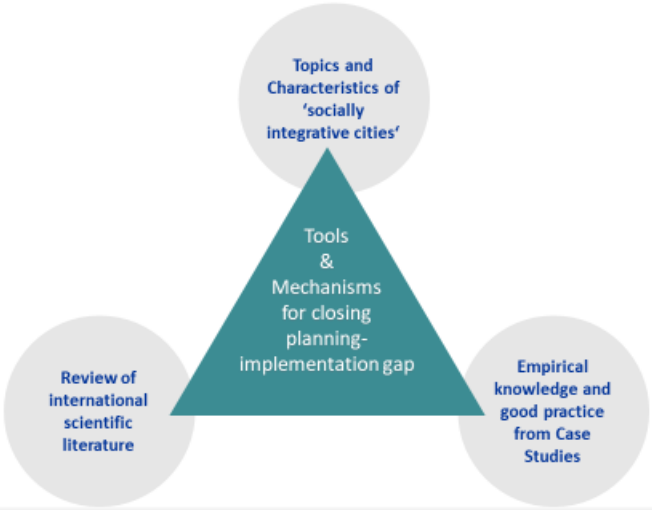
Methodology



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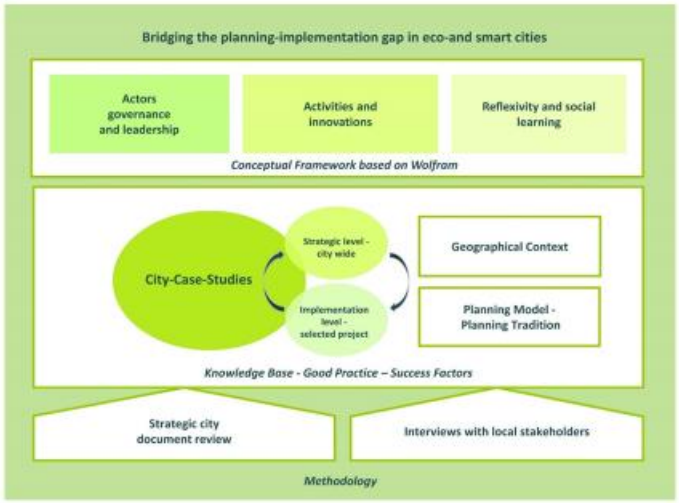
Transition towards urban sustainability through socially integrative cities in the EU and in China

Approach



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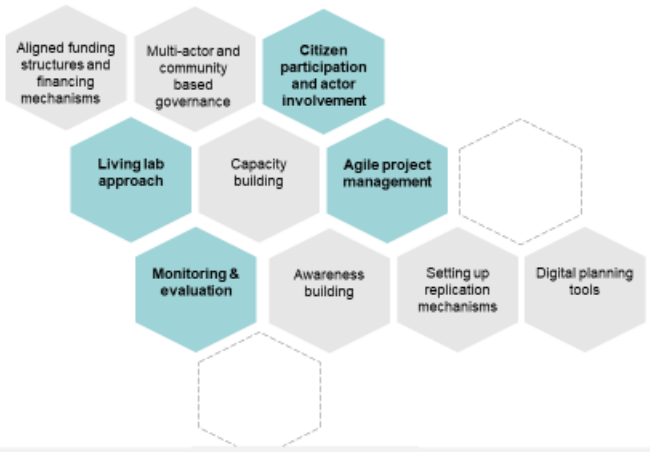
Transition towards urban sustainability through socially integrative cities in the EU and in China

Overview
Tools & Mechanisms
for bridging the planning-implementation gap



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Transition towards urban sustainability through socially integrative cities in the EU and in China

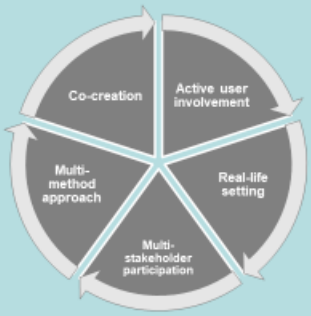
Living lab approach

Description

Living Labs (LLs) are defined as user-centred, open innovation ecosystems based on systematic user co-creation approach, integrating research and innovation processes in real life communities and settings (European Network of Living Labs).

Advantages

- *Co-creation process between different stakeholders, shaping the common ground*
- *Increasing role and engagement of the private sector (shared responsibility)*
- *Demand driven development and innovation*
- *Synthesis of knowledge from different fields*
- *Local solutions benefitting from global inspirations*
- *Tangible and specific outcomes*
- *New practice to cover new needs*



Source: ENOLL

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Transition towards urban sustainability through socially integrative cities in the EU and in China

Living lab approach

Diverse fields of application

- *Health and wellbeing*
- *Smart Cities and Regions*
- *Culture and creativity*
- *Energy*
- *Mobility*
- *Social inclusion*
- *Social innovation*
- *E-Government*
- *Education*

Source: ENOLL

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TRANS-URBAN-EU-CHINA

Transition towards urban sustainability through socially integrative cities in the EU and in China

Case Study: Seestadt Aspern (Vienna)

'Aspern Mobil Lab'

- 240 hectare area, built on a former airfield (11 000 new flats; 20 000 workplace)
- Planning and setting up the lab at the beginning of the development process (Responsible for implementation: 3420 AG)
- Using the living lab set up to develop locally suitable mobility solutions in line with the overall development strategy of Vienna
- Living lab as an interdisciplinary multi-stakeholder dialogue platform
- Citizens, experts and academic community work together on development of concrete solutions
- Community-based experimentation

Source: Stadt Wien 2020

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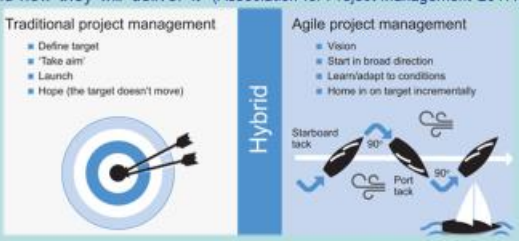
Transition towards urban sustainability through socially integrative cities in the EU and in China

Agile project management

Description

"In an agile environment, teams work together to develop the product they are working on; what they will deliver and how they will deliver it" (Association for Project Management 2017:3).



Source: Association for Project Management 2020

4 principles:

- Customer collaboration over contract negotiation.
- Individuals and interaction over process and tools.
- Responding to change over following a structured plan.
- Prototyping/working solutions over comprehensive documentation

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Transition towards urban sustainability through socially integrative cities in the EU and in China

Case Study: Smarter Together (Vienna)

- In a urban district of Vienna (Simmering), living area of 21 000 citizens
- Impulses for positive social dynamics and sustainable urban development
- Different stakeholder included
  (City administration, research institute, companies, citizens)
- Ongoing self evaluation of the team
- Coordination physically as well as digital with a project planning platform

Source: PID/Martin Votava

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Transition towards urban sustainability through socially integrative cities in the EU and in China

Monitoring & Evaluation

Description

The evaluation process defines the tools which are needed to measure in the monitoring process if the goals and objectives are reached with the defined solutions. Evaluation can be carried out at any time of the planning process and, unlike monitoring, it can be performed by external agents that are not part of the team in charge of the plan (Segura; Pedregal 2017:2f).

Source: Stockholm Stad 2020

Advantages

- enhance the effectiveness of plans
- corrective function, enabling timely adjustments
- identifies new research and information needs

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Transition towards urban sustainability through socially integrative cities in the EU and in China

Case Study: Royal Seaport (Stockholm)

- Large urban development area (12 000 new homes; 35 000 workplace)
- Land is owned by the City of Stockholm, for developing partly sold and partly leased
  - enables the city to implement an **effective monitoring and evaluation strategy**
  - city sets requirements for developers through **civil contract**
- Concrete targets of monitoring and evaluation are elaborated and translated into development requirements in thematic **working groups**
- Regular monitoring and evaluation is structured through **interactive working groups**
- By involving people during the whole process continuity of information is guaranteed
- Monitoring of the impacts

Source: Stockholm Stad 2020

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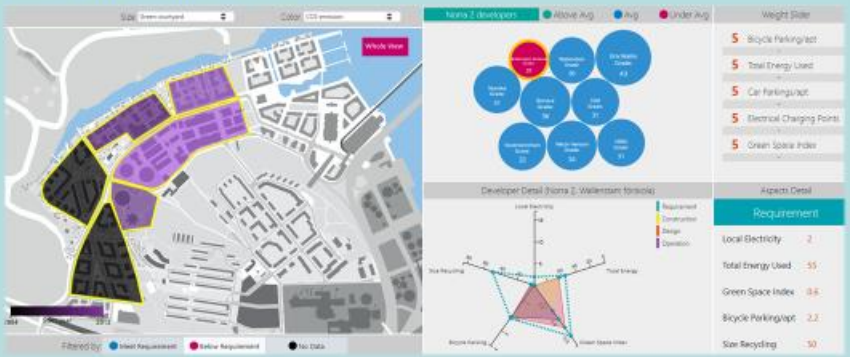
Transition towards urban sustainability through socially integrative cities in the EU and in China

Case Study: Royal Seaport (Stockholm)

Visualized targets and requirements



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Transition towards urban sustainability through socially integrative cities in the EU and in China

Citizen participation and actor involvement

Description

- Participation of different interest groups in plan implementation
- Participation of citizens and other actors enables a timely expression and negotiation process and provide space for exchange of ideas and joint development of integrative solutions

Advantages

- Addressing potential conflicting interests early on in the process
- Picking up the local know-how
- Bringing different types of knowledge together
- Enabling participants to be part of the solutions

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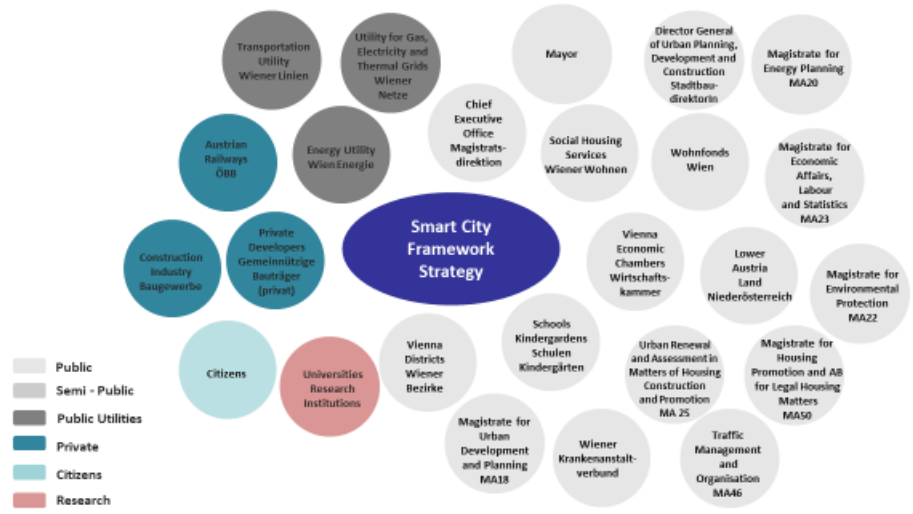
Transition towards urban sustainability through socially integrative cities in the EU and in China

Stakeholders required for the process of transformation



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TRANS-URBAN-EU-CHINA

Transition towards urban sustainability through socially integrative cities in the EU and in China

Case Study Vienna: Seestadt Aspern

- Responsible organization for implementation Aspern 3420 Development AG
- The involvement of various interest groups led to new points of view for solutions
- Approach enables reflexitivity and social learning
- Innovation & information embedding and coupling

Source: Christian Fürthner / PID

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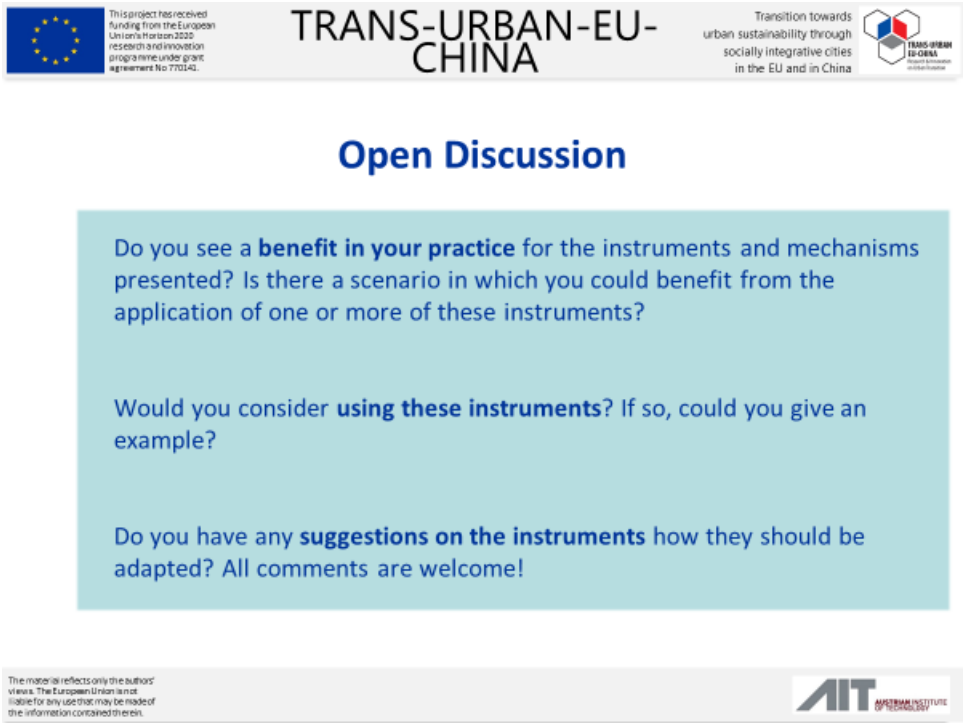

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 770141.
TRANS-URBAN-EU-CHINA
Transition towards urban sustainability through socially integrative cities in the EU and in China
Open Discussion
Do you see a benefit in your practice for the instruments and mechanisms presented? Is there a scenario in which you could benefit from the application of one or more of these instruments?
Would you consider using these instruments? If so, could you give an example?
Do you have any suggestions on the instruments how they should be adapted? All comments are welcome!
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