URBAN EUROPE

ERA-NET Cofund
SMART CITIES AND COMMUNITIES
Experiences and Insights

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Many projects started off in settings where abundant scientific literature was available, and where the need for system-wide transformation had been advocated by researchers and planners for a long time; yet few cities had managed to implement these changes.

ENSCC (and JPI Urban Europe) were among those that emphasised a narrative of energy efficiency that included housing, industry, heating, transportation—and not least how energy affects and is affected by people.

Municipalities are more likely to engage in projects if the projects are well connected to local challenges, municipal strategies, and the "day-to-day" work of administration officials.

Researchers that work most effectively with city authorities are able to explain the relevance of their research to decision-makers, are responsive to needs of the city authority, and are experienced project coordinators with strong leadership and knowledge on how to clearly and appropriately distribute work.

The observer status of JPI Urban Europe within the development of the Urban Agenda for the European Union, as well as growing support for the Driving Urban Transitions program, indicates the importance of the partnership orientation.

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Executive Summary

Since 2010, a transnational programme initiative comprising 20 countries of which 14 are official members has produced the *Joint Programming Initiative Urban Europe*, a knowledge hub supporting sustainable urban transitions. JPI Urban Europe engages member states, national funding agencies, academic researchers, and not least local stakeholders including local public authorities, public and private firms, and non-governmental organisations.

The ERA-NET Cofund Smart Cities and Communities (ENSCC) was the first major joint call opened by JPI Urban Europe and the Smart Cities Member States Initiative in December 2014 for transnational projects produced 2016-2019. The call was positioned to complement the larger "lighthouse" approaches supported within Horizon 2020 at the time in support of smart city development. It was also an effort to harness European smart city approaches for integrated urban development.

This report reviews the background of the ENSCC and its role within the Joint Programming Initiative Urban Europe. This includes some discussion of the evolution of the call text as new opportunities and priorities became apparent and discussions regarding programme goals matured. Annexes to the report detail the references and methodology used to analyse project results and patterns of coordination and international cooperation. The ERA-NET Cofund Smart Cities and Communities call was developed and launched as the JPI Urban Europe itself matured and as national and European perspectives on urban challenges evolved. Therefore, this report uses the ENSCC call as a lens through which to understand the current status and outputs of JPI Urban Europe and its capacity to meet future urban challenges and opportunities.

Management structure

Early decisions to focus on demonstrable and testable technologies and practices in smaller cities proved valuable. A streamlined and flexible management style was important for securing the involvement of the funding agencies who were ultimately responsible for funding the call. Taking the effort to craft a formal consortium structure while remaining flexible was time consuming and relied on intense personal effort but proved effective, helping the programme capitalise on new opportunities. On the other hand, harmonising the requirements of diverse national funding agencies, varied priorities for research excellence and transdisciplinary research and Commission requirements led to complex and sometimes confusing evaluation procedures. Monitoring became more standardised during the call process and can be developed further to incorporate more fine-grained information about local impacts.

Project portfolio and outputs

The ENSCC did not specify a budget for the four call topics offered or otherwise require a portfolio perspective in the evaluation procedure. Nevertheless, the resulting project portfolio covers all call topics and involved over 100 project partners from 12 countries as well as many other stakeholders not listed as project partners. This was more than twice the number of partners in preceding JPI Urban Europe calls. In general, projects focused on testing or implementing known and proven technologies or approaches in new contexts or settings. Most projects were led by researchers and/or consultants; some had close and active relations with municipal authorities while others were unable to fully engage local authorities or end users. While country connections, partner participation and gender balance may reflect funding agency requirements, we do see evidence of expanded and reinforced

connections among participating member states, with each country on average participating with seven others.

ENSCC aimed at innovation and implementation of integrated low-carbon energy and transport systems at the urban scale and, thus, required projects to include urban innovation and implementation activities. These activities were accompanied by two further types of output, namely applied urban research and strategic urban research. Both individual and community capacity building to address urban challenges are noted as the most important project outputs but closer analysis notes a range of more specific project outputs including new data sets, integrated analytical models, games and applications. The extent to which these can be replicated or ramped up remains to be seen, not least because projects reported limited understanding of other ENSCC project activities and some had difficulty in engaging municipal authorities and companies that would ultimately institutionalise or operationalise results.

Fostering user engagement

ENSCC aimed to engage a variety of local stakeholders in new and innovative ways. There was considerable emphasis on involving municipal authorities and companies, formally or informally, by testing new technologies or approaches that could be explicitly implemented in urban development initiatives and hopefully extended to other projects, contexts or even other cities. The call also promoted the engagement of a variety of other stakeholders, which ranged from partners needed to implement new technologies such as service providers and regional or national public authorities, to end users including residents, public transport users, energy consumers and the like.

The call text for the ENSCC[1] emphasised projects that could develop new and innovative forms for cooperation among stakeholders. The call noted the need to be "challenge-driven", but also to apply technologies and methods that have the potential to be used in other contexts or to address other urban challenges. Finally, the call encouraged projects that could identify and utilize the "innovation ecosystem", focusing on the interactions among stakeholders that represent various viewpoints and constituencies, but also different phases of urban development design, planning, production and use.

A taxology of cooperative forms

A preliminary review of the projects within ENSCC reveal at least three discrete organising principles for cooperation within ENSCC: *challenge-driven*, *method- or technology-focused*, and *value chain/production platform-focused*. The majority of ENSCC projects were challenge-focused; they organised their work based on the common articulation of a common urban challenge within the themes described in the call. This helped build a common understanding of challenges but sometimes at the expense of accepting a level of abstraction too high to lead to real change. Technology or method-focused projects were helpful in integrating several perspectives—into a common model or application, for example. These helped to harmonise various forms of data, or at least highlight discrepancies. On the other hand, it is unclear how many of these tools will be replicable or generalisable to other contexts. Finally, some projects focused on value chains or production platforms across phases from design to implementation. In these cases, more focus on the transition between phases, as opposed to discrete phases, is recommended.

[1] https://jpi-urbaneurope.eu/app/uploads/2020/04/ENSCC-Call-Text_2nd-Stage.pdf

Key recommendations for future programme and call development

1. **Continue to focus on specific activities and funding support that build communities**. This report finds that a high degree of personal engagement and an early decision to position the programme and the ENSCC call within the wider context of European partnerships and organisations has contributed to raising the status of urban research and support for continued partnership, including joint calls. The ENSCC experience has perhaps been less effective in building communities of practice within local communities and particularly across projects. Of particular note is the as yet underutilized potential for JPI Urban Europe projects to connect across calls and to see their activities within the context of the wider JPI Urban Europe programme. Despite the many opportunities offered by the programme for ENSCC projects to share knowledge and experience within the broader context of JPI Urban Europe, there is a sense that project participants lack an understanding of the benefit of actively engaging in the "JPI Urban Europe community." This may be a function of the relatively short duration of projects and the diversity of funding agency regulations. A long-term commitment to follow-on projects, project twinning, researcher colloquia and programme funding for additional workshops can improve local community building within and among cities and stakeholder groups.

2. **Built on the standardisation of monitoring activities, not least the online monitoring tool**. Consider supplementing monitoring activities focused on project reporting with fine-grained case studies such as follow-on research that provide more specific project narratives and include the perspectives of stakeholders that may not be involved in the project.

3. **Continue to use the JPI Urban Europe calls to develop a deeper understanding not just of how technologies or approaches can be replicated or expanded, but also the most relevant geographies for understanding interactions among institutions, systems, technologies and stakeholders**. "Ramping up" may include replication of technologies across a city but also small-scale solutions replicated among cities.

4. **Utilise the commitment of existing funding agencies not only to bring new countries on board, but also to increase the breadth of funding agencies within member countries.** In particular, a further integration of funding agencies with the mandate to fund municipal authorities is recommended.

Introduction

Since 2010, a transnational programme initiative comprising 20 countries of which 14 are official members have actively supported the creation of a knowledge hub for urban transitions known as the *Joint Programming Initiative Urban Europe*. Utilising a partnership instrument launched by the European Commission in 2008 for strategic cooperation, JPI Urban Europe has developed into a platform not only for funding research and innovation projects related to urban challenges, but also for experimenting with new institutions for engaging member states, national funding agencies, academic researchers, and not least local stakeholders including local public authorities, public and private firms, and non-governmental organisations.

The ERA-NET Cofund Smart Cities and Communities (ENSCC) was the first major joint call opened by JPI Urban Europe and the Smart Cities Member States Initiative in December 2014 for transnational projects produced 2016-2019. The call was positioned to complement the larger "lighthouse" approaches supported within Horizon 2020 at the time in support of smart city development. It was also an effort to harness European smart city approaches for integrated urban development. [2]

The sections that follow review the background of ENSCC and its role within the Joint Programming Initiative Urban Europe. This includes some discussion of the evolution of the call text as new opportunities and priorities became apparent and discussions regarding programme goals matured. The goals of this synthesis report and the report structure are also clarified. Annexes to the report detail the references and methodology used to analyse project results and patterns of coordination and international cooperation.

Goals and structure of this report

This report is intended to be a synthesis of the many documents, reports, results, and feedback from the experience of the ENSCC call to identify common insights, experiences and results that can lead to concrete recommendations to the JPI Urban Europe and future urban partnerships. The obvious challenge of this exercise is identifying the relevant body of evidence related to the ENSCC call. The ERA-NET Cofund Smart Cities and Communities call was developed and launched as the JPI Urban Europe itself matured and as national and European perspectives on urban challenges evolved. Although this report focuses on the experiences of ENSCC and its contribution to JPI Urban Europe, the outputs of this call were of course supported, influenced, shaped and framed by the many other activities within JPI Urban Europe.

As such, this report attempts to not only provide a synthesis of materials and documents directly related to the ENSCC call itself, but also uses the call as a lens through which to understand emerging institutions within the JPI Urban Europe and its capacity to meet future urban challenges and opportunities.

The report is divided into six major parts. A first section focuses on the institutions developed for the call and their capacity to mobilise and allocate resources necessary to meet programme goals for the call. A second section provides a portfolio analysis of the 17 projects supported by the ENSCC call. Which projects were generated, which stakeholders were (and weren't) involved, which topics were addressed, what approaches were used? Can we identify early achievements, challenges and results? Which countries tended to work together?

[2] Within the 2018-2020 Work Programme for Smart Cities and Communities within Horizon 2020, support was offered for "lighthouse" projects that demonstrated new technologies and services that could be implemented in cities to improve sustainable development within energy, transportation and information and communication technologies.

A third section describes project outputs in more detail and a fourth reports the engagement of users such as municipal representatives, firms and other stakeholders. Section 5 offers a taxonomy of cooperation forms used in ENSCC projects and section six describes what may be called the "legacy" of the ENSCC call. This includes current and upcoming calls directly attributable to the experience of producing the ENSCC co-fund, in particular the joint call with China in the areas of urbanisation and urban development, and support for the development of positive energy districts. It also looks forward to the candidate urban partnership *Driving Urban Transitions* and discusses how the experience of ENSCC can be used to support such a partnership.

A final section summarises insights and recommendations for future calls and for harnessing results and achievements from the ENSCC projects moving forward. Particular focus is given to structures, institutions and activities that can help cities scale up and/or replicate results, compare experiences across cities, and improve structures for involving diverse local stakeholders to meet urban challenges. Although it is too early to fully assess how well the goals of the call were met, we can identify some experiences and early results that can inform the future of the JPI Urban Europe as well. This includes how well this type of joint financing arrangement among diverse national funding agencies performs as an instrument to meet common goals. It can also provide project experience in a few key priority areas of importance to the *Driving Urban Transitions* moving forward: urban living labs, stakeholder co-creation with a particular focus on city authority engagement, and a district level approach to energy transition pathways.

An annex to the report details the methodology used to collect and analyse empery as well as a summary table of participating municipalities and municipally owned companies and their roles in individual projects.

Background and aims of the ENSCC call

The central goal of the ENSCC call was to support deployment of integrated low-carbon urban energy and transport solutions. The call text emphasises the demonstration and development of new solutions and tests and analyses to determine implementation feasibility, both in unique local contexts and in other European cities.

These solutions focused on optimal energy and resource efficiency, preferably through the integration of technologies (energy, mobility, ICT) across the board, but also via the development and use of new business models and new methodologies in urban governance, and in explicitly aiming towards social cohesion, liveability, and sustainability.

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In contrast to many calls focusing on technology development that could be offered to cities, the ENSCC call underscored the importance of understanding urban innovation ecosystems[3] and offering sociotechnical approaches to urban energy issues, particularly digitalisation potential and in conjunction with urban mobility and transport. In other words, the call placed a high importance on

[3] "Urban innovation ecosystems" describe the creative capacity of cities to co-create value and make up the level of deployment for RDI on smart city and urban energy technologies (FIREBALL, 2012; Lund Declaration, 2009; EIO, 2013; Coutard et al, 2014). Typical actors in an urban innovation ecosystem include urban decision-makers, communities, industry, citizens, researchers, NGOs, entrepreneurs, and utilities that typically become stakeholders in the development and implementation of smart city solutions.

understanding and engaging *stakeholders*: the complex web of actors and organisations with a stake in new business cases and financing models, standardisation, scalability and replicability of solutions, and user experiences. To achieve this, the call required that proposed projects develop creative new arenas and approaches to involve a diverse set of stakeholders in the co-creation of smart city solutions. Projects were expected to represent the full innovation cycle: urban municipally based activities comprising multi-stakeholder partnerships (including research and innovation actors) who address solutions concerning intelligent networking and integration of urban infrastructures to increase energy and resource efficiency as well as enhanced quality of life in urban areas.

Another distinguishing characteristic of the ENSCC call was the focus on clearly articulated but limited demonstrations and tests of "integrated low-carbon urban energy and transport concepts and solutions in smaller-scale projects at the local level, also involving smaller districts and cities, gathering key players into partnerships that build necessary scale and scope for larger demonstration on district, municipal or regional level, complementary to the large-scale lighthouse projects already envisioned in Horizon 2020."

Topics funded through the ENSCC call were in the areas of

- Smart integrated urban energy and transport systems
- Smart tools and services for integrated urban energy and transport systems
- Smart data, big data
- Smart governance and smart citizens

The call attracted 79 proposals and ultimately funded 17 projects involving 126 partners in 12 countries. A detailed overview of participating projects is provided in Section 2.

1 Management and governance institutions for the ENSCC

As the first major call within JPI European Europe, and one of the first ERA-NET Cofunds, the ERA-NET Cofund Smart Cities and Communities had high ambitions and few precedents. Early decisions to focus on demonstrable and testable technologies and practices in smaller cities proved valuable. A streamlined and flexible management style turned out to be important for securing the involvement of the funding agencies who were ultimately responsible for funding the call. Taking the effort to craft a formal consortium structure while remaining flexible was time-consuming and relied on intense personal effort but was well worth the investment, helping the programme capitalise on new opportunities. Harmonising the requirements of diverse national funding agencies, varied priorities for research excellence and transdisciplinary research and Commission requirements led to complex and sometimes confusing evaluation procedures. Monitoring became more standardised during the call process and can be developed further to incorporate more fine-grained information about local impacts.

1.1 An ERA-NET Cofund for Smart Cities

The period during which the ERA-NET Cofund Smart Cities and Communities was developed was one of interest in finding new ways to help European cities approach transitions towards sustainability. JPI Urban Europe had established itself as an effective platform for mobilising resources from member states seeking new ways to address urban challenges difficult to address within thematic framework programme areas in FP7 and Horizon 2020. The management structure for JPI Urban Europe had been established and the first pilot calls were underway. As early as 2010, the leadership for JPI Urban Europe began discussing how to scale up resources for research and innovation funding by leveraging national funds to qualify for added European Commission support. Various support mechanisms were discussed, including the establishment of an Article 185 initiative[4], but it was considered more effective and feasible to pursue an ERA-NET Cofund. This was in many ways an interesting strategic choice; the ERA-NET Cofund framework was also new and arguably required high initial transaction costs as the Management Team navigated several Commission entities and evolving funding programme procedures. On the other hand, this choice led to a better understanding of Commission priorities, current and future initiatives, and structures. The success of the ENSCC, as well as current planning for another ERA-NET Cofund in 2020 bears witness to the value of "growing together" with other innovative and experimental initiatives.

"The Commission was interested in finding an ERA-NET that could broaden member state funding for smart cities—our ambition was to become the focus point for urban related issues in Europe, a structure for other member states to join."

–Hans-Günther Schwarz
JPI Urban Europe Governing Board

In cooperation with the Smart Cities Member States Initiative[5], the ERA-NET Smart Cities and Communities call mobilised approximately 26 million Euro from national and regional funding agencies from twelve European countries as well as substantial support from Horizon 2020. The decision to use the framework of an ERA-NET Cofund was attractive because it provided a complementary funding to the large-scale lighthouse projects within Horizon 2020, thus making it possible for smaller cities and smaller

[4] https://ec.europa.eu/programmemes/horizon2020/en/h2020-section/article-185
[5] https://www.smartcities.at/europe/networking/the-smart-cities-member-states-initiative/

projects to experiment with integrated low carbon urban energy and transport concepts. On the other hand, working within the institutional confines of the ERA-NET framework had its own challenges with respect for instance to evaluation procedures and funding allocation, discussed in more detail below.

1.2 A larger programme for smaller cities

A review of working materials, interviews and related documents during the development phase underscores the fact that the ENSCC call was an opportunity for JPI Urban Europe to offer a more ambitious funding opportunity by addressing a wider range of urban issues, while maintaining a focus on supporting small, well-defined tests and living labs in smaller urban areas and districts. Already in the development of the consortium for the ENSCC, interview respondents describe the decision to apply for an ERA-NET as a strategic exploration of ways to rapidly ramp up funding for urban sustainability issues and establishing JPI Urban Europe as a platform that would make it easy for other member states to join.

In practice this entailed a continual dialogue within the management team regarding how best to support cities and what ramping up might entail. Would the local innovation system be best served by supporting blue sky research, new partnerships or new ways of working? Interviews underscore the importance of supporting new combinations of problem owners, researchers and companies while recognising that this may have implications for the potential to implement innovations permanently or on a larger scale. Local authorities have the daunting challenge of needing to continually build capacity to improve service efficiency and meet development goals, but not at the risk of disrupting daily local service provision in areas such as transportation, waste management and energy use. Equally important was the need to test new technologies and approaches while being cognisant of market regulations that could preclude partners from scaling up experiments and tests.

1.3 Management structure—formal but agile

The ENSCC Consortium Agreement formalised the management, financial provisions and rules governing the call. The governance structure of the Consortium follows a fairly traditional organisation, with all financing partners comprising a steering committee as the ultimate decision-making body (representing all partners). The steering committee is supported by a management team (work package leaders and their subcontractors) and a call secretariat to ensure efficient management activities of the call. The Consortium Agreement also envisions the establishment of a body of "project observers" to monitor the success of funded projects. In practice these were individuals within participating funding agencies that were rather more focused on technical and managerial issues related to funding allocation rather than observers following specific projects and reporting on project progress. On the other hand, the Management Team discussed the importance of monitoring results and facilitating continuous improvement from early on. A concrete result of these discussions was the further development of an online monitoring tool that is being implemented for the entire JPI Urban Europe initiative and is described in detail in Section 1.6.

The combination of a slim management structure and a broad network orientation was critical to helping ENSCC stay on track.

A review of the management team meeting minutes (2015-2019) suggests a few insights regarding the efficacy of the ENSCC management structure. The management team had the advantage of a formal legal structure governing the Consortium but was nevertheless able to address technical and financial issues on short notice as well as discuss opportunities for ENSCC to utilise additional opportunities such as cooperation with China and realisation of support for positive energy districts. Interview respondents have noted that this management agility was the result of individual

commitment to the goals of the Consortium and also thanks to their professional networks, both past and current. In other words, the management team in particular was able to identify formal and informal partners that could help quickly resolve fairly complex issues and capitalise on new opportunities that arose with short notice. It may be argued that this combination of a slim management structure and a broad network orientation was critical to helping ENSCC stay on track. This would seem to reflect not only ENSCC but an Urban Europe zeitgeist that clearly positions the JPI Urban Europe initiative in the landscape of partnerships, funding agencies, and European Commission units.

1.4 Evaluating proposals

A consequence of working within the ERA-NET Cofund structure is that the evaluation procedure was somewhat complicated. Pre-proposals received under the joint call were first checked by the Call Secretariat to ensure eligibility with transnational requirements. Preproposals were then ranked by international experts with only the best proposals invited to submit full proposals. International experts, using ranking rules similar to Horizon 2020, then ranked proposals according to the programme's evaluation criteria. This resulted in a list of proposals suggested to the Call Secretariat for funding. The Steering Committee was then tasked with agreeing on a final list of proposals for funding.

In practice it was difficult for international experts to both apply scoring mechanisms developed by the Commission and to accommodate funding agencies for academic research and practitioner-oriented projects. Moreover, the ranking system and evaluation procedure did not take into account the portfolio of projects eventually funded. An advantage of this approach is that although there were limitations to project participants from each country, there were no limits to topics or approaches. This led to a "bottom-up" portfolio approach that gauged the interest in various topic areas. A disadvantage is that the ENSCC call funded *projects* rather than *project areas*. Projects interviewed for this report note a rather limited understanding of other projects with similar focus- or even from the same country. This could be mitigated by programme activities aimed at fostering a sense of community and actively linking similar projects.

1.5 Funding and resource allocation challenges

Although the management structure for the ENSCC call was straightforward, it was a challenge to harmonise the priorities and requirements of the 18 national funding agencies as well as Commission requirements. The process of authoring the call text highlighted the somewhat different priorities of funding agencies and the JPI Urban Europe Governing Board. The Urban Europe initiative was the brainchild of national policymakers seeking to find a common platform for addressing Europe's urbanisation challenges and facilitating national participation in international collaboration. However, it was ultimately funded and operationalised through national funding agencies with somewhat different institutional restrictions. This came into sharp focus during the process of developing the call text for the ENSCC which:

(…) highlights the tensions between national policy goals interested in exploring transdisciplinary approaches and promoting cross-country interaction, and funding agencies of which many had both requirements and traditions of strictly prioritizing academic research excellence.

As one of the first ERA-NET Cofunds, ENSCC also faced a challenging task balancing the supply of research funding with the demand and quality of proposals. The required budget to fund the top-ranked projects exceeded the original budget in Austria, Belgium, Cyprus, the Netherlands and Switzerland in which cases the budget was increased, or ERA NET top-up funding was used. For example, in the Netherlands, the budget needed to be more than doubled to fund the successful Dutch project

partners. Conversely, the Swedish funding agencies' budgets exceeded the requested funding by the successful proposals. ENSCC, thus, played an important role for the JPI Urban Europe call programme to gauge demand for research funding in conjunction with the quality of proposals. Reasons for diverging ratios of original national budget to granted funding may be the success in motivating local research communities, quality of research or the size of the allocated budgets.

Funding in each country also differed by project partner type. The distribution of funding by project partner type is mostly determined by the respective funding agencies' internal policies and regulations. Depending on the national regulation, Funding agencies were limited in the types of project partners to which they were able to provide support. For example, while the Netherlands exclusively funded universities and other educational institutions, Spain focussed on companies and governmental institutions. The distribution of funding by project partner type is mostly determined by the respective funding agencies' internal policies and regulations. Inspecting shows that, overall, universities contracted the largest share of funding in the ENSCC call while city authorities and non-profit organisations received the smallest share.

The direct effect of the funding agency regulations on outcomes in terms of funded ENSCC projects depends on the national context. Although the Dutch funding agency was not able to directly fund public city authorities as project partners, the Netherlands hosted the largest number of cities involved in ENSCC projects as can be seen in the Annex to this report. In the Dutch case, the dedication of financial and human resources to research is seen as a means to increase cities' commitment to the projects. In most other contexts, financial support is a crucial incentive for cities to participate in ENSCC.

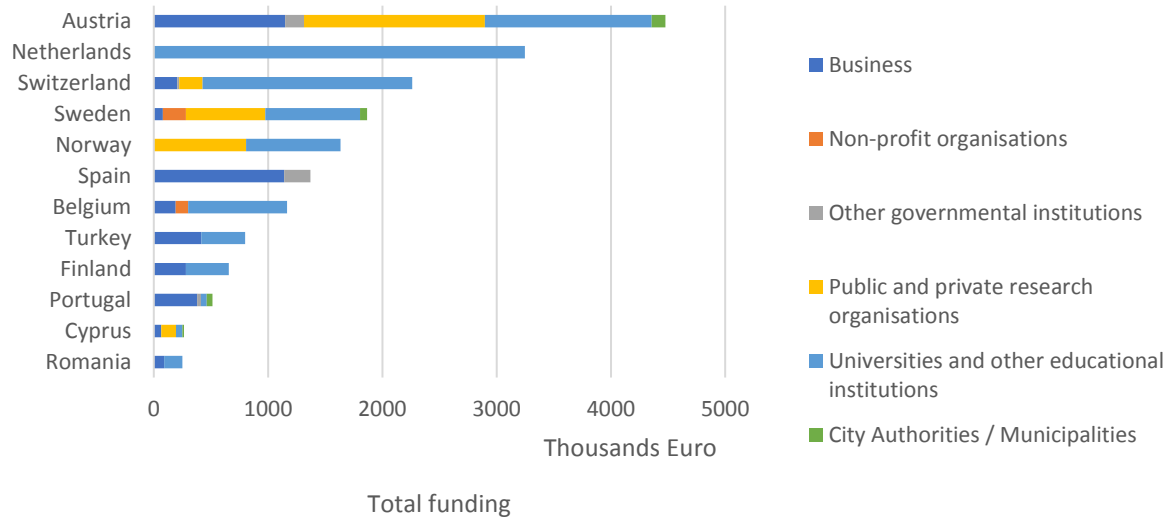

Figure 1: *Total project funding by organisation type and country. The category 'Business' includes industry, public utilities operating on a market logic, as well as private commercial actors. Source: Project data*

Again, the agility and commitment of the Management Team and participating funding agencies for the ENSCC call proved critical. Rather than abandoning promising projects that did not fulfil the criteria for all affected funding organisations, every effort was made to use top-up funding to fund them. Some interview respondents do note the inherent risks of using top-up funding to ease financial restrictions of limited national funds, as this may create a perverse incentive for member states to underinvest from funding agency resources, betting that common funds will finance local projects. However, there is no evidence that this transpired in the ENSCC call.

1.6 Monitoring

Measuring impact is challenging as impacts often arise long after project running time and changes of behaviour of target groups and the urban system are inherently hard to quantify. Provisions for monitoring in JPI Urban Europe are under constant development to better gauge project impacts and learn from the implemented calls. ENSCC represented a leap forward in this regard as it included the development of the Online Project Monitoring System, a dedicated web-platform to retrieve, structure and report on project implementation including activities, stakeholders and outputs. The system is designed to capture project-related information from the grant agreement until the finalisation of the project. Project coordinators enter relevant information, such as a comprehensive list of project partners (regardless of their funding status), on an annual basis and submit their annual reports. The Online Project Monitoring System is planned to be used in future JPI Urban Europe calls and is one of the manifest legacies of ENSCC.

After projects were selected in ENSCC, they were obliged to submit annual progress reports to their funding agency. The reporting template focusses on operational aspects of project execution and was designed to help the respective Funding Agency/-ies in their operational tasks. However, the template was not designed to capture project impacts or outcomes from a broader perspective. Annual reports would provide an opportunity to go deeper and understanding activities in the context of the objectives they pursue. For this reason, a publishable project report would help to gauge impacts on the urban system the project addresses- and its scientific contribution. The reporting template should specifically address the benefits achieved for cities and their embeddedness in the urban system. The publishable report, furthermore, provides another opportunity for JPI Urban Europe to support projects in their communication and dissemination efforts.

Moreover, the implementation of a Project Coordinator Survey is recommended in the future. It represents an additional instrument for comprehensive data collection of project activities complementary to the Online Project Monitoring System. The rationale for the Project Coordinator Survey is the collection of standardised information and qualitative assessment of their contribution to the initial project objectives.

The Online Project Monitoring System, however, covers only one aspect of measuring project impact, as the task starts before projects are selected and long after their completion. It is worth noting that the JPI Urban Europe is continuing to develop a comprehensive monitoring system. Monitoring impact starts with the call text and grant agreements as they specify objectives and regulate means of communicating outputs and intended impacts. Impacts are seen in the context of a logical frame connecting inputs of the funding agencies to their outputs, from activities of projects to change the behaviour of the target group and, further on, change of the urban system as illustrated in Figure 2.

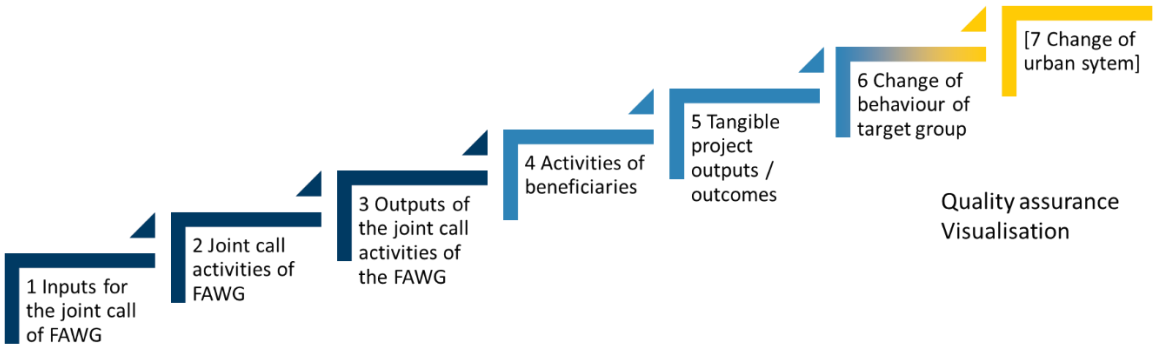

Figure 2: Logical frame for JPI Urban Europe project monitoring. Source: JPI Urban Europe (2019) FAWG= Funding Agency Working Group

A Task Force on Project Monitoring was established within the JPI Urban Europe in 2018 and expanded as Task Force on Programme Management in September 2019 as a co-creation and sounding board for activities and outputs related to monitoring. It aims to support the professionalisation of JPI Urban Europe programme management and translate findings from monitoring to actionable learnings. Concrete recommendations relate, for example, to the introduction of publishable project reports, a Project Coordinator Survey and a Project Contact Point, which are described below.

As the monitoring system for JPI Urban Europe continues to develop we expect to see more structured monitoring scheme allowing for results and insights to be shared across calls and specially to inform the monitoring of joint calls. With the growing portfolio of JPI Urban Europe projects and their results, the need arises to establish a dedicated capacity to keep close relations with projects, monitor interesting achievements and developments and support networking among projects. First strides towards developing a profile for the centralised project contact point have been made to date. The person will use and partly maintain the Online Project Monitoring System and will be tasked with providing first level support for projects, linking to funding agencies and the JPI Urban Europe Management Board, follow-up on all projects, interface with the communication team and link to the monitoring.

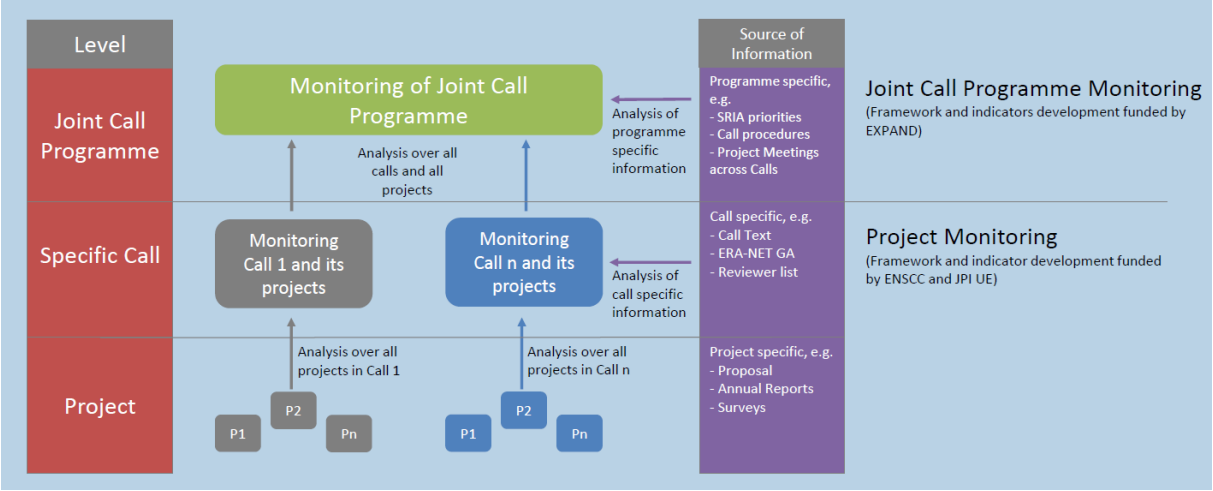

Figure 3: *Monitoring Concept for JPI Urban Europe.*

2 Project portfolio summary

The ENSCC did not specify a budget for the four call topics offered or otherwise require a portfolio perspective in the evaluation procedure. Nevertheless the resulting project portfolio covers all call topics and involved over 100 project partners from 12 countries as well as many other stakeholders not listed as project partners. This was more than twice the number of partners in preceding calls. In general projects focused on testing or implementing known and proven technologies or approaches in new contexts or settings. Most projects were led by researchers and/or consultants; some had close and active relations with municipal authorities while others were unable to fully engage local authorities or end users. While country connections, partner participation and gender balance may reflect funding agency requirements, we do see evidence of expanded and reinforced connections among participating member states, with each country on average participating with seven others.

2.1 Key report statistics

The ERA-NET Cofund Smart Cities and Communities (ENSCC) call was the largest of the first six JPI Urban Europe calls in terms of funded projects. 17 projects across four call topics involved 126 project partners from 12 countries. Only the Sustainable Urbanisation Global Initiative (SUGI) call exceeded ENSCC in terms of granted funding and number of beneficiaries. Consortia included in the median 7 project partners and contracted on average 1.09 Million EUR.

							Budget (Million EUR)		
Call	*Project running time (approx.)*	*Number of Funding Agencies*	*Countries*	*Projects*	*Project partners*	*Median Consortium Size*	allocated by Funding agencies before the call	granted	Average project cost
Pilot call I	2013-2016	8	6	10	39	3.5	7.6	9.5	1.21
Pilot call II	2014-2017	15	8	10	49	5.0	15.0	10.6	1.29
ENSCC	2016-2019	15	12	17	126	7.0	26.0	18.5	1.48
ENSUF	2017-2020	25	17	15	100	6.0	23.8	14.1	1.24
SUGI	2018-2021	25	20	15	137	8.0	28.5	22.6	1.06
MCW	2019-2022	6	4	6	42	7.0	4.7	5.3	1.07
Total		39 (distinct)	29 (distinct)	73	493	6.0	105.55	80.6	1.23

***Figure 4**: Call characteristics of the first six JPI Urban Europe Joint Calls: Pilot call I, Pilot Call II, ERA-NET Cofund Smart Cities and Communities (ENSCC), ERA-NET Cofund Smart Urban Futures Call (ENSUF), Sustainable Urbanisation Global Initiative (SUGI)/Food-Water-Energy Nexus and Making Cities Work (MCW). Source: Project data.*

Each ENSCC project was required to submit annual project progress reports which provide the empirical basis for the following analyses. In the case of short project durations, project coordinators submitted only two reports (mid-term and final report). Figure 5 illustrates the project progress reports on the overall project timelines. Most projects lasted 36 months, while 3 projects had a shorter project duration, and few exceeded the planned maximum duration of three years.

On average, the first reporting period coincided with the first half of the projects. Almost all projects have been completed at the time of writing this report. While most project outputs have now been produced, the assessment of long-term impacts is based on the assessment of project coordinators and interviews.

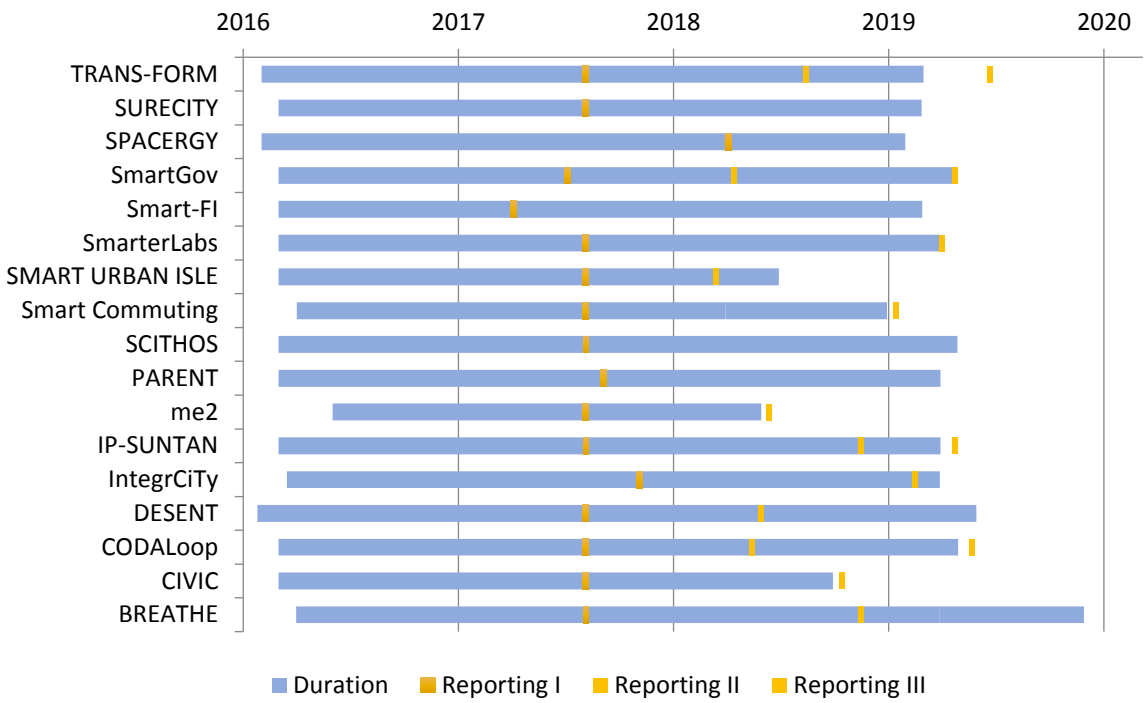

Figure 5: Timeline showing project duration and project report timing. These were the numbers at the time of writing in 2019 and they might have changed since. Source: Project data and project reports.

Among the 12 participating countries, Austrian project partners (26 project partners, 4.48 Million EUR) contracted the largest share of granted funding followed by the Netherlands and Switzerland. The Romanian and Cypriot funding agencies funded two and four project partners, respectively, and granted on average 0.25 Million EUR. ENSCC was organised as a mixed-mode common pot which ensured that the selection of proposals strictly followed the joint ranking while maintaining a "fair return" principle so that each Funding agency supports the project partners in their country. The variation in granted funding by country is, thus, a result of 1) the budget allocated to the call by the funding agencies and 2) the required funding after the evaluation of the project proposals. If many successful project applications involve partners from a specific country and the required funding after the evaluation of project proposals exceeded the funding agencies' allocated budget, funding agencies were able to increase their budget. Remaining gaps were filled by the ERA NET top-up funding as a result of a negotiation process.

2.2 Interdisciplinarity and Co-creation

ENSCC projects promoted interdisciplinary research and sought to support collaboration between a wide range of stakeholder groups from civil society, business, city authorities, practitioners and research. At least half of the projects integrated both natural sciences and social sciences disciplines in their projects. Interdisciplinarity was understood as necessary to approach the interactions between research and policy making in multi-stakeholder settings.

Many projects started off in settings where abundant scientific literature was available, and where the need for system-wide transformation had been advocated by researchers and planners for a long time; yet few cities had managed to implement these changes.

A frequently mentioned benefit of the interdisciplinary setting across various types of organisations was the use of tools, techniques and data sources. For instance, ICT actors introduced software solutions to research organisations, societal actors and municipalities, which led to more efficient project management or facilitated communication activities. At the same time, the interdisciplinary setting was perceived as challenging. Finding a common language and terminology between project partners from diverse backgrounds and simultaneously differentiating research processes and integrating research findings was time-intensive. Close collaboration between project partners was mentioned as success factors which enabled co-creation between researchers, practitioners and experts from different fields and countries.

Co-creative approaches with stakeholders and citizens in local communities added a further layer of complexity. Projects argued that leveraging existing societal initiatives and activities was key to engage stakeholders as researchers. Nevertheless, understanding the functioning of actor networks lay at the heart of most projects, including the integration of needs and expectations of local authorities and citizens. Furthermore, city representatives, being problem owners, delivered insights into the specific issues faced by the city authorities. Finally, testing guidelines in action research projects was reported a success factor.

2.3 Project Partners

An explicit goal of the ENSCC call was to stimulate researchers, practitioners, innovators and other stakeholders to join forces with municipalities, their relevant business entities and industrial suppliers to address the Grand challenges at hand. Moreover, it encouraged collaboration between partners from across Europe with broad geographical spread where relevant for implementation.

126 organisations from 12 countries were (funded and not funded) official project partners in the 17 ENSCC projects and many more directly or indirectly involved. Figure 6 shows the distribution of beneficiaries across partner type and geographical location. The majority of official project partners were universities (38%) and private business entities (28%). The latter category spans industry actors, public utilities operating on a market logic and private commercial actor. Around 12% of all project partners were city authorities and another 12% public and private research organisations. Geographically, beneficiaries were located across their respective countries with slight clustering towards dense urban areas.

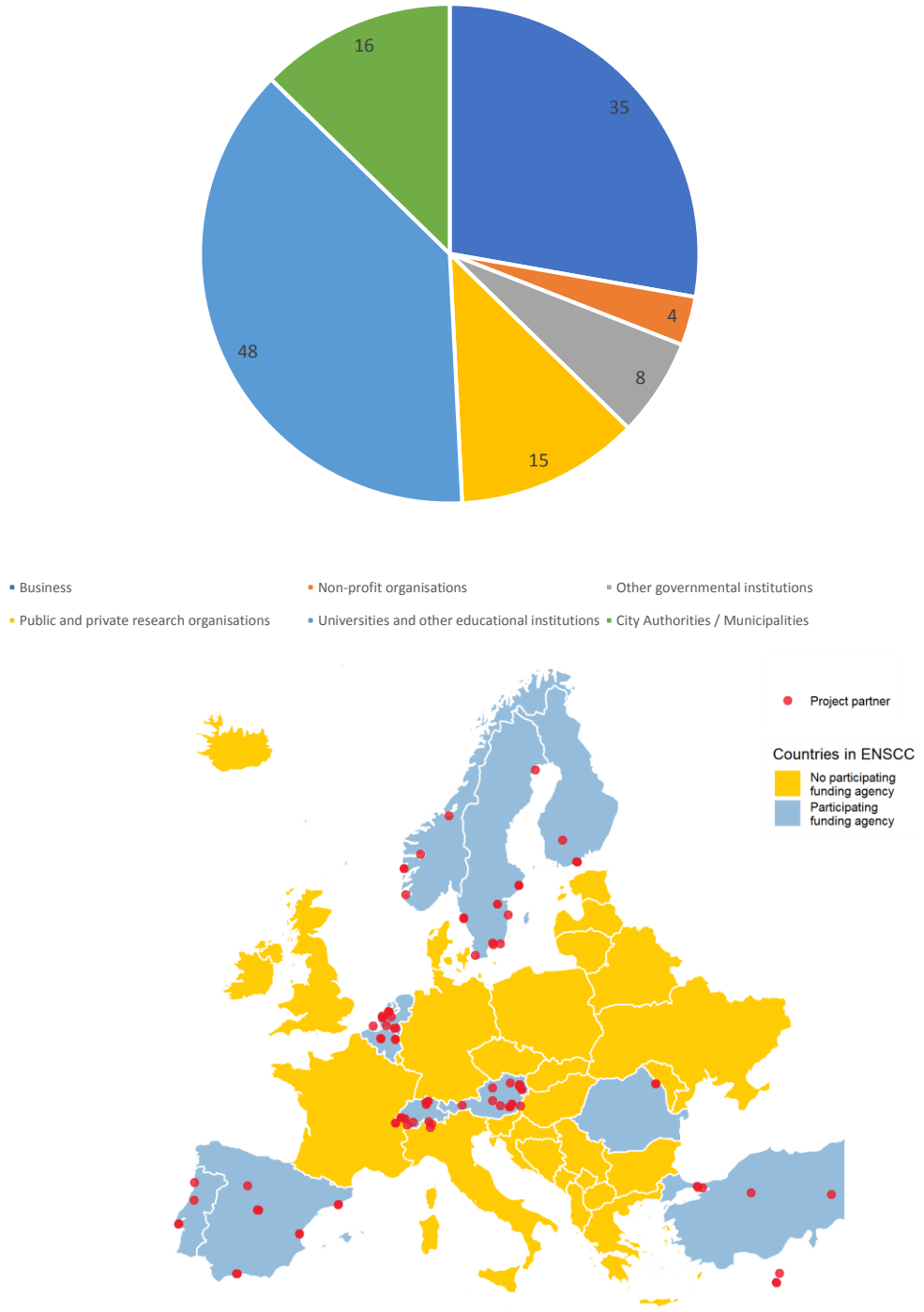

***Figure 6**: Type (circle diagram) and location (map) of ENSCC project partners. Source: Project data*

The distribution of project partner type differed between countries as shown in Figure 7. The Netherlands hosted the largest proportion of universities due to the regulations of the funding agency. The four Dutch businesses and two Dutch city authorities which were official project partners did not receive funding. Conversely, Spain hosted only one university partner and a large proportion of businesses. City authorities were not eligible as beneficiary institutions in Belgium, Norway and

Romania. Finnish cities would have been elegible for funding but only together with Finnish companies in parallel funding schemes. No Finnish city authority was officially part of a consortium.

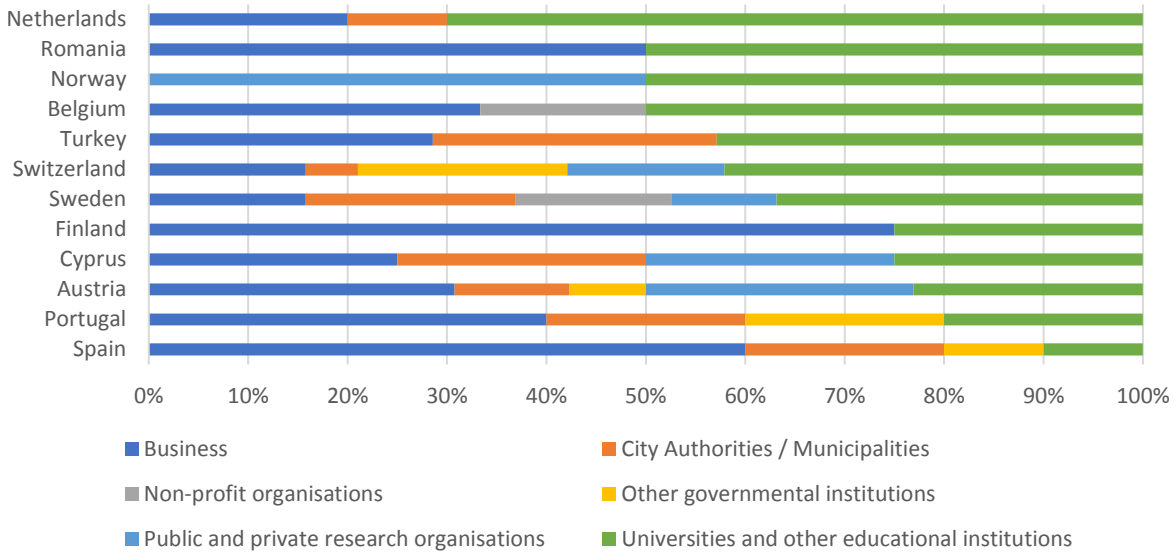

***Figure 7**: Number of project partners by type and country. Source: Project data*

The distribution of official project partners (Figure 7) differs from the funding received by partner type because of 1) the number of project partners which did not receive funding and 2) differing funding volumes by partner type. 26 out of 126 official project partners did not receive funding. These institutions were located in the Netherlands (7), Switzerland (7), Sweden (6), Spain (3), Turkey (2) and Austria (1). This status pertains mostly to cities authorities or municipalities in the consortia, and hints to a larger issue in the collection of project data in the ENSCC, whereby project partners – regardless of their importance in the implementation of the project – might not be recorded in the database. The inclusion of non-funded project partners depends on:

1. The project coordinators' decision to list project partners in the proposal which do not request funding
2. The respective Funding Agency's ability to fund certain types of beneficiaries

The development of the Online Project Monitoring System, which was funded by ENSCC, amends this problem by introducing a standardised procedure for collecting information on all project partners regardless of their inclusion in the project proposals or Funding Agency specific regulations. Further information on the Online Project Monitoring System can be found in Section 1.6.

A different picture emerges when looking at the funding for each partner type as shown in Figure 8. Private companies are the second most frequent partner type, but receive on average less funding including a large number of partners without funding. Business partners receive lower funding rates, 70% in the median, compared to full funding in the median for universities and 80% for public and private research organisations. Another reason for lower funding volumes for business partners are slightly lower project costs. Cities and municipalities, the third most frequent partner type, received the smallest grants on average. Among city authorities which received funding as project partners, median funding rates lay at 55%.

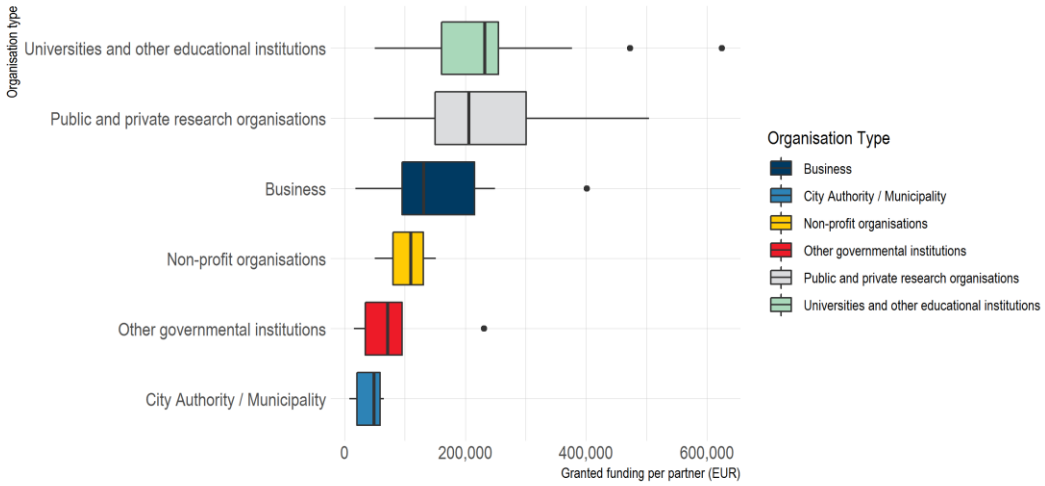

***Figure 8**: Distribution of funding by organisation type based on granted funding per project partner. In detail, the lower and upper hinges correspond to the 25th and 75th percentiles. The bar in the middle depicts median project partner funding. Data beyond the end of the whiskers are outlying points and are plotted individually. Source: Project data*

2.4 Project challenges and obstacles

Although most ENSCC projects produced impressive outputs within expected time plans and budgets, projects note challenges and obstacles that can inform future JPI Urban Europe calls. The most frequently mentioned challenges and obstacles in the 17 project reports were data access or data analysis (8 of 17 projects), difficulties in recruiting respondents or participants (6), new or changing project partners (6), a low participation of project partners or stakeholders (5) and delays due to a change of personnel (4). This led to delays in work packages for 13 of 17 projects and delays of the project completion for 3.

Other mentioned obstacles concerned political aspects, such as a lack of political support or challenges regarding the introduced EU general data protection regulation (GDPR). Furthermore, uncertainties in the planning phase and cancellations of experiments or demonstration projects have affected some projects. Projects also faced a variety of individual and project-specific difficulties, such as technological or budget-related constraints. In summary, the main challenges and obstacles identified concerned the project schedule and delays, the level of commitment and cooperation with project partners or stakeholders, the current political landscape and methodological and operational difficulties.

"Cities are always invited to the SCITHOS progress meetings. In the first meeting all cities participated, but in the second only three cities did. This was disappointing and we have since increased our regular contact with the cities to ensure better uptake for the next meeting."
- SCITHOS

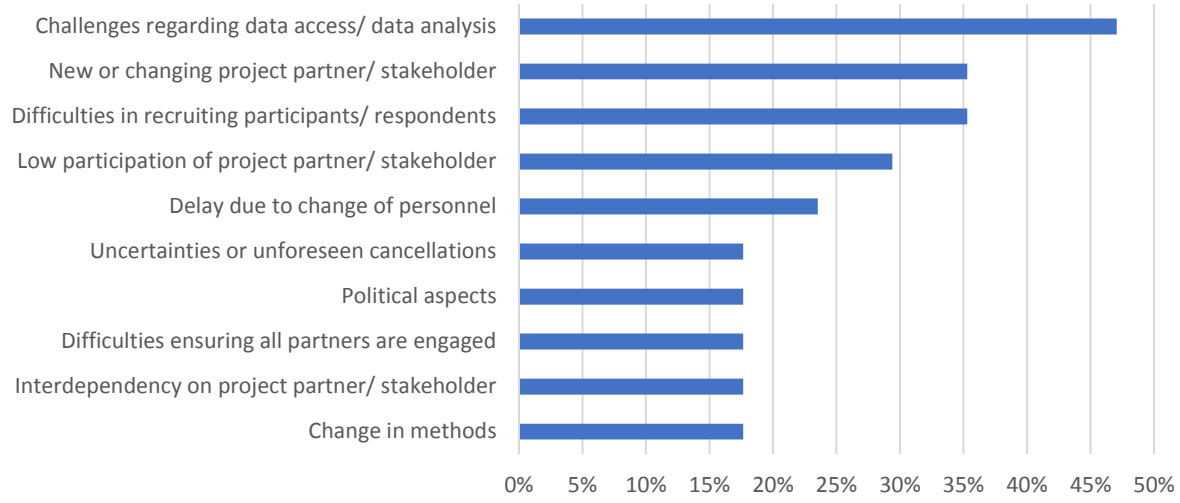

***Figure 9**: Main challenges and obstacles mentioned in project reports. Source: Project reports*

2.5 Project networks

Figure 10 shows the network of countries which supported urban research projects in ENSCC. The size of a node represents the number of project partners based in a country while the thickness of the connections depicts the number of partners collaborating between these countries. Swedish and Austrian project partners collaborated most frequently leading to the thickest line between the two country nodes. Across 4 projects, 10 Austrian and 10 Swedish project partners led to 24 collaborative combinations.

In the left panel countries are positioned close to each other, if many projects have involved (funded) project partners from both countries leading to a network structure with central countries towards the middle. The right panel shows the same information as the left panel with the geographic position of a node at the country capital. For instance, although there are as many collaborations between Belgian and Swedish project partners as there are between Dutch and Swedish project partners, Belgium is located further outside the network in the left panel as it is less central in the social network (i.e. fewer links to other central nodes).

ENSCC funded more than twice as many project partners than the preceding Pilot Calls and extended the network to new countries (Cyprus, Portugal, Romania, Spain, Switzerland). It established a dense network of research collaboration among participating countries.

The density of the network, i.e. number of connections between countries as a proportion of all possible connections, is 62% and a country is on average connected to seven other countries.

In general, the collaboration network can be described as having a core-periphery structure. The Netherlands, Austria, Switzerland and Sweden comprise the core structure of collaboration in ENSCC. All projects involved at least one partner from one of these countries and collaboration between these countries was frequently observed. The periphery comprises Cyprus, Finland, Norway, Portugal, Romania and Turkey. These countries were each represented in fewer than five projects and hosted fewer project partners. The comprehensive monitoring system being implemented for the entire JPI Urban Europe programme will facilitate comparison of these patterns of collaboration with those of

other calls and help to track the development of ongoing collaboration among both individual researchers and between countries.

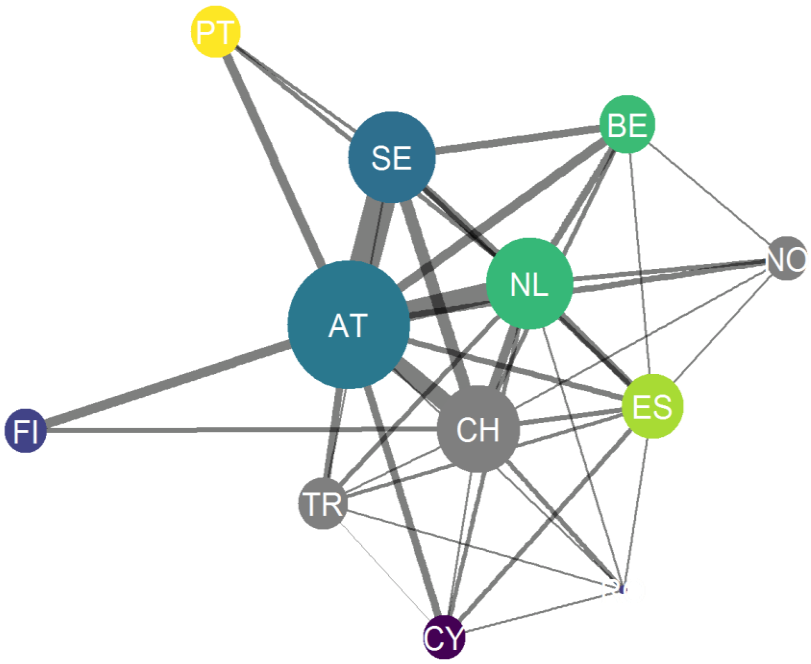

***Figure 10**: Collaboration network based on ENSCC project partners: social network structure. Node size shows the number of project partners and line thickness the number of collaborations in projects. The colour of the nodes shows the geographic location: West – yellow, central – green, east – blue, grey – non-EU28. The displayed country codes are AT Austria, BE Belgium, CH Switzerland, CY Cyprus, ES Spain, FI Finland, NL Netherlands, NO Norway, PT Portugal, RO Romania, SE Sweden, and TR Turkey.*

***Figure 11**: Collaboration network based on ENSCC project partners: a map of the geographical network. Node size shows the number of project partners and line thickness the number of collaborations in projects.*

2.6 Gender

ENSCC aimed to promote gender equality by gender mainstreaming the evaluation panel for projects and by underscoring gender equality as an important criterium to reviewers. The urban innovation ecosystems approach by ENSCC offered an opportunity to integrate gender/sex analyses in the focus of smart city projects. Various funding agencies already have routines in their application manuals for project descriptions to consider gender issues and requirements on gender balance in research teams. The ENSCC call itself did not include overarching requirements on gender balance in research teams or in decision-making.

Although information on the composition of reviewer panels is not readily available, some evidence can be found in the project reports. In their annual reports, project coordinators indicated the number of female researchers involved in their projects. The proportion of female researchers is on average 30%. Smart and Big Data, call topic 4, included the largest proportion of female researchers. Only three projects had female researchers in leadership roles.

The proportion of female researchers decreases with the total project size as measured by granted funding. Figure 12 shows the female ratio and granted project funding for each of the 17 ENSCC projects. The size of a point shows the number of project partners while its colour indicates the main call topic. The chart appears to hint at a negative relationship between female ratio and project volume; however, not enough information is available to confirm the negative relationship between underrepresentation of women and project size.

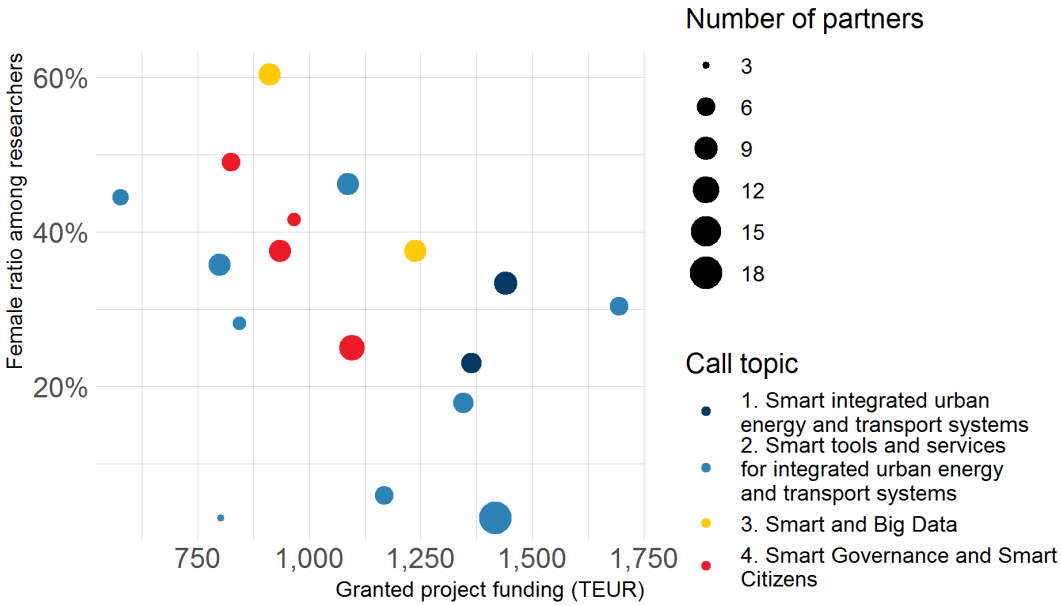

***Figure 12**: Average project funding, female researcher ratio and number of project participants by call topic. Source: Project data and project reports.*

2.7 Themes

The ENSCC was established to address new solutions in the urban field and demonstrating the feasibility of their implementation in the context of grand challenges such as demographic transformations, resource depletion and climate change. Four call topics were identified jointly by European Funding Agencies linked to the Member State Initiative Smart Cities, JPI Urban Europe and additional countries.

Projects assigned themselves according to the call topics during the application process. The most frequently addressed topic was Smart Tools and Services for Integrated Urban Energy and Transport Systems (7 Projects) followed by Smart Governance and Smart Citizens (5 projects). Smart and Big data and Smart Integrated Urban Energy and Transport Systems included three and two projects, respectively.

ENSCC Call Topics

1) Smart integrated urban energy and transport systems
2) Smart tools and services for integrated urban energy and transport systems
3) Smart data, big data
4) Smart governance and smart citizens

Within the JPI Urban Europe context, the call was embedded in the programme's strategic research and innovation agenda (SRIA) [6] which expresses thematic priorities for its multi-annual call agenda. ENSCC addressed three priorities, namely Environmental Sustainability and Resilience, Accessibility and Connectivity, as well as Urban Governance and Participation. Projects were sorted ex-post to SRIA thematic priorities by JPI Urban Europe to establish connections between projects funded in different calls. The most frequently addressed thematic priority of SRIA 2015 by ENSCC projects was Urban Environmental Sustainability and Resilience with eight projects. This is followed by five projects working on Accessibility and Connectivity and four projects on Urban Governance and Participation. The thematic priorities Vibrant Urban Economies and Welfare and Finance have not been implemented by any of the 17 ENSCC projects. Figure provides an overview of the addressed call topics and SRIA thematic priorities.

[6] SRIA thematic priorities mentioned in this report relate to the SRIA 2015 which was the current agenda at the time of the ENSCC call.

Call Topic	SRIA thematic priority		
	Accessibility and Connectivity	Environmental Sustainability and Resilience	Urban Governance and Participation
1. Smart integrated urban energy and transport systems		• DESENT • Smart Urban Isle	
2. Smart tools and services for integrated urban energy and transport systems	• IP-SUNTAN • Smart Commuting	• BREATHE • PARENT • SURECITY	• IntegrCiTy • Smart-FI
3. Smart and Big Data	• TRANS-FORM	• CODALoop	• SmartGov
4. Smart Governance and Smart Citizens	• me² • SmarterLabs	• CIVIC • SPACERGY	• SmartCityHospitality

***Figure 13**: Projects according to call topic (self-assigned) and SRIA thematic priority (assigned ex-post). Source: Project data*

The SRIA and call topics differ in terms of the funding volume granted to beneficiaries. The second call topic received the largest amounts of funding, exceeding the sum of the other three topics as can be seen in Figure 14. Environmental Sustainability and Resilience, similarly, is the SRIA thematic priority with the largest funding volume just short of the sum of the other two addressed thematic priorities.

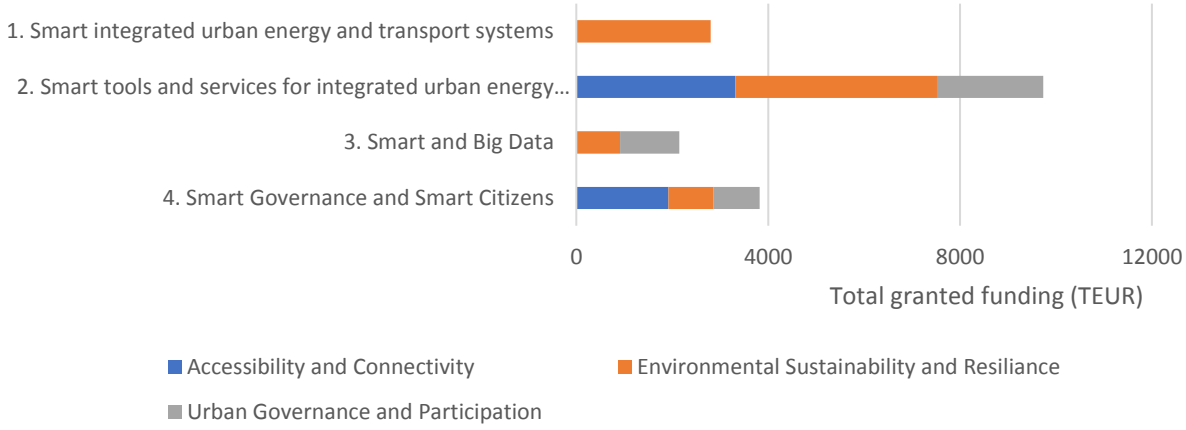

***Figure 14**: Funding volume by call and SRIA topic. Source: Project data*

Based on project proposals and reports, projects were coded based on their potential relevance to the United Nations Sustainable Development Goals and the Urban Agenda for the EU. All projects naturally relate to the Sustainable Development Goal 11 ”Make cities and human settlements inclusive, safe, resilient and sustainable” and the three targets 11.2 (access to safe, affordable, accessible and sustainable transport systems for all), 11.3 (inclusive and sustainable urbanisation and capacity for participatory, integrated and sustainable human settlement planning and management) and 11.6 (reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management).

Project experiences from this call can support the ongoing working relationships between JPI Urban Europe and the current Urban Agenda for the EU partnerships.

As for the developing Urban Agenda for the European Union, the ENSCC projects are mostly relevant to the partnerships 10.2 Air Quality, 10.8 Energy Transition, 10.10 Urban Mobility, 10.11 Digital Transition and the interrelated topic 12.5 Innovative Approaches, including Smart Cities. Project experiences from this call can support the ongoing working relationships between JPI Urban Europe and the current Urban Agenda for the EU partnerships.

3 Project outputs

ENSCC aimed at innovation and implementation of integrated low-carbon energy and transport systems at the urban scale and, thus, required projects to include urban innovation and implementation activities. These activities were accompanied by two further types of output, namely applied urban research and strategic urban research. Both individual and community capacity building to address urban challenges is noted as the most important project output but closer analysis notes a range of more specific project outputs including new data sets, integrated analytical models, games and applications. The extent to which these can be replicated or ramped up remains to be seen, not least because projects reported limited understanding of other ENSCC project activities and some had difficulty in engaging municipal authorities and companies that would ultimately institutionalize or operationalize results.

ENSCC projects produced a variety of innovation and implementation project outputs. Figure 15 presents an overview of the proportion of projects producing certain outputs. The categorisation of outputs has been produced based on a qualitative coding of the project reports and thus does not represent a comprehensive picture of all outputs, but rather only the most notable outputs from the perspective of the project coordinator (further information in the methodology in the Annex to this report). For example, outputs such as capacity building in municipalities were not directly mentioned in the reports but play an important role in the impact mechanisms of ENSCC.

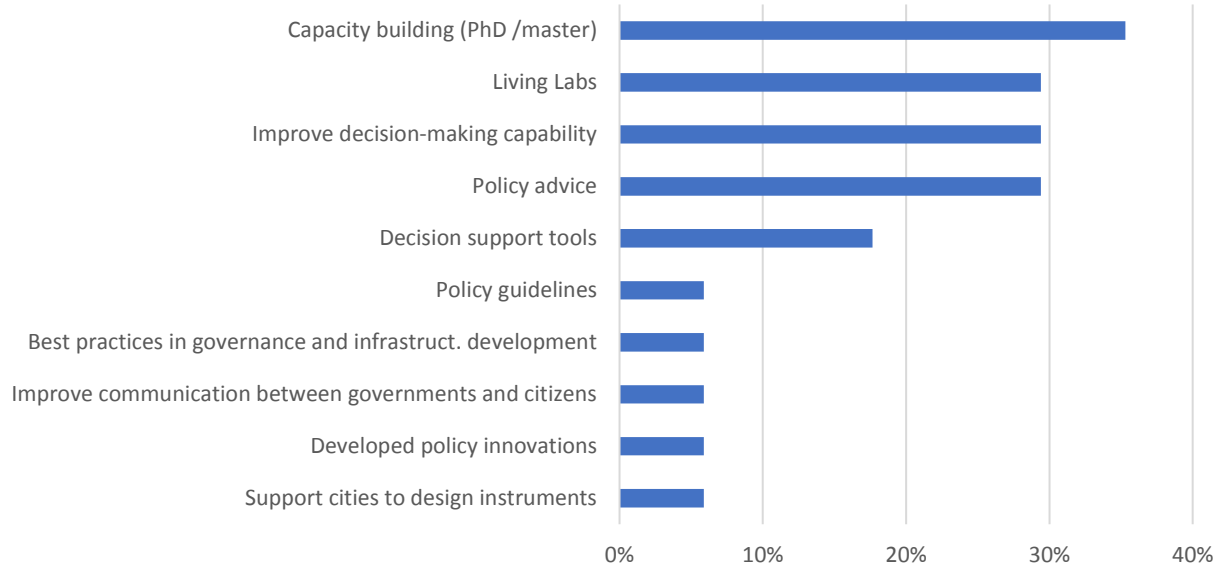

***Figure 15**: Proportion of projects producing project outputs by category. Source: Project reports*

3.1 Capacity building

Capacity building is the most frequently mentioned project output. No report mentioned patents or licenses as a result of their ENSCC engagement. The creation of living labs, which can be understood both as a research method and as an output itself was the second most frequent output. Policy advice and the improvement of decision-making capabilities via policy briefs, ICT tools and learning platforms were another way of delivering results to target groups. Project reports underscore that novel methods

and sustainable tools improve efficiency and effectiveness by simulating the potential impacts of decision alternatives, thus offering decision support to decision makers regarding sustainable policies.

3.2 Innovative games and applications

Outputs, however, also took more creative forms, for instance the smart governance board games as in the case of the *CIVIC* project or mobile phone applications as in *me²* or *SMART-FI*. For example, the *CityGO* app (http://city-go.eu) which was developed in the *SMART-FI* project is helping citizens in Malaga to use public transport by indicating what public transport options are available at any time for a particular route. The most important highlights in the projects, as perceived by the project coordinators, included the adoption of their outputs by individuals. *IP-SUNTAN*, for example, established tradable mobility permits which were used according to the underlying theory. This particular project also reported substantial behavioural changes towards public transportation as commuters living outside Vienna switched to off-street parking facilities. *SmartGov* demonstrated new models for citizens services in the form of collaborative tools to enhance governance practices which were validated by the participants in their pilot cities. Also, the *me²* project succeeded in implementing a community challenge and, thus, reduced electric vehicle charging demand during peak hours.

3.3 Publications, presentations and event participation

Producing applied or strategic urban energy research in journals was highly encouraged and assumed as important aspect of applied and strategic urban research. As project reports only included non-standardised lists of publications and presentations and publications are likely to be published after the end of the reporting periods only indicative statistics on publications and presentations can be drawn. According to the project reports, a project published an average of 4.6 scientific papers, conference proceedings or book contributions (79 in total) and gave an average of 7.6 presentations (129 in total). Several publications received awards at scientific conferences.

ENSCC project events were, based on interviews conducted for this report, perhaps more frequently attended by researchers and businesses than by municipal representatives. Attendance of city authorities could be improved using better communication and outreach by better specifying the benefits of attendance, emphasizing that city authorities and urban public administrators are a core target group, as well as better timing of communication so that urban public administrators can plan for attendance well in advance. Furthermore, event design that is more tailored to providing specific added value to cities could also increase city authority participation. These include events that offer: 1) networking opportunities, 2) opportunities to learn about funding opportunities that clearly spell out the benefits for city authorities when participating in R&I projects, and 3) formats that facilitate exchange and mutual learning between cities as well as with researchers and businesses. The SET Plan Cities workshop on 3-4 April 2019 was a good example of this as are many other JPI Urban Europe initiatives such as the Urban Lunch Talks webinars which can be joined online and accessed anytime.

Photo: The ENSCC projects catalogue is available on the JPI Urban Europe web.

3.4 Contribution of project results to decision support

ENSCC aimed towards innovation and implementation of integrated low-carbon energy and transport systems at the urban scale. Applied outputs should always have a policy influence and bear tangible results to impact actual decisions. Projects relating to smart and big data should leverage the potential for improving participatory decision-making through real-time monitoring, management, optimisation and visualisation of urban systems, while smart governance should enable citizen involvement in decision-making.

Decision support systems are, thus, among the most important innovations, mentioned by project coordinators in the project reports. Decision support took several different forms in the 17 ENSCC projects. While some projects developed concrete IT solutions to model and analyse urban networks, other projects developed guidelines, handbooks and documents. Living Labs and urban observatories were implemented to further help decision makers improve their capability to develop needs-based solutions. Developed decision tools helped to assess the relevant criteria of various stakeholder groups and take citizens' concerns into account.

"In Limassol, garbage collection workers confirmed that the newly implemented garbage collection schedule was indeed better than the one previously carried out based on their responses to the evaluation questionnaire."
– SmartGov

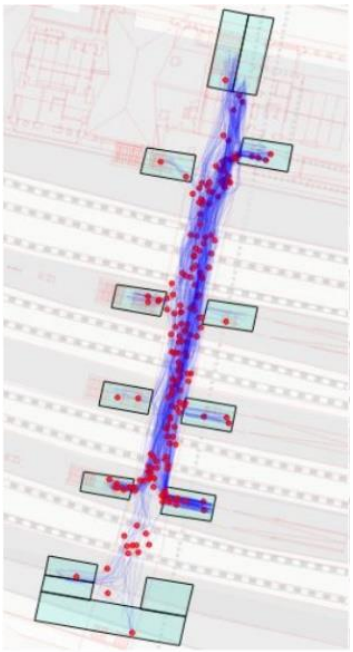

***Figure 16**: Pedestrian trajectories moving inside Lausanne station using the TRANS-FORM decision support tool. Source: http://www.trans-form-project.org/wp-content/uploads/D1.3_Final.pdf*

Several projects led to more integrated transport systems to avoid congestion and decrease emissions. Low emission zones, pricing schemes, and process optimization led to a sustainable reduction of pollution on construction sights and traffic emissions in general. The *TRANS-FORM* project designed and developed a tool to process, filter and analyse travel demand data. Graphical analysis (such as depicted in Figure 16 for the Lausanne train station) and network analyses provide a sound basis for more efficient traffic planning. The developed tools including their codebase has since been made publicly available and licenced under the permissive GNU General Public Licence 3.

Another tool tested in Brussels, Amsterdam, Vienna and Stockholm is the *Multi-Actor Multi-Criteria Analysis* (MAMCA). A product of the *CIVIC* project, it is used for making decisions on alternatives to organize construction logistics and highlight the difference of preferences across stakeholders. MAMCA can therefore play a role as a mediator as well as a decision support tool. In a long-term perspective, projects thus hope to achieve sustainable improvements in energy and resource efficiency. *CIVIC* was successful in launching a follow-up project, *MIMIC*, as a means to implement the Smart Governance Concept in cities. The project has the aim to increase understanding among authorities of how construction logistics affect the environment, urban traffic flows and mobility. The *CIVIC* project will, thus, be able to work more with providing stakeholders with a supportive platform for urban development decision processes.

Other decision support tools related to energy consumption by households. For example, the energy monitoring web-platform developed by the *me²* project has been deployed on Android and iOS and is available in three languages. Besides connecting communities and businesses with an online market on energy-related products and service, the developed platforms may also be used by distribution system operators for peak-shaving and valley-filling operations in the local grid. In Lisbon, more than half of the pilot participants achieved an over 10% smoothened load curve through increased awareness and direct, gamified peak-shaving incentives. In Amsterdam, participants reduced their electric vehicle charging during peak hours by more than 30% in a community challenge.

Photo: me² Green Points algorithm to predict the electricity demand curve and motivate behavioural changes. Source: https://www.hva.nl/kc-techniek/gedeelde-content/projecten/projecten-algemeen/me2.html

Novel data sources for decision support were either made more accessible or developed during the course of the projects. The collaboration between ICT companies, city actors and researchers for example led to the retrieval of full-scale congestion charging systems, such as a system of excess charges for drivers to improve accessibility and reduce emissions, that previously had not been accessed due to data privacy reasons. An interesting approach was developed by the *SmartGov* project which yielded fuzzy cognitive maps as decision support tool for Smart Cities. By incorporating linked open data and social media into modelling and visualisation, the tools aim to strengthen contemporary urban governance, decision support and two-way communication between citizens, governments and other stakeholders in (smart) cities.

"One of the most important innovation processes of this project has been to improve the decision-making capability of the political system regarding the transport in cities, to improve its substantiality and efficiency. Efficient transport systems are also fundamental for innovation in all other sectors in the cities' economy."
– IP-SUNTAN

Economic impacts of decision support may include enabling municipalities to adapt logistic solutions to specific contexts and stakeholders such that costs related to logistics decrease because ad hoc solutions can be avoided. Research in the *IP-SUNTAN* project – meta-analysis of parking price elasticities – revealed, for example, the price elasticities of parking fees which will enables city administrators to set optimal parking prices to decrease cruising for parking and urban street congestion. The analysis received positive feedback from cities which may use the results to design more sustainable and efficient urban flows.

3.5 Ramping up results

ENSCC projects were selected based on their expected impact including (market) potential of the project and the extent to which the project is likely to be of value to user communities and cities. Long-term perspective and potential replicability and upscaling was not a requirement at the project proposal stage but fed into the outlook of some annual project reports. However, at the time of final reports, full impact and further developments of the projects have likely not materialised.

Several projects mentioned the institutionalised use of guidelines and handbooks in the municipalities day-to-day business. For example, the Construction Logistics Hub near the port of Amsterdam will

apply the handbook of the CIVIC project and provide further opportunities for collaboration between research, practice and education. Long-term multi-disciplinary collaboration between the two educational institutions (University of Amsterdam and the Amsterdam University of Applied Sciences) and logistics partners (Deudekom, PostNL, Transmission) has led to the creation of a logistics hub to reduce inefficient courier routes and replace delivery trucks with electric vehicles. As part of the follow-up project *MIMIC*, funded by the JPI Urban Europe call *Making Cities Work* the findings from the *CIVIC* project will be translated to other urban areas and use cases.

Photo: The CIVIC project's consortium meeting in Amsterdam, 2017. Source: CIVIC

Three projects had prospective "customers" or parties who had either expressed interest in replicating their results or tools (*me²*, *IP-SUNTAN*) or parties who wanted to implement them on a larger scale (*SmartGov*). For example, the municipality of Quart de Poblet was looking into ways of implementing the Fuzzy Cognitive Maps developed in the *SmartGov* project on a larger scale by involving more children and schools.

One project successfully upscaled their services to various districts in Austria with ongoing negotiations for first service operations in Germany (*Smart Commuting*). There are first indications of international economic success of these mobility service concepts as during the project *Kyyti Group* provided the optimisation technology for mobility service in Switzerland, and *ISTmobil* scaled their services to many districts in Austria and also started negotiations for first service operations in Germany as well (*Smart Commuting*). Some projects already mention follow-up projects to continue their research and further the collaboration between partners.

3.6 User engagement

ENSCC aimed to engage a variety of local stakeholders in new and innovative ways. There was considerable emphasis on involving municipal authorities and companies, formally or informally, by testing new technologies or approaches that could be explicitly implemented in urban development initiatives and hopefully extended to other projects, contexts or even other cities. The call also promoted the engagement of a variety of other stakeholders, which ranged from partners needed to implement new technologies such as service providers and regional or national public authorities, to end users including residents, public transport users, energy consumers and the like.

Most of the project partners are research organisations and companies. A collaboration network analysis across all projects of JPI Urban Europe shows that universities are central to all projects and collaboration with cities and non-profit organisations as project partners is comparatively low. This analysis is based on the project database of official project partners. Cities and municipalities, as the problem owners, take up a more important role than shown in the network chart. The experience in ENSCC helps to further develop the monitoring processes within JPI Urban Europe calls that comprehensively capture the project partners' roles.

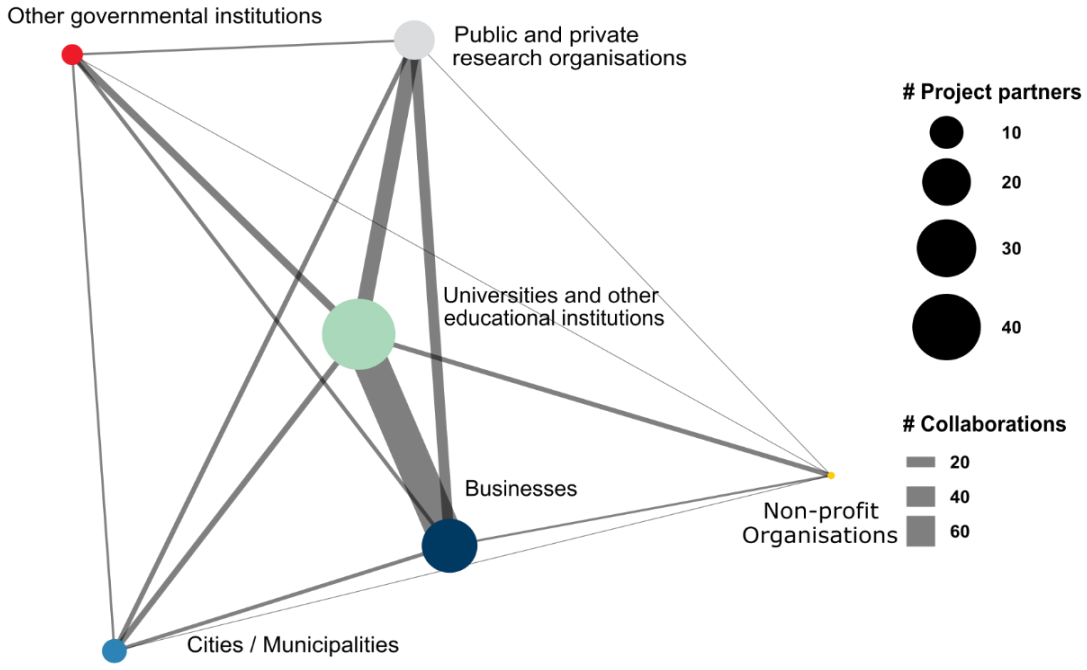

***Figure 17**: Network of collaboration in ENSCC projects by actor type*

The following sections are based on interviews conducted to delve deeper into the summary results described above. Information regarding interview methodology is provided as an annex to this report.

3.7 Engagement of municipal authorities

In total, 85 city and regional authorities from 19 countries across Europe have been involved in ENSCC across all projects (see full list in the Annex to this report). Out of the 85 city authorities 5 (Malmö, Limassol, Almada, Graz, Judenburg) were supported financially by the ENSCC funding agencies. Two of the cities are involved in more than one project. The remaining 79 city authorities cooperated with projects or were involved in the project implementation without ENSCC project funding. This cooperation took a variety of forms, ranging from partners contributing in-kind funding, to offering access to data, interview subjects, sites or other resources. Therefore, financial involvement (either contributing cofounding) or receiving ENSCC funds should not be seen as a proxy for measuring local authority engagement.

Findings from previous research on knowledge partnerships stress the importance of trust and previous acquaintance as a facilitator for their formation. This is also the case in ENSCC project consortia: From a city authority perspective, consortium formation in ENSCC projects was driven largely by previous acquaintance with project partners, institutional and personal, as well as the aim of broadening their networks nationally, internationally and across domains. In most cases, the city authorities have had long history of collaboration with the leading university partner (frequently also the project coordinator) in previous projects who then approached them with the opportunity to collaborate again in the ENSCC project. In two cases, city authorities were closely connected to the lead business partner in the project/country. Other partners, especially European/international ones, were by and large new contacts for city authorities.

Interviews revealed that, in addition to the institutional network, personal ties were important facilitators for science-city cooperation. In some cities, collaboration with universities was established and successfully continued due, in large part, to city staff having a history of working at the university, sometimes even researching topics similar to those pursued in their city's joint cooperative projects.

The projects were typically highly relevant for cities, being well connected to their challenges, their strategies, the "day-to-day" work of involved administration officials and delivered outputs useful and practicable for city policy development. Some projects also delivered decision support resources such as software tools to improve traffic flows.

The *SureCity project:* User dialogues between researchers and a municipality result in harmonized formats for data collection

Many municipalities are actively working with data collection in areas such as energy use adapted to the local context. This can result in developing locally adapted and proprietary formats for data collection. So one challenge for the *SureCity* project was to assess what information that was already available and could be incorporated into more holistic models that can engage other users such as companies and residents in policymaking. The *SureCity* project developed a software platform that bridges many different scientific models to design of local energy and emission abatement strategies for neighborhoods and cities. Together, municipal representatives and researchers identified formats for data collection that could help municipalities more easily assess policy impacts. Participating researchers decided to draw on existing templates that were familiar to the local authority (such as the one used by the EU-initiative Covenants of Mayors) to facilitae use and comparability. In a follow-up project (funded by the Swedish Energy Agency) participants have continued to resolve issues identified in the *SureCity* project regarding what format of energy data that the municipality would find most useful as decision support for defining objectives and making priorities.

City authorities noted in the interviews that funding is important for project participation – in some cases even a precondition. City authorities as project partners that received funding reported having a stronger internal justification for participation. ENSCC funding made city authorities' feel more highly engaged as "*problem owners*."

Although reimbursement for staff and other costs were preferred, city authorities were sometimes willing to accept only funding for travel and other direct costs. Moreover, many cities offered in-kind contributions. Cities were most willing to engage in projects that were challenge driven. In other words, the more directly projects addressed issues of high priority the city authority, and the more aligned the project structure was to their 'day-to-day' work, the more cities were willing to engage in projects with or without ENSCC funding to city authorities.

This is important in as much as cities are only eligible for funding in a few participating funding agencies in ENSCC (Austria, Sweden, Portugal, Cyprus). A survey to funding agencies of JPI Urban Europe (see Annex for details) showed that, although cities are not eligible for funding, almost all funding agencies are able to support cities in other ways: cities in living labs (as research infrastructure), through subcontracts or as individual experts.[7]

City authorities had diverse roles in ENSCC projects. An analysis of final project reports revealed that 20 of the 85 urban settings (24%) were pilots/test beds (Figure 18). Almost all projects mentioned at least one city as pilot or test bed as projects needed to demonstrate a close link to an implementing party (e.g. cities or public utilities). Another 16 cities were actively involved and co-created results and declared their interest in applying the results of the projects, for example including them in their city strategies.

Five projects indicated that they used an urban living lab approach which is defined in the JPI Urban Europe SRIA (2015) as a forum for innovation, applied to the development of new products, systems, services, and processes in an urban area and employing working methods to integrate people into the entire development process as users and co-creators. Urban living labs were set up in 13 cities and dealt with smart transport technologies, urban quality of life and energy transition, for example to ensure continuous participation of stakeholders in the co-creation of the *PARENT* platform in Amsterdam, Bergen and Brussels. The *SmarterLabs* project focused entirely on testing and upscaling new methods for living labs. They developed frameworks and generic implementation guidelines for Smart City Living Labs[8]. Challenges regarding living labs included extensive collaboration requirements between different project partners.

[7] Meyer, S., Kalcik, R., Wang, A., Dinges, M., *Self-Evaluation Report of the JPI Urban Europe - Engagement of cities in the JPI Urban Europe,* Deliverable 7.3, *EXPAND*, GA no 726744

[8] https://smarterlabs.uni-graz.at/en/publications-results/smarterlabs-guidelines-video/

Photo: The PARENT project is one out of several Urban Living Labs in the ENSCC call. Source: PARENT

Nine cities were classified as case study areas, which meant that they were the settings and areas chosen to study and test innovations, but were not explicitly linked to municipal activities or actors. For example, two case studies were conducted regarding road-side parking in Vienna. The city administration of Vienna was interested in the results of the project but did not actively support the research activity.

For the project *TRANS-FORM*, The Hague was not only a case study area, but the public transport operator also played an important role for the project by providing data and expertise essential for the empirical analysis of vehicle position data and passenger smartcard data. However, for most cities mentioned in the reports (48%), no specific information was provided on their exact activities and roles.

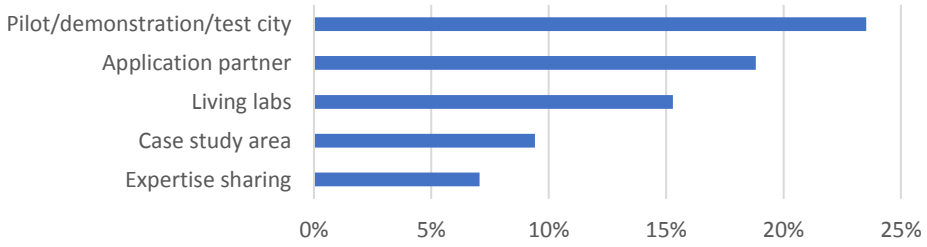

***Figure 18**: Roles of cities in ENSCC projects. Source: Project reports*

The interviews with city authorities confirm their various roles in the projects. First, cities were beneficiaries of relevant outputs that (hopefully) can be used even after project completion. Second, cities were sites and test beds for piloting project outputs. Third, in some projects, city authorities were providers of specific non-research expertise. Additionally, the interviews indicate that cities provide

data and feedback relevant to the research project and related issues of city administration through workshops and regular meetings. Interviewees also confirmed that they benefit from mutual learning and exchange with academia and other cities, gaining experience in new thematic areas or advancing topics a city authority has less experience in with the help of researchers, and connecting with previously unknown organisations and other cities.

Effective communication of complex science and technology concepts to risk-averse city decision makers is thus key. Cities prefer projects that are practice-based and apply and demonstrate science in real-life urban settings. The personal engagement of involved city administration civil servants is also important as well as having the "right" people involved from the start, i.e. individuals with sufficient competence within the city administration to support the project and provide a close link between the project and municipal institutions.

The right timing to approach cities for project participation is also critical in order to pique the interest of officials and facilitate internal decisions to participate. Additional JPI Urban Europe support could improve the perceived relevance of projects for cities through its project selection process and monitoring of its project portfolio.

Making cooperation work between researchers and cities:

Researchers that work most effectively with city authorities are *able to explain the relevance* of their research to decision-makers, are *responsive to needs* of the city authority, and are *experienced project coordinators* with strong leadership and knowledge on how to clearly and appropriately distribute work.

Key success factors for cooperation among researchers and public authorities:

- High relevance of research, demonstration and innovation projects to city needs and challenges, focused on problems where the cities is the main driver of solutions

- Alignment of project activities and outputs to the 'day-to-day' work of the city administration; linking to ongoing processes, initiatives, and city strategies.

3.8 Developing user perspectives in multi-stakeholder partnerships

ENSCC projects involved municipal authorities and cities but also a wide range of other types of project partners, including universities and educational institutions, public and private research institutions, business, non-profit organisations, and other governmental organisations.

In the call for proposals for projects within the ENSCC programme[9], smart cities and communities were defined as "innovation ecosystems, covering the full innovation cycle: urban municipally-based activities comprising multi-stakeholder partnerships (including research and innovation actors) who address solutions concerning intelligent networking and integration of urban infrastructures to increase energy and resource efficiency as well as enhanced quality of life in urban areas."

[9] https://jpi-urbaneurope.eu/app/uploads/2020/04/ENSCC-Call-Text_2nd-Stage.pdf

Notably, ENSCC left it open for project proposers to define relevant user perspectives. In practice, although relevant users were identified already at the proposal stage, defining and incorporating user perspectives was a complex process and arguably one of the most important outputs of the ENSCC call. User perspectives in the projects were developed in dialogue between cities, local organisations and researchers. Engaging a wider range of users and stakeholders (NGOs, local housing associations etc.) provided scope for discussing how these processes came into place as a form for co-creation of new knowledge. In practical terms, these processes of knowledge interaction were generated and shaped by project dialogues aiming at development of tools, apps and new models for analysis of traffic flows, attitudes to congestion charges, models for efficient resource use and management of construction processes in cities, to mention a few examples.

Developing a common understanding of user perspectives may seem abstract and difficult to measure. However, we do find examples where ENSCC projects have contributed to improved understanding among different users regarding what information is relevant and how it can be collected, formatted and integrated in ways that improve its usefulness to problem owners. For example, *access to data* has been a crucial motivator for public, private and academic stakeholders participating in projects focused on integrated systems and data, or tools and services such as *SureCity*, *IP Suntan* and *Smart Urban Isle*, Partnerships that offered participants access to data were important in areas such as analysis of traffic flows and electricity systems. Partnerships with local authorities and actors are also of importance for increasing the chances that project results can be integrated and used in policy and decisions by the city representatives. By drawing on dialogue with local organisations in neighbourhoods, this type of co-creation process can include a wide range of perspectives from stakeholders and users. This also includes diversity of perspectives from administrative units managing issues such as traffic planning and environmental objectives in a city. This role of city authorities refers to their roles as knowledge carriers of local user perspectives and represent another side of the coin of city authority roles, discussed above. The role as knowledge carriers can also be valuable in the phase of dissemination of results from JPI Urban Europe, where municipality actors can facilitate a broader invitation to their network of users of project results.

The *IntegrCiTy* project
Energy dialogues with users and local neighbourhoods

The ambition of the project *IntegrCiTy* was to develop, test and implement decision support tools for stakeholders and users including city-planners and energy providers in the selected cities in Sweden (the Hammarby Sjöstad area of Stockholm) and Switzerland (Geneva and Vevey). The users included local utilities and city administrations, focusing on thermal and electrical networks linked to low-carbon resources. Experiences from *IntegrCiTy* show that local community organisations can play an important role as dialogue partner to both researchers and to city representatives. In Hammarby Sjöstad in Stockholm, *IntegrCiTy* coordinated new dialogues with locally anchored organisations such as housing associations in the neighbourhood.

Researchers working with *IntegrCiTy* in Stockholm were granted previously unavailable access to data owned by the local electric company. Inteviews indicate that this ENSCC project may have motivated the local electric company to share its data with researchers because the electricity company perceived benefits of the analysis to its understanding of electricity needs at the local level. Specitically, *IntegrCiTy* helped to clarify priorities and related energy management decisions needed to estimate total energy needs and availability at the neighborhood scale, and raised questions about trade-offs between various uses including heat pumps and electric vehicles.

The experience of the Stockholm site within *IntegrCiTy* underscore importance of involving locally anchored organisations and offering new forums for sharing datasets and other resources. It also raises questions about how dialogues can be facilitated in less affluent neighbourhoods where there may not be an active local organisation as a dialogue partner for the city representatives or researchers.

Other projects focused on improving a common understanding of end user experience. These included local services where residents are end users as well as municipal energy governance wherein the end users are local politicians and policymakers. These projects aimed to meet the challenge of cooperating among residents (through neighbourhood representatives or interest organisations), local authorities and researchers. The experiences of *SmartCity Hospitality*, *SPACERGY* and *Smarter Labs* underscore the importance of discussing how co-creation of new knowledge is actually carried out. When researchers actively work with local organizations, it is critical to understand what the expectations are for public engagement in these projects. These may include a few key elements of Urban Living Lab methodologies, such as public engagement as channels for dissemination or as forums for interaction and development/experimentation of certain tools and models. Public engagement can also be arenas for determining how projects can give the collaborators access to new networks and resources.

It could be useful to compare ENSCC projects focused on public engagement with other international experiences such as the "Pathways to Impact" initiative in the United Kingdom. The latter raises questions about different researcher views regarding public engagement activities as *disseminating to the public* or *talking with the public* by interacting with the intended audience [10].

[10] A perspective on this issue from the United Kingdom can be found in Welcome trust (2015) Factors affecting public engagement by researchers. A study on behalf of a Consortium of UK public research funders, https://wellcome.ac.uk/sites/default/files/wtp060033_0.pdf

4 Cooperation forms in ENSCC

The call text for the ENSCC emphasized projects that could develop new and innovative forms for cooperation among stakeholders. Projects needed to be "challenge-driven" but were also required to apply technologies and methods with the potential to be used in other contexts or to address other urban challenges. Finally, the call encouraged projects that identify and utilize the "innovation ecosystem," focusing on the interactions among stakeholders that represent various viewpoints and constituencies, but also different phases of urban development design, planning, production and use. In practice these types of cooperation transpired in quite different ways. A preliminary review of the projects within ENSCC reveal at least three discrete organizing principles for cooperation: *challenge-driven*, *method or technology focused*, or *value chain/production platform focused*.

4.1 Challenge-driven focus

A challenge-driven focus links stakeholders that agree on the nature of an urban challenge but offer diverse perspectives, ideas and methods to meet this challenge. Not surprisingly, the majority of ENSCC projects organised their work based on the articulation of a common urban challenge within the themes defined in the call. Public authorities interviewed for this report noted the importance of a challenge-driven focus to motivate their participation. Interviews with city authority representatives indicate that municipalities are more likely to engage in projects if they are local challenge-driven, clearly linked to municipal strategies and the "day-to-day" work of administration officials. Projects must deliver highly useful and practicable outputs supporting policy development and implementation. Moreover, municipal representatives should be involved in the identification of challenges, requiring an early engagement in projects.

A major advantage of a challenge-driven focus is that it invites a diversity of perspectives and helps project participants develop a better understanding of the nuances and plurality of impacts of various solutions. It tends to support the creation of new collaborative networks to achieve common goals. On the other hand, anecdotal evidence suggests a danger that diverse stakeholders with diverging definitions of what the challenge is may define the challenge at a higher level of abstraction. This can help achieve consensus regarding the challenge at hand but make it difficult to define or analyse specific solutions. For example, stakeholders may have a common interest in "a sustainable transportation system" but prefer very different solutions to meeting this challenge.

Municipalities are more likely to engage in projects if they (the projects) are well connected to local challenges, municipal strategies, and the "day-to-day" work of administration officials.

"The ultimate challenge is to allow for both productive high density and liveability in cities at the same time. Clearly, such integrated urban energy planning should be on the agenda of any Smart City with a long planning horizon."
- BREATHE

The ENSCC call criteria were in this sense quite innovative; they required the testing or pilot implementation of specific solutions to meet defined challenges. This meant that projects could not fall into the trap of meeting abstractly articulated challenges with equally abstractly constructed solutions. In practice, a reading of project proposals and reports shows rather broadly defined challenges (e.g. "improved energy efficiency in transport") linked to testable, small scale solutions that address only a

limited aspect of a complex challenge and may mask the interactions and impact implications of specific solutions or policy initiatives.

4.2 Method or technology focus

An alternative to the challenge-driven organising principle is to structure cooperation around the use of a specific model or technology that can be used to address a multiplicity of challenges. For example, a smart phone application developed to engage citizens in local energy conservation initiatives can also be expanded or modified to encourage user feedback to proposed housing development. This approach has the advantage of linking stakeholders that work in different arenas and fields—public and private, academic and professional, or within varied disciplines—but use similar models and tools.

The portfolio analysis and preliminary findings in Sections 3 and 4 indicate that familiarity with a specific model or tool was an important prerequisite for successful cooperation in the testing of solutions. Indeed, where stakeholders worked using very different approaches, including different scales or forms of data, projects struggled to access needed data, agree on common approaches and generally stay on track. In addition, many project reports note that the tools developed could be applied to other types or problems or other urban contexts.

In sum, the method or technology focus tends to result in project organisations and stakeholder involvement that can efficiently move solutions from idea to implementation and also offer insights into innovative new uses for existing models. On the other hand, it can also result in tools and models developed “for their own sake” in isolation from an evolving understanding of the complexity and nature of urban challenges.

4.3 Value chain or production platforms focus

Finally, the ENSCC call text emphasis on the “innovation ecosystem” encouraged projects to identify and exploit the chains, webs or platforms of interaction necessary to advance innovative ideas to meet urban challenges through phases of development. This suggests a project organisation that explicitly teams stakeholders that represent various phases of development and working programmes that focus on the transitions between development phases. For example, a smart city standard for digitalising energy data or building information must be adopted and exploited as initiatives move from the design and planning phase to operations and monitoring phases.

Most ENSCC projects tended to focus on a discrete development phase rather than on transitions between development phases. Many projects, for example, developed and advanced understanding of stakeholder and user interactions in the planning of transportation, energy or public infrastructure. However, it was more difficult to gauge from project reports whether or not the standards and data forms used within these tools could be applied in production or monitoring phases. It may be useful for JPI Urban Europe to invite projects that explicitly focus on transitions between development phases and related implications for stakeholder involvement, data standardisation and project design.

5 The legacy of the ERA-NET Cofund Smart Cities and Communities

The ERA-NET Cofund Smart Cities and Communities mobilized an impressive common budget, linked funding agencies and funded 17 projects in the interests of understanding the system dimensions needed to achieve urban transitions towards sustainability. The process of developing and producing the call has had some important direct effects on other Urban Europe activities and has likely contributed to ongoing urban partnerships in other ways as well. These include a joint call with China, support for positive energy districts and mobilizing a commitment for continued urban partnership in the European partnership landscape.

5.1 Joint Call between JPI Urban Europe & the National Natural Science Foundation of China

As early as 2015, discussions had begun regarding ways to support cooperation with China within the structure of JPI Urban Europe. Europe and China share a common interest in finding ways to support sustainable urban transitions in an era of rapid economic developments and climate change. There is a long-standing history of Sino-European research collaboration through European Union R&I framework programmes and bilateral agreements between European countries' ministries and funding agencies and Chinese national and regional authorities, research organisations and foundations. Some of the bilateral cooperation activities between China and European address urban issues. A few of these involve up to four European funding agencies, but many involve single funding agencies and/or European member states. This can make it difficult to articulate a common Sino-European perspective on urban transitions towards sustainability and capitalise on opportunities for European and Chinese researchers to work together.

JPI Urban Europe (JPI UE) offers a unique opportunity for China to cooperate with groups of European ministries and funding agencies that work on the basis of a commonly agreed *Strategic Research and Innovation Agenda* (SRIA)[11]. That led to a joint pilot call "Sustainable and Liveable Cities and Urban Areas" organised by JPI UE and the National Natural Science Foundation of China (NSFC), inviting interdisciplinary Sino-European consortia opened on January 31st, 2018.[12] Call topics included a range of urban challenges including *Climate change and new urban economies*, *Transformation of energy systems and strengthening urban circular economies, Urban public administration and services innovation*, and *Urban data management*.

Working with JPI UE provided a mechanism for Chinese organisations to cooperate with several European member states simultaneously. Thus, JPI Urban Europe together with NSFC developed a forum for advancing mutual understanding and agreement of priorities and defining the framework conditions for cooperation and not least funding requisites. The ENSCC team was instrumental in negotiating the funding and parameters for the joint call with China (over 9.3 million Euro in European funding).

[11] https://jpi-urbaneurope.eu/documents_library/
[12] For more information see https://jpi-urbaneurope.eu/calls/sustainable-urbanisation-china-europe/

"We see a movement from blue sky to user-oriented basic research, and this is a challenge to funding international cooperation both within Europe and with China."
- Manfred Horvat
Advisor to the JPI Urban Europe Governing Board

As noted, this collaboration was unique in that the JPI UE is not a legal entity but rather a cooperation initiative supported by European member states and associated states. This is another example where the unique combination of the JPI UE's clear consortium agreement, its *Strategic Research and Innovation Agenda* (SRIA), its agile management structure and its willingness to experiment with new forms of collaborative were instrumental. Within the context of the ERA-NET Cofund Smart Cities and Communities, JPI UE worked with nine European funding agencies and NSFC to articulate the call. This included preparing documents on the background of EU-China cooperation in sustainable urban development, identifying the major relevant European and Chinese documents and policies such as the EU-China Urbanisation Partnership, the New Type of Urbanisation Plan and the Five-Year plans,[13] and organising joint workshops and other discussions together with NSFC and key Chinese organisations.[14]

The elucidation of topics and the preparation of the call text provide a case in point. Participating funding agencies agreed on the framework conditions for launching the call and the evaluation and selection procedures of proposals. In that context, the ENSCC management team was contributory in navigating between the Chinese side and individual European countries' funding agencies' requirements.

From the beginning, NSFC made it clear that it was not interested in a "one-off" joint call, but rather a long-term perspective for determining call topics and procedures for setting up calls. Through the structure of the ENSCC, JPI UE was able to mobilize both funding agencies and relevant experts from Europe and China and has sown the seeds for long term cooperation and additional joint calls. Different individual professional networks and the investment of time and energy by JPI UE in involving other European structures for funding helped leverage support for joint discussions and workshops in China, including cooperation with the DRAGON STAR PLUS Horizon 2020 coordination and support action.

The fact that more than 100 proposals were submitted to the call shows the huge potential of JPI Urban Europe's approach.

The experience gained by JPI Urban Europe while preparing and implementing the China call also emphasises the complexity of these types of innovative R&I funding partnerships and the work yet to be done. On the one hand, the fact that more than 100 proposals were submitted to the call shows the huge potential of JPI Urban Europe's approach. On the other hand, however, about 40% proposals were ineligible because they did not conform to funding agencies' rules. The call text had ten individual annexes clarifying the different funding agencies' specifications and special rules. Making progress in aligning framework conditions for future cooperation will be a continued challenge. Another challenge will be to find ways to fund transdisciplinary urban research involving non-academic users, as NSFC can only fund universities and research institutes.

[13] Manfred Horvat: The policy context of EU-China STI cooperation in the areas of sustainable urbanisation and the development of smart cities. ENSCC project 855377. April 2017 (rev. 2019)

[14] These include the Chinese Center for Urban Development (CCUD), the Chinese Academy of Urban Planning and Design (CAUPD), the Urban Planning Society of China, and the Chinese Academy of Social Sciences (CASS). See: Manfred Horvat, Initiation of cooperation with China in the areas of urbanization and urban development. Part I: Strengthening and deepening the contacts between JPI UE and Chinese partners; Part II: The policy context of sustainable urbanisation in China as presented by the 13th Five Year Plan. ENSCC Project BW000001920. Vienna, April 2018. Available through the JPI Urban Europe secretariat.

5.2 Positive Energy Districts and Neighbourhoods

Concurrent to the evolution of the ENSCC was the development of the Strategic Energy Technology (SET) plan for the European Union[15]. Several countries, and even key individuals involved in developing the SET plan were also involved in Urban Europe and the ENSCC. The synergies between the goals of the SET plan for improving city implementation capacity in technology fields relative to energy and the ENSCC became apparent. The leadership for ENSCC began to discuss the overlap between work with the SET plan and insights from the ENSCC. In particular, both the SET plan and the ENSCC had begun to explore the ways in which cities—as both physical spaces and as overlapping institutions for governance, energy provision, economic activity and social interaction—were critical arenas for achieving Europe's energy efficiency and sustainability goals. The concept of the "Positive Energy District" (or Positive Energy Neighbourhood") began to take shape, envisioning definable (net) energy self-sufficient urban areas with annual net zero carbon dioxide emissions. [16]

This led to the idea of utilising the ERA-NET Cofund Smart Cities and Communities to advance specific actions necessary to realise the SET plan in the area of positive energy districts/neighbourhoods. In particular, ENSCC took on the task of helping to take the first steps towards setting up one hundred positive energy districts across Europe. The fit between PED/PEN ambitions and the ENSCC was the common recognition of urban space as an organising structure for managing energy systems. 25% of the budget for ENSCC had been allocated to valorisation; instead of producing additional conferences and other materials reflecting on the outputs of ENSCC, the decision was made to use a share of remaining ENSCC resources to help move the PED/PEN initiative forward. This includes articulation of a framework definition of a PED/PEN, information and discussion activities and plans for additional research and innovation funding.

ENSCC and JPI Urban Europe emphasised a narrative of energy efficiency that included housing, industry, heating, transportation, and not least how energy affects and is affected by people.

Insights from ENSCC have proven important to the ongoing development of the PED/PEN concept as well as the realisation of specific pilot areas across Europe. Beyond the obvious importance of allocating funding to PED/PEN promotion, ENSCC had begun to broaden the narrative of what is meant by a "smart and sustainable" city. As far back as 2015, the consortium of funding agencies formed as JPI Urban Europe, in the context of the ERA-NET Cofund ENSCC, emphasised the importance of defining smart cities as those that harmonise both technological and social perspectives. Whereas smart cities were often defined as those utilising innovative ICT or energy management technologies, ENSCC (and JPI Urban Europe) were among those that emphasised a narrative of energy efficiency that included housing, industry, heating, transportation—and not least how energy affects and is affected by people.

As the 17 ENSCC projects got underway, the complexities of achieving the "smart" city in practice became more apparent. ENSCC projects could address a broad variety of themes but were required to test new technologies or practices in real-world urban settings. They tested generally proven technologies in innovative ways. This required that projects tackle the complex challenge of understanding the system dimensions needed to achieve transitions. Whether or not individual energy-oriented ENSCC projects (see Table 2) can be said to be successful in this respect, they raised awareness of the need to "get the geography right" with respect to organising and managing

[15] https://ec.europa.eu/energy/en/topics/technology-and-innovation/strategic-energy-technology-plan
[16] SET Plan Action 3.2 - the Programme "Positive Energy Districts and Neighbourhoods for Sustainable Urban Development" supports the planning, deployment and replication of 100 Positive Energy Neighbourhoods by 2025 and is joined by 20 EU member states.

interactions that affect energy demand, generation opportunities and use patterns. Whereas the "lighthouse" projects focused on city commitment to a few very well-specified solutions (including energy solutions), the ENSCC helped identify new technologies or technology uses as well as identifying stakeholder groups whose preferences, contributions and impacts are not institutionalised in local energy decision-making processes. An important legacy of ENSCC may thus be the first specific tests of the ways in which the many dimensions of energy management play out at the urban district level.

5.3 Ongoing partnership with other European Urban Initiatives

ENSCC co-evolved with several other national and European initiatives and during a period notable for an increasing interest in a multidimensional approach to urban challenges. JPI Urban Europe was launched, according to interviews, to provide an alternative forum for member states seeking a partnership to address urban issues.

It is evident from a review of working documents, interviews and related materials that the ENSCC, and indeed JPI Urban Europe in general, has had an open attitude towards contact, information sharing and partnership with a variety of other European initiatives. This may be a result of the fact that JPI Urban Europe was a member state initiative as opposed to a coalition of cities or of funding agencies. This is noted as a challenge by interview respondents who describe JPI Urban Europe as having had to "recruit" funding agencies and urban authorities to participate. When asked to describe the experience of developing the ERA-NET Cofund Smart Cities and Communities, respondents note real commitment from JPI Urban Europe to help funding agencies feel an "ownership" of the call. Respondents also note a substantial commitment of time and energy to connecting JPI Urban Europe to relevant European Commission Directorates, initiatives and partnerships and to European urban coalitions such as Eurocities, ICLEI (Local Governments for Sustainability) and ERRIN (European Return and Reintegration Network). This may have had the double advantage of offering funding agencies an efficient bridge to European programmes with which they may have been less familiar, while offering Commission representatives a unique connection to national funding agencies.

The observer status of JPI Urban Europe within the development of the Urban Agenda for the European Union, as well as growing support for the Driving Urban Transitions, indicates the importance of the partnership orientation.

The experience with ENSCC reflects a particularly effective strategy within JPI Urban Europe. Rather than trying to replicate similar urban funding programmes, JPI Urban Europe—perhaps by necessity—has adopted a partnership strategy that has continually mapped and re-mapped the position of JPI Urban Europe in the landscape of other partnerships. Perhaps as much an ongoing evidence of impact of JPI Urban Europe as a legacy of ENSCC, this willingness to work in partnership has arguably increased the status and support for urban partnerships on the European stage. The observer status of JPI Urban Europe within the development of the Urban Agenda for the European Union, as well as growing support for the *Driving Urban Transitions*, indicates the importance of the partnership orientation. Embedding the ENSCC in this network of partnerships has meant several advantages.

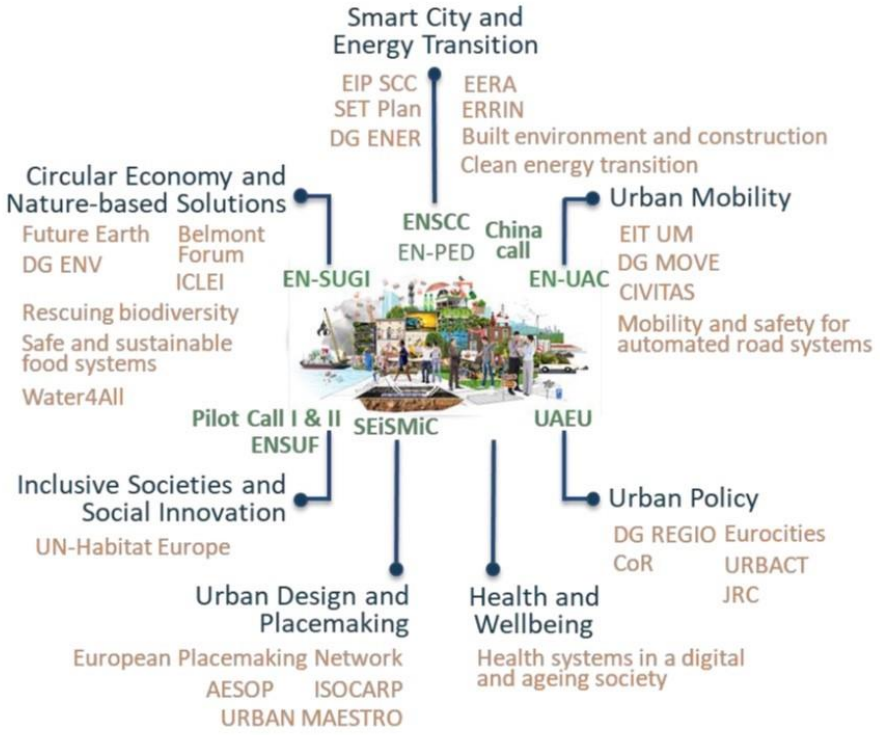

***Figure 19**: JPI Urban Europe positions its calls and activities, including ENSCC, in an ever-changing landscape of other European partnerships, initiatives, organisations and networks.*

6 Insights and recommendations for continued programme development

The success of funding calls such as ENSCC relies on building a sense of community and engagement—among partners within projects, between projects, among cities and among funding agencies. A management structure both formal and agile has been supported by individuals with a high personal commitment to the call and to JPI Urban Europe in general. More formal monitoring systems will support continued programmeme planning but should be complemented by additional qualitative tools and support measures to fully understand project experience. A particular feature of ENSCC is its focus on aligning relevant geographies with urban areas—this could be codified to clarify programmeme priorities as additional themes, countries, partnerships and funding opportunities expand.

6.1 Engaging municipal authorities

Being given *partner status* may increase a municipality's internal justification for participation and increase city authorities' feeling as 'problem owners'. The diversity of funding eligibility criteria encouraged or hindered various types of stakeholders from participating. Unfortunately, municipal authorities were ineligible for funding from agencies in several countries. The funding agency survey revealed that in almost all countries there are other funding agencies or ministries, not partnering with JPI Urban Europe, that are in fact able to fund city authorities. Alternatively, funding agencies could find alternative ways to support city authorities in projects by funding support services such as test facilities, experts or subcontractors. The practice of involving cities via "Letters of Intent" does not provide enough binding commitment for project participation. The challenge for JPI Urban Europe is to make alternative support measures visible and communicate it to city authorities to at least cover the most necessary costs at city level to reduce the entry barrier to projects.

City authority interviews indicate that events are more frequently attended by researchers and companies than public authorities. This may in part be due to limited travel grants for urban public administrators but may also reflect limited knowledge about the ENSCC projects and their potential benefit to local municipal policymaking and service delivery. Some municipality representatives that participated in the programme also had experience from previous participation. This can indicate a threshold for participation by municipal authorities and the need to allocate time and resources to ensure their participation. JPI Urban Europe partners could discuss ways to target urban authorities or require more project resources directed to producing local or international events relevant to city authorities and communicating events well in advance. These include events that offer: 1) networking opportunities, 2) opportunities to learn about funding opportunities that clearly spell out the benefits for cities when participating in R&I projects, and 3) formats that facilitate exchange and mutual learning between cities as well as with researchers and businesses.

- Additional programme events designed to attract cities/showcasing partner cities
- Dialogues with member states regarding opportunities to support cities both with funding and perhaps with other forms of support
- JPI EU sponsored "funding agency twinning" to help similar funding agencies in member states discuss ways to incorporate additional funding agencies to work with JPI Urban Europe.

6.2 Engaging researchers

ENSCC was one of the first ERA-NET Cofunds and struggled to balance prioritising academic excellence and transdisciplinary approaches. Nevertheless, topics were broad but well defined. Interviews with researchers and input from the ENSCC final event indicates that this apparent dichotomy is being ever more successfully navigated. Researchers, particularly in applied urban studies, reported that ENSCC produced projects that benefited from deep commitment from project initiators working in real-world environments. In some cases new combinations of problem owners, particularly along value chains, were able to gain access to data sets that opened new opportunities for developing new analytical models for decision support. In those cases, the partnerships between municipal actors and researchers at universities and institutes also proved useful as a leverage to access data needed for analysing complex challenges for cities.

However, there was less feeling of community with other projects and opportunities to generalise project results across the call portfolio were few, both within and across countries. Specific ideas to enhance exchange of experiences across countries and cross-call learning include:

- Encourage national funding agencies to sponsor local project colloquia, perhaps also linking ENSCC projects to similar national initiatives
- Consider approaching an academic journal willing to publish conference proceedings incorporating project working papers of the highest quality
- Require specification of budgets for researcher twinning or mentoring across countries and/ or additional international conferences. Work with funding agencies to sponsor travel grants for participating in ENSCC workshops and conferences.
- Utilise opportunities for sequenced calls that would allow staged researched projects that can allow the best projects continue to build on innovative project results. One such opportunity may be in the potential for a large, multi-year European urban partnership *Driving Urban Transition*.
- Consider a variety of project forms (consortium-building, demonstration, meta-analysis, etc) that help project teams incorporate new partners and frame follow-on projects. A menu of project funding opportunities including short, explorative projects focused on local consortium building may be especially useful.

6.3 Supporting individual capacity building for transdisciplinary research

ENSCC launched with the goal of exploring concrete opportunities to explore opportunities for co-creation of demonstrable solutions to well-defined urban challenges. This is ever more common in the research and innovation community worldwide but seldom supported by programme activities that build capacity for this innovative way of working. City authority interviews underscored the need for researchers that know how to approach and work with urban public administrators, are able to explain the relevance of their research to decision-makers, are responsive to the needs of the urban area, and are experienced project coordinators with strong leadership and knowledge regarding how to clearly and appropriately distribute work. The personal engagement of involved city administration officials is also important as well as having the “right” individuals involved from the start.

There seems to be a distinct need to intensify knowledge exchange and build trust between urban public administrators, research organisations and funding agencies, also on an individual level.

Researchers from universities and research institutes, and some firms that are active participants in European research, are often the initiators of ENSCC projects. They follow calls for proposals and are more familiar with funding agency requirements. While some individual researchers have well established connections to municipal representatives, many do not. Only few funding agencies reported having trustful relationships to city authorities and report challenges in approaching the right persons. There seems to be a distinct need to intensify knowledge exchange and build trust between urban public administrators, research organisations and funding agencies, also on an individual level.

6.4 Change—a risk and an opportunity

A common challenge to the ENSCC projects, as with most multi-year research and development projects, is their dependence on interaction among specific individuals representing various stakeholder groups. Individuals change or leave jobs, local elections shift priorities and resources, and individuals may or may not represent the plurality of perspectives within a stakeholder organisation. On the other hand, there were also instances in which individuals given a new assignment or role used that opportunity to open up the project to new groups or organisations, expanding the stakeholder network.

A lesson learned from the experience of the ENSCC is to be cognizant of the opportunities and risks to project goals due to the tacit knowledge, expertise, organisational identification, and status of the individuals involved. There are likely many ways to lower risk and exploit opportunities afforded by individual professional mobility and projects can be challenged to assess these in proposals and as the project progresses. These may include

- special events designed to increase project knowledge throughout partner organisations
- identifying “deputies” that can assure project momentum in case of partner changes
- investigating ways to incorporate new organisations into existing projects to allow individuals to easily forge links to their new workplaces.

6.5 Aligning opportunities with geographies

The ENSCC call placed particular emphasis on creating new networks and arenas for cooperation and partnership, encouraging an open environment where new ideas and diverse perspectives flourish. Interviews with project representatives indicate that there were several instances in which ENSCC projects deconstructed “silos” isolating stakeholders. On the other hand, the creation of new open environments does not necessarily mean that stakeholders will abandon other more “protected” or closed institutions. Indeed, there is some indication that open projects with comprehensive communication and outreach programmes can reduce individual partner willingness to experiment with unproven but innovative new tools or ways of working. The ENSCC projects offer an interesting contribution to resolving this paradox: the development of tools and methods that “substitute” for real world experience. Many ENSCC projects developed games, simulations and living lab environments in which individuals and organisations could easily shift roles, shuffle tasks and explore new solutions without risking the implications of public failure.

Photo: ENSCC projects workshop together during the final event in 2019.

In short, the ENSCC experience adds credence to the idea that "gamification" can encourage experimentation with new ideas and develop new stakeholder networks in a protected environment. The challenge remains to ensure that game models and exercises can be used to apply solutions in real world settings. It could be interesting to explore projects that specifically address the transition from virtual simulations and games to formalised real-world applications. In particular, ENSCC experience with living labs could be assessed in more detail with respect to their ability to facilitate these types of transitions.

There needs to be rather more attention given to the challenge of ramping up solutions—not just signing on more cities, but rather finding a form for R&I support that preserves opportunities for experimentation and inclusion while thinking carefully about how results will replicate, develop or otherwise be applied to other contexts.

The ENSCC emphasis on space as the sensemaking framework for aligning challenges to solutions and creating appropriate institutions to implement them may be its most important legacy. This may be a district level, linked neighbourhoods, a city-wide policy, or international comparative demonstrations—as long as the geography chosen can yield results that can be replicated, compared or expanded.

6.6 Structure and flexibility to ramp up and out

JPI Urban Europe has already begun to work with ways to provide both structure and flexibility in its joint calls. Topics in JPI Urban Europe joint calls develop, evolve and "drift" as new insights and conditions emerge. The Strategic Research and Innovation Agenda provides a framework and a roadmap specifying programme goals and anticipating themes that should be addressed. As specific calls develop however, topics gain or lose prominence; new topics appear, and others fade. This synthesis has noted an unusual flexibility on the part of the programme management to articulate topics for the ENSCC and later calls with China and related to PED/PEN that deftly harmonise funding

agency requirements while responding to input from and merging of interests with 'external' events and actors

The inclusion of the urban partnership for smart and sustainable cities and communities *Driving Urban Transitions* on the list of European partnership priorities offers an exciting opportunity to significantly expand partnership and funding resources. However, programme management has required a high degree of individual commitment that may be difficult to maintain as the programme expands.

JPI Urban Europe has demonstrated a superior capacity to incorporate new ideas, foster new partnerships and engender new calls. The management and production of ENSCC underscores the benefits of this agile and creative approach at the programme management level. On the other hand, individual projects experienced almost the opposite; project representatives reported that rigidity in programme specification requirements made it difficult to incorporate insights gained as projects develop, to craft follow-on projects or compare results with other projects. There is, in other words, somewhat of a disconnect between the ambitions of ENSCC (and indeed, the entire JPI Urban Europe programme) to support opportunities for promotion and exchange across projects and calls, and the perception of individual projects that they cannot utilize these opportunities. With JPI Urban Europe maturing as a programme with several calls and a clear strategic agenda, there is considerable potential for helping projects identify with the wider research and innovation programme and capitalize on opportunities to engage with the broader programme.

Photo: ENSCC Final Event 2019

6.7 Learning from monitoring to gauge impact

A clear result of ENSCC was the further development of more structured and continuous monitoring templates. The online monitoring system will help to follow and compare project statistics. It will especially help monitor joint calls. Opportunities for continued improvement include:

- Annual publishable project reports that specifically address the benefits achieved for cities and their embeddedness in the urban system. These reports would also offer another opportunity for JPI Urban Europe to support projects in their communication and dissemination efforts.

- Implementation of a Project Coordinator Survey, an additional instrument for comprehensive data collection of project activities complementary to the Online Project Monitoring System. The Project Coordinator Survey would collect standardised information and allow for qualitative assessment of progress meeting project objectives.

- Support for follow-on research as an important complement to structured online monitoring, particularly to capture the processes of local community building and to understand the perspectives of stakeholders *not* involved in the projects.


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