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Executive summary

The establishment of an innovation platform in the three Lighthouse Cities will pave the way for further upscale of the smart solutions developed within RUGGEDISED. Cultural and social factors could function as drivers or barriers for further diffusion and upscale of smart solutions. Scaling up smart solutions is to some extent a different process compared to processes of innovation. Urban Innovation Platforms (UIP) have been recognised as key ways to support creative urban development and the establishment of multi-stakeholder networks. Heterogeneous networks have been proven to be essential for the diffusion of innovation, which is the first step for upscaling and deployment. However, a great deal of evidence reveals that the diffusion of innovation often takes place through peer-to-peer networks, which tend to be rather homogeneous. Solutions or ideas that come close to what is already the norm seem to be much easier to implement and diffuse. This creates a catch-22: Although an innovative smart solution could be too difficult to upscale and made bankable because it is viewed as too radical. Innovations must therefore be transformed and adjusted to be used in new contexts. Such transformations could take place in UIP.

Here UIP are understood as organisational structures that support Collaborative Innovation Networks (CoIN) based on stakeholders with a clear mandate to work together to support urban innovation. UIP developed in RUGGEDISED have two functions. First, UIP function as a platform for creative meetings between actors and the development of heterogeneous multi-stakeholder networks that could be fertile grounds for creative and innovative smart solutions. Second, UIP support peer-to-peer learning between stakeholders from similar communities of practice with similar professional backgrounds and the develop bankable business cases based on one or several of the smart solutions developed within RUGGEDISED. In short, UIP could be described as a means to opening up rather than closing down developmental processes. We will elaborate on this distinction and explain how this relates to the establishment of UIP.

To open up developmental processes, the UIP are built on lessons learned and conclusions made by the other Work Packages (WPs), especially Work Package (WP) 1 but also to a large extent WPs 2, 3, and 4. The results from the liaison groups as well as contextual scenario analysis and analyses of existing urban innovation systems are the stepping stones for the development of UIP. The theoretical framework for WP 6 must be built upon and further expanded by theories that address brokering, different forms of knowledge, and conditions of learning formulated within WP1.

This deliverable (6.1) presents initial findings form the establishment of Innovation Platforms. It will be the starting point for the on-going work with the establishment of UIP within the three Lighthouse Cities, knowledge that will ultimately provide conclusions and recommendations for how to establish UIP.

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1. Introduction

In Work Package 1 of the RUGGEDISED project, the main task is to 'prepare the ground for innovation and implementation of measures in the Lighthouse Cities'. Following this aim, WP 1 develops a process to facilitate the Lighthouse Cities' implementation of smart solutions. WP 6 largely builds on the output of WP 1. Urban Innovation Platforms (UIP) strengthen the capacity of the three Lighthouse Cities (Rotterdam, Glasgow, and Umeå) to work with urban innovation and upscaling. WP 6 establishes collaborative structures and deeper knowledge on upscaling potential of the smart solutions generated within these cities. It is essential to assess the organisational, legal, and social aspects that influence the upscaling of smart solutions. Therefore, WP 6 supports these cities to ensure that the smart demonstration projects become part of already existing eco-systems of Smart City innovation in Rotterdam, Glasgow, and Umeå.

During 2017, the RUGGEDISED liaison groups developed the Overarching Innovative and Implementation Framework for smart cities (Figure 1). This model has been proven to be useful for identifying factors that influence the implementation of smart solutions, their level of impact, and the drivers and barriers to upscaling.



Figure 1. Overarching Innovation and Implementation Framework (RUGGEDISED, 2017)

The last step in this model is upscaling and deployment, often the most difficult step to achive. WP 6 aims to make UIP an efficient way to support innovation, innovative collaboration, and diffusion of ideas.

1.1 Urban Innovation Platforms (UIP) as an arena for learning and upscaling

Urban Innovation Platforms (UIP) can take many shapes, fulfil several roles, and be more or less embedded into a municipality's ordinary organisation. UIP strive for broad synergies between actors in urban development as well as formalized cooperation between stakeholders engaged in research and development. Actors involved include public actors, private companies, universities, non-profit organisations and their users, clients, and citizens in general. The issues handled and the work carried out should be based on an overall perspective on sustainable urban issues, so the platform should be based on a common vision. In addition, the development of the platform requires active leadership and a well-defined organisation and ownership. In many cases (e.g., RUGGEDISED), the platform focuses on selected geographic areas in the city, so participants are the people who live and/or work in these areas. Therefore, UIP must strive for participation from all relevant actors. In some cases (e.g., the Governance Lab Graz in Graz, Austria), the innovation platform develops new ways for citizen participation and establishment of new governance modes that foster urban transformation (Scholl et al. 2017).

Increased cross-sector collaboration and support of multi-stakeholder networks are the keys for successful implementation of UIP. It is important to remember that the word 'platform' should not be understood literally. UIP may not belong to a specific part or department within a municipality, a company, or an NGO. Rather, conceptually 'platform refers to an approach or a way of working, similar to what researchers such as Gloor (2006) and Torfing (2016) describe as a Collaborative Innovative Networks (CoIN). In the next part of the report, we will describe further what characterises these kinds of networks.

The involvement of several partners and cities in RUGGEDISED experimenting with smart solutions in different urban contexts allows us to examine the different ways of successfully implementing innovations in cities. UIP transform unique and highly innovative smart solutions developed within RUGGEDISED into standardised solutions that make innovations bankable and transferable to new cities and new contexts. Next, we will discuss possible strategies for achieving this.

1.2 Aim of this deliverable and reading guide

This deliverable (6.1) describes the starting point for the establishment of innovation platforms in the three Lighthouse Cities. The main body of the deliverable reflects on and synthesises the potential for innovation platforms to upscale innovation. The report will also describe the relations between the different parts in WP 6. The results from task 6.2. to 6.5 will be the foundation for the construction of the three innovation platforms. Each of these tasks (6.2. – 6.5) will provide scenarios and analyses that point out directions for the development in each Lighthouse City. Based on these suggestions, the innovation platforms will present ways to organise and support the steps required to fulfil the proposed scenarios and solutions. The lessons learned from all these efforts will then be summarised in 6.7, where guidelines are presented for how to establish an innovation platform.

Part 2 of the report presents a framework for understanding the conditions for collaborative innovative networks and combines this with theories about organisational and professional learning. UIP provide an arena for learning – the main driver for upscaling innovations. Part 2 also presents an overview of UIP with examples from Europe. Part 3 presents the needs an innovation platform could fulfil in the three cities involved in RUGGEDISED – Umeå, Glasgow, and Rotterdam. Finally, part 4 provides suggestions about ways to move forward and presents questions that need further exploration in task 6.7.

2 A framework for understanding collaborative

innovation, upscaling, and transformantion

Upscaling and replication in the context of innovation processes and demonstration projects are the main concepts in state-of-the-art literature. Upscaling and replication of demonstration projects are influenced by and have an influence on transitions. Kemp and van der Bergh (2006, p. 1) define transitions as 'society-wide changes that involves fundamental and interrelated changes in technology, organisations institutions and culture'. To clarify the terms and to introduce socio-technical concepts for better understanding scaling-up processes, van Winden and van den Buse (2017) identify three types of upscaling in their review of literature:

- roll-out mainly refers to manufactured smart city products and service innovations and their scaling up on the market (market roll-out) or in organisations (organisational rollout);
- 2. expansion refers to increasing the size of existing smart city projects (such as mobility platforms); and
- 3. replication refers to the implementation of solutions developed in pilot projects in other contexts (other organisations, other parts of the city, other cities

Naber et al. identifies four types of upscaling: 1) Growing (the demonstration continues with more actors); 2) Replication (similar demonstrations take place on different locations); 3) Accumulation (links are established to other demonstrations and experiments); and 4) Transformation (the demonstration shapes wider technological, institutional, cultural, and organisational changes) (2017).

In general, such types of upscaling include spatial dimensions (geographical enlargement), intertemporal dimensions (expanding duration and continuity), and attempts to influence institutional environments to accommodate the upscaling process. Particularly, the last element bears similarities to the 'transformation' pattern of upscaling in Naber et al. (2017). Van Winden and van den Buuse (2017) specifically emphasise conditions and drivers for up-scaling processes and identify four main issues, which are largely in line with Sigrist et al. (2016):

- 1. prospects of economies of scale, which provide a strong incentive to scale-up projects;
- 2. management of the interplay of exploration and exploitation activities and the different competencies related to this as a precondition for up-scaling;
- 3. meeting the challenge of knowledge transfer (particularly tacit knowledge), a key issue for transferring new solutions to other contexts and replicating them; and
- 4. conditioning the role of regulatory, legal, and policy frameworks when projects are replicated in other places. (van Winden and van den Buuse, 2017)

The Multi-Level Perspective (MLP) could help us gain a better understating of the complex processes that guide and affect upscaling (Geels 2002). The MLP distinguishes between three levels: niche, regimes, and landscapes. It should be understood as a hierarchy where niches are embedded with regimes and regimes are embedded within landscapes, which refer to dominated socio-technical system. Landscapes change very slowly, and changes affect actors within regimes and niches. Regimes often change incrementally. More radical changes can take place at the level of niches.

Three processes are critical for a successful development of niches: social network building,

articulation of visions, and deep and reflexive learning processes (Geels 2004). Social network building is essential for the first form of upscaling – growing. Social networks that support growing must be both broad (i.e., include a large array of stakeholders and actors) and deep (i.e., stakeholders and actors must have access to necessary resources). Learning processes are central for the other forms of upscaling: replication, accumulation, and transformation. In this report, we will focus on learning processes.

2.1 Knowledge brokering as the first step in upscaling

Starting from the above understanding of upscaling, it becomes obvious that successful roll-out, expansion, or replication depend on successful learning processes. Therefore, the success of RUGGEDISED depends on the establishment of social networks that support learning processes, the main arena for UIP. Knowledge brokers play an important role initiating and governing these learning processes.

Figure 2 illustrates different learning processes. Providing Information and consultation are important for upscaling and growth. Initiating and sustaining growth not only require matchmaking and engagement but also replication and accumulation. Collaboration, especially building capacity, is also crucial for upscaling in the form of transformation. Figure 2 also illustrates the importance of brokers who initiate, manage, and take responsibility for putting upscaling into practice.



Figure 2. Knowledge brokering instruments (Magnuszewski et al 2010)

UIP should support and become an arena for all knowledge-brokering strategies described above. Each strategy is important for upscale and diffusion. However, upscale of smart solutions also depends on *professional* learning processes Therefore, UIP must be based on one or several CoIN (Torfing 2016).

2.2 Collaborative Innovation Networks (CoIN) as a tool for learning and innovating in urban contexts

In this report, we will argue that the development of Collaborative Innovation Networks (CoIN) (Gloor 2006; Torfing 2016) is an important first step for establishing networks. CoIN include any peer-to-peer social networks with dispersed and interdependent memberships. That is, members could be spread over time and space but share the same goals. CoIN are essential for supporting innovation in the public sector such as new ways of working or new services (Torfing 2016). CoIN aim for public innovation from departments within a city with different work tasks and professional backgrounds. The members can also belong to different stakeholder groups from outside the city, including public and private organisations as well as citizens. Because members work toward a common goal, they are willing to contribute time and other resources to the network. UIP must be based on specific local needs and conditions.

This kind of independent collaboration depends on trust and the members' ability to selforganise. The high level of interdependency and self-organisation also means that these networks have no simple hierarchical structure; that is, there is no centralised leader. Decisions are decentralized, and conflicts are solved without the need of a hierarchical organisation. Authority among members is based on skills and previous experience. Members gain authority based on their personal traits, not their position in an organizational chart. That is, CoIN must discover networks that make knowledge accessible to everyone. In addition, they establish an informal and flexible environment to facilitate and stimulate collaboration and exchange of information, ideas, and knowledge. If UIP are organised around the principle stated above, they have the potential to support the development of many types of new solutions based on local needs and circumstances, with no delimitations about the kind of innovation that the platform work would create. CoIN are particularly valuable for supporting the two more complex forms of upscaling, identified by Naber et al. (2017) as accumulation and transformation. CoIN could link similar experiments through joint projects, so experience from one demonstration project could be translated and scaled up through co-management and co-production of knowledge (Figure 2).

It takes time to establish these self-organised, interdependent networks based on trust and common goals. Therefore, these multi-stakeholder partnerships in UIP must be built on shared ownership. The leadership must be more focused on facilitating progress. According to Torfing (2016), different forms of network governance carried out by individuals with the ability to function as meta-governors and boundary-spanners have proven the most successful way to lead these networks and platforms.

2.3 Heuristic of Urban Innovation Platforms (UIP)

As indicated above, UIP refers to a variety of approaches, instruments, and activities. As a consequence, in comparing activities throughout Europe, we encounter very different aims, setups, formats, and governance modes linked to those UIP. As we state in the executive summary, we view UIP as organisational structures that support CoIN based on stakeholders with a clear mandate to work together to support innovation in a city.

The Swedish innovation agency VINNOVA supports the development of UIP in several Swedish cities (Stockholm, Gothenburg, Malmo, Lund, Boras, and Kiruna). According to VINNOVA, UIP should be based on sustainable urban issues. UIP collaboration should enable the exchange of information, knowledge, problem descriptions, and solutions.

An active leadership for the platform's development and a common vision has proven to be essential for providing broad synergies between actors in urban development, be it public actors, private companies, universities, non-profit sectors, or users. To create long-term stability, it is important to establish some form of structured collaboration between stakeholders.

Initially, VINNOVA hoped the platform would focus on selected geographic areas in cities. However, innovation platforms could result in many different types of new solutions. The Swedish platforms evolved to arenas for broader strategic discussions with a greater focus on system innovation based on local needs and conditions.

In WP 6 of Ruggedised, we identified some characteristics of UIP that operationalize the term for empirical analysis:

- consists of actors relevant to the area such as municipalities, businesses, citizens, customers, universities, and research institutes;
- aims at catalysing innovative solutions that could be based on location;
- identifies stakeholders who could form one or several CoIN;
- establishes a holistic (cross-sectoral) and systematic approach targeted at a long-term perspective on urban transformation;
- supports and follows a mission-orientated innovation policy; and
- provides access to expertise and resources.

The following overview of selected UIP in Europe deepens the understanding of how UIP work, how they are designed, and what purpose they serve. From a city's as well as from a governance perspective, it is important to understand which type of urban innovation is capable of supporting which type of goal. In this way, we can identify how to improve existing platforms and establish new platforms when needed, contributing to the institutionalisation of UIP in SCC1 Lighthouse Cities and beyond.

However, identifying examples of UIP is not a trivial task. Some UIP show all characteristics of UIP but are not named as such (e.g., the 'UIP' in Glasgow and London). In addition, some examples could be seen as collaborative innovation/learning arenas but follow a different rationale (e.g., exchange between Urban Living Labs or other rather temporary networks/platforms). Therefore, we have analysed the potential of UIP for sustainable and resilient urban development (as this is the focus of Ruggedised) along several dimensions:

- *characteristics and governance of the UIP* such as aims and topics, key actors, framework conditions, and timeframe;
- activities and innovations initiated/triggered by the platform as well as details on level of commitment, target groups, focus and spatial level, and cross-sectoral and cross-administrative characteristics; and
- *embedding and success of the platform* such as links to city strategy, financial resources, monitoring, and main challenges.

As a result, we have identified five UIP described along the six analytical dimensions of the UIP heuristic (Table 1):

- (1) Global/national platforms Network of platforms;
- (2) The local networking platform;
- (3) The supportive/financing platform;
- (4) The collaborative and strategic platform; and
- (5) The co-creation platform.

UIP type	Goal	Addressed knowledge brokerage principles	Addressed actors	Activities
Network of platforms	Knowledge exchange between cities with the innovation ecosystem in the focus; connecting local initiatives to the global level	 Matchmak Build capacity 	Cross-sectoral both actors from local initiatives and the global level	Network meetings, study visits Exchange of ideas and knowledge
local networkin g platform	Build local capacity among practitioners and establish local networks, creating new ideas	 Inform (Consult) Matchmak Build capacity 	Local stakeholders across sectors and institutions	Knowledge exchange formats around various thematic clusters, initiating and supporting projects
supportiv e/financin g platform	Use or distribute financial resources/incentives to support projects	 (Inform) Consult collaborat e 	Start-ups, SMEs	Support with different forms of funding, such as venture capital, for upscaling and diffusion
collaborat ive & strategic platform	Bringing together stakeholders to implement and/or to work on urban innovation/developmen t strategies; strong governance focus following the strategic goals of the city	 Engage Collaborat e 	Different actors/stakehol ders (cross- sectoral, cross- administrative, and quadruple- helix)	Meetings, working groups, establishment of strategic alliances
co- creation platform	Provision of a specific location (e.g., 'space' and 'lab') to support a creative, experimental milieu, focused on specific local needs and urgent issues of a neighbourhood	 Consult (Matchma ke) Engage Collaborat e Build capacity 	Bottom-up initiatives	Workshops, Living Labs, etc.

 Table 1. Heuristic of Urban Innovation Platforms in Europe

In the following, we describe selected examples in Europe that were identified based on an extensive desk research as well as in-depth interviews with stakeholders involved in or responsible for different UIP in Europe. These interviews were conducted using a two steps

procedure. First, we consulted the SCC1 project coordinators on their understanding of UUIP. Second, based on these responses, we developed a questionnaire and the analytical dimensions (see above).

Global/national platforms (Network of platforms)

The platforms focus on the connection between local initiatives and global levels, catalysing local innovation ecosystems, providing access to expertise and resources.

Examples of glo	bal/national platforms	
European	The European Network of Living Labs (ENoLL) is the	https://enoll.org/network/l
Network of	international federation of benchmarked Living Labs	iving-labs/
Living Labs	in Europe and worldwide. ENoLL provides facilities	
	(such as digital and face-to-face learning labs) for	
	co-creation, user engagement, test, and	
	experimentation to target innovation in energy,	
	media, mobility, healthcare, agri-food, etc. As such,	
	ENoLL is well placed to act as a platform for best	
	practices, exchange, learning, and support, and	
	Living Lab international project development. The	
	platform is a non-profit organisation for all Living	
	Labs in Europe (benchmarked Living Labs as well as	
	fee-paying members).	
Finland (Six	The primary objective of the Six City Strategy is to	https://6aika.fi/in-english/
Cities)	strengthen Finland's competitiveness by using the	
	country's six largest cities as innovation development	
	and experimentation environments. Six City Strategy	
	focuses on three areas: 1) open innovation	
	platforms, 2) open data and interfaces, and 3) open	
	participation and customership. The innovation	
	platforms are used to create and test new services	
	and products in real-world conditions. The data	
	generated and opened up by the cities serve as the	
	raw material for developing new services. Finally,	
	open participation and customership invites the	
	entire urban community to design and develop	
	service innovations.	

The local networking platform

The local network platform establishes networks among local stakeholders by providing an arena for presentation and discussion of projects and hot topics.

Examples for local networking platforms				
future.hamburg	The digital platform future.Hamburg is the	https://future.hamburg/		
	point of contact to learn about the			
	innovation landscape of the metropolitan			
	region of Hamburg and to inspire and			
	enable local networking opportunities and			
	establishes new contacts between frontiers,			

	targeting communication about new	
	projects (ideas). The platform is	
	administrated by a marketing company and	
	is open for all innovation actors in the	
	metropolitan region of Hamburg.	
Amsterdam	Amsterdam Smart City is an open collective	https://amsterdamsmartcity.com/
Smart City	that brings citizens, businesses, knowledge	
	institutions, and public authorities together	
	to shape the city of the future. The main	
	aims are to share knowledge and give	
	actors the opportunity to present their topics	
	and receive feedback/new ideas in order to	
	develop innovative solutions for	
	metropolitan issues of a social, economic,	
	and ecological nature.	
	The platform consists of both individual and	
	institutional actors.	

The supportive/financing platform

The supportive/financing platform uses financial resources/incentives to support projects and focuses on support using different forms of funding such as venture capital for upscaling and diffusion.

Examples for supportive/financing platforms			
Innovation	Innovation Platform Gothenburg	https://www.mistraurbanfutures.org/	
Platform	was a temporary UIP established	en/project/innovation-platform-	
Gothenburg (2013-	for transdisciplinary project	gothenburg	
2015)	development and implementation		
	outside established city structures.		
	The local projects were linked with		
	international cooperation and other		
	platforms. Furthermore, a number		
	of PhD projects have been		
	supported.		
Funding London	Funding London bridges the	https://fundinglondon.co.uk/	
	economic gap for early stage		
	businesses and enables real		
	opportunities for sustainable		
	growth. The catalyst function is to		
	manage European and UK funding		
	for entrepreneurs. The platform is		
	managed by an intermediary		
	between the Mayor of London and		
	contracted fund managers. It		
	addresses very early stage		
	technology and science		
	businesses.		

The collaborative and strategic platform

This collaborative and strategic platform brings together different actors/stakeholders (cross-

sectoral, cross-administrative, and quadruple-helix) to implement the strategic goals of the city.

Examples	for collaborative & strategic platforms	
Future by	Future by Lund is an innovation platform	http://futurebylund.se/
Lund	focussing on sustainability and	
	attractiveness of the city. This is a	
	meeting place for new and established	
	participants. Different test environments	
	are created (focus is on six challenges	
	that will shape sustainable smart cities).	
STUNS	STUNS brings together decision-makers	http://www.stuns.se/en/in-english/
(Uppsala)	to discuss common concerns at the	
	interface between universities, business,	
	and the public sector. The focus lies on	
	paving the way for growth and	
	competitiveness in the Uppsala region	
	through initiatives, activities, and projects	
	in strategic focus areas.	
Urban	Urban Innovation Vienna aims at	http://www.urbaninnovation.at/de/about
Innovation	developing innovative strategies for	
Vienna	overcoming the diverse and complex	
	agendas of a city through dialogue with	
	decision makers from politics,	
	administration, and businesses, and to	
	lead international discourse on the subject	
Forum	The Forum Virium Helsinki can be	https://forumvirium.fi/en/introduction
Virium	characterised as an innovation	
Heisinki	intermediation platform that develops	
	needs-based and internationally	
	competitive digital services in	
	collaboration with private businesses,	
	public organisations, and citizens in the	
	Helsinki metropolitan area. It especially	
	tries to build bridges between the public	
	and private sectors, including the national	
	coordination of 'Six Cities Strategy'.	

The co-creation platform

The co-creation platforms provide a specific location (space and lab) to support a creative, experimental milieu for bottom-up initiatives.

Examples for co-creation platforms			
Evolab Graz	Fostering open innovation; organization of	https://www.evolaris.net/de/pres	
	competitions, user involvement	s/evolaris-launcht-open-	
		innovation-plattform-evolab/	
Raumpionier	Platform for Crowdfunding, Crowdsourcing,	https://www.raumpioniere.at/	
e Wien	and Crowdengaging. The platform supports		
	actors in finding supporters of their ideas in		
	terms of finances and know-how as well as		
	organisational issues.		
Urban Mill	The Urban Mill Innovation Platform defines	https://urbanmillblog.files.wordpr	
Innovation	itself as a 'Co-working and Co-creation	ess.com/ 2018/04/urban-mill-	
Platform	platform prototype for urban innovations'. It	presentation-icy-2018-04-04.pdf	
(Espoo)	brings together different research, innovation,		
	business, and community actors involved in		
	ICT-enabled urban services development.		
	Situated at the heart of the Espoo Innovation		
	Garden at Aalto University, Urban Mill is a		
	public-private-people partnership run by a		
	private company, Järvelin Design Ltd, and the		
	City of Espoo as one of the main partners.		

2.4 **Professional learning as the starting point for innovations**

Above, we stated that learning processes are central for upscaling, especially replication, accumulation, and transformation. These learning processes must be broad in the sense that they must focus on aligning different perspectives and forms of knowledge, and reflexive in the sense it is second-order learning. This could be described as developmental (Elleström 2001) or double-loop learning (Argyris & Schön 1978).

The opposite of developmental learning is adaptive learning (Ellström 2001) or single-loop learning (Argyris and Schön 1978). Single-loop and adaptive learning means that one becomes better (and more efficient) at tasks one already does. Sometimes this type of learning is desired so one can solve problems in an efficient and structured way. Double-loop and developmental learning, on the other hand, starts by questioning established ways of naming and framing. According to Ellström, adaptive learning is characterised by a situation where the working task is given, the methods of carrying out the task are given, and the desired results are given. Developmental learning is characterised by the opposite: the task is not given, the methods are not given, and the desired results/solutions are not given. Innovations depend on creative learning. If we return to the distinction above between opening up and closing down, we understand developmental (and innovative) learning as a process that opens up. However, opening up also makes things more complex and uncertain. Problems could become 'wicked'. We will explain what we mean with 'wicked problems' later.

Donald Schön (1983) describes professional learning as an outcome of professionals' abilities to reflect on their own practices. Schön's concept of reflection in action was inspired by John

Dewey, who characterized reflection as a way of thinking about what is required when trying to resolve a situation so it is 'clear, coherent, settled, and harmonious' (Dewey 1933). According to Schön, professional problem solving is also based on judgement, and therefore problem setting is a judgement about the problem situation that also contains the prescription of desirable action.

Relying on a broad range of case studies on how professionals work, Schön concludes that professional problem solving is a process of naming and framing. When professionals make judgements and solve problems, they apply a frame to a field of experience. This frame enables them to highlight certain features of the situation, including certain worries, which we call symptomatic. At the same time, professionals must ignore or de-select certain features of the situation, including certain features of the situation, including the relevant. In the end, professionals bind together the salient features of the situation, including the relevant worries, into a coherent and graspable pattern (Schön 1983). From this perspective, innovations could be understood as the establishment of new ways of naming and framing, which then become the base for new ways of acting (Rein & Schön 1995). Metaphorically, these new ways of naming and framing could be described as a process of opening up rather than closing down. Ignoring some aspects of a problem is necessary to transform complex issues into well-defined tasks that could be handled in a day-to-day practice. On the other hand, innovation per se means that we must be open to new perspectives.

CoIN could then be understood as arenas where participants learn to name and frame in new ways; in other words, CoIN are arenas where issues and questions can be opened up. The capabilities of CoIN will then be affected by the participants' ability to go beyond their own understanding and learn to name and frame in new ways; that is, the participants open up an established practice.

Professional knowledge is tacit and embedded. Beginners or inexperienced professionals solve problems by following rules (i.e., names and frames a problem according to rules). However, rather than following pre-set rules, experienced professionals (i.e., a skilled expert) solve problems relying on their intuitive understanding developed through experiences and may not be able to fully explain why and how they solved a problem. Their naming and framing are based on embedded and tacit knowledge (Schön 1983). But here in lies a trap that could hinder innovation. Experienced professionals could be tangled in their own tacit and embedded understanding. CoIN must therefore challenge professional experience to overcome established ways of naming and framing and support innovative learning.

2.5 Handling wicked problems through collaborative learning

The phrase 'wicked problems' was first used by Horst Rittel and Melvin Webber in the beginning of 1970s to critique of the dominate paradigm of rationalistic planning (Rittel and Webber 1973). Urban development, argued Rittel and Webber, is by itself a wicked problem that could never be solved but only temporarily settled. Wicked problems are characterised by complex interactions, multiple causation and feedback loops, radical uncertainty of knowledge grounds, and contestation of facts, values, and norms. Distinctions between structured, moderately structured, and unstructured (or wicked) problems, as defined by Robert Hoppe (2011), could help us formulate more nuanced approaches to wicked problems (Figure 3).



Figure 3. Four types of problem structures (Hoppe 2011, p.73)

Figure 3 illustrates that wicked problems have two dimensions: a knowledge dimension and a value dimension. According to Hoppe, their 'wickedness' is more than a lack of knowledge: these problems also include value conflicts. Relying on Schön, we see that wicked problems could be named and framed in several ways. Moreover, there are conflicts between different ways of naming and framing that cannot be solved by adding more knowledge. Broad social networks are a useful way to gather and diffuse knowledge that could facilitate handling wicked problems. Wicked problems could also be an important driver for experiments that could foster transformations.

Another way to approach wicked problems is through different forms of co-production (Polk 2015) and Urban Living Labs (Marvin et al. 2018). UIP are not the same as an Urban Living Labs. However, UIP could be arenas for one or several Urban Living Labs or could host one or several ColN. Here, our point is that UIP are arenas for opening up issues through Urban Living Labs. Urban Living Labs are useful for initiating and supporting accumulation and transformation of smart solutions.

If we connect the model in Figure 3 with the distinction between the two basic forms of professional learning (single-loop/adaptive and double-loop/developmental learning), the following picture emerges: structured problems, tasks, methods, and results are given (according to Ellström's definition presented in part 2.3). On the other hand, wicked problems are a source for creative learning and innovation. If we return to Schön's description of professional problem solving as a process of naming and framing, another picture emerges: innovation depends on the ability to develop new ways of naming and framing, and a first step may be to make structured problems more wicked by adding new perspectives and uncertainties. If we make structured problems too hard by ignoring too many aspects of a wicked problem, then we may hinder the ability to innovate.

As mention above, naming and framing, as well as professional problem-solving could be understood as a movement between open and closed processes of naming and framing. To open up, means that we add on new perspectives but in doing so we may risk making a structured problem less structured. By closing a process of naming and farming, we ignore one or several parts of a problem, which makes the problem less wicked although more structured. On the other hand, we may risk losing opportunities for innovation. CoIN, which we understand as one way to organise innovation platforms, could then be seen as arenas that both opens up problems for innovation and as arenas that close down structures and wicked problems to develop functional solutions that are not necessarily innovative.

2.6 Upscaling and diffusion as organisational learning

Upscaling and diffusion of innovations depend on professional learning and could be understood as the establishment of new ways of naming and framing. Here opinion leaders could play an important role by introducing new ways of naming and framing – i.e., providing new perspectives on urban challenges. However, it is not enough that individuals and teams gain new perspectives. Upscaling also requires a change on three levels (Figure 4). First and foremost, individuals such as opinion leaders or knowledge brokers must adapt to innovations and advocate for them. Then teams and working groups must start using the innovations at least in demonstration projects in other parts of the city or in other cities. In RUGGEDISED, the liaison groups serve this role by functioning as a channel for knowledge brokering. Figure 4 illustrates learning processes at the niche level and how they affect changes within regimes.

But successful upscaling, which will lead to accumulation and transformation, requires learning on a third level – the organisational level. If this happens, a loop will be created (illustrated by the arrows in Figure 4) that supports replication, innovation, and transformation. UIP have the ability to be the tool where learning on the organisational and structural level could take place through co-prodcution of knowledge that builds capacity (Figure 2).



Figure 4. Three levels of learning¹

¹ The model is inspired of and further developed from a framework originally formulated by Crossan et al. (1999).

It is also well known that this step is often hard to achieve. It is common that attempts to support transition end up in a situation where established technological systems and infrastructures combined with organisational structures, laws, and regulations become barriers for upscaling and diffusion of innovations that have been successful as demonstration projects (Figure 5). This results in a situation where individuals and teams who are involved in smart city innovation projects learn a lot but fail to upscale the innovation project. On an individual and group level, a demonstration project could be very successful, support second order learning, and increase the abilities of professionals. However, if the overall goal is to achieve urban transformation through upscaling, the third level must be affected.

Hommels (2005) introduced the concept 'urban obduracy' to describe obstacles to upscaling. Urban obduracy refers to the resistance to change of large, embedded urban socio-technical assemblages. Obduracy makes it difficult to scale up innovations from urban experiments. Hommels identifies different forms of urban obduracy that might hinder processes of upscaling. The first is situations in which technological frames of key actors' clash and compete, blocking replication and accumulation. Another common form are situations in which social and technical elements are so firmly integrated and embedded in urban assemblage that changing one element meets with resistance towards the whole assemblage. Urban obduracy could also have a cultural and knowledge dimension in which long-standing (cultural and planning) traditions and imaginaries (embedded in the reasoning of key stakeholders) influence current decisions in ways that prevent more radical changes from happening.



Figure 5. Urban obduracy as an obstacle to upscaling²

Figure 5 illustrates a situation where learning only happens within a niche. It could be very innovative, but if it does not affect the regimes (i.e., no learning takes place on the organisational level), it will be hard (impossible?) to upscale through accumulation and transformation. Some upscaling could of course take place, but not growth and only some replication.

According Dijk et al. (2018), urban obduracy can be overcome by scale jumping, articulation of

² Developed by combining Crossan et al. (1999) with Hommel (2005).

expectations, and shared visions. Scale jumping means all forms of replication and growth are local where stakeholders link up with actors both in other cities and on a global level as a way to initiate replication and accumulation. Scale jumping could be encouraged by CoIN that extend beyond cities on a regional or an international level. Obviously, carrying out multiple demonstrations to convince urban planners, future users, policy makers, and decision makers is essential for overcoming urban obduracy. However, if the lessons learned are not disseminated through social networks, successful demonstration projects will be hard to replicate or transfer to new contexts.

Joint projects and co-management, which lead to increased collaboration and capacity building (Figure 2), can stimulate learning on the third level. In the work to establish UIP in the three Lighthouse Cities, this framework, combined with the framework in Figure 2, could be used as a way of becoming aware of the need for learning on all three levels.

In the next section, we will present drivers and barriers to the establishment of UIP in the three Lighthouse Cities identified during the initial phase. The five types of platforms listed in 2.2 above – i.e., the Global/National Platforms, the Network Platform, the Supportive/Financing Platform, the Collaborative and Strategic Platform, and the Co-creation Platform – could help us highlight one or several functions that the proposed innovation platforms should have. Each platform illustrates different governance models. The five platforms could also help us define what kind of platform is best suited for fulfilling the needs in the three Lighthouse Cities.

3 Adaptation of Urban Innovation Platforms to local needs

This section presents how each of the Lighthouse Cities prefer to adapt the proposed UPI to their local needs. The aim is to formulate a starting point for the further work of the establishment of UPI in Umeå, Rotterdam, and Glasgow based on the needs each city identifies. We will also use the five examples of UPI listed in 2.2 to highlight how to support collaborative innovative structures for upscaling.

3.1 Umeå: How to increase the municipality's capability to scale up smart solutions

Umeå is the 13th largest city in Sweden and an important centre for growth in northern Sweden. Within the municipality, there is a core group of skilled project leaders who have experience with previous smart city projects. However, there is a need to broaden this group as a way of increasing the capability within the municipality to initiate and realize innovative projects. The overall strategy from the municipality is to use planned and ongoing urban developmental projects as arenas and testbeds for smart solutions such as those developed within the framework of RUGGEDISED.

At the political level, Umeå made a strategic decision to increase its ability to support different forms of upscaling (see Naber et al. 2017). Therefore, the municipality must increase its capability to perform project-based work. The Innovation platform, developed within RUGGEDISED, must support and be aligned with this ambition.

The first step is the establishment of CoIN within the municipality, which will form the ground for

an innovation platform. In the first phase, the network will involve employees within the municipality who work with urban planning because it is easier for self-organising collaborative networks to evolve if the members share the same background and professional practices (see 2.1). On the other hand, networks in which participants share the same understanding (way of naming and framing) also run the risk of being too homogeneous and therefore less innovative (see 2.3 and 2.4). The ambition must then be to expand the network with participants from both other parts of the city as well as participants from other stakeholders such as private companies, citizen groups, and NGOs.

The platform that Umeå wants to use is largely a local networking platform that may evolve into a Collaborative and Strategic platform. Umeå has also expressed a need for a Co-creation platform. Both ways are possible but require different approaches. A Collaborative and Strategic platform may be easier to link to established structures within Umeå. Such a platform could bridge different departments and functions for an on-going strategic conversation about how planned and proposed urban developmental projects could support the long-term strategic development of Umeå. Such a platform could also function as a peer-to-peer network for diffusing ideas and innovations developed within specific urban UIP. Such a platform could also support adaptive learning where good examples could be spread through the municipality's internal organisation. A Collaborative and Strategic platform could also be an arena for different stakeholders to exchange information, knowledge, problem descriptions, and solutions.

Active leadership is needed to ensure the platform works effectively, but the platform may not be owned by the municipality alone. An important condition for shared ownership between different stakeholders is a long-term agreement that also considers stakeholders with different resources and abilities. For example, smaller businesses may be relevant to include but lack the time and resources to participate in smart city solutions. However, municipalities that own the platform should take the responsibility for mediating on-going strategic conversations with a broad range of stakeholders.

Compared to a Strategic and Collaborative platform, a Co-creation platform demands a stronger effort from different participants. Organised around more temporary settings, a Co-creation platform has a larger potential to support processes of creative and double-loop learning. A Co-creation platform could also foster open innovation and involves different stakeholders in short-term projects. It is of course possible to combine two or more platforms. One suggestion for Umeå could be a two-level structure. The basis could be several smaller Co-creation platforms linked to specific urban developmental projects. These smaller platforms could be gathered under the umbrella of a Strategic and Collaborative platform, organised as an arena for different stakeholders enabling the exchange of information, knowledge, problem descriptions, and solutions.

3.2 Rotterdam: How to include one more innovation platform in the city

The situation in Rotterdam differs from Umeå, mainly as a matter of scale. Rotterdam is a much larger city with a much more complex organisation. Rotterdam also hosts several large-scale urban innovation platforms. In contrast to Umeå, Rotterdam's main challenge is coordination between a growing number of innovative platforms. As a part of the work with 6.1, TNO accomplished a field investigation with representatives from different parts and departments within Rotterdam. The answers identified three main challenges for upscaling and diffusion of innovations.

The first challenge was the absence of a long-term strategic vison for the city that guides the set priorities for ideas and innovations. A second challenge was the lack of structures and systematic methods for assessing and selecting new solutions. The city is regularly approached by tech companies that need both a testbed for new solutions and already have smart solutions to sell. There is a need for better coordination and on-going dialogue between different parts of the city with the aim to avoid situations where different parts of the city adopt smart solutions for similar problems that may not support each other. This traces back to the overall need for better coordination between a broad range of ongoing and planned innovation projects identified by public administrators in both the survey and during a workshop. According to TNO interviews, the third challenge is the need to establish an arena like CoIN to support learning and reflection among employees within the city who work with innovations.

In some respects, the situation in Rotterdam resembles what is illustrated in Figure 5. Rotterdam has several arenas where groups and individuals share information and develop smart solutions, testbeds, and demonstrations for innovations. However, because the city lacks an overall strategy, these innovations are hard to diffuse and upscale. The survey identified a need for UIP or CoIN that support organisational learning on a city level. A first step would be the establishment of a network within the city's administration that helps share lessons learned.

The model proposed in Rotterdam is close to what we describe 2.2 – a network platform. In Rotterdam, the overarching need is an arena for public administrators to exchange information, knowledge, problems, and solutions. This platform could serve as an arena for professional learning among public planners and city administrators. This network should be open primarily to civil servants. However, the existing innovation platforms in Rotterdam lack an arena with the function of a "safe haven" where urgent and relevant matters can be discussed freely. Such an arena/network could help coordinate needs and priorities so as to meet the second challenge listed above.

This platform could help reinforce the city innovation ecosystem. The idea is to 'install' people who share responsibility for contributing to the innovative capacity of the city. This community will form the platform that will support replicating successful applications and further combine and integrate various applications. The participants should focus on informal exchange of knowledge and practical experience. The platform will also be an arena for learning from best practices as well as failures. Finally, the platform will help identify and act on opportunities for upscaling. This requires moving away from project-logic and fragmented administration. The proposed platform should consist of members of the municipality of Rotterdam. Private partners may be involved as part of a second ring in dedicated working groups.

The platform should take a leading and guiding role in the Energy Transition and guide the selection and implementation of new technologies. Another important task for the platform is to facilitate learning with respect to all integrated policy practices in general and to facilitate 'public space experiments' with innovative techniques. The development of the platform could be organised similar to the way it is organised in Umeå. A first step could be a replication of the thematic workshops planned in Umeå with the same or similar teams.

3.3 Glasgow: How to govern urban transition

The innovation platform in Glasgow will be a part of Sustainable Glasgow, which is a council-led initiative formed in 2010 to make Glasgow a world-leading centre for sustainable policy, innovation, and action and a hub of the sustainable energy sector. Sustainable Glasgow addresses city-wide issues such as the need for better air quality, sustainable transportation, and strategies for reducing fuel poverty. Another area is systematic change within the economic sector such as the growth of a circular economy and other forms of green economic growth. One main objective is to meet this extra demand with sustainable low carbon energy sources, while at the same time finding ways to sufficiently control demand. Making buildings more energy efficient is another strategy. By mapping areas of high inefficiency, schemes such as community heating can be investigated. Another high priority is the need to reduce fuel poverty and change attitudes towards energy consumption. Other areas they are investigating include transportation systems, reducing car and other vehicle use in the city, and planting more trees in a city already nicknamed the 'dear green place',

The city council's planning strategy will take sustainability into account in long-term plans. The partnership includes, but is not limited to, Glasgow City Council, University of Strathclyde, University of Glasgow, the National Health Service, Strathclyde Passenger Transport, Glasgow Housing Association, Scottish Government, and Scottish Enterprise. Scottish Enterprise,

In addition, the Glasgow Chamber of Commerce hosts the Green Business Network to help members and businesses improve efficiencies, drive sustainability, and increase profits. Using a mixture of expert help, consultants, and training, the Chamber runs the Green Light Programme to guide businesses on how to develop environmental management systems. Sustainable Glasgow also strives to increase public participation and create a supportive public policy environment. Important parts are the development of a strategy for green jobs, the creation of a community fund, the integration of Sustainable Glasgow into City Plan 3, and educational and training programmes. Figure 6 illustrates the proposed organisation of the urban innovation platform in Glasgow.



Figure 6. A propose structure for the UIP in Glasgow

The platform will be an arena for addressing city challenges using local and organisational expertise to derive solutions and present recommendations to Glasgow City Council. The foundation will be several so-called 'Task & Finish Groups' (T&FG) or Expert Commissions. These groups bring together expert stakeholders and community representatives to devise recommendations to address specific challenges and drive inclusive change. They could be organised as City Labs/Urban Living Labs based on which challenges the T&FG will address. The Sustainable Glasgow Innovation Platform will be the core and provide the forum for the dissemination of city challenges and creation of T&FG and will govern the progress of recommendations. Sustainable Glasgow aims to function as a 'switchboard' for ideas and innovation and will therefore also be the core for diffusion and upscaling of ideas and innovation developed in one or several T&FG.

Connected to the Sustainable Glasgow IP is the CERS Group, which provides operational governance of broad issues and ensures challenges meet strategic and operational needs of the city. Glasgow City Council Committees will receive recommendations from Sustainable Glasgow IP based on the results from at least one of the T&FG and recommend which recommendations to approve. This structure is close to what we define as a Collaborative and Strategic Platform (section 2.2), which offers a structure for governance of problem solving. However, the T&FG could function as a Co-creation platform. This structure resembles the structure used in Umeå.

4 The future process

This report is the first step in the delivery of task 6.1 and marks the starting point for the process that will end up in Task 6.7 – i.e., conclusions and recommendations for how to establish UIP that support diffusion and upscaling of innovations. Feeding into this work are the deliverables from task 6.2. (scenario analysis), task 6.3. (context and critical conditions), task 6.4. (energy system analysis), task 6.5 (plans for integration innovation platforms into local innovation systems), and task 6.6. (business models for smart cities). During the remaining time of RUGGEDISED, we will follow how each of the Lighthouse Cities make use of these deliverables and how they impact future work with the innovation platforms.

In this final section, we will first present the next steps in the three cities. Then, we will conclude with a description of how the theoretical framework presented in part 2 will be used in future work.

4.1 Umeå

The first step of the evolution of Umeå's Urban Innovation Platform will be a series of workshops organised by RISE during the spring and fall of 2019. The workshops are aimed at employees in the municipality from different departments who work with ongoing urban developmental projects. The participants will be handpicked to develop a network with a broad membership as a first step towards creating an environment for innovative and collaborative learning. The goal is to establish a social network with 15 to 20 participants.

Five workshops will be conducted each with a specific team that comments on different challenges or aspects of collaborative innovation. The point of departure is the fact that those who work with innovation within an organisation develop professional skills that seldom are recognised. Often, these people are employed as a professional with a clear title and role such as a planner. However, if they work within one or several innovation projects, they develop a kind

of 'shadow profession' related to their experience. The planned workshops will then be arenas for reflections over these experiences, which (according to Schön) will support professional development. The Innovation Platform in Umeå will at first be composed of employees who already have or are interested in developing a 'shadow profession' as innovation leaders. The workshops will support these kinds of reflections and create a collaborative innovative network.

One group of topics is related to different aspects of this shadow profession as, for example, municipal change agent. What role can one take (or be given) in the municipality when the project is completed? What skills must one develop? In what ways can an innovation platform become an arena for developing these skills? One skill is the ability to steer and drive processes when one lacks a formal mandate to make decisions about the allocation of resources. Another side of this situation is that a project leader often works between different departments and therefore must relate to and negotiate with several persons in managerial positions. An additional challenge to that position is to make sure that projects survive organisational changes.

In innovation projects, it is common that important information about content and layout of the project is concentrated with some key personnel. As a project progresses, these key people will develop experience and knowledge that could be lost if these people stop participating in the project. How do you ensure knowledge and strategic information does not disappear when people leave? How do you create continuous learning? What role can an innovation platform have?

During the fall of 2018, RISE together with the RUGGEDISED project team in Umeå will select a relevant team and put together a customized series of workshops that will gather a group of project leaders from the municipality, which in turn will form the core of CoIN in Umeå that during 2020 will evolve into an Innovation platform. This way of working aims to establish a peer-to-peer network that can share ideas and perspectives on how to work with innovations. This aims to make it easier for innovations to diffuse and be upscaled after RUGGEDISED is finished.

4.2 Rotterdam

As noted in part 3, there are several established innovation platforms and networks in place in Rotterdam, but these function mainly on a cross-city level. What is considered lacking is an innovation network within the city. Such platforms should be an arena for mutual coaching and motivation. It should also facilitate alignment of ideas, projects, and activities across departments/segments. The platform should also support replicating and upscaling innovations that need broad city support. An innovation platform may benefit if it 'stays focused' and 'on target'. One suggestion is that this platform should be limited to one topic or theme such as the Energy Transition as a first step.

The smart solutions developed in RUGGEDISED are based on place. An important function for the network of city administrators is therefore further standardisation of tools and procedures for shaping experiments (e.g., procurements and legal issues). Hence, the platform should primarily be a 'club of civil servants' that together are in a position to orchestrate innovation. This 'club' must follow energy and needs of community members but avoid becoming too formal. However, it is important that the platform should somehow be 'anchored' within the city government.

4.3 Glasgow

Officers within Glasgow City Council are working with the new political administration to embed this new model for UIP through the governance model presented in Figure 6. For the platform to have any meaningful impact on the challenges faced by Glasgow, it needs to be approved at the highest levels within the political and corporate structure of the organisation.

Furthermore, each of the existing partners of Sustainable Glasgow will need to understand and accept their new role within the new structure. This will require more input than has been previously expected from these organisations and they will need to evaluate whether their inclusion in designing innovations for the city is worth the potential resource implications. The lessons learned from the way of working with the Sustainable Glasgow Innovation Platform will then be included in the development of task 6.7.

4.4 The use of the theoretical framework for comparative analysis

Each Lighthouse City has chosen different approaches to and strategies for developing urban innovation platforms. The conclusions and recommendations presented in task 6.7 will be based on comparative studies of the forthcoming work in Umeå, Glasgow, and Rotterdam. The themes that will be covered are listed below.

- The characteristics of each urban innovation platform. In section 2.2, we listed five types of platforms: Global/national platforms, the Network platform, the Supportive/Financing platform, the Collaborative & Strategic platform, and the Co-creation platform. In section 3, we gave suggestions for what kind of platform each city seems to strive for. Over the next several years, we will follow and see which kind of platform will evolve within RUGGEDISED or if the Urban Innovation Platforms in Ruggedised will be hybrids or a new form of platform formulated from those listed above. Each Lighthouse City has proposed different strategies for developing UIP that suit their local needs. Umeå plans a series of workshops as the first step. Rotterdam and Glasgow are looking for ways to connect UIP developed within the framework of RUGGEDISED with already existing platforms such as Sustainable Glasgow. Each strategy will result in structures probably with both similarities and differences to those five types of platforms listed above. In addition, there is a relation between UIP and Urban Data Platforms. All three Lighthouse Cities try smart solutions that generate urban data. Each city develops or implements different kinds of urban data platforms. An urban data platform could be understood as a form of UIP, which also differs from one of the five types listed above.
- Urban Innovation Platforms' capacity to handle and structure wicked problems. In chapter 2, we presented a model of wicked problems (Figure 3), which presented four kinds of problems: wicked problems, two moderately structured problems, and structured problems. According to the Figure 3, these four problems could be organised along two dimensions: a knowledge and value dimension. UIP could be arenas for transforming wicked or moderately structured problems into problems that are so well-structured that they could be solved. However, Figure 3 highlights that complex and wicked problems might not be solved by more and better knowledge. There might also need to be a discussion about norms and values. UPI might need to be an arena for handling and solving normative disagreements related to urban development. Sustainable urban development has a value

dimension that we must be aware of. An interesting question will be to what extent UIP will be arenas for discussing the normative dimensions of wicked problems.

- How should urban innovation platforms be organised to support diffusion? We will focus on if and how different forms of urban innovation platforms affect upscaling and diffusion. Each Lighthouse City has chosen different strategies and forms of governance of the proposed innovation platforms. On the other hand, one or several of the Lighthouse Cities will try similar smart solutions. This overlap gives an opportunity to compare and describe critical conditions for governance and organisation of innovation platforms with the aim of supporting upscaling and diffusion. Another issue to explore further is how each Lighthouse City includes (or not) UPI in existing structures of governance. Figures 4 and 5 illustrate a common situation where learning (and innovation) occurs among individuals or project groups (like RUGGEDISED) but does not affect established structures. Upscaling and diffusion might be hard to achieve without organisational learning (Figure 4). If UIP are not included or in some way related to the city's overarching structures for governance, it may be hard to achieve organisational learning. Here, we will examine if there are certain forms of urban obduracy that hinder upscaling of smart city projects and use Hommels (2005) as a theoretical framework.
- A new view on diffusion and upscaling. In the theoretical framework, we have addressed a tension between innovation versus diffusion/upscaling. We used theories about learning to further illustrate tensions between innovation and adaption or creative learning and adaptive learning. In Figure 1, although the word 'replication' is used, UIP have a preponderance towards innovative/creative learning. Rogers' (1995) classic studies focused on specific and concrete innovations like new forms of corn. The innovations developed within RUGGEDISED are much more complex and diverse, which means that we must understand the meaning of upscaling and diffusion in new ways. We will use Naber et al. (2017) to apply four types of upscaling 1) Growing, 2) Replication, 3) Accumulation, and 4) Transformation as a framework for examining which forms of upscaling are working in RUGGEDISED and if and when forms of urban obduracy block one or several forms of upscaling.

5 Conclusion

UIP could take many shapes, fulfil several roles, and be more and less embedded in a municipality's ordinary organisation. RUGGEDISED focuses on how UIP could be a tool for upscaling, replication, and diffusion. This ambition exposes a tension between innovation and replication. This tension could take different shapes depending on which kind of innovation is upscaled. The tension could also be handled in different ways. During the analysis of different UIPs in Europe with focus on their potential to support upscaling, it becomes obvious that successful roll-out, expansion, or replication depend on successful learning processes. Therefore, the success of RUGGEDISED in the lighthouse and fellow- cities depends on the establishment of social networks, which support learning processes between actors in each city and between cities. Knowledge brokers play an important role initiating and governing these professional learning processes, which can be supported by different strategies within UIP (providing room for one or several CoINs). Furthermoe, multi-stakeholder partnerships in UIP must be built on shared ownership, focusing on facilitating progress.

RUGGEDISED offers an opportunity to compare the three Lighthouse Cities and will give several

examples of best practises regarding the tension between innovations and replications. In chapter 2, we understood the establishment as collaborative innovative networks, which could support knowledge brokering, as the key to upscaling and diffusion. Such networks can have different degrees of heterogeneity. There seems to be a positive correlation between heterogeneity and the capability to innovate. On the other hand, a certain degree of homogeneity seems to help the diffusion of innovation through peer-to-peer networks. Through this report, we have returned to this tension from different perspectives and described it as a tension between creative versus adaptive learning or a tension between innovation and replication. The further work with WP 6, which ultimately will end up with conclusions and recommendations for how to set up innovation platforms for innovative cities, will focus on these tensions and explore how each Lighthouse City will handle these tensions and develop UIP that support innovations as well as upscaling and replications.

The further work with WP 6 ultimately will end up with conclusions and recommendations for how to set up innovation platforms for innovative cities and will focus on these tensions and explore how each Lighthouse Cities will handle them and develop UIP that support innovations as well as upscaling and replications.

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