

Experimental Governance for Sustainable Cities and Climate Action – Case Study ANN (A New Normal) RADAR Hamburg

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1 ABSTRACT

In response to the challenges of climate change and other environmental and structural problems, different new forms of urban governance have been developed and tested throughout European cities. Urban Living Labs constitute one form of experimental governance, whereby urban stakeholders develop and test new technologies and ways of living to address the challenges of climate change and urban sustainability. Characteristics of Urban Living Labs in the sense of experimental governance are temporal limitation, spatial selectivity and problem-orientation.

Staging urban experimentation requires an evidence-based process to identify suitable urban target locations for urban testbeds. The research project ANN (A new Normal) RADAR addresses this challenge. Through a data-driven evidence base, it aims at identifying areas that have a particular demand and provide ample context for experimental interventions. The underlying research question is in how far experimentation strategies for sustainable urban development and climate mitigation can benefit from digitalisation by enriching the political decision-making process of identifying potential urban testbeds with analysing, processing and visualising available data. This paper describes the ANN RADAR approach and methodology, reflects experiences from pilot application and discusses issues relevant for further research.

Keywords: living lab, experimental governance, sustainable city, climate mitigation, digital tool

2 EXPERIMENTAL GOVERNANCE AND SUSTAINABLE CITIES

In recent years, European cities have tested new forms of urban governance to respond to the challenges of climate change and other environmental problems. They are embedded in efforts of sustainability transition to foster cities' capability to reach climate neutrality and the global Sustainable Development Goals by accelerating policy change and implementation in related fields of action like mobility, energy or housing.

Experimental sustainability transition focuses on the role of timely and spatially limited experiments to overcome implementation restrictions for game-changing innovations. Cities are complex, multi-actor and multi-level systems that have the tendency to hinder and slow-down the creation and implementation of innovations by multiple factors (non-innovative setting). The experiment as a method of innovation management overcomes these barriers by offering calculated risk, reversibility and low costs. The success and benefit of experiments offer the chance to let the invented social practices become the "new normal" which then can be rolled out throughout the city and even furthermore. (e.g. Evans et al. 2016; Kronsell and Mukhtar-Landgren 2018)

As methodological framework for experiments Urban Living Labs (ULL) have been applied in cities. They constitute one form of experimental governance, whereby urban stakeholders develop and test new technologies and ways of living to address the challenges of climate change and urban sustainability (Bulkeley and Castán Broto 2013, Kronsell and Mukhtar-Landgren 2018). Characteristics of ULL in the sense of experimental governance are temporal limitation, spatial selectivity and problem-orientation, e.g. test a new solution for urban sustainability transition for a limited time in a selected part of a city or quarter. By reflecting on and learning from experiments, urban living labs create the basis for mainstreaming new solutions on a broader scale. Experiments are therefore often seen as a way of establishing niches, i.e. fringe spaces for emerging technologies or alternatives to current methods of governance (Schot and Geels 2008).

Experimental governance and related transition management (or experimental sustainability transition) are part of the transition theory framework (Grin et al. 2010; Geels 2002; Geels and Schot 2007). In the multi-level-model of transition management (see Fig. 1) experiments insert innovation in the regime structure. Together with local pioneers they are seen as change agents and drivers of social innovation and transition towards sustainability. They operate in niches or as part of the existing regime (political-administration

system, business sector, academia). In the context of the experimentation approach the goal is to analyse these niche actors, their contributions to sustainable cities, and success factors and restrictions for their pioneering ambitions and activities, as well as to provide a transparent basis for the co-design of urban futures together with transition pioneers.

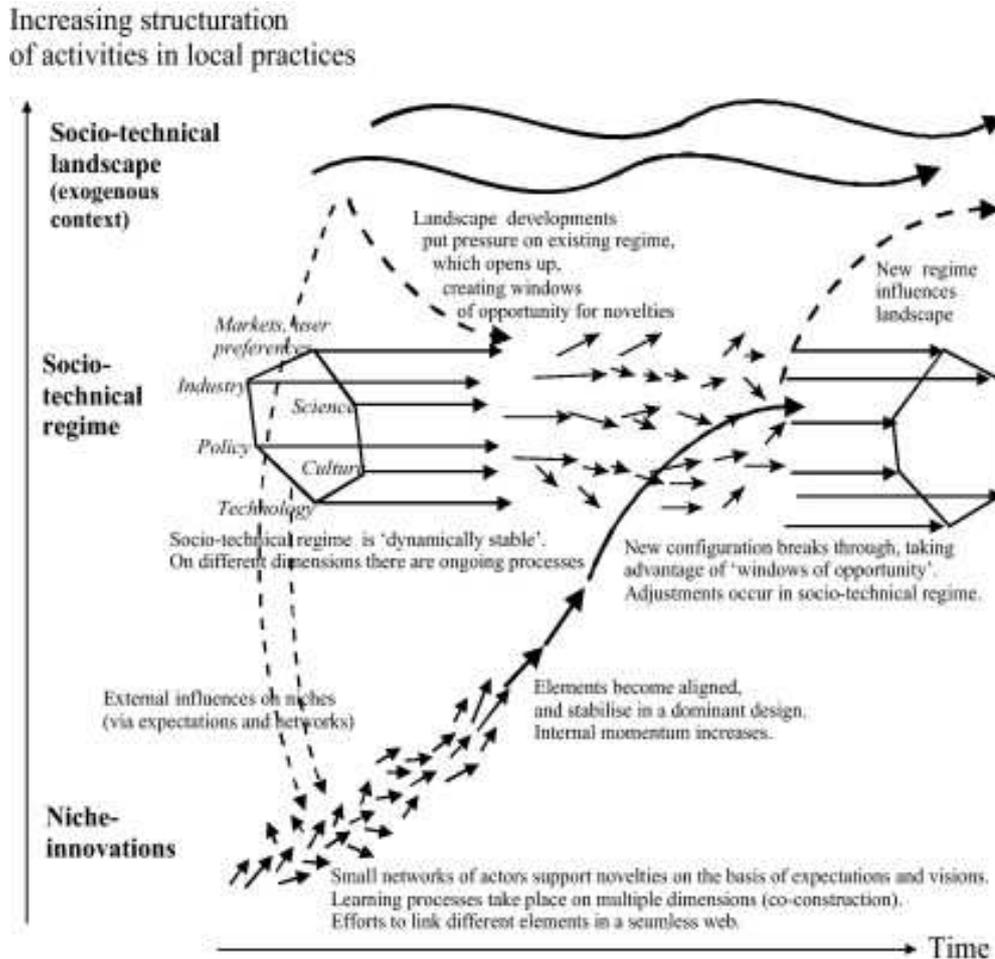


Fig. 1: Multi-level perspective on transitions, adapted from Geels (2002: 1263)

Establishing successful strategies within the urban sustainability transition requires transdisciplinary approaches that foresee the engagement of different stakeholders in the urban environment (Wittmayer and Loorbach 2016). Engaging the public is seen as an essential factor for achieving sustainable urban development (UN-Habitat 2020), because complex problems are best solved when the different groups who can affect it or are affected – the stakeholders in the sense of Freeman (Freeman 2010) – work together in partnership. Moreover, consulting stakeholders is an instrument to collect information for evidence-based policymaking. Their views, practical experience and data will help deliver higher quality and more credible policy initiatives and evaluations (European Commission 2021).

3 URBAN LIVING LABS AND EXPERIMENTATION

In various urban sustainability sectors, cities have been developing pilot projects and 'Living Labs' in the spirit of urban experimentation to explore innovative approaches and then, based on initial evaluation, upscale, replicate or make permanent interventions resulting in a new and more sustainable practice. Not only does this provide testbeds for experimenting with new technologies and social innovations, but it also facilitates the building of awareness and acceptance of such interventions amongst citizens and other stakeholders. The European Network of Living Labs (ENoLL), an umbrella organisation for living labs around the world, defines them as "user-centred open innovation ecosystems based on a systematic user co-creation approach, integrating research and innovation processes in real-life communities and settings. Living Labs are both practice-driven organisations that facilitate and foster open, collaborative innovation, as well as real-life environments or arenas where both open innovation and user innovation processes can be studied as subject to experiments and where new solutions are developed." "Living Labs are real-life test and

experimentation environments that foster co-creation and open innovation among the main actors of the Quadruple Helix Model, namely: Citizens, Government, Industry, Academia." (openlivinglabs.eu/aboutus) Living labs emphasise innovation by engaging user and stakeholder perspectives in developing public services. They take a radically different approach to innovation than the top-down routine associated with traditional public administration (TPA) and New Public Management (NPM), adhering instead to a network approach based on integration of stakeholders, problem solving by collaboration and joint implementation efforts. (Fuglsang and Hansen 2022)

4 STAKEHOLDER PERSPECTIVES IN URBAN INNOVATION

Urban Living Labs have been becoming increasingly important in developing and testing responses to the social, environmental and economic challenges present in contemporary urbanism (Vallance et al. 2020). In Urban Living Labs, engaging citizens and other stakeholders are essential components and can be found in any characterisation of the key elements in the literature (ENoLL; Hossain et al. 2018; Leminen et al. 2015). In contrast to many other forms of innovation, living labs involve heterogenous stakeholders such as academics, developers, business representatives, citizens, and users, as well as various public and private organisations in living lab networks (Hossain et al. 2018). Living Labs thus assume the Quadruple Helix conception of innovation theory.

The Quadruple Helix framework is an iteration of the more established Triple Helix theory of innovation through the interaction between industry, government and university partners. The Quadruple Helix model adds a fourth sphere that more explicitly recognises the coproduction role of the public or other civil society actors (Carayannis and Campbell 2009). For Carayannis and Campbell, leading proponents of the Quadruple Helix model, this represents a more democratic approach to innovation. It also more easily allows for the outcomes of these interactions across institutional boundaries to be conceived as forms of social rather than just technological or business innovation (Vallance et al. 2020).

Because attention to stakeholders is so important, stakeholder analysis becomes important (Bryson 2004). There are different methods for identifying and analysing the relevant stakeholders (ENoLL, Rees et al. 2009, Bryson 2004). The simplest and most widely used method for identifying relevant stakeholders is the "Stakeholder Power/Interest-Matrix" (Ackermann and Eden 2011). This matrix can be found in many guidelines for stakeholder engagement, e.g. in EU-funded research projects (e.g. AREA 21, REPAiR, Cities4People, mySmartLife, Move21, see Tatum et al. 2020, Lange and Knieling 2020; Fischer et al. 2020). Once the relevant stakeholders have been identified and categorised, strategies for action can be developed on this basis. The different ways stakeholder engagement can occur can be described in five levels of participation: inform, consult, involve, collaborate and empower (Bammer 2019). Where the involvement of relevant stakeholders in living labs goes beyond information and consultation, active participation and co-creation are described as relevant elements of living lab experience (Hossain et al. 2018).

Although this is a vital first step in any participatory exercise, stakeholders are often identified and selected on an ad hoc basis without applying any structured methodology. The reasons for this are complex and range from a lack of resources and knowledge to concern about the results (Bryson 2004). In any way, non-systematic actor analysis and selection have the risk to marginalise relevant groups, bias results and jeopardise long-term viability and support for the process (Rees et al. 2009: 1933).

Which method is used for the stakeholder mapping, who the key stakeholders are and what roles they take on (Stahlbröst et al. 2015; Westerlund and Leminen 2011; Arnkil et al. 2010) depends on each specific project setting. For ANN RADAR, however, the systematic identification of the relevant stakeholders needs to take into account the Quadruple Helix model and an engagement strategy based on this to implement an Urban Living Lab successfully.

Against the background of the described methodological framework the underlying research question is in how far experimentation strategies for sustainable urban development and climate mitigation can benefit from digitalisation by enriching the political decision-making process of identifying potential urban testbeds with analysing, processing and visualising available data. The following section provides insights into the ANN RADAR research.

5 ANN (A NEW NORMAL) RADAR

Chronéer, Ståhlbröst and Habibipour (2019) have identified key components of Urban Living Labs such as governance models, financing and business models, a physical representation that takes place in a real-life setting in the city context, an innovation to experiment with partners and end users, including citizens, public and private actors, and academic institutions (i.e., a quadruple helix), and approaches for engaging different stakeholders and collecting data.

Staging urban experimentation requires an evidence-based process to identify suitable target locations. The project ANN (A new Normal) RADAR addresses this core challenge. Through a data-driven evidence base, it helps to identify areas that have a particular demand and provide ample context for experimental interventions and to support with the evaluation of their effectiveness. The underlying research question is in how far experimentation strategies for sustainable urban development and climate mitigation can benefit from digitalisation by enriching the political decision-making process of identifying potential urban testbeds with analysing, processing and visualising available data that relate to the aforementioned key elements of urban living labs.

ANN RADAR is designed as an instrument for experimental transition processes in cities and urban districts. It accumulates indicators from multiple dimensions including localised strategies, transformational goals and paths, urban data, as well as stakeholder and citizens engagement for the identification of best suited city areas for urban testbeds for sustainability and climate mitigation action. Guiding initial use case scenarios for ANN RADAR are European calls for urban experimentation, such as for New European Bauhaus pilot regions; German federal and state funding for thematic experimentation in the areas of solar energy, energy efficiency and mobility; as well as city and district initiatives for urban experimentation. Strategic climate action plans embedment, citizens and stakeholder engagement approaches, urban data evidence, (social) inclusiveness, replicability and scalability are at the core of the scenarios.

The project follows a collaborative and participatory methodology mixed with state-of-the-art digital formats for integrating data and rapid innovation technologies, initially in the City of Hamburg. The mayor's office, the district coordination office, climate coordinators and other stakeholders in Hamburg are part of the co-design and the experimental governance approach. The methodology draws on research and practices in experimental transition processes, living labs and urban testbeds, as well as stakeholder and citizens engagement.

The increased demand for sustainable urban development spawned a wealth of activities from developing climate plans to planning climate mitigation actions. All of these provide information, be it concepts and plans or structured data from experiments and operations. This information provides a valuable source of data which ANN RADAR leverages to assess climate actions, understand status and impact of urban testbeds as well as the maturity of experimentation and experimental governance in municipalities and selected geographic areas. Alongside, ANN RADAR taps into sources of data from the local authorities and the open data available for the respective locations.

As an example, ANN RADAR uses solar potential data (estimate of PV electricity harvesting from rooftops) from Hamburg's geo portal to assess the percentage of households' electricity consumption (average consumption for households of a specific size - according to the BDEW, federal association of energy and water management) which could be harvested from PV installations on the respective building for its inhabitants.

In one of the scenarios larger buildings (a minimum of 20 households) with 80-120% of photovoltaic (PV) coverage potential (meaning 80-120% of households' yearly electric energy consumption could be harvested from PV) in underprivileged areas (ideally buildings with subsidised housing) are considered as the most promising areas for a sustainability testbed taking into account the "social" leverage and the return on investment (ROI) for the respective measures. Social inclusiveness is one of the key attributes in the aforementioned scenarios.

To assess the public resources (e.g. financial, personnel) information about ongoing initiatives can be used to identify sources for funding as well as the availability of personnel to support new initiatives and provide knowledge about specific areas as well as stakeholder networks. In the case of Hamburg special development areas (RISE: Rahmenprogramm Integrierte Stadtteilentwicklung - framework for integrated urban development) are an example of such areas which provide an opportunity to leverage available public

resources. Since these specific areas have been established due to the need for inclusive social development in the selected areas it emphasises social development as an important factor for the selection of testbeds. In the ANN RADAR initial test scenario, a socially challenged inner city quarter with high solar potential for urban experimentation is identified within the context of the “New European Bauhaus” programme. The detailed examination of that specific quarter in return also advanced the prototypical approach by helping to identify urban data segments that are trans-local in their relevance, such as the social and cultural infrastructure and the aforementioned zoning in the framework of integrated urban planning.

Urban testbeds in the presented scenarios can be described as socio-economic entities which have to be assessed from various viewpoints, such as the structure of the built environment, e.g. like the number and average size of parcels, as well as social status of households in an area. These provide the “physical” parameters and factors to be considered, which are usually provided by the city. For the success of urban testbeds, several other, “softer” factors, like citizen and stakeholder engagement, strategies and plans for sustainable development as well as public resources play an important role. To provide a holistic view of these different perspectives a key instrument of ANN RADAR is a Balanced Scorecard (BSC) which tries to capture these different viewpoints in a structured and standardised way.

Based on the state of research, own experiences and the explorative approach of the project on urban testbeds, the ANN RADAR approach is based on four BSC dimensions: Strategy & Plan, Stakeholders, Public Resources, Urban Data.

“Strategy & Plans”: This dimension assesses whether an area is being managed with a strategic vision and if this vision is linked to actionable plans. During recent years many municipalities started to budget for climate mitigation actions as well as climate adoption. This led to the development of action plans (e.g. SUMP, SECAP) which describe the actions and their impact on the area and the climate (usually reduction of GHG emissions). To assess the intent and political, as well as governmental support for climate actions these plans provide a valuable source of information starting from a general vision down to specific climate actions, including the intended impact and required investments. Hence this dimension provides insights into the ability and willingness to execute the defined climate strategies and the associated measures. An extensive analysis has been undertaken to deconstruct the local climate strategies and plans into scorecard criteria. These include the existence and measurability of transformational goals and paths regarding our prototypical urban experimentation thematic areas solar potential, energy efficiency and mobility, monitoring processes in place and experience with model quarters and urban testbeds.

“Stakeholders”: This dimension offers insights into the structure and the management of the stakeholder ecosystem, the experience gathered and the ability to manage a diverse group of stakeholders to gain acceptance and commitment. It assesses past experiences with stakeholder management, setting up binding agreements with stakeholders and involving diverse stakeholder groups (quadruple helix) in long term development processes.

“Public Resources”: This dimension explores which assets the public sector could offer as a contribution to an urban testbed. It could comprise real estate, personnel to support testbed development, as well as funding sources to make investments or subsidise testbed development. Public resources are a crucial part of the experimental governance readiness for municipalities and districts to engage and permit urban experimentation.

“Urban Data”: This dimension assesses the ability to support data driven evaluation of the physical potential (e.g. number of inhabitants, size of buildings/areas) as well as constraints (regulations) and opportunities for the testbeds under consideration. For example, the total area available for PV installations on rooftops provides insights regarding the maximum PV energy harvesting potential from rooftops. Besides physical properties, social and ecological indicators provide valuable information to evaluate the feasibility to successfully implement a testbed.

The Balanced Scorecard integrates all four dimensions which build additional layers of ANN RADAR (see Fig. 2) and can be adjusted and combined as needed for a specific scenario, e.g. application for EU funds or investments from local budgets in urban testbeds to initiate climate actions.

Adding the physical potential to the picture a holistic view on the feasibility and suitability of an urban testbed for a given scenario can be provided. This integrated view could guide the selection process and supports an evidence-based process to establish urban testbeds.

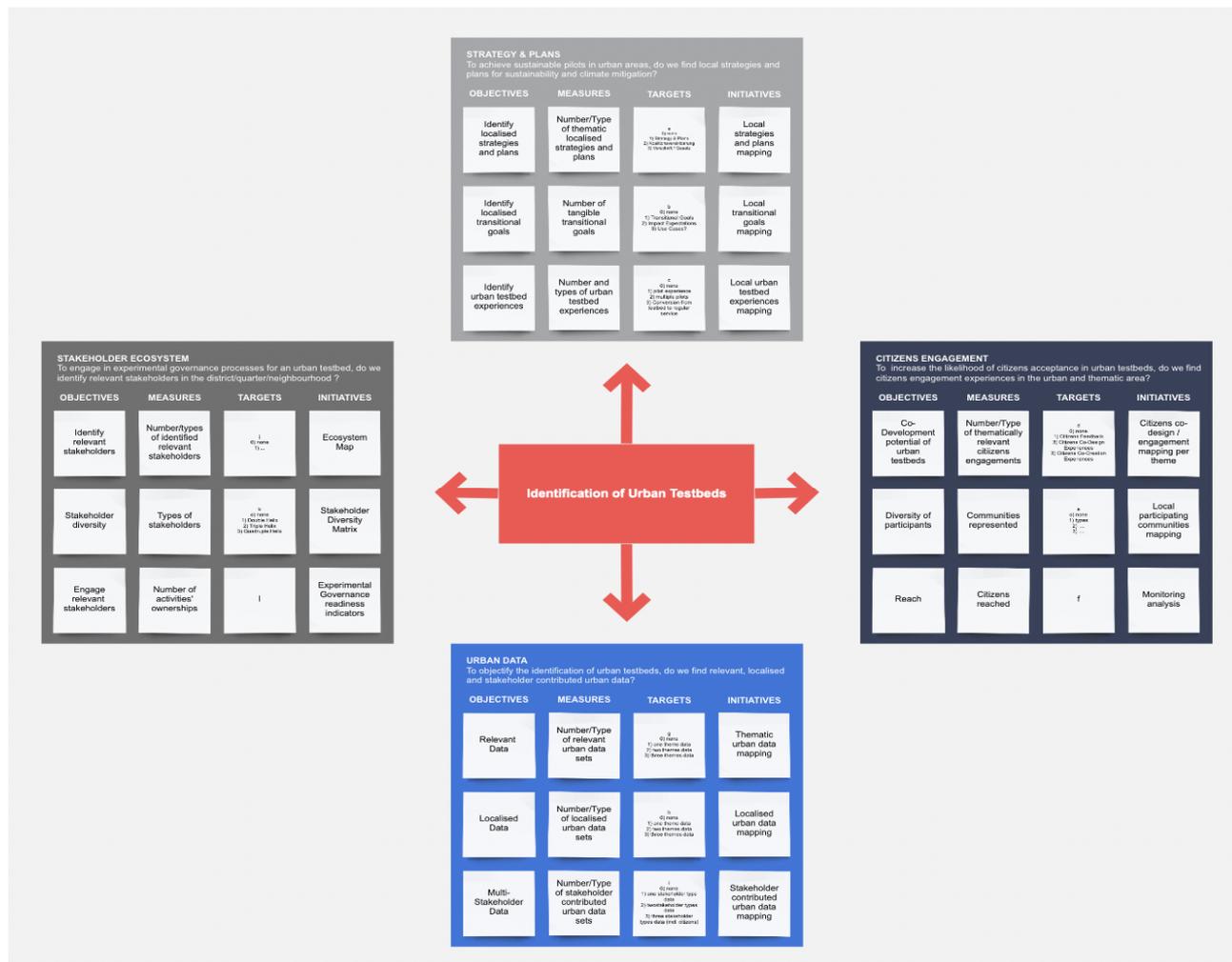


Fig. 2: Balanced Scorecards – excerpt and early-stage design

The Balanced Scorecard results will be one element of the ANN RADAR-Dashboard (see Fig. 3). Here the key dimensions for identifying suitable urban experimentation locations are shown with a geo-located reference. Data layers depicting contextual geo-located information including social monitoring results, social and cultural infrastructures, existing model quarters, urban testbeds and funding zones for integrated urban developments, can be viewed and discussed in connection with co-evaluated balanced scorecards for local climate mitigation and sustainability strategies and plans, stakeholder engagement, public resources for experimental governance readiness and urban data availability. Physical sustainability potentials can be assessed to the level of building blocks, both in summary and in detail.

Most of the data used by ANN RADAR is publicly available and can be accessed through the urban data platform or the geo-portal of the city of Hamburg. However, some of the data is not publicly available or easily accessible (e.g. number of households per building, roof top solar potential). The reasons being manifold like license/ownership restrictions, data privacy concerns or commercial interest in the data. To overcome these obstacles a strong data competency and data awareness needs to be established in the public administration and the government. This should cover legal as well as technological and data analytics capabilities to provide as much raw data as possible as open source whilst additionally offering data insights through accessible tools for all interested parties, be it citizens, businesses, NGOs, academia or government organisations. This will require political and legislative support to ensure reliable and secure access to the data sustainably. Besides availability and accessibility of the data, data literacy will become ever more important to facilitate data and evidence driven societal consensus on key questions around sustainable urban development. Consequentially, a two pronged approach, providing data and insights as well as enabling data retrieval and interpretation, is needed to capture the full value of open and free access to urban data.

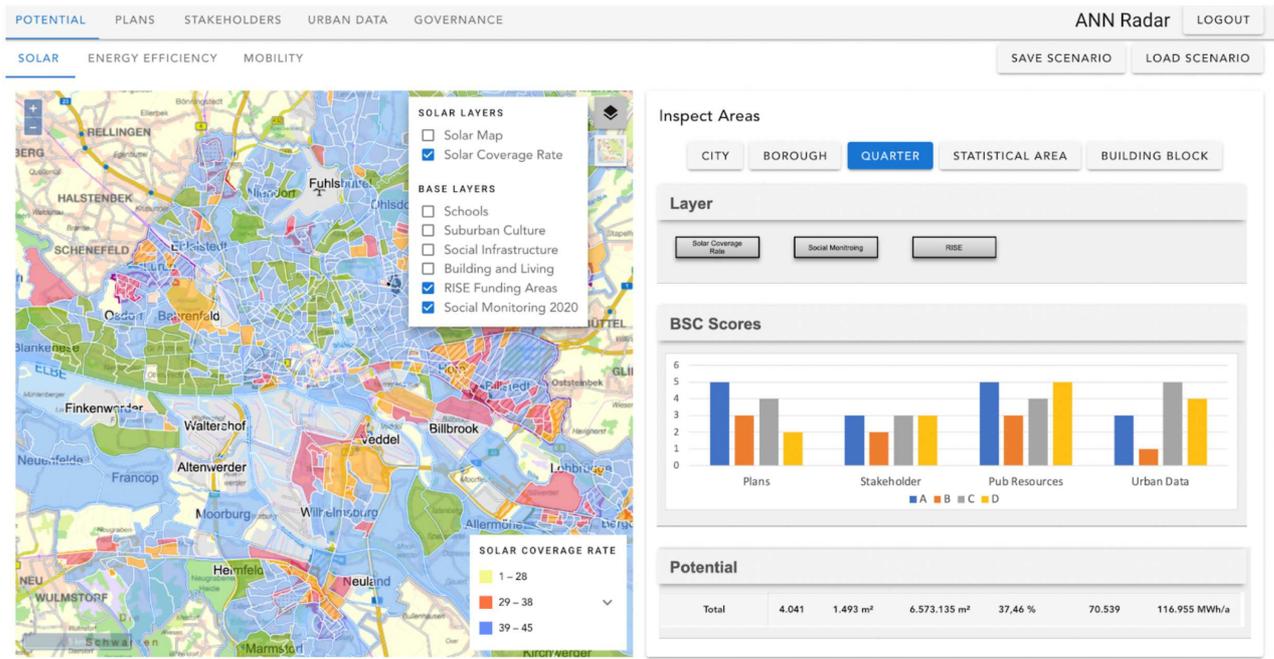


Fig. 3: ANN RADAR Prototype Dashboard for the co-evaluation process of identifying suitable locations for urban experimentation

6 REFLECTIONS

The approach and methodology of ANN RADAR aims at supporting the decision-making process for urban experimentation for sustainability and climate action in the context of location-based experimental governance and co-creation with citizens and stakeholders. From our point of view just inclusion in sustainability action can be achieved by informed, broad and inclusive participation of citizens and diverse stakeholders. An example is manifested in the Malmö Commitment (2022), which “positions local and regional governments at the centre of the global response to today’s challenges, by encouraging sustainable approaches, innovation, adaptability, participation, and inclusiveness in policy-making to tackle the current climate emergency and by embedding social equity at the core of their local sustainable development”. Digitalisation enhances data-driven, evidence-based and transparent participation which leads to a more just and equitable participation in decision-making processes. Such urban data evidence-based and transparent decision-making is at the intersection of digitalisation and sustainability, and as such this ‘third way’ of a socially embedded digital agenda, and is understood as a contribution to a European perspective of sustainable digitalization.

Putting ANN RADAR in the wider context of digitalization it can be seen as an example for leveraging (open) urban data for sustainable urban development. Since raw data usually cannot be easily understood it is necessary to process, aggregate and present the data in an accessible and digestible way. The widespread approach of many municipalities to provide geo-data portals is a first step towards this goal. However, leveraging Artificial Intelligence and Big Data exploration methods offers a further opportunity to capture the full value of urban data by turning raw data into insights and finally stories which can transform into actions. This approach would allow municipalities to leverage the rich urban data available for transparent, evidence based sustainable urban development.

In its research ANN RADAR has developed and applied a methodology to aggregate, annotate, visualise and evaluate urban data in regard to key dimensions for identifying suitable urban experimentation locations. In this phase, the prototype has been introduced in an iterative co-design process to stakeholders engaged in pre-selecting urban testbeds in the initial ANN RADAR scenarios of European, national and state funding calls. Stakeholders include the mayor's office of Hamburg, the district coordination office, climate actions management of selected boroughs and climate action and sustainability consultancies that are deeply engaged in local climate action planning, as well as citizens and stakeholder engagement processes.

Besides technological challenges of the ANN RADAR approach, experimental governance is confronted with restrictions resulting from personnel shortages in local administration. Experiments need additional administrative capacity to provide a suitable environment. In competition with routine tasks that have to be fulfilled anyway, experiments have difficulties to gain the necessary priority in the internal agenda setting. Thus, there is the fundamental finding that experiments need additional funding to compensate additional costs and personnel resources. Furthermore, the extra-benefit of experiments for local sustainability transition needs to be communicated to motivate politicians and administration to take the effort and risk.

In next steps of the ANN RADAR research on experimental governance, it is planned to extend the scope of the thematic sustainability areas beyond the initial three areas to gain further knowledge in how far the methodology is transferable on different policy areas and in how far such a multi-thematic approach contributes to experimentation platforms as conceptualised by Rehm et al. (2021). Furthermore, the analysis and deconstruction of the local climate plans as one significant input for the balanced scorecard toolkit will be supported by artificial intelligence. Here the aim is to explore how far artificial intelligence can support the analysis of local climate strategies and plans with their transformational goals and paths in the context of changing local, national and international urban agenda frameworks on sustainability and transformation. Such an approach is foreseen to enhance the usability of ANN RADAR in various urban and regional functional areas for stakeholders without the means or expertise to aggregate and input the core information for the balanced scorecards as one of the key elements of the ANN RADAR process.

The ANN RADAR research will be reflected with the help of iterative evaluation in the varying contexts of different functional urban areas' sizes and complexities and against the ongoing discussion of the key elements of urban experimentation, including conceptual considerations on evaluating smart city approaches (e.g. Rodrigues et al. 2022), and research regarding the development from a quadruple helix to a quintuple helix perspective. Here, an important question will be in how far the expert driven process of data-collection and processing for experimental governance can be connected with formats of citizen participation or if this approach holds the tendency of excluding citizens or at least parts of the citizenship.

Note:

ANN RADAR is a third-party funded research project (ICLEI Action Fund) and as such it is part of a network of projects throughout Europe that use a combination of private and open-source data to drive environmental action in their respective cities. The project started in 2020, it is focused on transition processes in three selected sectors, renewable energies, energy efficiency and mobility.

7 REFERENCES

- Ackerman, F.; Eden, C.: Strategic Management of Stakeholders: Theory and Practice, Long Range Planning, Vol. 44, Issue 3, pp. 179-196, 2011, DOI: 10.1016/j.lrp.2010.08.001
- Arnkil, R.; Järvensivu, A.; Koski, P.; Piirainen, T.: Exploring Quadruple Helix Outlining user-oriented innovation models, Final Report on Quadruple Helix Research for the CLIQ project, under the Interreg IVC Programme, Työraportteja 85/2010 Working Papers, Tampere, 2010.
- Bammer, G.: Key issues in co-creation with stakeholders when research problems are complex, Evidence & Policy, Vol. 15, Issue 3, pp. 423–435, 2019, DOI: 10.1332/174426419X15532579188099
- Bryson, J. M.: What to do when Stakeholders matter. A Guide to Stakeholder Identification and Analysis Techniques. Public Management Review, Vol. 6, Issue 1, pp. 21–53, 2004.
- Bulkeley, H.; Broto, V. C.: Government by experiment? Global cities and the governing of climate change. In: Transactions of the Institute of British Geographers, Vol. 38, pp. 361-375. 2013.
- Carayannis, E.; Campbell, D.: 'Mode 3' and 'Quadruple Helix': Toward a 21st century fractal innovation ecosystem, International Journal of Technology Management, Vol. 46, Issue 3/4, pp. 201-234, 2009.
- Evans, J., Karvonen, A.; Raven, R.: The Experimental City. London and New York: Routledge by Taylor & Francis, 2016.
- European Commission: "Better Regulation" toolbox. 2021, https://ec.europa.eu/info/sites/default/files/br_toolbox-nov_2021_en_0.pdf (accessed 10/08/2022)
- Fischer, J.; Alimi, D.; Knieling, J.; Camara, C. 2020. Stakeholder Collaboration in Energy Transition: Experiences from Urban Testbeds in the Baltic Sea Region. Sustainability, Vol. 12, Issue 22, p. 9645, 2020.
- Freeman, R. E.: Strategic Management: A Stakeholder Approach, New York: Cambridge University Press, 2010.
- Fuglsang, L.; Hansen, A. V.: FramingImprovements of Public Innovation in a Living Lab Context: Processual learning, restrained space and democratic engagement. Research Policy, Vol. 51, Issue 1, pp. 2-12, 2022. DOI: <https://doi.org/10.1016/j.respol.2021.104390>
- Geels, F.: Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study, In: Research Policy, Vol. 31, pp. 1257-1274, 2002.,
- Geels, F. W.; Schot, J.: Typology of sociotechnical transition pathways. Research Policy, Vol. 36, pp. 399-417, 2007.
- Lange, K.; Knieling, J.: EU Smart City Lighthouse Projects between Top-Down Strategies and Local Legitimation: The Case of Hamburg, Urban Planning, Vol. 5, Issue 1, pp. 107–115, 2020, DOI: 10.17645/up.v5i1.2531

- Grin, J.; Rotmans, J.; Schot, J.: *Transitions to Sustainable Development, New Directions in the Study of Long-Term Transformative Change*, New York: Routledge, 2010.
- Hossain, M.; Leminen, S.; Westerlund, M.: A systematic review of living lab literature. *Journal of Cleaner Production*, pp. 976-988. 2018.
- Knieling, J.; Lange, K.: *Smart Guidance: Governing the Urban Energy Transition*. In: Droege, P. (ed.), *Urban Energy Transition. Renewable Strategies for Cities and Regions*. pp. 513-524. Amsterdam/Oxford: Elsevier, 2018.
- Kronsell, A.; Mukhtar-Landgren, D.: *Experimental governance: the role of municipalities in urban living labs*. *European Planning Studies*, Vol. 26, Issue 5, pp. 988-1007, 2018.
- Leminen, S.; Habib, C.; Westerlund, M.: *Living Lab as Innovation Platforms: The Key Constructs*. Research Day. Conference proceedings 2015. <https://issuu.com/enoll/docs/276089123-enoll-research-day-conference-proceeding> (accessed 10/08/2022)-
- Malmö Commitment: <https://worldcongress.iclei.org/malmo-commitment/>, May 2022
- Rees, M. S.; Graves, A.; Dandy, N.; Posthumus, H.; Hubacek, K.; Morris, J.; Stringer, L. C.: *Who's in and why? A typology of stakeholder analysis methods for natural resource management*. *Journal of Environmental Management*, Vol. 90, pp. 1933–1949, 2009.
- Rehm, S.-V.; McLoughlin, S.; Maccani, G.: *Experimentation Platforms as Bridges to Urban Sustainability*. *Smart Cities*, Vol. 4, pp. 569–587. 2021. <https://doi.org/10.3390/smartcities4020030> (accessed 10/08/2022)
- Rodrigues, N.; Vale, M.; Costa, P.: *Urban experimentation and smart cities: a Foucauldian and autonomist approach*. *Territory, Politics, Governance*, Vol. 10, Issue 4, pp. 549-567, 2022. <https://doi.org/10.1080/21622671.2020.1777896>
- Schot, J.; Geels, F. W.: *Strategic niche management and sustainable innovation journeys: theory, findings, research agenda, and policy*. In: *Technology Analysis & Strategic Management*, Vol. 20, Issue 5, pp. 537-554, 2008.
- Ståhlbröst, A.; Bergvall-Kåreborn, B.; Ihlström Eriksson, C.: *Stakeholders in Smart City Living Lab Process*. Americas Conference on Information Systems (AMICIS). Puerto Rico, USA. August 13-15, 2015.
- Tatum, K.; Cekic, T.; Landwehr, A.; Noennig, J.; Knieling, J.; Schroeter, B.: *Co-creation of Local Mobility Solutions: Lessons from the Mobility Lab in Hamburg-Altona*. In: Müller, B.; Meyer, G. (eds.), *Towards User-Centric Transport in Europe*, No. 2, pp. 16-27. Berlin, 2020.
- UN-Habitat (2020): *Building Participatory Accountability Systems for City Policies: Handbook*, https://unhabitat.org/sites/default/files/2021/06/210618_building_participatory_accountability_systems_for_city_policies.pdf (accessed 10/08/2022).
- Vallance, P.; Tewdwr-Jones, M.; Kempton, L.: *Building collaborative platforms for urban innovation: Newcastle City Futures as a quadruple helix intermediary*. *European Urban and Regional Studies*, Vol. 27, Issue. 4, pp. 325-341, 2020.
- Wittmayer, J. M.; Loorbach, D.; *Governing Transitions in Cities: Fostering Alternative Ideas, Practices, and Social Relations Through Transition Management*. In: Loorbach, D.; Wittmayer, J.M.; Shiroyama, H.; Fujino, J.; Mizuguchi, S. (eds.): *Governance of Urban Sustainability Transitions*, pp. 13–32. Tokyo: Springer, 2016.