The ANN RADAR Playbook

How to use the decision support tool to identify suitable locations for urban testbeds

HafenCity Universität Hamburg

supported by the ICLEI Action Fund

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https://github.com/ANN-RADAR/ann-radar-prototype

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Introduction

The Project ANN RADAR

Identifying potential urban testbeds

In Hamburg, Germany, HafenCity University implemented the project **ANN (A New Normal) RADAR**, to identify spaces and districts that can be used as urban testbeds for prototyping sustainability innovations. The identification is made through an interactive decision support tool, based on public and private environmental, climate and energy data of different districts in the city.

ANN RADAR evaluates local climate and sustainability strategies and specific environmental monitoring data available in Hamburg with focus on sustainable mobility, energy efficient buildings, and solar energy. The project enables stakeholders to identify urban spaces as potential testbeds for prototypes and pilots in alignment with local climate mitigation goals.

The ANN RADAR Prototype

Process

ANN RADAR uses defined (or to be defined) **use case scenarios**, for example an European call for pilot regions in the context of the New European Bauhaus.

Based on the scenario, **general data layers** are chosen that contribute best to the decision-making process. Social Monitoring data (for the purpose of social inclusion) and areas within the framework for integrated urban planning (high potential for additional or ongoing funding mechanisms, sets of rules including stakeholder and citizens engagement requirements) are relevant data layers in the Hamburg scenario.

Sustainability domains are chosen to display information relevant for potential urban testbeds. In our prototypical application, solar, energy efficiency and a limited perspective of mobility where used. The outlook section of this playbook extends the potential sustainability themes.

A dynamic **balanced scorecard** approach supports the decision-making process in regard to the validation of plans and strategies, stakeholder involvement, urban data availability and experimental governance experiences in respect to the urban entitites (city, district, quarter).

Existing **urban testbeds and model quarters** (more permanent innovation zones) can be viewed, assessed or added as relevant experiences in urban experimentation.

#identifying

#urban testbeds

#for sustainability and climate mitigation action

#supported by evidence

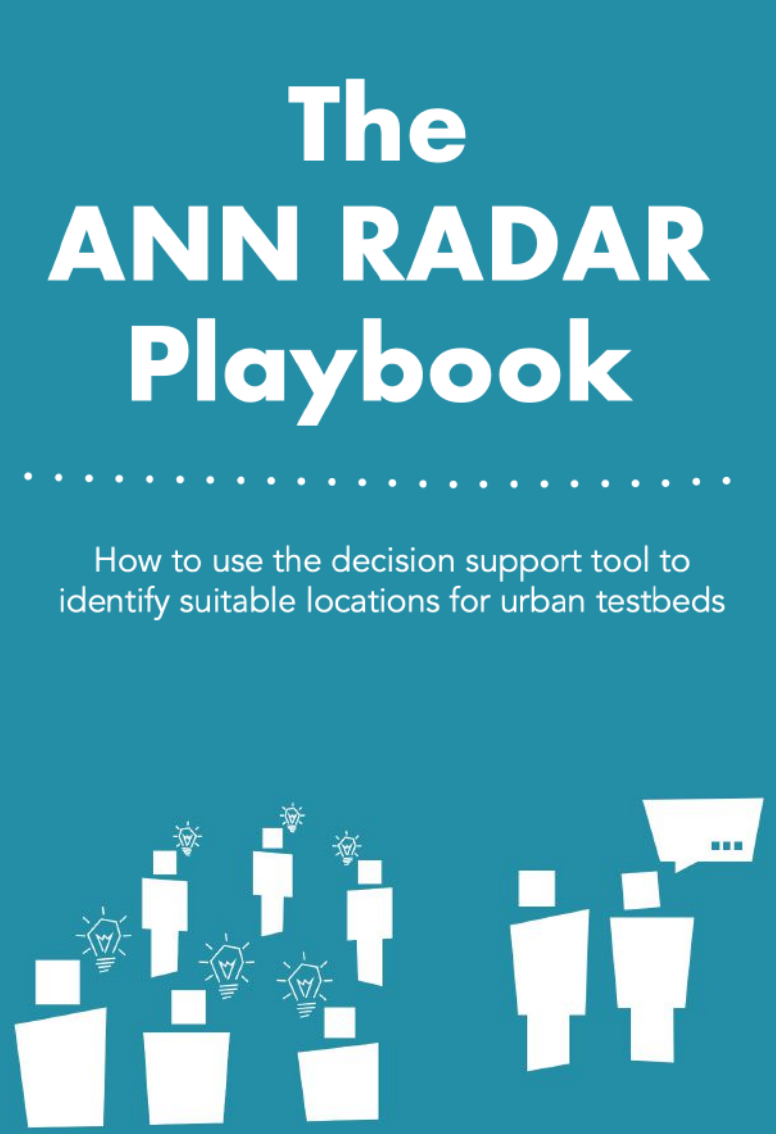
The Playbook

Purpose

The ANN RADAR Playbook serves the purposes of making the ANN RADAR methodology, the prototype principles and the exemplary data dimensions as part of a decision-support process transparent to professional stakeholders chiefly involved in these processes.

Municipalities, climate plan and engagement consultancies, as well as academic institutions initiating and managing urban experimentation, are at the core of the focus.

The exemplary Hamburg cases can easily be adapted in other local municipalities with similar stakeholder mixes.



The Playbook

Structure

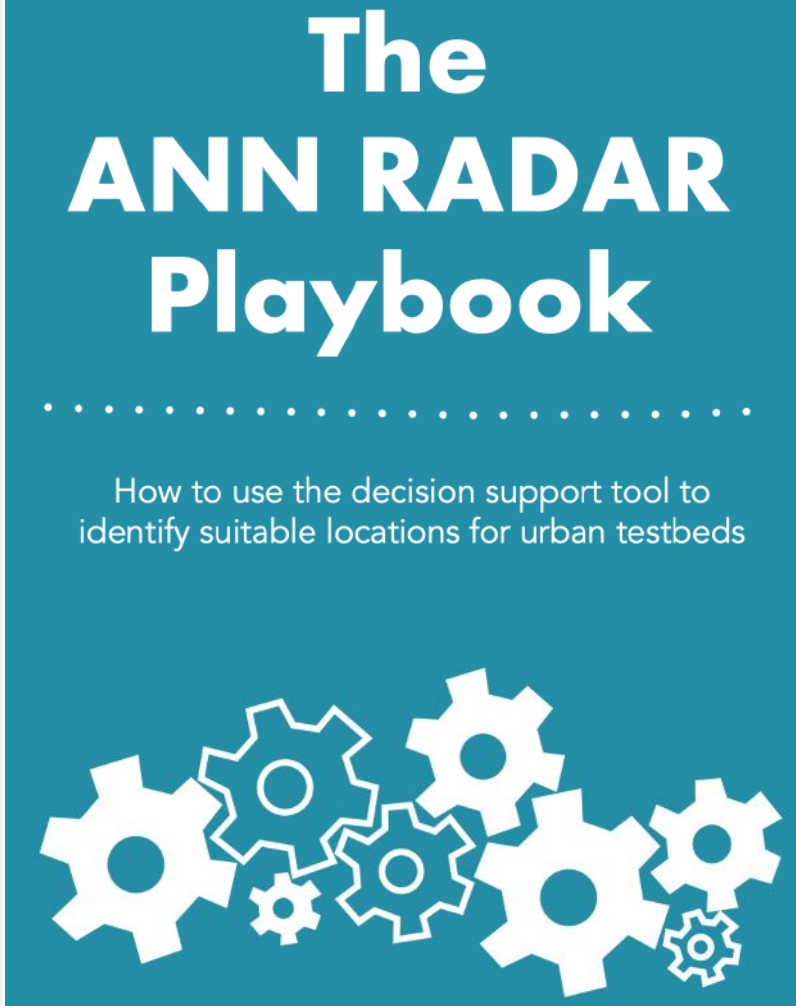
The playbook consists of four content sections.

First, the introduction to the overall ANN RADAR principles and the contextual information regarding urban living labs, stakeholder and citizens engagement, as well as experimental governance.

Second, a guided tour of the ANN RADAR prototype leading through a realistic scenario for identifying urban testbeds for sustainability and climate mitigation action. In this guided tour, a prototypical click-through is documented with all the elements: choosing a scenario, selecting a sustainability theme, opting for relevant data filters, identifying and understanding existing urban testbeds or model quarters as reference in the local areas of interest, applying the balanced scorecard principle, and viewing of results for discussion.

Third, selected stakeholder cases. The international mobility project MOVE21 pinpoints their application of ANN RADAR in the search for locations for mobility logistic hubs and the understanding (analysis) of neighbourhoods in this process. The climate consultancy ZEBAU presents how they could use ANN RADAR in their municipal engagements.

The fourth section provides an outlook and lists references for literature and data sources.



“ZEBAU supports multiple districts in Hamburg in their climate action plan development and rollout including multiple stakeholder engagements.

We have been deeply involved in the co-design of ANN RADAR and look forward to utilizing the prototype and methodology in some of our engagements.”

Jan Gerbitz, Head of Projects
ZEBAU, Climate and Energy Consultancy

Context

Introduction to the context

The aim of ANN RADAR is to provide an evidence-based decision-making basis for the selection of suitable locations for urban experiments. In addition to the physical factors that suggest the suitability of certain locations (in ANN RADAR, these are the sustainability domains), the experiences with citizen and stakeholder engagement, with the implementation of Living Labs and with experimental governance, are of particular importance.

Cities, districts or even neighbourhoods that have already gained experience in these areas stand out from others and are particularly suitable as places for new urban experiments. In the following, the theoretical-conceptual approaches to Citizens and Stakeholder Engagement, to Living Labs and to Experimental Governance are briefly presented, which in turn provide the basis for the development of the Balance Score Card. The Balance Score Card serves as an evaluation support system to check how well a city, district or neighbourhood is prepared for urban experimentation.

Focus on Living Labs by Category

Why are Living Labs an important category?

When it comes to identifying suitable locations for urban experimentation, engaging with Living Labs is mandatory. Urban Living Labs are gaining increasing attention in the development and testing of approaches to urban challenges because

- they have a high potential for innovation in the development of solutions through close cooperation between scientists, practitioners and policy-makers,
- they put the participation and action of the communities directly and indirectly affected by the intervention in the foreground
- they test, research and validate existing and developed concepts, products and services in real time to facilitate more professional development and social impact in real contexts,
- based on reflection and learning, they create the basis for the dissemination of new solutions on a broader scale.

„Living labs are defined 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. In practice, living labs place the citizen at the centre of innovation, and have thus shown the ability to better mould the opportunities offered by new ICT concepts and solutions to the specific needs and aspirations of local contexts, cultures, and creativity potentials."
(ENoLL)

The European Network of Living Labs (ENoLL) is the international federation of benchmarked living labs in Europe and worldwide.

Key Characteristics of Living Labs

The following key elements of Living Labs can be found in the extant literature (Hossain et al. 2018):

- **Real-life environments**: LLs take place in a real-life environment, ranging from a single isolated place to broader environments such as educational institutes, people's homes and workplaces, and even a city or a part thereof.
- **Stakeholder**: LLs assume a quadruple helix (i.e. a collaboration between business, research and education, public administration, and civil society/users)
- **Activities**: Activities in LLs include testing, validation, experimentation and co-creation
- **Business models and networks**: LLs explore the feasibility of a business model of complex solutions in real-life contexts and are by definition networks, because they include multiple stakeholders.
- **Methods, tools and approaches**: LLs differ widely in their use of methods and tools. ENoLL has been recognized in Europe as a major source of the various methods and tools used in different living labs.
- **Challenges**: The challenges are diverse and associated with the type of LL and the context in which it operates. They include temporality, governance, unforeseen outcomes, efficiency, the recruitment of user group(s) and the sustainability and scalability of their innovation activities.
- **Outcomes**: The result or "product" of LLS can take very different forms. Tangible outcomes include designs, products, prototypes, solutions and systems, whereas intangible outcomes include concepts, ideas, intellectual property rights, knowledge and services.
- **Sustainability**: LLs emerge as a type of collective governance and experimentation to address sustainability, especially in urban areas.

Hossain et al. (2018): A systematic review of living lab literature. Journal of Cleaner Production 213

Menny, et al. (2018): Urban Living Labs and the Role of Users in Co-creation. GAIA, 27

Bulkeley et al. (2019): Urban living laboratories: conducting the experimental city?. European urban and regional studies, 26

Urban Living Labs in ANN RADAR – Data Layer

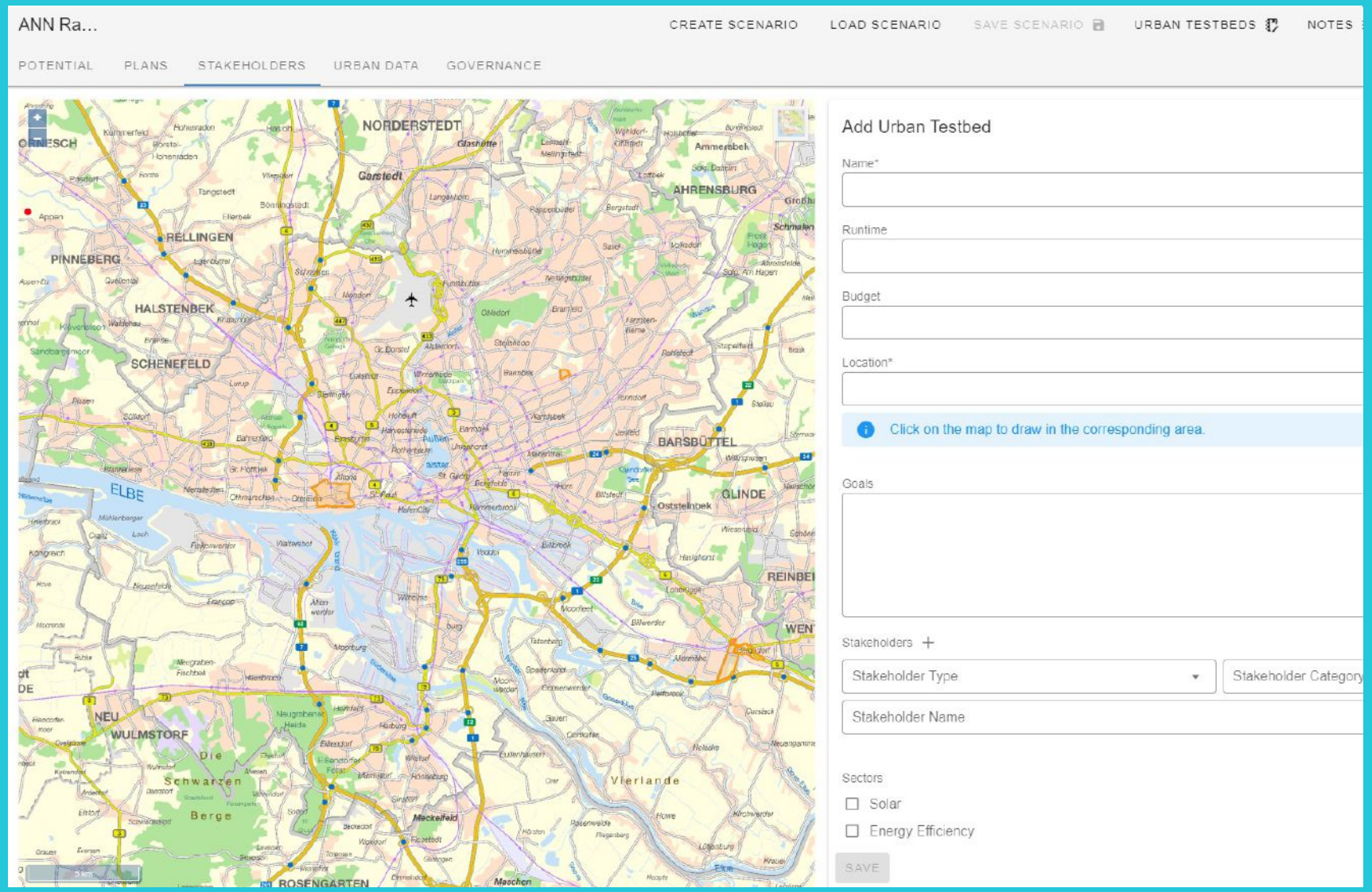


Fig. 1: ANN RADAR Prototype

The template can be used to record Living Labs that have already been carried out. The projects thus become visible and can be seen as good practice that other projects can follow up on. The following categories should give an insight into the design of the Living Labs:

- basic information such as name, runtime, budget and location,
- the goals associated with the establishment of the Living Lab,
- the stakeholders involved, differentiated by type and category,
- the different sustainability domains to which the innovation activities in the Living Labs contribute,
- and finally experience with Experimental Governance.

Focus on Stakeholder & Citizen Engagement by Category

Why are these important categories?

The participation of citizens and relevant stakeholders is an essential part of urban experimentation because

- complex problems and challenges can best be solved when the various affected and influential groups - the stakeholders as defined by Freeman - work together in partnership,
- innovative ideas are generated through their involvement, which includes not only technical or economically-oriented innovations, but also social innovations, especially through the participation of the general public,
- it incorporates local knowledge, problems and needs - not only expertise but also the everyday knowledge of local people - giving the ideas and solutions generated greater quality and credibility and helping public decision-makers to make evidence-based decisions,
- last but not least, resources for the successful implementation of sustainable solutions can be generated - such as human and financial resources, access to spaces or networks.

„Engaging the public in planning for the city through participatory means is an essential factor for achieving sustainable urban development. A participatory process is a channel which involves the reflection and the exchange of ideas between the city council and city stakeholders.“
(UN-Habitat, 2020)

Building Participatory Accountability Systems for City Policies -Handbook | UN-Habitat (unhabitat.org)

Good Practice Citizens Engagement

What characterizes a good citizens engagement strategy?

- Public participation can take different forms in terms of scope and extent and is differentiated according to the degree to which it is binding. A frequently used model is the participation ladder - following Arnstein - with the steps: Inform - Consult - Collaborate - Empower.

- Regardless of the scope and extent of participation, it is essential to formulate a clear objective and framework: Who can participate? What is the goal of participation? What scope is there for shaping the process? What happens to the results?

- The choice of appropriate formats has an influence on the motivation to participate, especially of hard-to-reach groups. Depending on the objective of participation, a mix of face-to-face events (both centralised large-scale events and decentralised offerings that pick-up people more at their everyday locations) and online formats is recommended.

- Evaluation of the participation process against the background of clear quality criteria should be an integral part of any process.

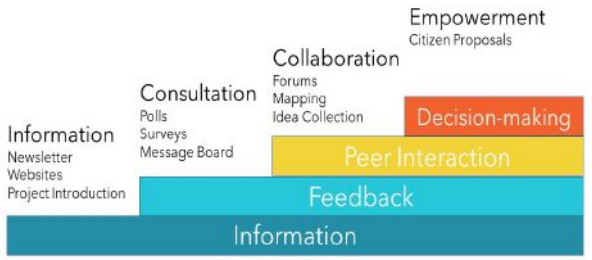


Fig. 2: HafenCity Universität Hamburg

Arnstein, S. (1969.) A ladder of citizen participation

Bertelsmann Stiftung: Beteiligungskompass

Peter Patze-Diordiychuk, Paul Renner (Hrsg.): Methodenhandbuch Bürgerbeteiligung

OECD (Hrsg.): Innovative Citizen Participation and New Democratic Institutions

Good Practice Stakeholder Engagement

What makes a good stakeholder engagement strategy?

- Stakeholder engagement in the sense of the Quadruple Helix is an important core component of Urban Living Labs. By involving stakeholders from all four sectors - public institutions, business, academia and citizens - the best-case scenario is to achieve results that benefit all stakeholders.

- It is therefore essential to first systematically identify the relevant stakeholders and develop an engagement strategy based on this. Which method is used for this depends on the project environment. The most widely used is the "Power/Interest Matrix".

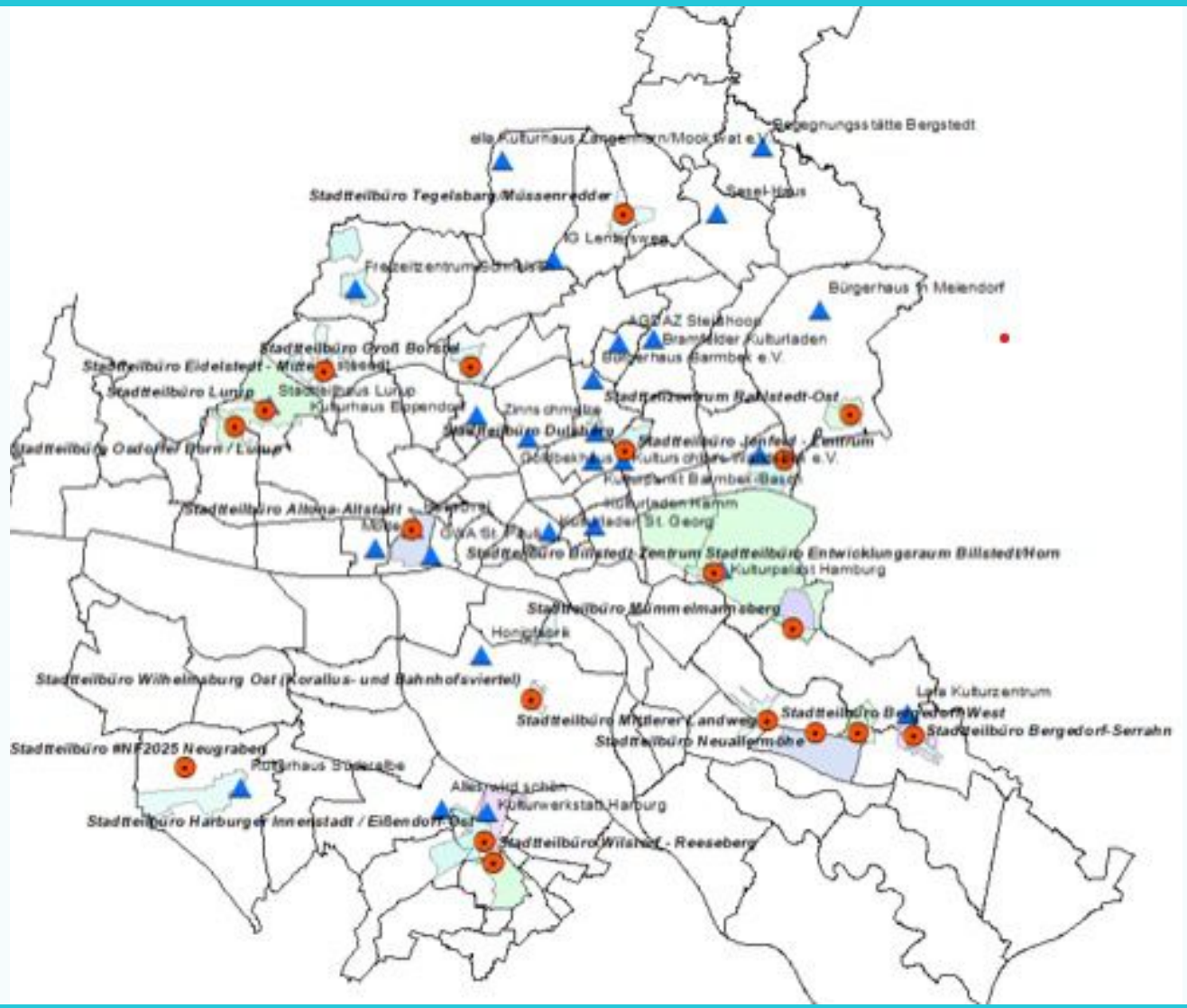
- The analysis of the relevant stakeholders also provides information about which actors should be won as partners. Partners play an active role in solving challenges, for example by providing know-how, financial and human resources, access to spaces or networks. In this way, they can make a significant contribution to the success of the experiments.

"The SDG 17 recognises multistakeholder partnerships as important vehicles for mobilising knowledge, expertise, technologies and financial resources"
(UN-Habitat 2016)

Reed et al. (2009): Who's in and why? A typology of stakeholder analysis methods for natural resource management

Bryson (2004): What to do when Stakeholders matter. A Guide to Stakeholder Identification and Analysis Techniques

Citizens Engagement in ANN RADAR – Data Layer

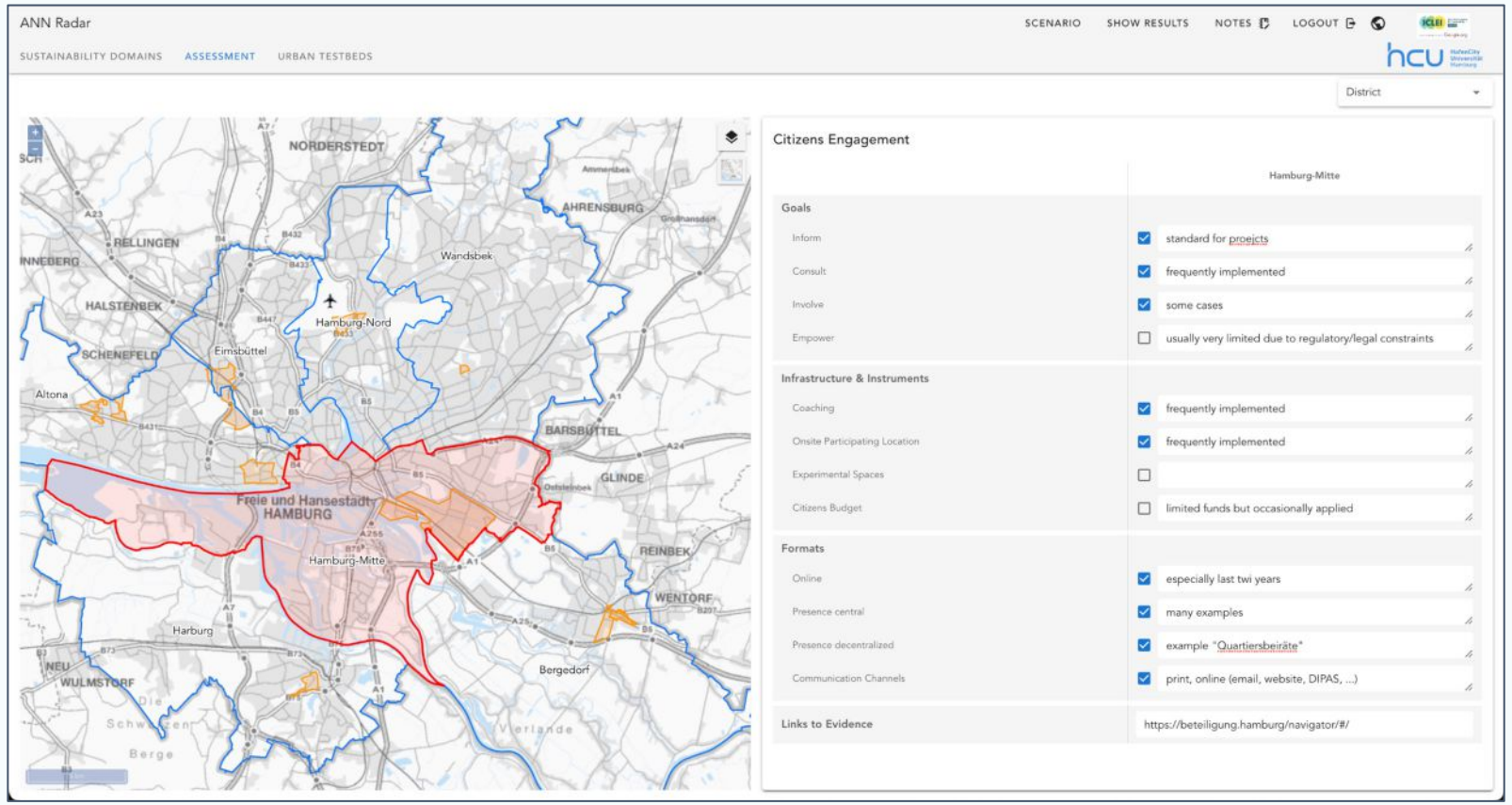


Three data layers map geo-based civic engagement in ANN RADAR:

- **District cultural centres & community centres** as places of civic engagement
- **District offices in the RISE areas** as the first point of contact for participation opportunities in the RISE areas
- **Participation procedures from DIPAS** provide a geo-based overview of participation procedures that have already been carried out

Fig. 3: HafenCity Universität

Citizens Engagement in ANN RADAR - Template

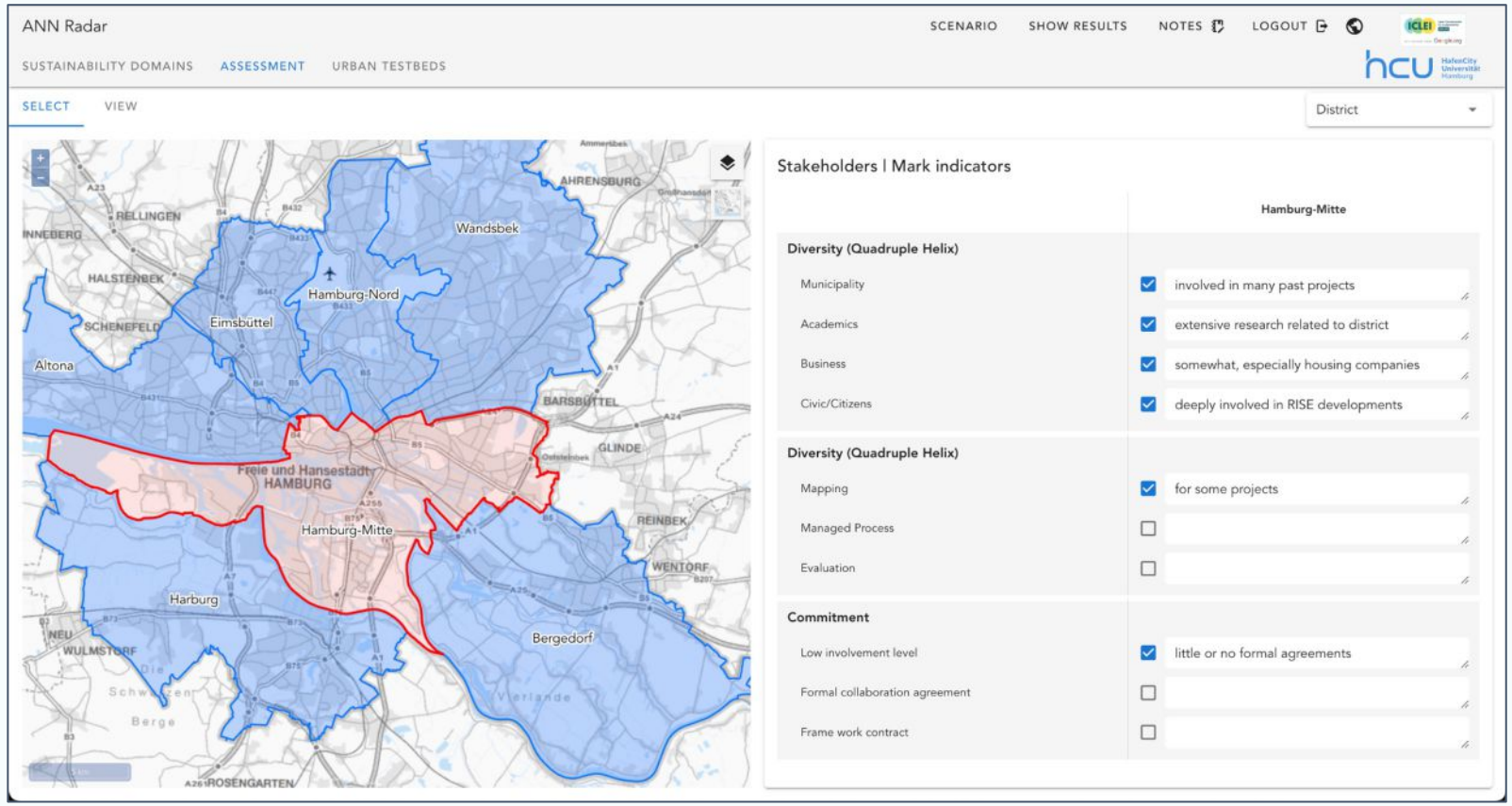


The template can be used to record participation procedures that have already been carried out. The categories are intended to provide information on the depth and breadth of participation:

- the project description provides the basic data
- objectives provide information on the scope and extent and represent the "participation promise“
- infrastructure & Instruments includes the resources that the "Engagement Initiator" provides for the process
- the formats provide information on what was done to reach people

Fig. 4: ANN RADAR Prototype

Stakeholder Engagement in ANN RADAR - Template



The template can be used to record stakeholder participation that has already taken place. The categories should provide information on the depth and breadth of participation:

- the project description provides the basic data
- objectives provide information on what is to be achieved through stakeholder engagement
- infrastructure & Instruments includes the resources that stakeholders provide for the process
- the "engagement level" provides information about the commitment of the partnership

Fig. 5: ANN RADAR Prototype

„We have engaged in exchanges with ANN RADAR from early on in regard to citizens' engagement indicators and the mapping of citizens engagement infrastructures. The documentation of the increasing citizens engagements in our city and districts can be a great asset to the municipal decision-making processes."

Maren Mayer de Groot, District Coordination Office, City of Hamburg

Focus on Experimental Governance by Category

Why is Experimental Governance an important category?

- Experimental governance is increasingly being implemented in cities around the world through living labs, testbeds, platforms, and innovation districts to address a wide range of complex sustainability challenges.
- The aim of experiments is to design, test and learn from innovation in real time in order to respond to particular societal, economic and environmental issues in a given urban place.
- Collaboration is a cornerstone of Experimental Governance where different actors contribute in multiple ways to develop synergistic solutions that cannot be achieved by a single actor.
- Municipalities play a key role in this often public-private partnerships and lead the experimental activities in cities.
- This stretches the responsibilities of local authorities beyond conventional practices of policymaking and regulation to engage in more applied, collaborative, and recursive forms of planning.
- Municipalities can contribute to urban sustainability innovations through experimental governance.

Experimental governance is a mode of policy-making that extends beyond the normal boundaries of the public sector by allowing for a greater degree of collaboration and experimentation in the formulation of the policies.
(Wolfe 2018)

Wolfe, D. (2018), "Experimental Governance: Conceptual approaches and practical cases", Background paper for an OECD/EC Workshop

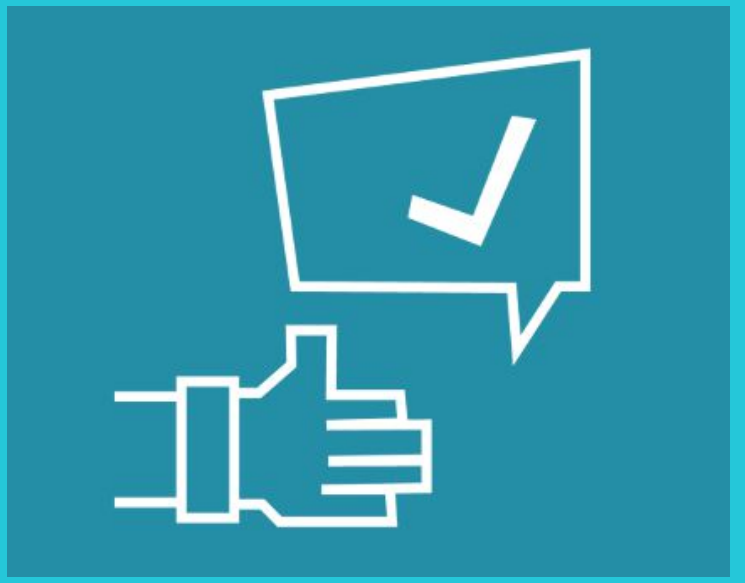
Laakso et al. (2016): Dynamics of experimental governance: A meta-study of functions and uses of climate governance experiments, Journal of Cleaner Production

Experimental Governance and the Strategic Functions of Municipalities

The role of municipalities

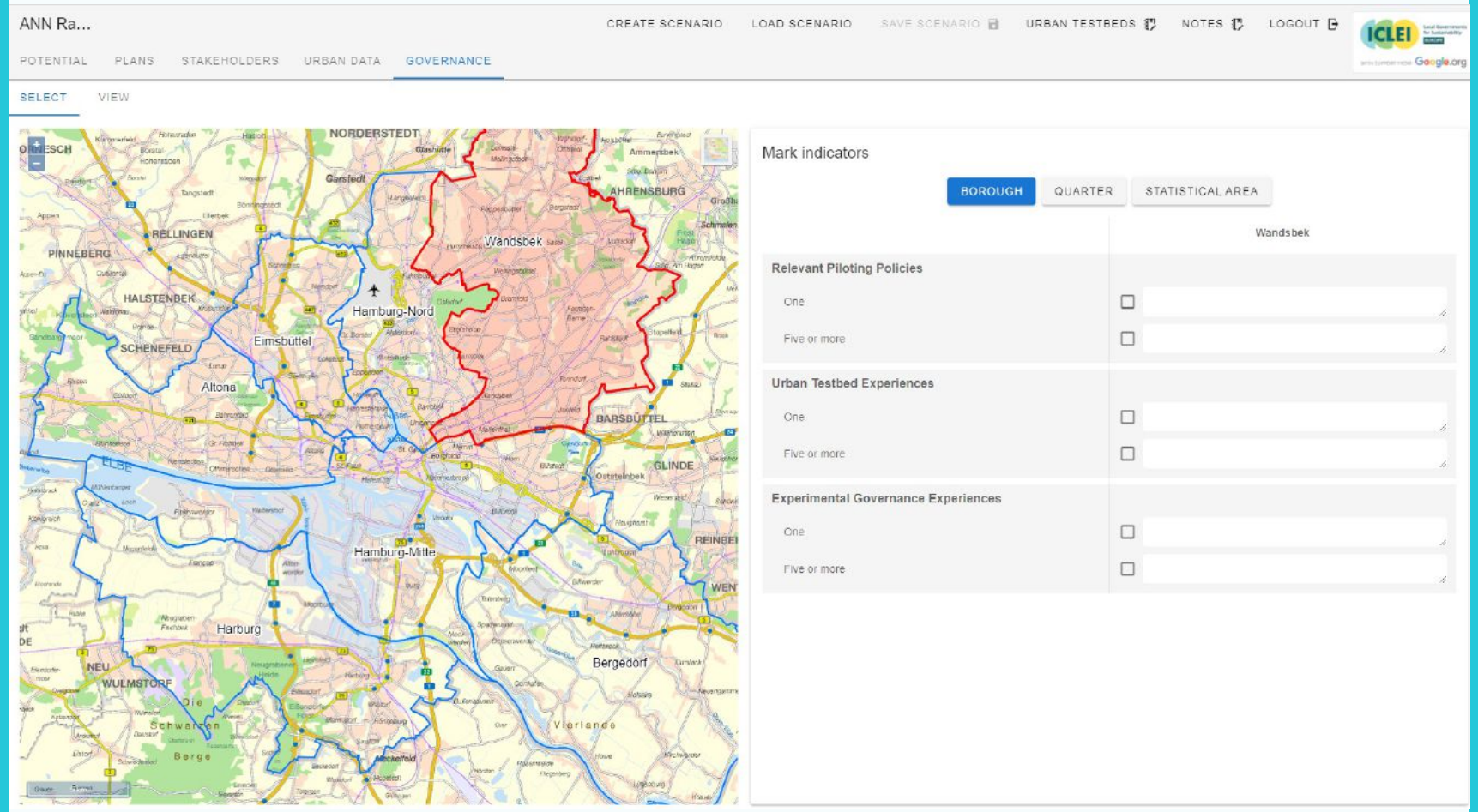
The literature discusses different roles that municipalities can play in the initiation and implementation of urban experiments. In the following, we draw on Eneqvist and Karvonen's (2021) five strategic functions played by municipalities in experimental governance:

- **Visioning**: A primary function for municipalities is to frame values, norms, and perceptions. Municipalities are often the driving force in visioning processes to steer local stakeholders towards long-term collective urban planning goals.
- **Facilitating**: Municipalities facilitate engagement between urban stakeholders by building trust, developing contacts, identifying resources and maintaining a common agenda.
- **Supporting**: Municipalities provides services, resources, infrastructure, buildings, open spaces and permits to support experimentation; but they do not actively participate in experimentation in this functions.
- **Amplifying**: The amplifying function focuses on the upscaling and transferability of the results of experiments through replication and diffusion.
- **Guarding**: Municipalities has to ensure that public values are upheld in the problem definition and implementation of experiments and that they are in line with existing local policies.



Eneqvist, E. & Karvonen, A. (2021): Experimental Governance and Urban Planning Futures: Five Streategic Functions for Municipalities in Local Innovation, Urban Planning, 6 (1), 183-194

Experimental Governance in ANN RADAR – Data Layer



The template can be used to record Experimental Governance experiences that have already been carried out. The following categories should give an insight into the experimental governance policies, resources and experiences on a local level:

- Identify piloting policies: collect documented and agreed piloting policies
- Identify experimental governance experiences: find examples for piloting policies and experimental governance applied
- Puplic ressources: Buildings, personal, budgets, permits

Fig. 6: ANN RADAR Prototype

ANN RADAR
Guided Tour

The ANN RADAR Prototype

A guided tour of the ANN RADAR prototype leading through a realistic scenario for identifying urban testbeds for sustainability and climate mitigation action.

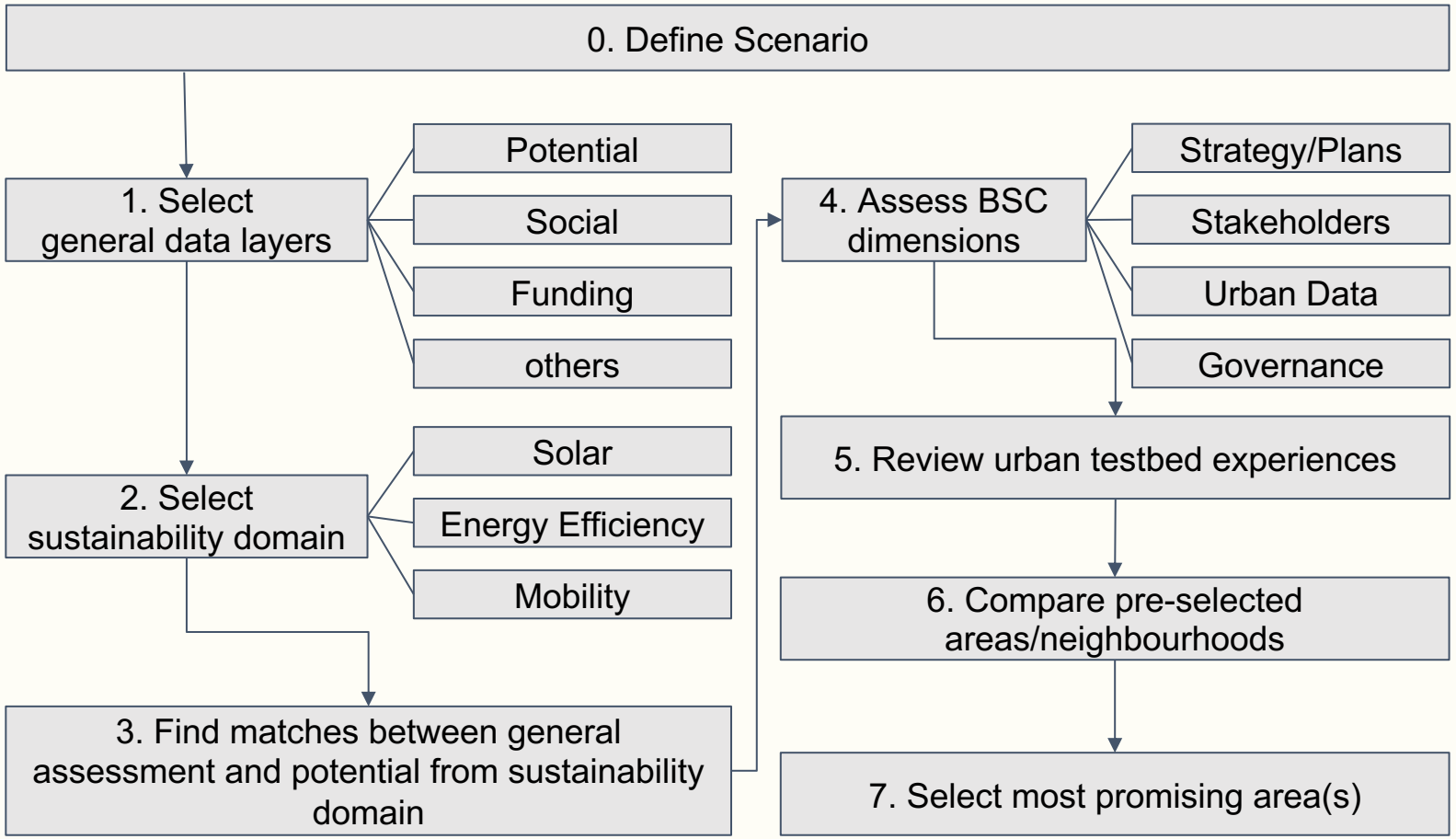
In this guided tour, a prototypical click-through is documented with all the elements choosing a scenario, selecting a sustainability theme, opting for relevant data filters, identifying and understanding existing urban testbeds or model quarters as reference in the local areas of interest, applying the balanced scorecard principle and viewing of results for discussion

The ANN RADAR - workflow is organised in three pillars

opportunity for testbed to explore and drive sustainability action

1	2	3
assess general suitability of areas	assess sustainability domains	assess local experiences and plans
funding schemes	solar energy	strategy & plans
social / demographic structure	energy efficiency	stakeholder engagement
social infrastructure	mobility	urban data
		experimental governance

The ANN RADAR assessment and selection process can be organised like this



ANN RADAR provides three main views:

1. Sustainability Domains
Assessment of physical potential and general properties of areas

2. Balanced Score Card (BSC) Assessment
Validation of plans and strategies, stakeholder involvement, urban data availability and experimental governance experiences

3. Urban Testbeds
Assessment of existing urban testbed experiences and projects

Selection of general data layers is driven by the scenario and it’s goals

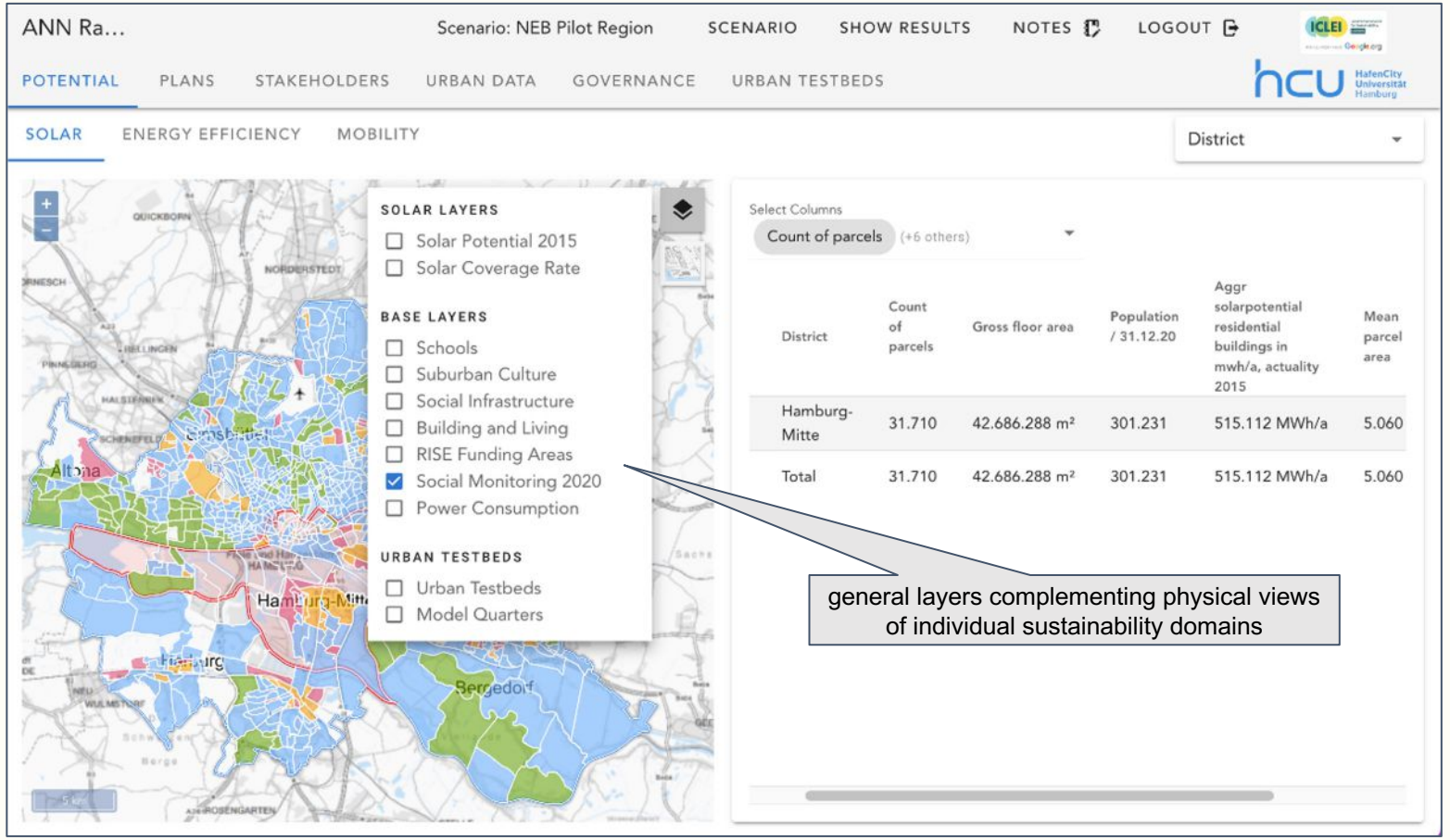


Fig. 7: ANN RADAR Prototype

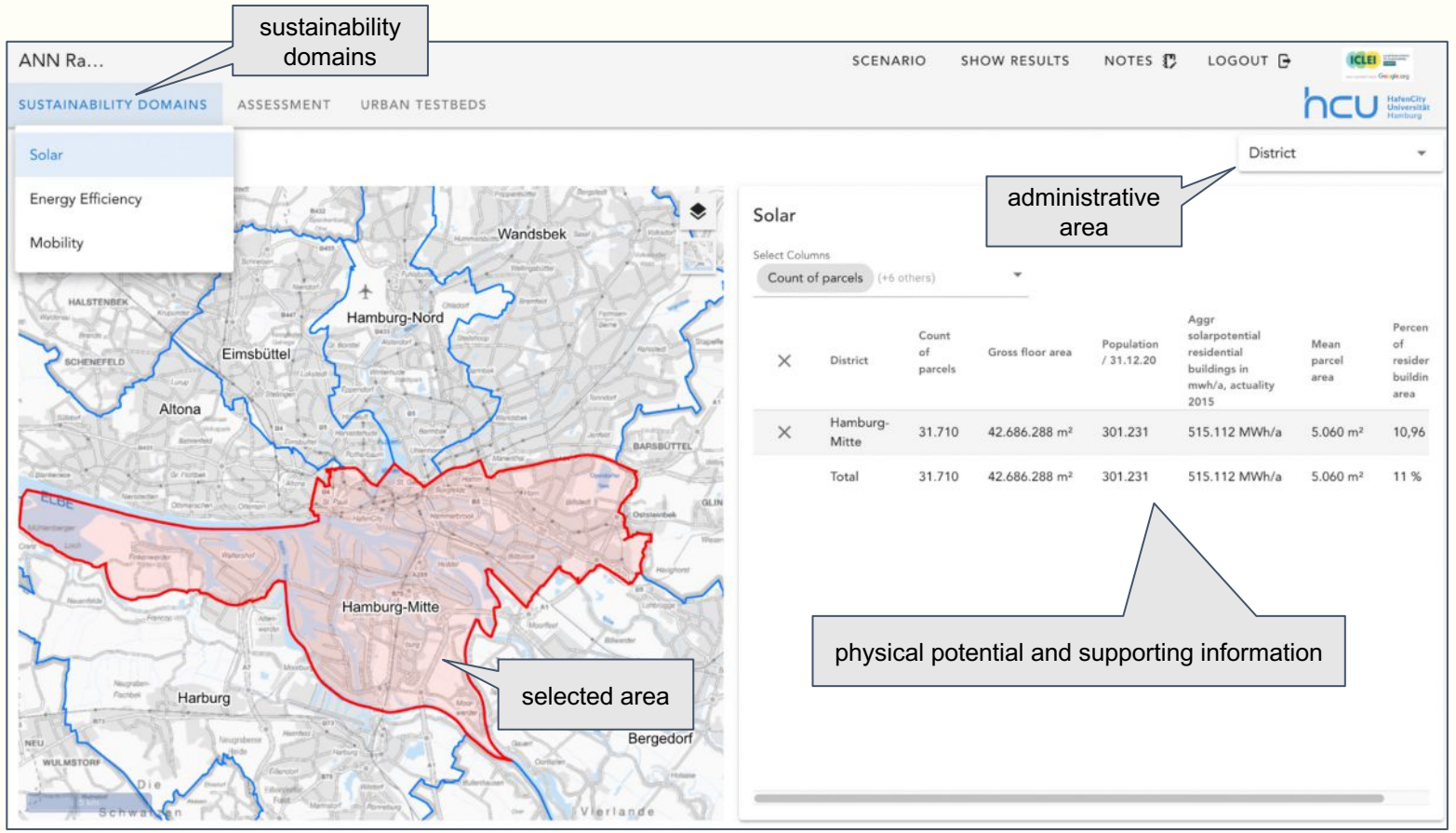
Selecting the relevant data layers depends on the goals and focus of the scenario selected. These data layers will be used to complement the physical view on topics like mobility, energy efficiency or solar potential.

General layers could be:

- Social structure/social monitoring
- Schools
- Social infrastructure like cultural hubs, neighbourhood centers…
- Power consumption of buildings

These layers allow to assess supporting information to understand the environment and local conditions which may influence the selection of an urban testbed for experimentation.

Sustainability domain views reveal details about the physical potential for each domain



District	Count of parcels	Gross floor area	Population / 31.12.20	Aggr solarpotential residential buildings in mwh/a, actuality 2015	Mean parcel area	Percen of resider buildin area
Hamburg-Mitte	31.710	42.686.288 m²	301.231	515.112 MWh/a	5.060 m²	10,96
Total	31.710	42.686.288 m²	301.231	515.112 MWh/a	5.060 m²	11 %

Selecting the sustainability domain sets the focus on one physical dimension and the assessment of the associated potential gains in this domain.

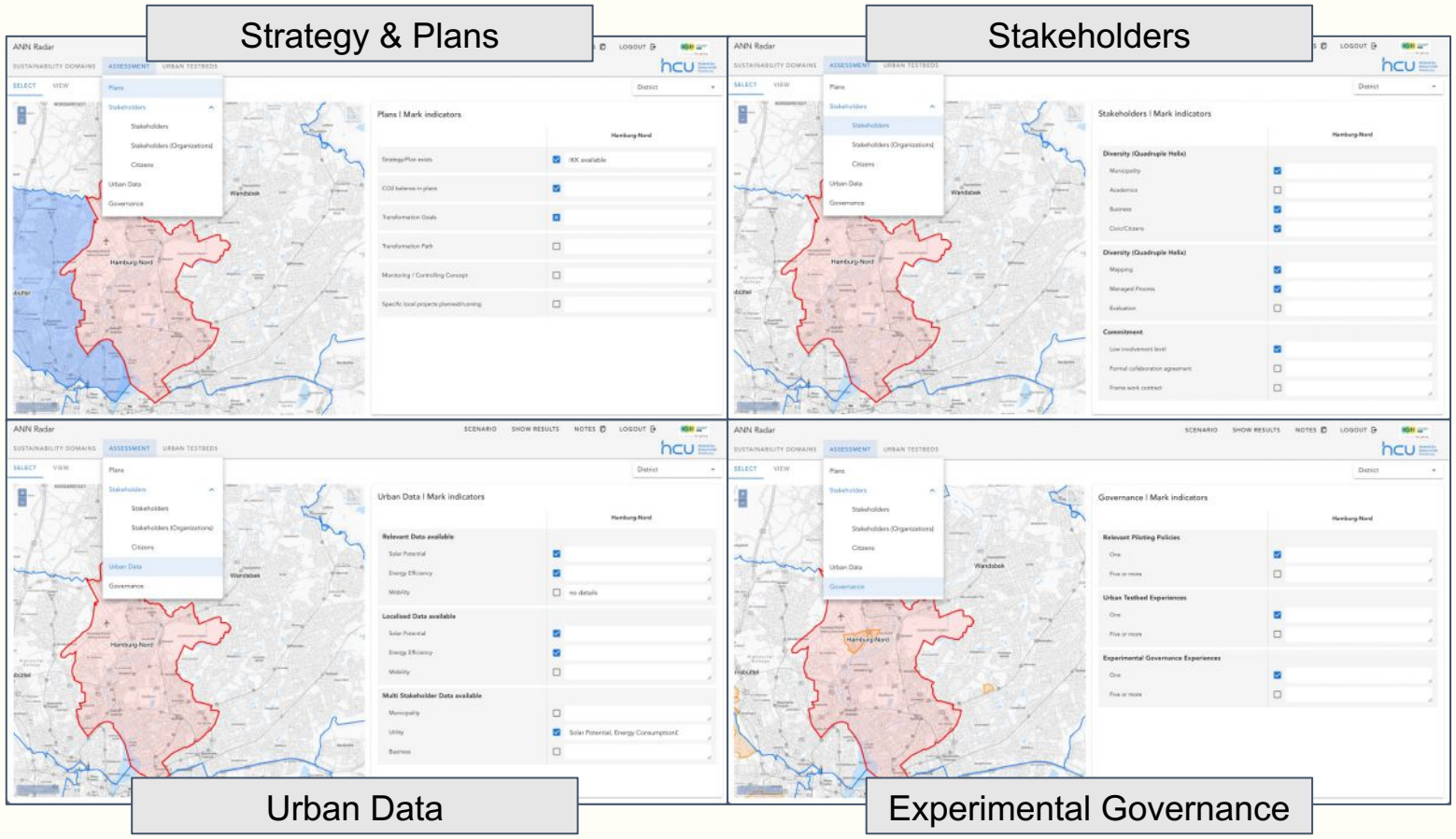
Selecting the administrative level defines at which granularity the assessment shall be made.

Pointing and clicking on the map selects an administrative area and shows selected indicators to quantify the potential and provide supporting information (table on the right).

Usually a drill down to the statistical area or building block is recommended.

Fig. 8: ANN RADAR Prototype

The Balanced Scorecard (BSC) provides insights into critical success factors for testbeds



Investigating the four dimensions of the Balanced Score Card helps to understand the maturity of the selected areas in terms of urban testbeds and urban experimentation.

Strategy & Plans
Currently many cities develop strategies and plans how to mitigate climate impact. These ambitions will be assessed and evaluated.

Stakeholders
Climate action requires multi stakeholder engagement. Here it is important to assess the experiences and practices of the respective area and the responsible public administration.

Urban Data
ANN RADAR provides data driven decision support, thus the availability and accessibility of urban data is essential.

Experimental Governance
Expertise and experience in providing "space" for experimentation by temporarily deregulating current rules or law opens up opportunities for urban experimentation.

Fig. 9: ANN RADAR Prototype

A look into the individual assessments sharpens the understanding for local particularities

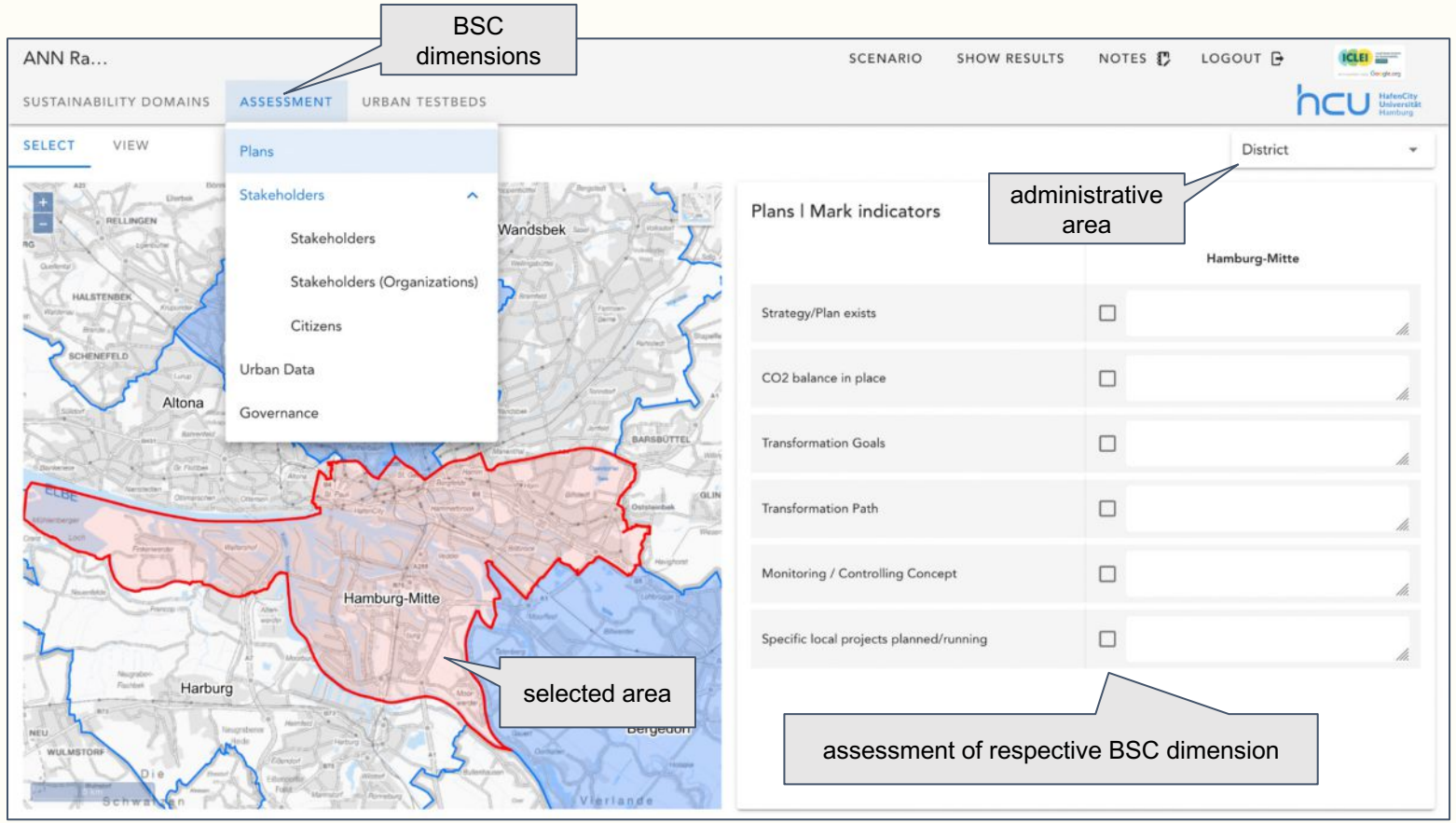


Fig. 10: ANN RADAR Prototype

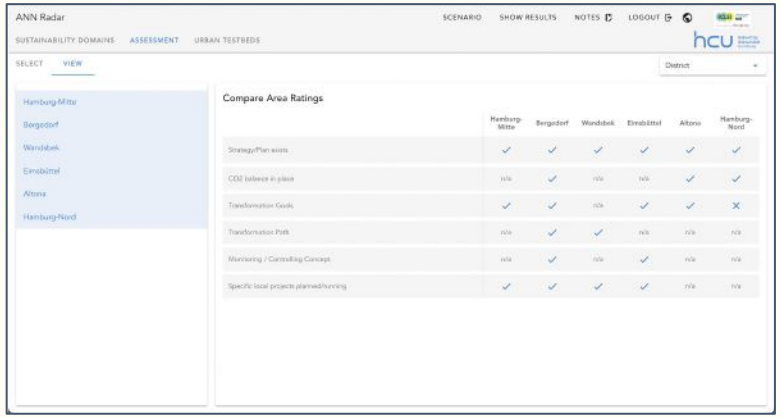
Assessing the BSC dimensions, Plans, Stakeholders, Urban Data and Governance provides deeper insight and understanding of the maturity of the selected area.

Each dimension addresses critical capabilities and success factors for running urban testbeds and experiments.

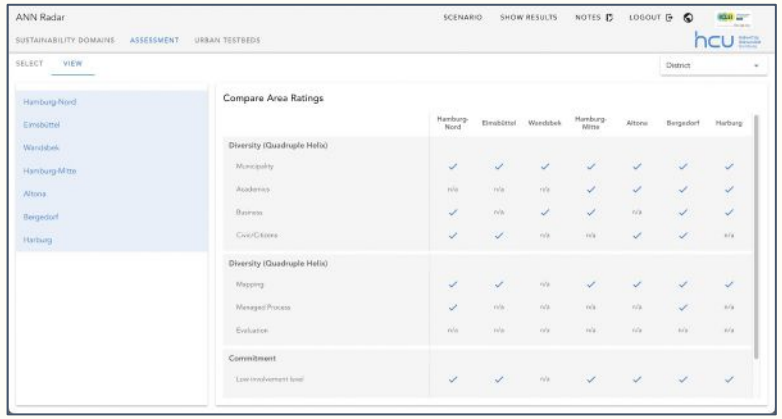
Assessing ambitions and plans (Plans), exploring experiences in stakeholder management and engagement (Stakeholders), exploring urban data availability and quality and finally assessing experiences and ambitions related to experimental governance provide deep understanding of these important ingredients for successfully executing urban experimentation.

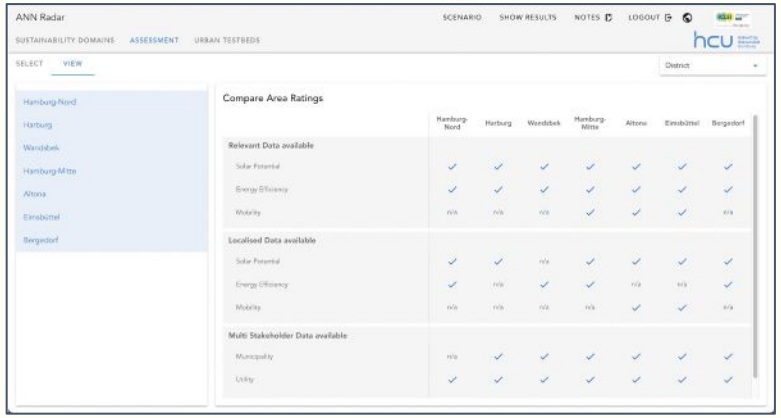
Comparing areas along the four BSC dimensions reveals differences and guides decisions

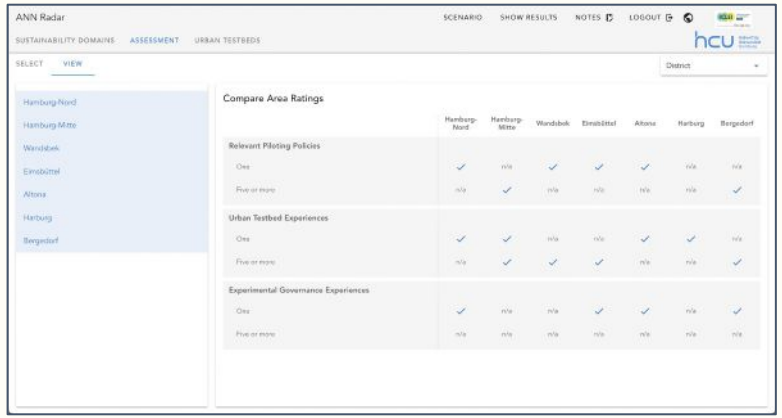
Strategy & Plans



Stakeholders







Urban Data

Experimental Governance

To compare short listed urban areas regarding a BSC dimension, the selected areas can be shown in a list view where the scores for each area are shown.

This view allows to comprehend the differences at first sight and analyse how these differences may impact the selection of an area for urban experimentation and if adjustments to the underlying information need to be made.

This comparison view is provided for all for BSC dimensions.

- Strategy & Plans
- Stakeholders
- Urban Data
- Experimental Governance

Fig. 11: ANN RADAR Prototype

The results view offers a compact multidimensional comparison of the selected areas

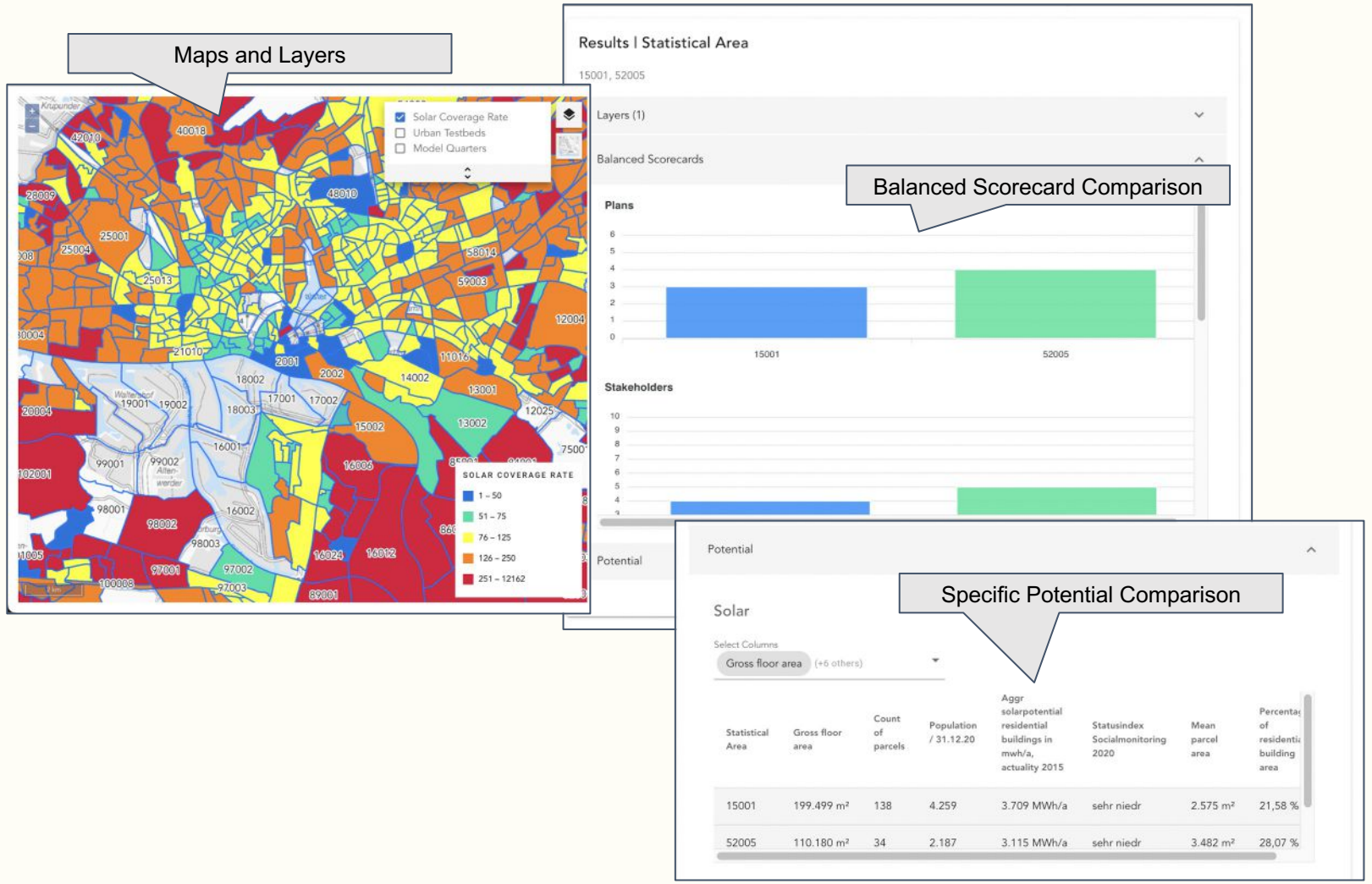


Fig. 12: ANN RADAR Prototype

After the previous steps have been finalised the scoring and physical potential for the selected areas can be viewed in a summary report.

This report shows the physical potential for the selected areas and the individual scores per Balanced Score Card dimension.

The selection and view can be stored as a scenario to be recalled later for further investigation and enhancements.

A layer for testbeds and model quarters provides insight into local testbed experience

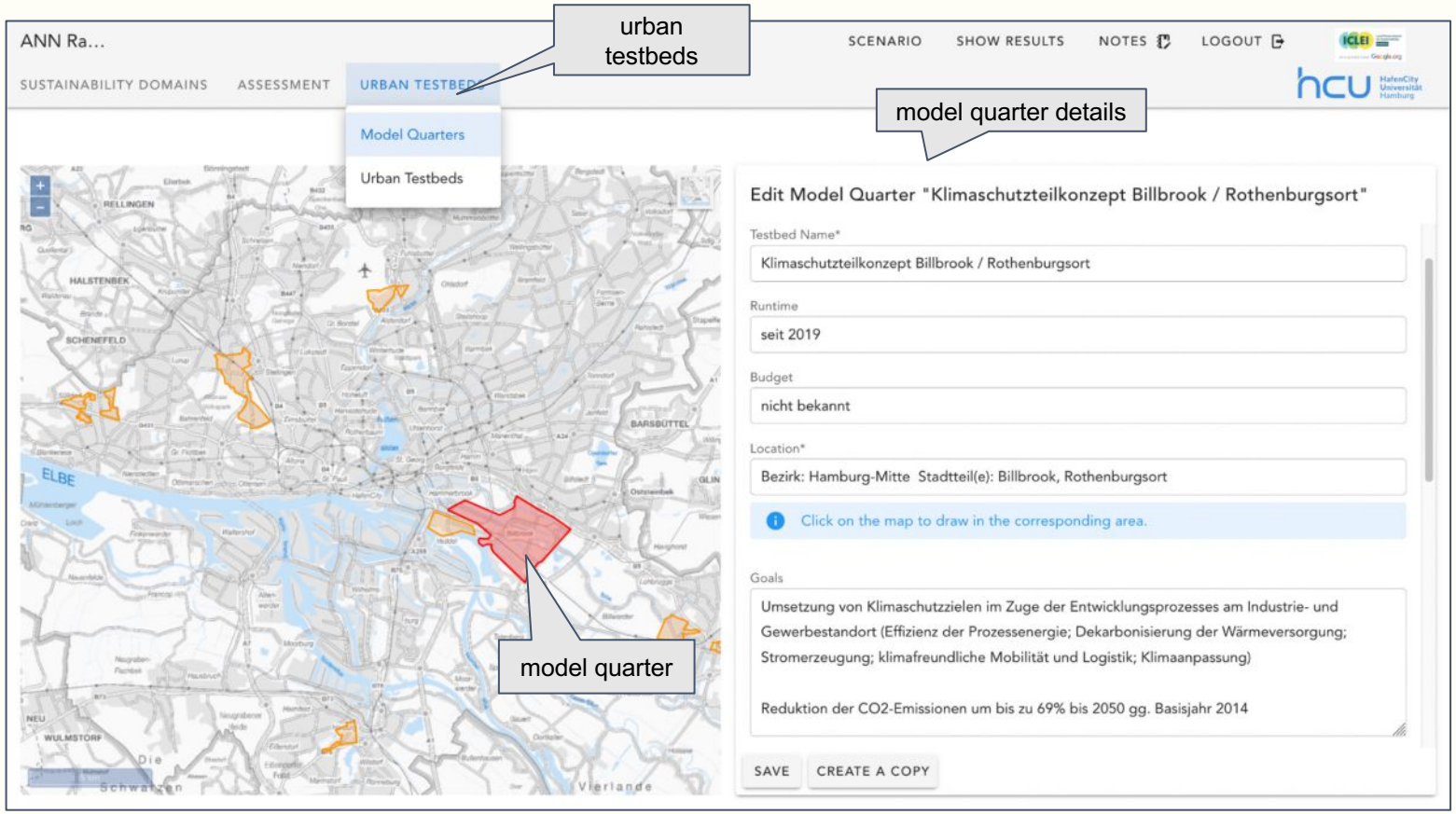


Fig. 13: ANN RADAR Prototype

Recording and viewing urban testbeds (Model Quarters, Urban Testbeds) provides deeper insights into the currently running and completed projects in the area.

Details about the practical experiences of the areas under consideration for new urban testbeds become visible and can be used to deliberately draw conclusions regarding the prerequisites and capabilities to start new experiments in selected areas.

The information about the test beds is closely related to the BSC dimensions Plans, Stakeholders and Governance and should be considered as a contribution to the BSC assessment.

The scenario “New European Bauhaus” shows one way of using ANN RADAR

Scenario: European/national funding for scalable sustainability action
(e.g. New European Bauhaus)

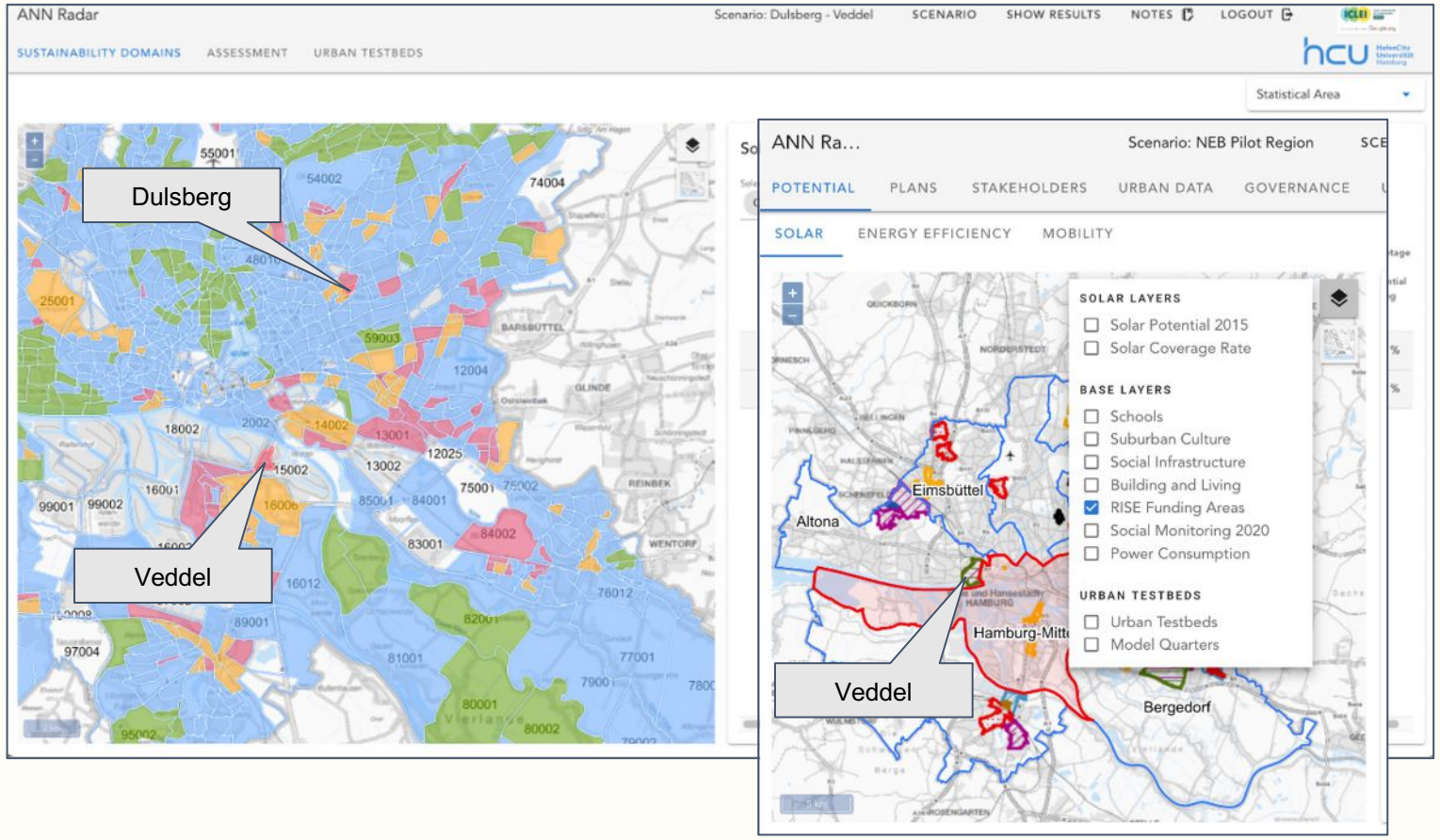
Objectives:

- Find suitable pilot areas to address challenges defined by fundgiver
- Drive sustainable and climate mitigation action in the built environment in a pilot area
- Identify potential for co/match/continued financing
- Engage multiple stakeholders
- Built socially inclusive solutions
- Protect vulnerable communities
- Engage multiple stakeholders and citizens

ANN RADAR supports data driven collaborative decision making by leveraging local urban data in a facilitated process with tangible outcomes.

references

The basic layers provide first insights and guide selections for deeper investigation



In our "New European Bauhaus" case, social inclusion and supporting challenged communities is an important goal.

The social monitoring layer provides a detailed overview of the social status of each statistical area and allows to select those with a low status.

Alongside this indicator knowledge of running inclusion programs and associated funding schemes is helpful to identify areas with high potential for running a successful urban testbed.

The layer for RISE areas (social status low, program for increasing livability and social inclusion running) provides a way to identify suitable places in Hamburg.

Fig. 14: ANN RADAR Prototype

Taking a look at solar potential in relation to household's consumption

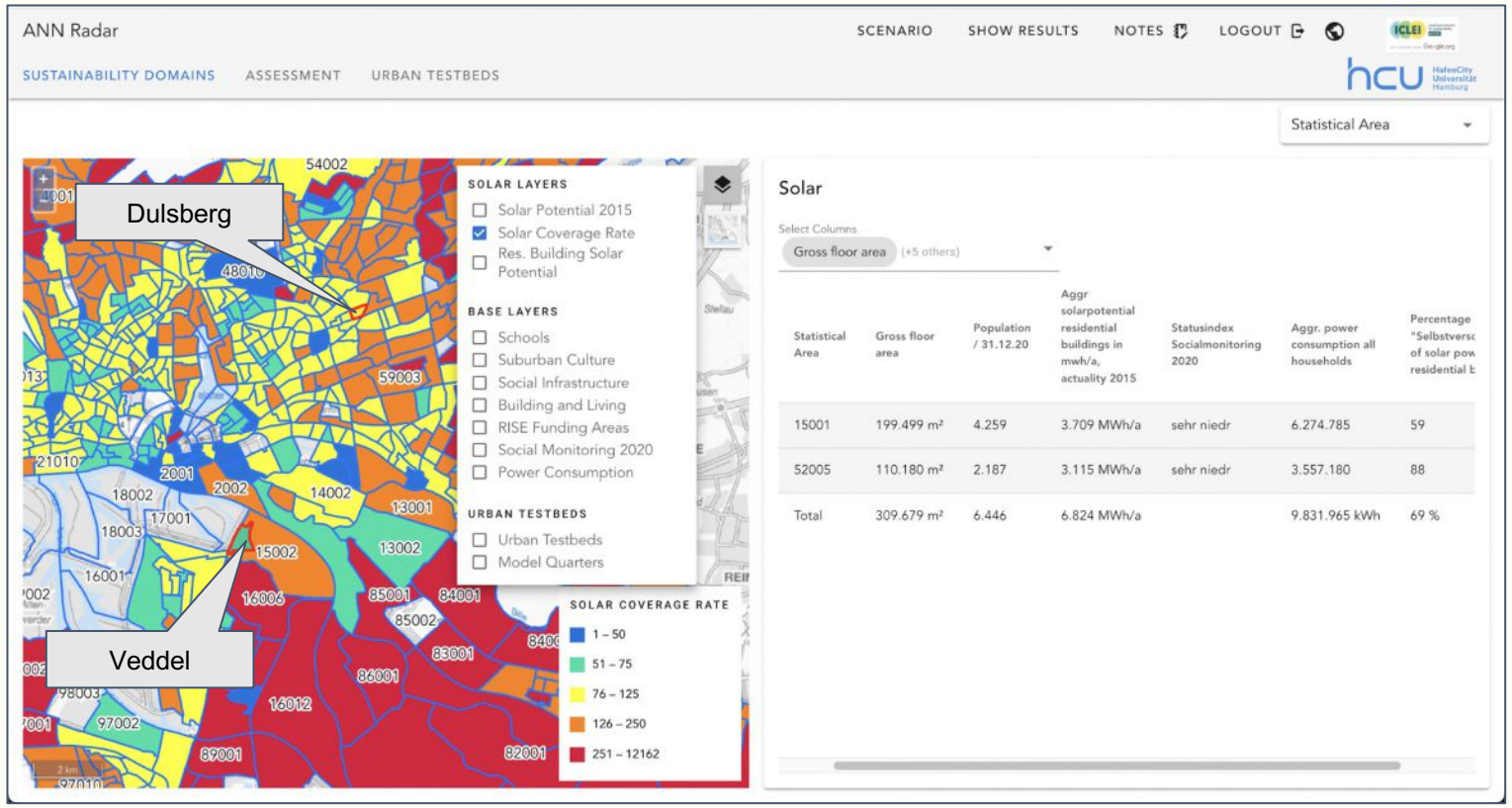


Fig. 15: ANN RADAR Prototype

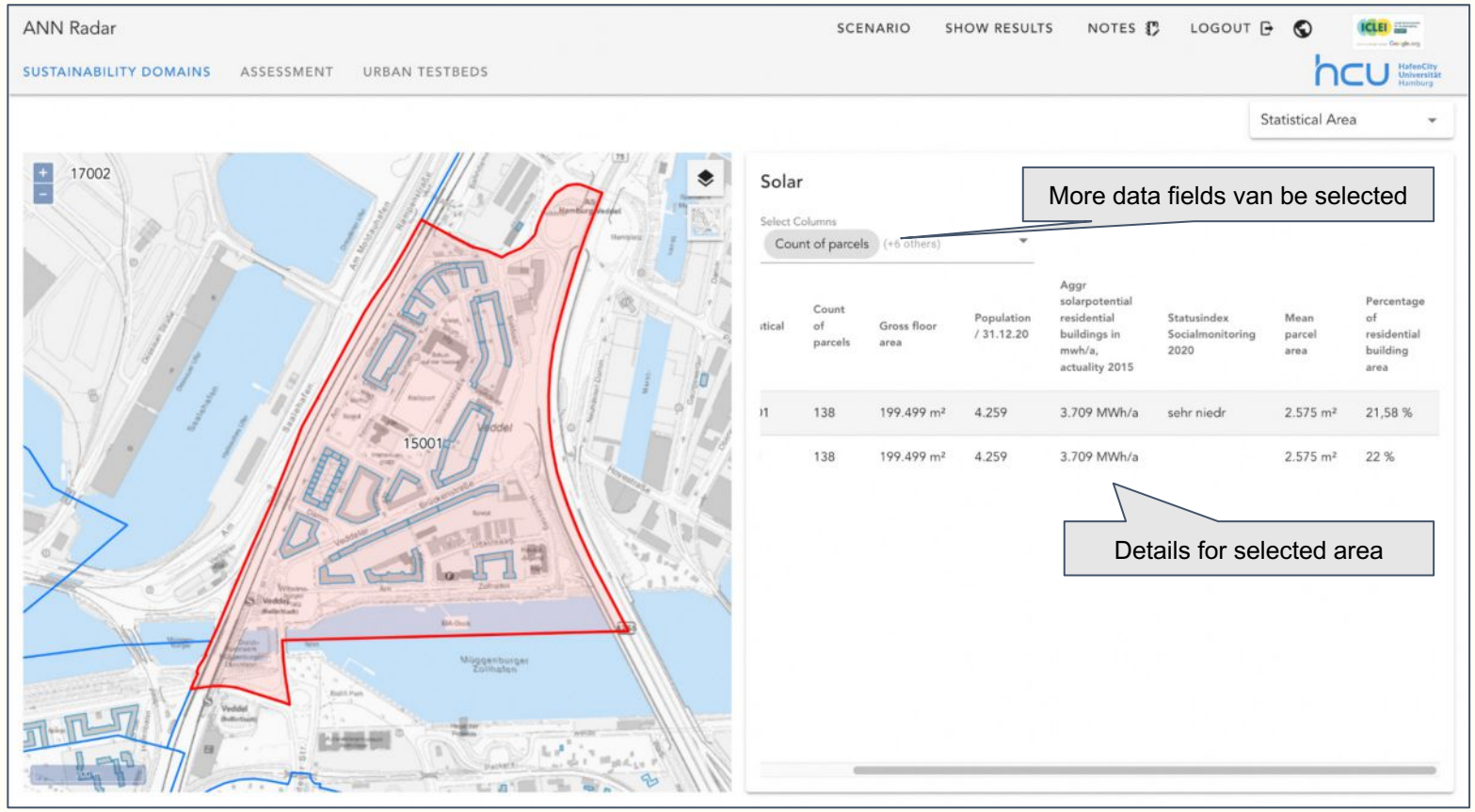
Finding suitable areas to establish solar energy harvesting would benefit if production and consumption of the energy would be geographically close to each other.

To assess the opportunity ANN RADAR provides a view which shows the solar potential related to the estimated consumption of electrical energy by the households in the area.

We took the mean consumption of electrical energy from national statistics for typical household sizes and applied these to the household sizes provided by the urban data hub.

At first sight we see that the solar coverage rate in Dulsberg (59%) at the statistical area level looks better than in Veddel (59%). However, to find suitable buildings we may want to take a closer look at the building block level

A deeper dive into the selected areas reveals details of the identified areas



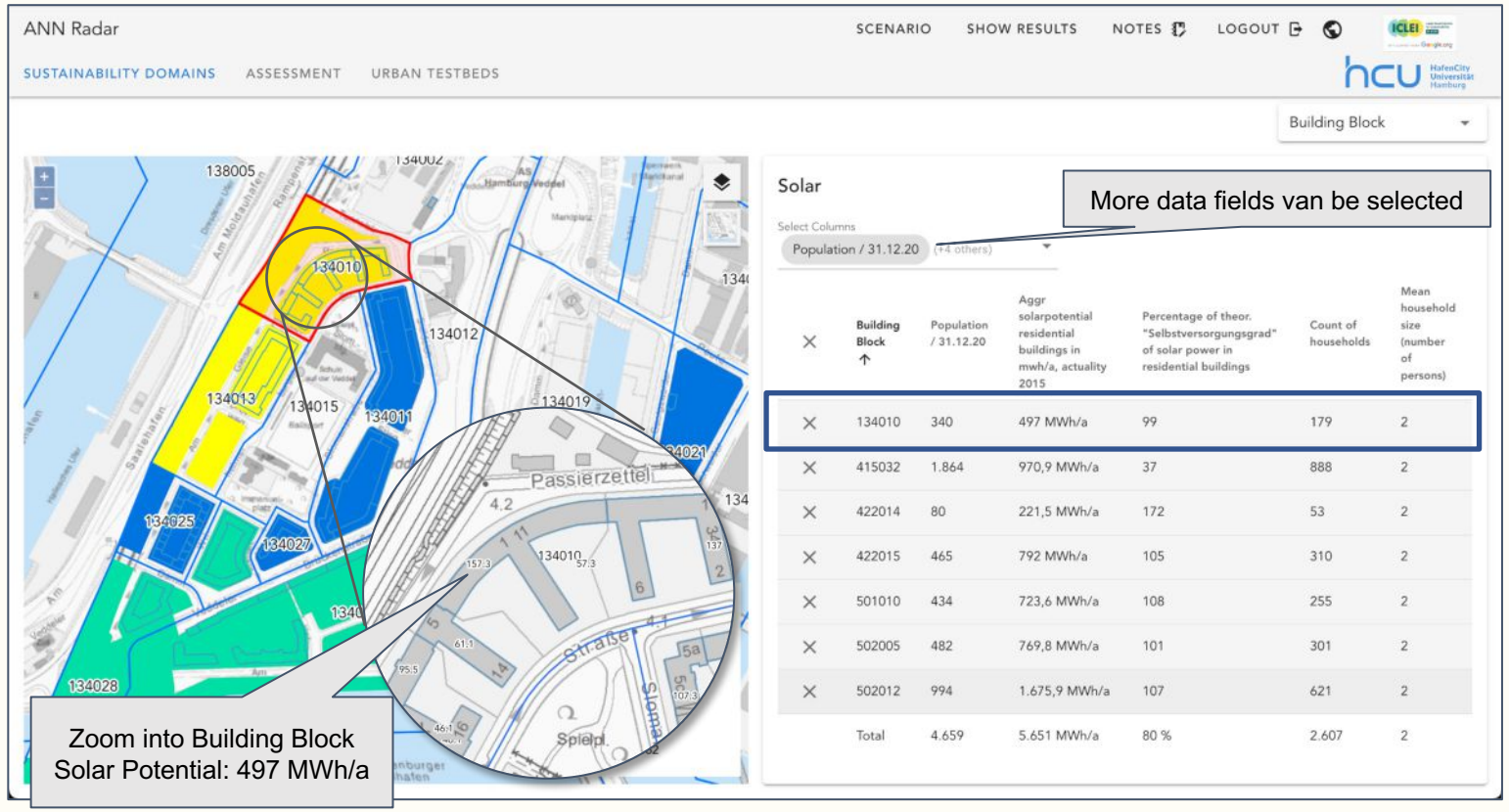
Details for the selected area (in this case a part of Veddel) show that there a significant residential population of 4259 people is present and that the social index is very low.
22% of the area is covered with residential buildings.

The total solar potential from all residential buildings in the statistical area is 3,709 MWh/a.

This looks like a reasonable prerequisite to dive deeper into the details (next page).

Fig. 16: ANN RADAR Prototype

Drilling down to the building block level shows some more relevant facts



Building Block	Population / 31.12.20	Aggr solarpotential residential buildings in mwh/a, actuality 2015	Percentage of theor. "Selbstversorgungsgrad" of solar power in residential buildings	Count of households	Mean household size (number of persons)
134010	340	497 MWh/a	99	179	2
415032	1.864	970,9 MWh/a	37	888	2
422014	80	221,5 MWh/a	172	53	2
422015	465	792 MWh/a	105	310	2
501010	434	723,6 MWh/a	108	255	2
502005	482	769,8 MWh/a	101	301	2
502012	994	1.675,9 MWh/a	107	621	2
Total	4.659	5.651 MWh/a	80 %	2.607	2

Exploring the details for building block 134010 shows that 340 people in 179 householods live there meaning that approximately 2 people live in each household. This allows us to estimate the demand for electrical energy per household and the building block in total (estimate from utility company for household electricity consumption).

Comparing this number to the potential solar energy harvesting capacity of the building roofs allows to get a rough estimate for the potential coverage of the electricity consumption of the residents by harvesting energy from photovoltaic installations on the rooftop of the buildings.

An estimate of 99% coverage looks promising and we might select this building block to take it to the next step of our exploration validating the findings with more detailed information, e.g. construction plans, cadastral records and many more.

Fig. 17: ANN RADAR Prototype

Assessing the BSC dimension strategy & plans at the higher level

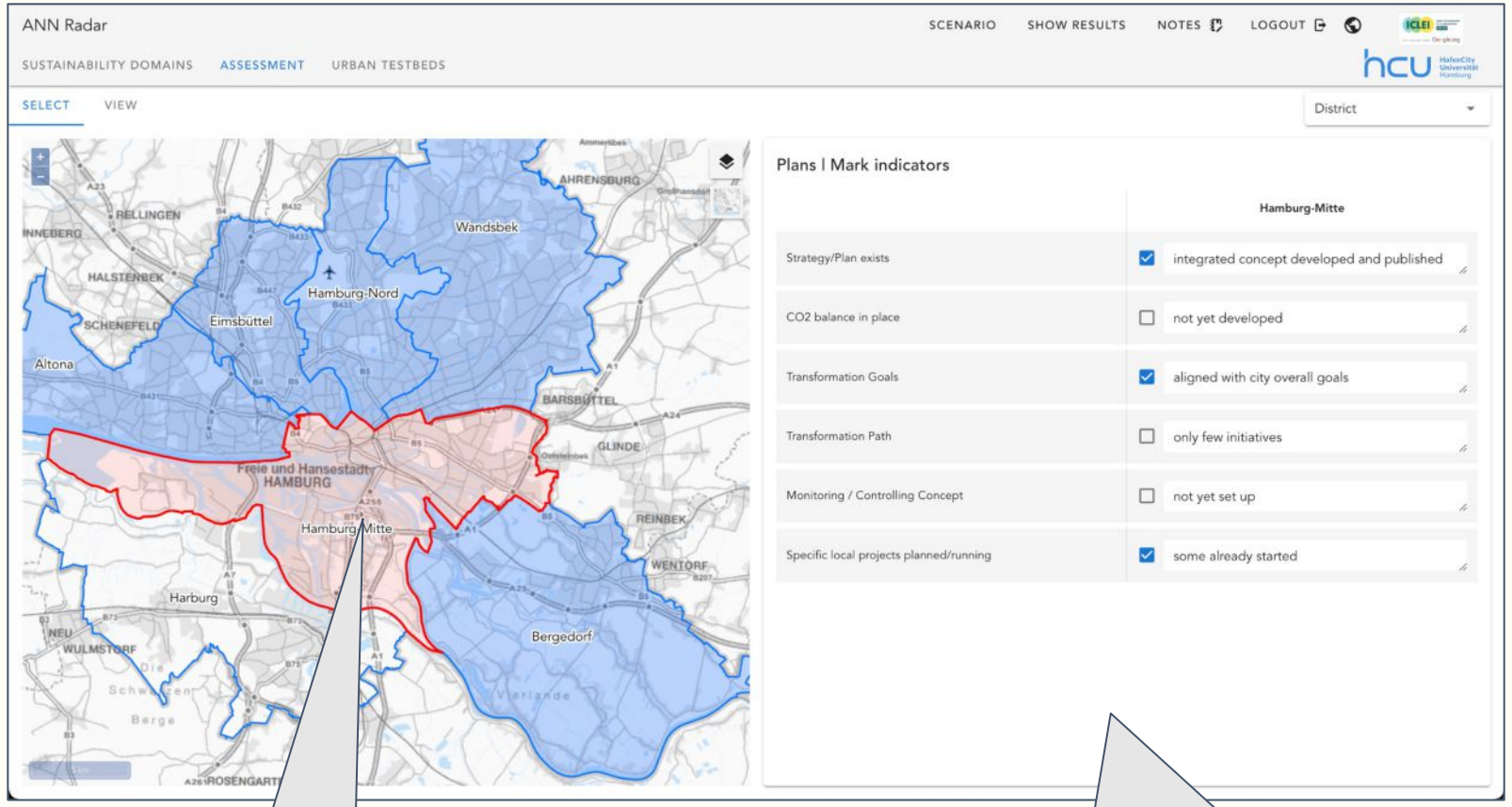


Fig. 18: ANN RADAR Prototype

BSC Dimension Strategy & Plans

In Hamburg climate protection strategies and plans are developed at a city and district level. Thus a comparison has to happen at the district level.

For the district Hamburg-Mitte where Veddel is loacted, an integrated climate protection plan has been developed and published.

This plan contains transformation goals but not a comprehensive plan of measures to achieve these goals.

Climate monitoring has not yet been designed or implemented.

A few projects to address climate challenges have already been kicked off.

Assessing the BSC dimension Stakeholders at the higher level

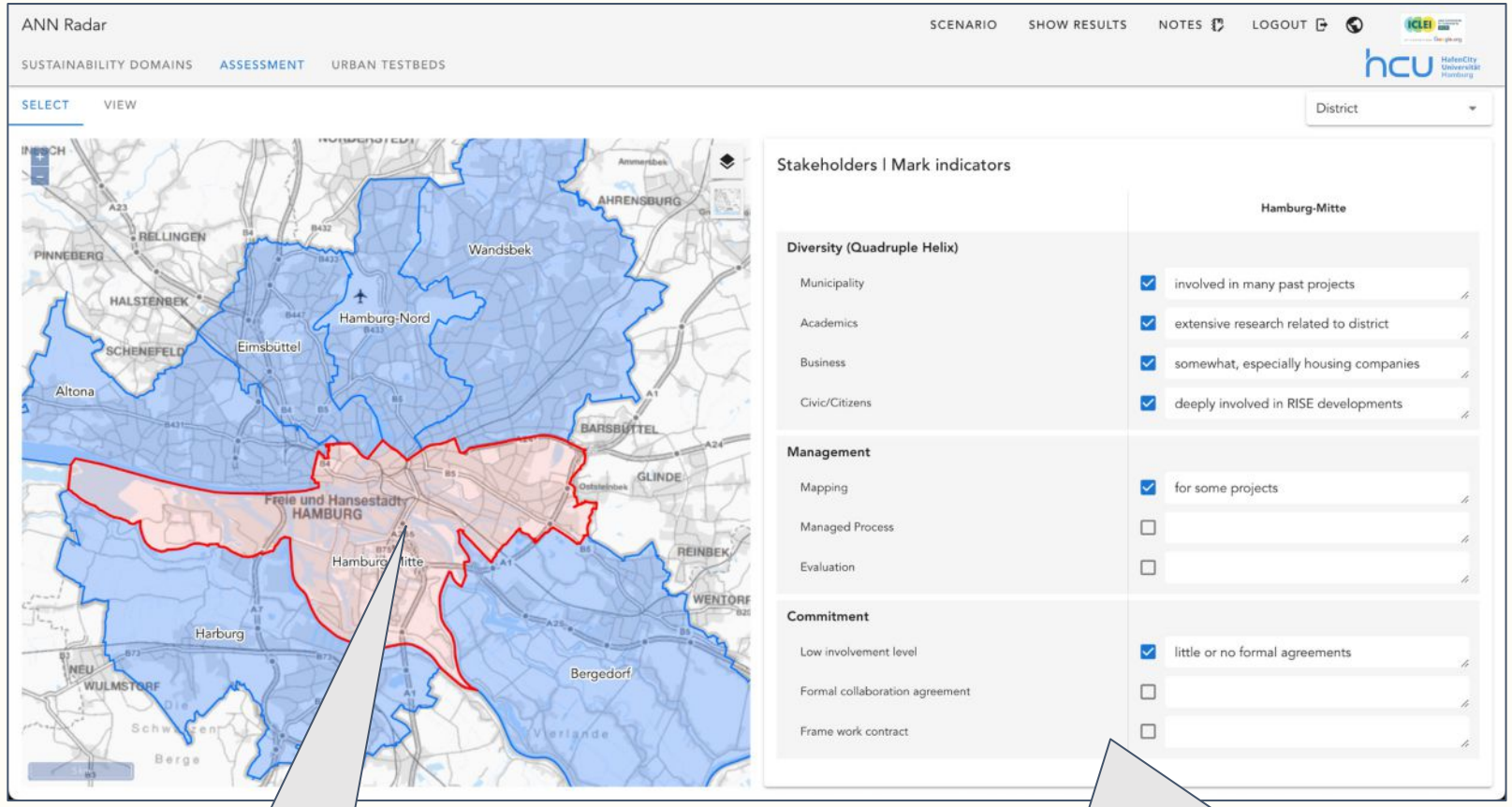


Fig. 19: ANN RADAR Prototype

BSC Dimension Stakeholders

Stakeholder involvement is a critical factor for ueband testbed's success. Thus, managing and engaging stakeholders becomes an important factor for selecting testbed candidates.

The first category assesses the diversity of stakeholders involved following the Quadruple Helix theory.

The second category records how the process is managed, assessing the maturity of the activities conducted.

The third category evaluates how deeply stakeholders had been involved and how formal the involvement was set up.

Assessing the BSC dimension Urban Data at the higher level

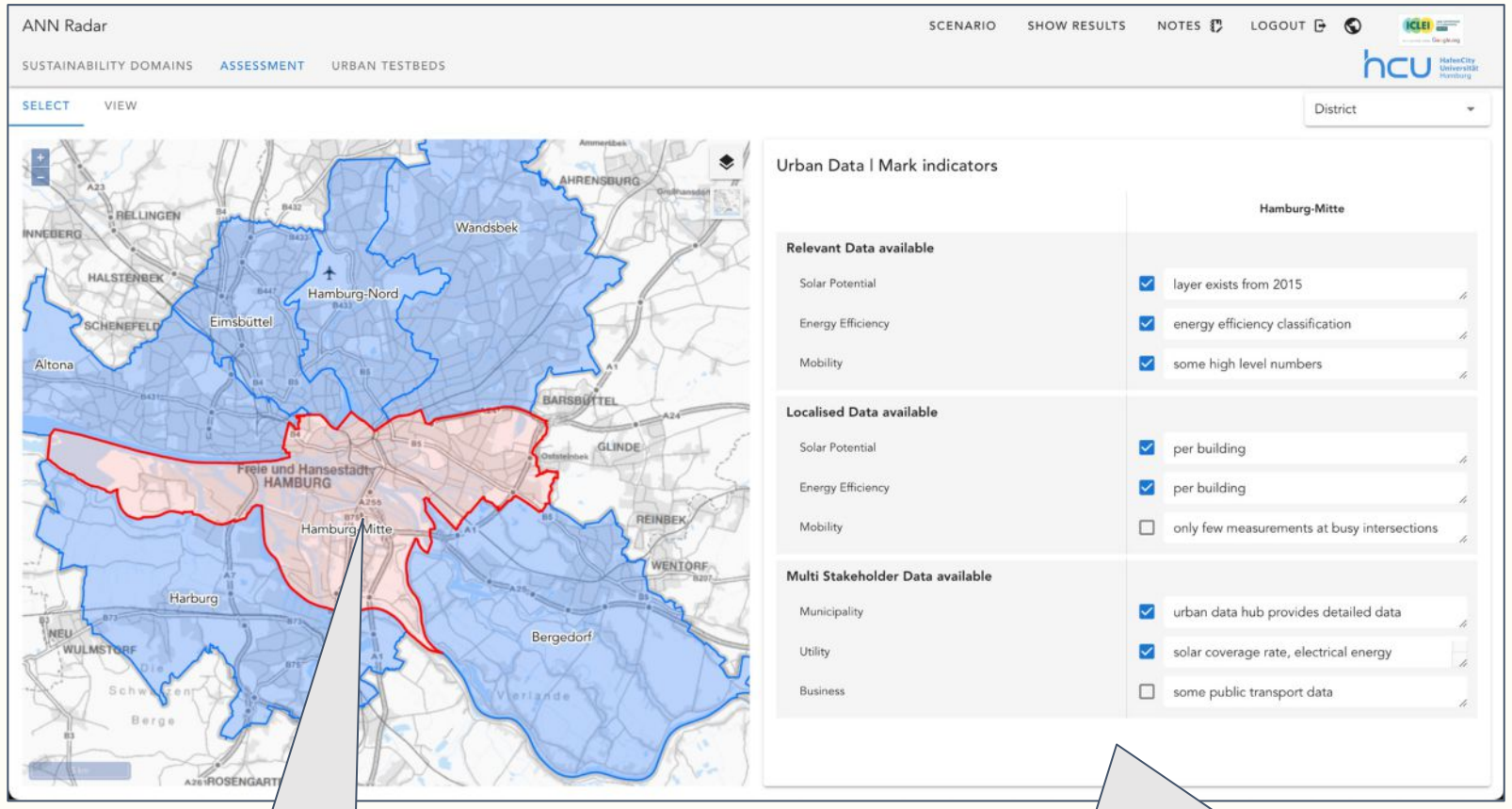


Fig. 20: ANN RADAR Prototype

BSC Dimension Urban Data

Urban data can significantly help to identify urban testbeds and provide unbiased insights into relevant parameters for the selection decision.

Here the availability of relevant data for the selected physical dimension, it's granularity (how fine grained is the data?) and how diverse the data contributors are (in our case municipality and utility companies were in focus although this could be expanded by others like public transport companies) can be recorded and retrieved.

Assessing the BSC dimension Governance at the higher level

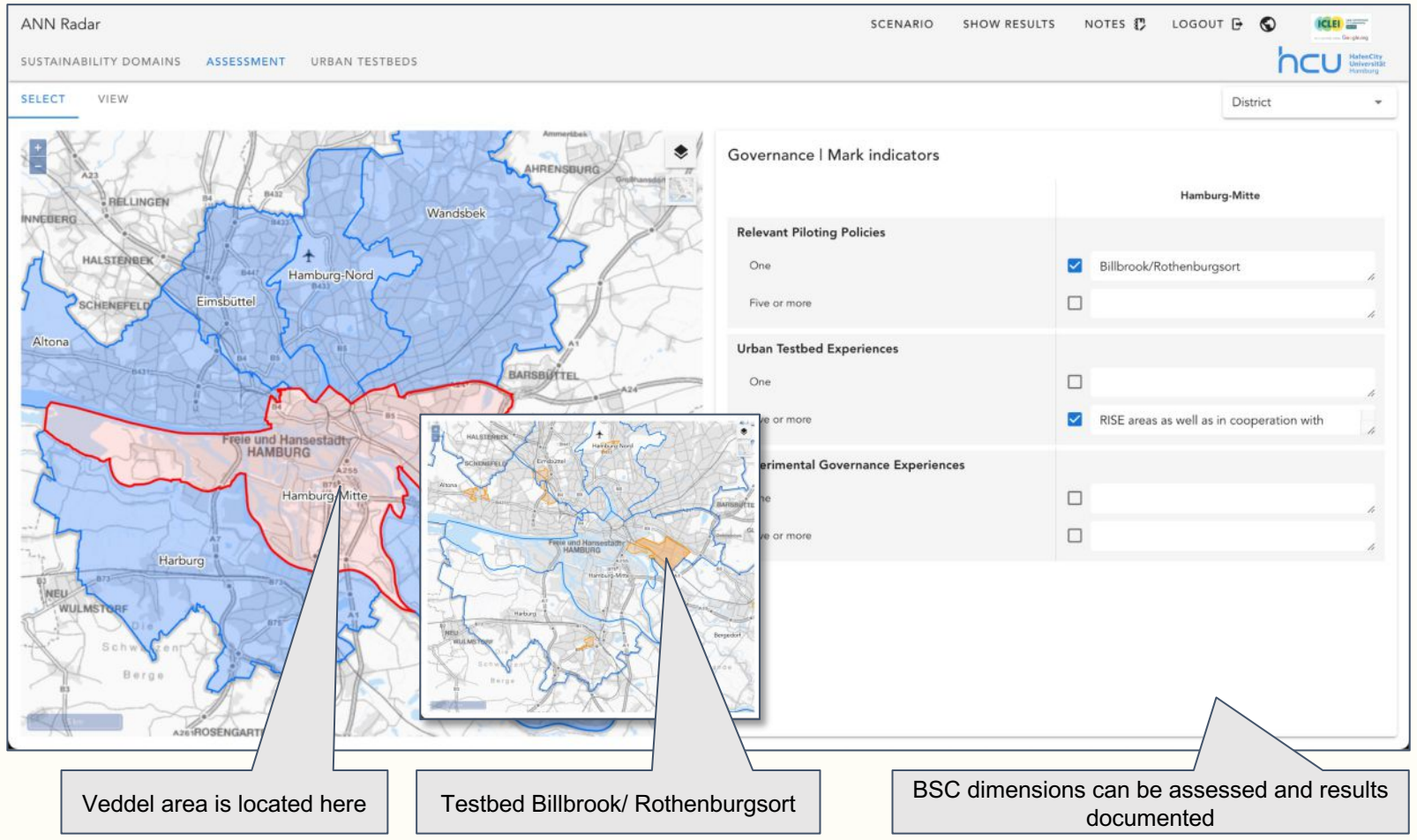


Fig. 21: ANN RADAR Prototype

BSC Dimension Governance

To support development of urban testbeds a piloting policy can help to frame programs as well as funding schemes and joint activities with multiple stakeholders to start urban experimentation.

Urban Testbed Experiences provide evidence that the area/district is prepared to run experiments and prerequisites have been met in the past. This could also indicate that resources to support urban testbeds are still available.

Since urban testbeds are established to explore new and innovative approaches it is very likely that these contradict existing laws and regulations. So in many cases it is important to provide exemptions from the current regulations.

Mobility view in ANN RADAR

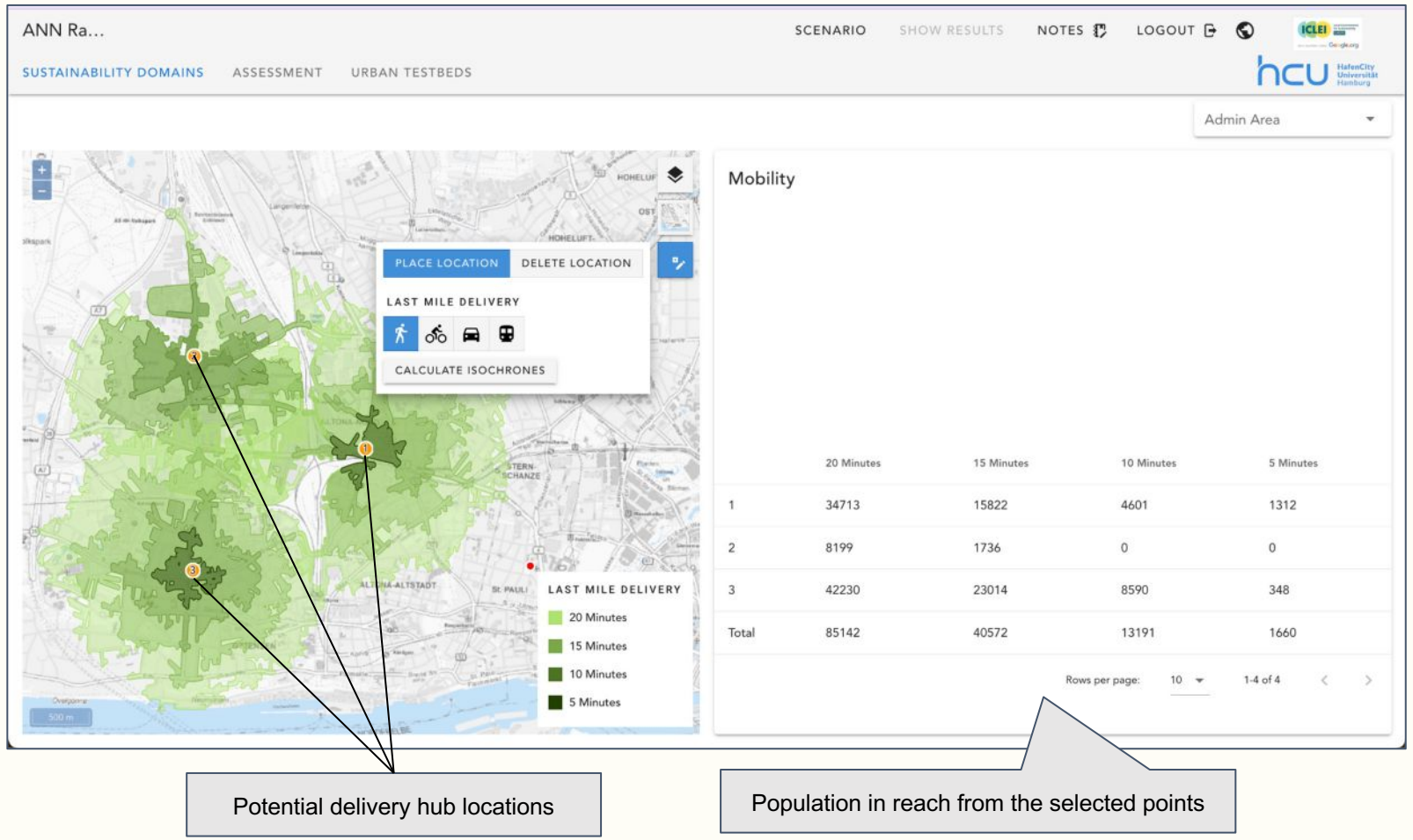


Fig. 22: ANN RADAR Prototype

Mobility

To assess the people in reach from or the approachability of locations and points of interest (POIs) an isochrone around any point on the map can be created.

This functionality has been used to evaluate potential locations for last mile delivery hubs. The isochrones provide the number of people in reach for a specific means of travel.

Another way of using this functionality to evaluate POIs within range for a certain means of locomotion (e.g. schools, groceries, public libraries).

Currently the table on the right shows the people in reach with in a certain amount of travel time from the selected location.

Cases

EU-Project “MOVE21” is one potential use case of ANN RADAR

Fig. 23: MOVE21, www.move21.eu

Project Brief

The EU project MOVE21 is about testing innovative solutions for for mobility of passengers and goods in combination with social or cultural offers in the district of Altona. For this purpose, a multi-functional ‘neighbourhood hubs’ is being conceptualized and implemented from which packages are delivered to end customers by cargo bike or another electro-mobilised small vehicle. This should reduce traffic flows and emissions from delivery traffic. In addition to logistics services, mobility services should also be integrated into the micro-hubs (e.g. car and bike sharing services). In addition, the hub should have a social use and be developed into a meeting place in the neighbourhood together with the residents.

Main Home - Move21

#multi-functional ‘neighbourhood hubs’
#reduction of traffic
#reduction of traffic-related emissions
#urban living labs #Horizon2020

For the EU project MOVE21, there are three ways to using ANN RADAR

Understand the neighbourhood around the micro-hub

- Calculating last mile delivery
- Map population data around the hubs: How many people do we reach?
- Map the social infrastructure around the hubs: What is available? Who are potential cooperation partners?
- Social monitoring: Is it a neighbourhood in need of support?
- RISE area: Is the area part of the programme “Integrated Urban Development”?
- Urban Testbeds: Have testbeds or model quarters already been carried out in the neighbourhood?

Identify potential locations for further micro-hubs

- Location analysis: traffic flows, transport hubs, accessibility, population structure, social infrastructure
- Availability of space: communal areas, housing associations

Provide information and findings from the project

- By being set up as an "urban testbed" in ANN RADAR, MOVE21 gains visibility as a pilot project.
- In addition, the information about goals, involved actors, experiences with experimental governance are presented transparently, which other projects can follow up on.

Availability of further data sources

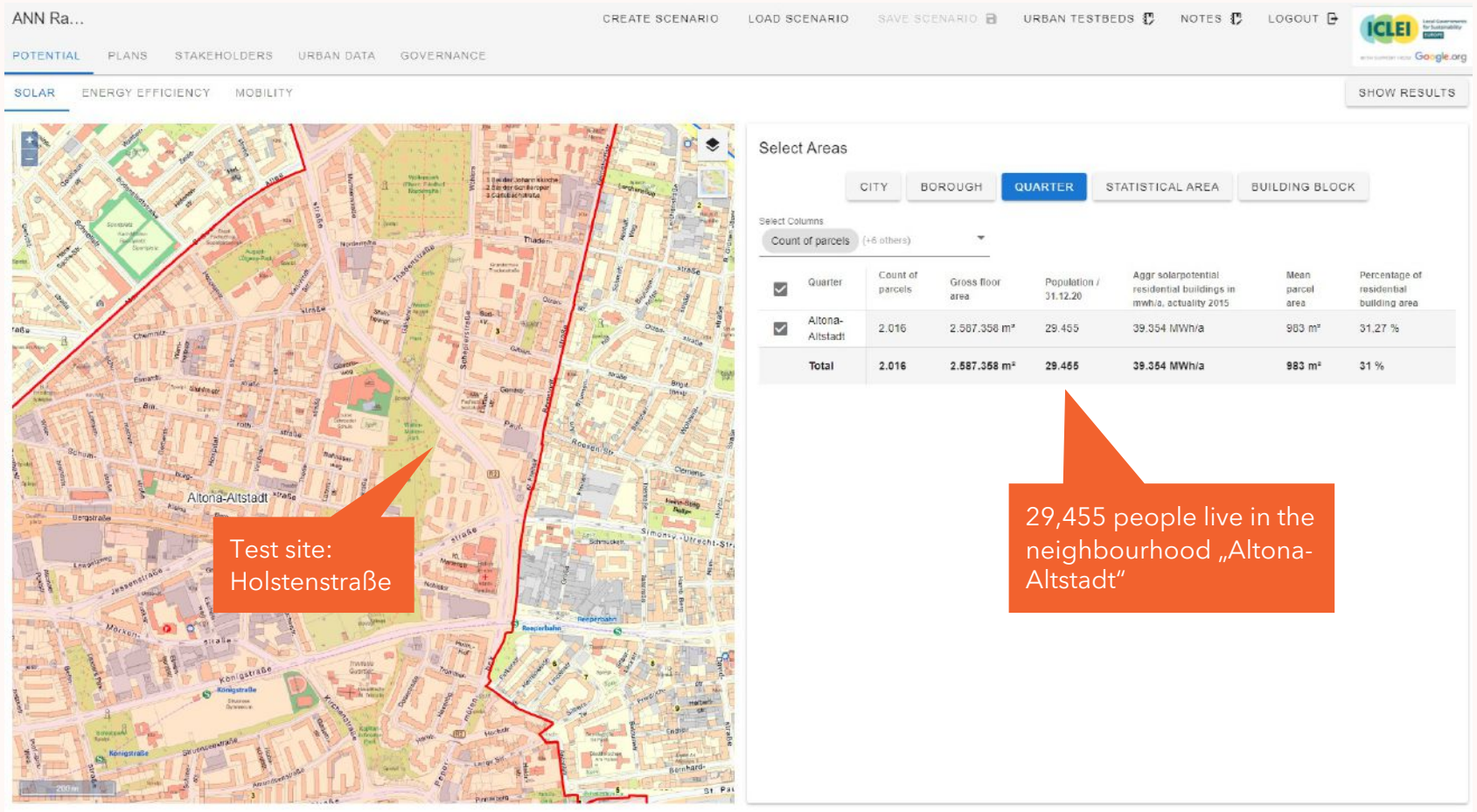
The ANN RADAR prototype only covers a section of the urban data currently available. The availability of mobility data in particular is still very limited.

Further data sources that can be used

Geoportal Hamburg: "Geo-Online" is the web-based map service of the city of Hamburg, run by the Landesbetrieb Geoinformation und Vermessung (LGV). Here, for example, the current traffic situation, development plans, educational institutions or the location and current occupancy status of e-charging stations can be displayed.

Urban Data Platform Hamburg: The Urban Data Hub (also run by LGV) is working on an easily accessible offer of urban data that can be accessed by companies, public administrations, science and research as well as civil society in order to develop urban applications on this basis. Data from the areas of e.g. transport, environment or economy are linked together on the platform and can be evaluated in real time.

MOVE21: Looking at the first pilot implementation of a micro hub



Test site: Holstenstraße

- The location for the first pilot implementation of a micro hub is at Holstenstraße 20
- Property owner: SAGA (municipal housing company)
- Opening of the location in January 2023
- Citizen engagement

Fig. 24: ANN RADAR Prototype

MOVE21 - Results: Calculating last mile delivery

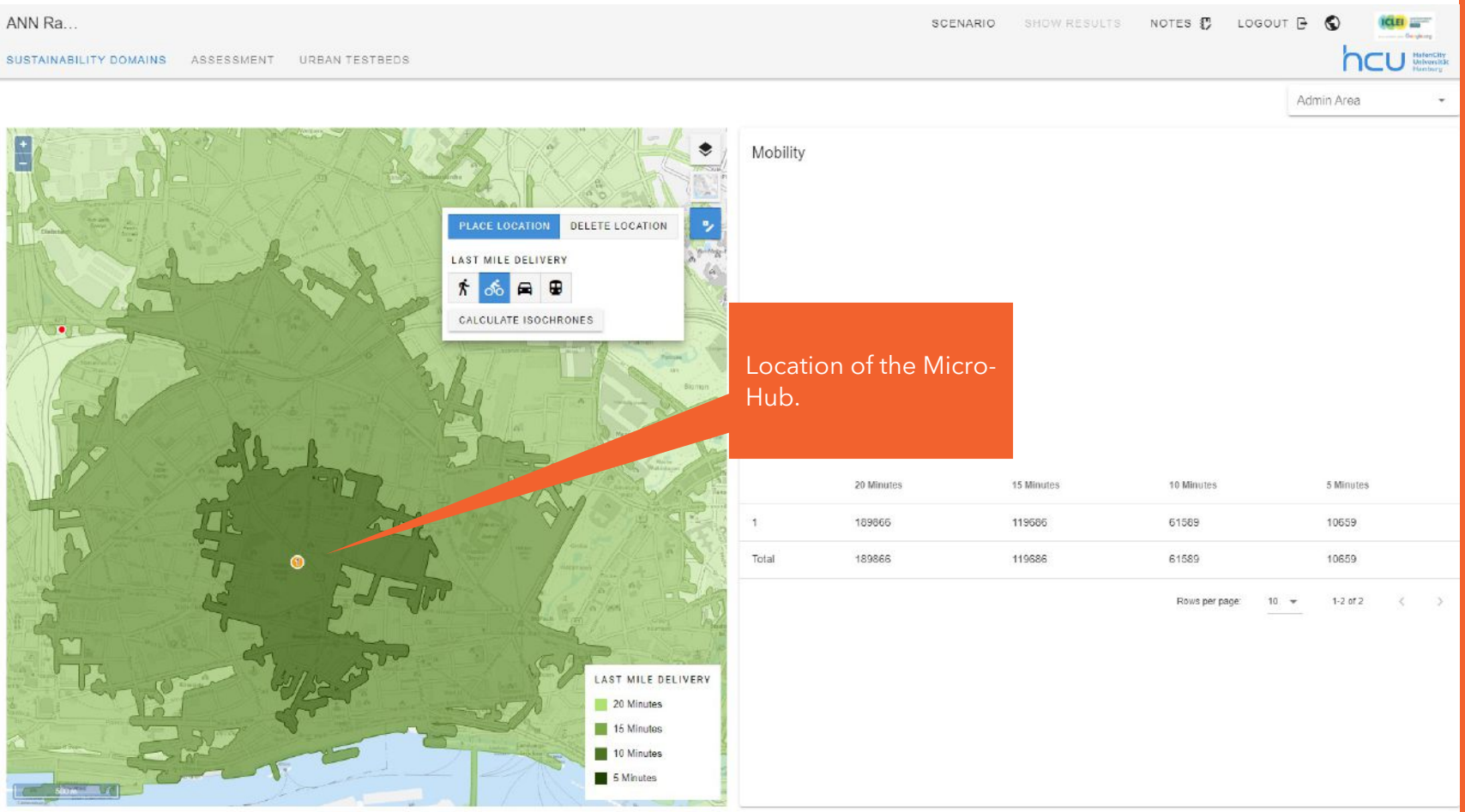


Fig. 25: ANN RADAR Prototype

Perspectives

- What are the ideal locations for the mobility logistic hubs?
- Is there an overlap or too far a distance between the local hubs?
- How does the mode of mobility in the neighbourhoods influence this?

Moreno et al. (2021): Introducing the "15-Minute City": Sustainability, Resilience and Place Identity in Future Post-Pandemic Cities

MOVE21 - Results: Social Monitoring in and around the neighbourhood

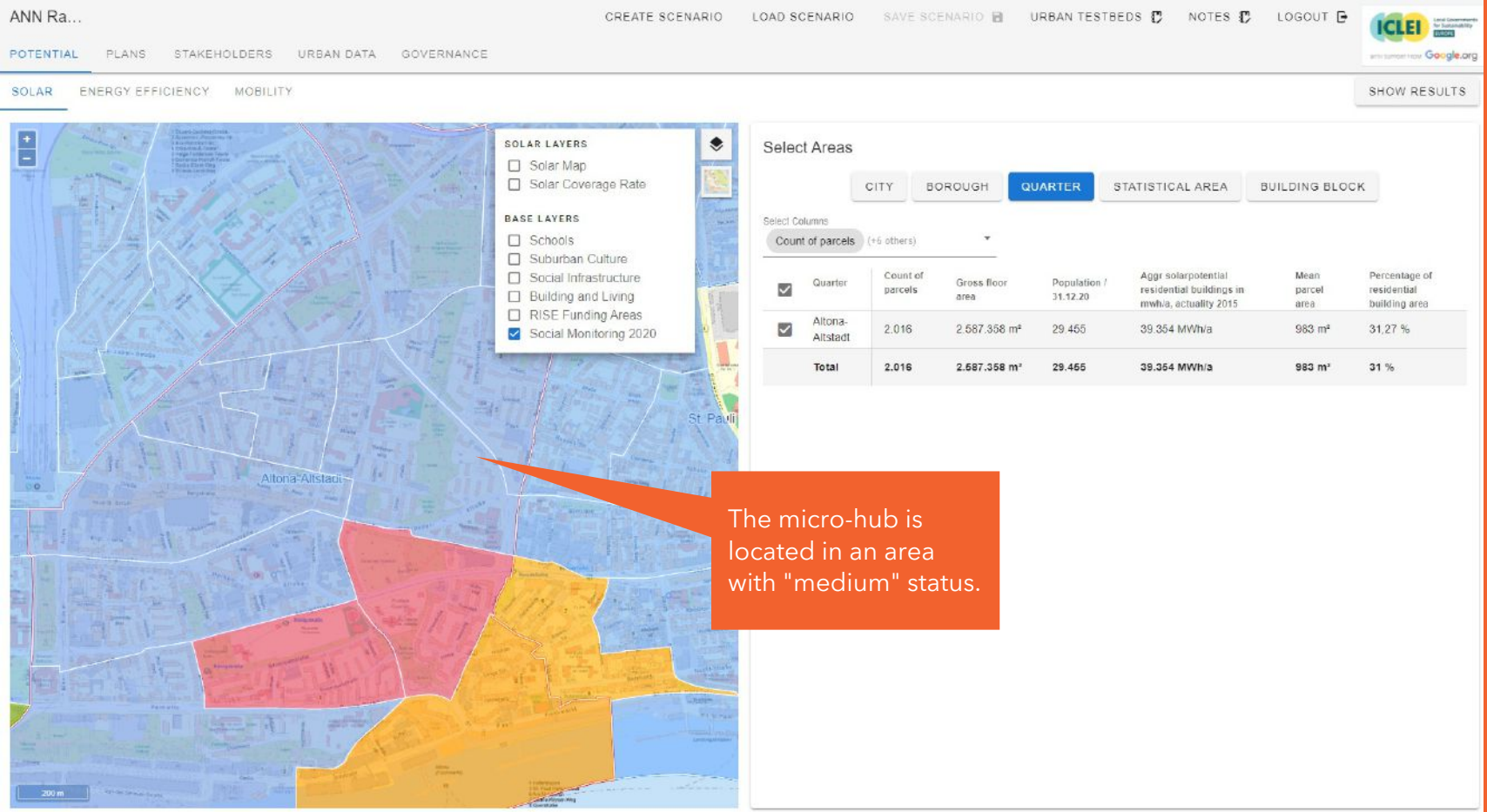


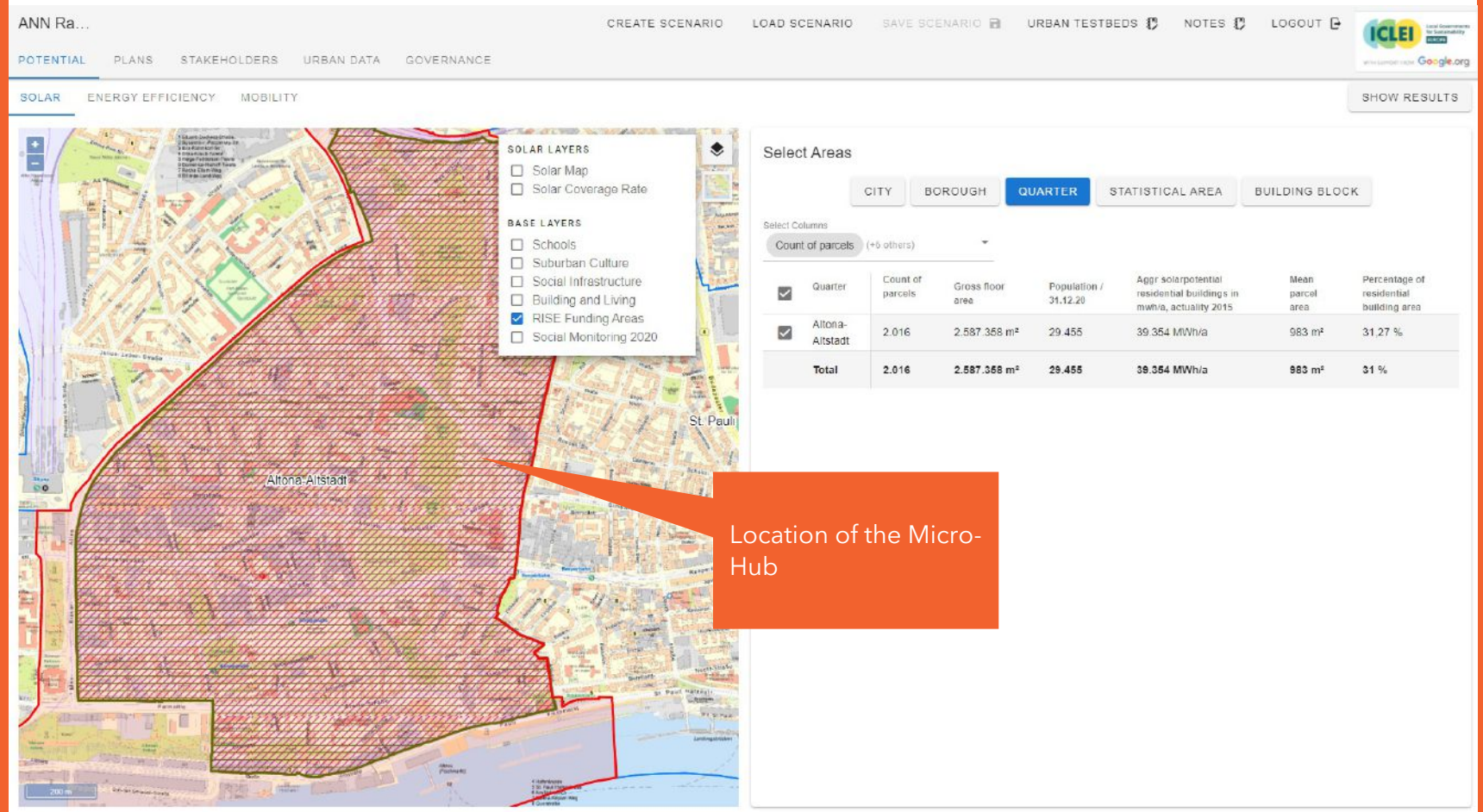
Fig. 26: ANN RADAR Prototype

Social Monitoring

- Social monitoring uses socio-spatial data for all statistical areas and serves Hamburg's authorities and district offices to identify neighbourhoods with social challenges at an early stage and to use the results as a basis for socio-spatial planning.
- The area around the micro-hub has a "medium" status. However, some of the surrounding areas have a low to very low status.

Sozialmonitoring - hamburg.de

MOVE21 - Results: The Neighbourhood “Altona-Altstadt” is a RISE area



Location of the Micro-Hub

Fig. 27: ANN RADAR Prototype

Framework integrated urban development – RISE

- The aim of the programme is to upgrade neighbourhoods with special development needs through urban development measures and to strengthen social cohesion by establishing cooperation structures and providing funding.
- The resources made available in the RISE areas and the mobilised actors can provide relevant starting points for MOVE21.

[RISE – Rahmenprogramm Integrierte Stadtteilentwicklung (hamburg.de)]

MOVE21 - Results: Social Infrastructure in and around the Neighbourhood

Fig. 28: HafenCity Universität

Social Infrastructure

- The data layer "Social Infrastructure" includes cultural hubs and neighbourhood centers. In addition, schools can also be displayed.
- The social infrastructure offers many points of contact for MOVE21. These places are suitable as potential cooperation partners for the social use case or as multipliers for citizen participation.

Further data layers on social infrastructure can be found on the geoportal of the City of Hamburg: https://geoportal-hamburg.de/geo-online/#

MOVE21 - Results: Building on existing testbed experience

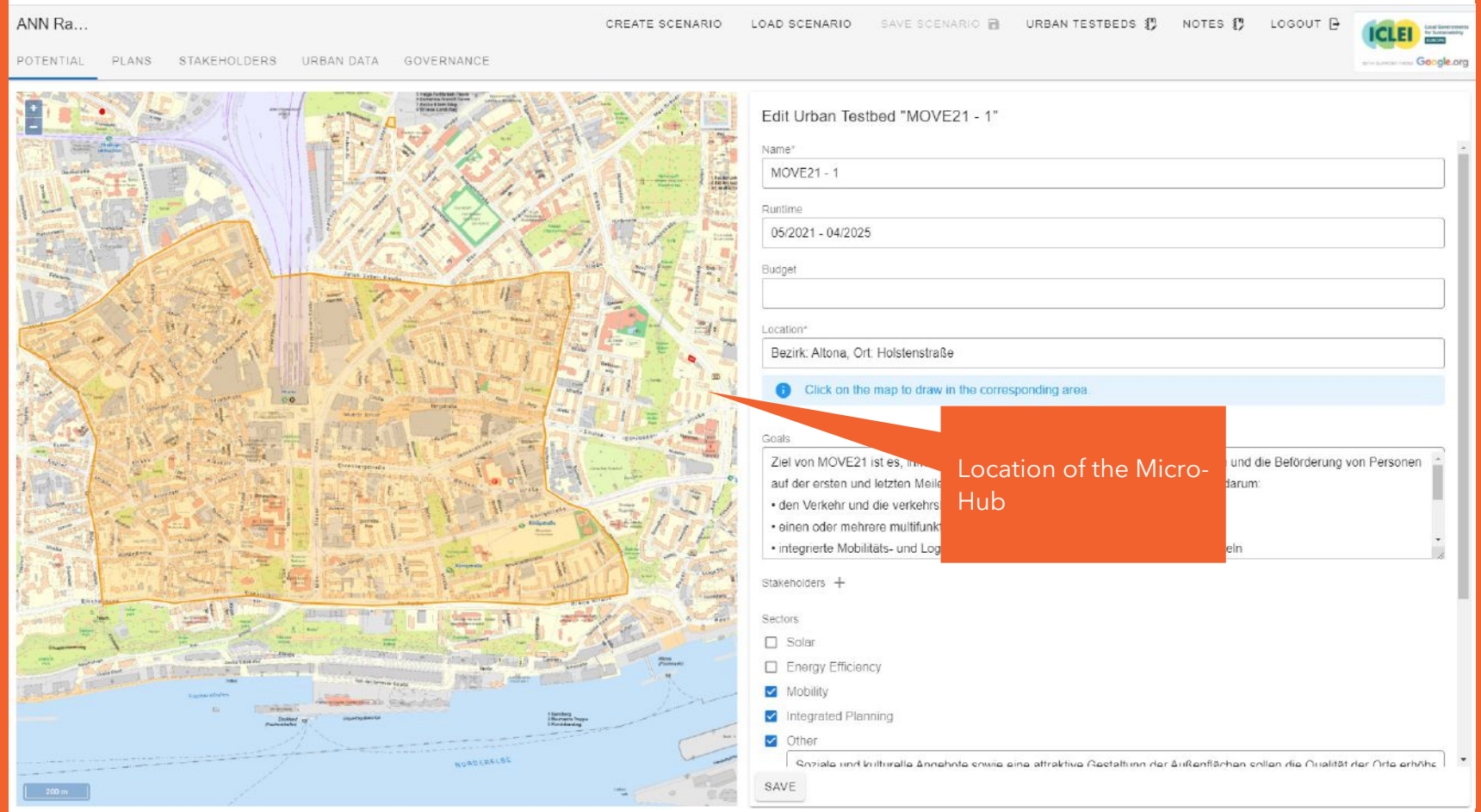


Fig. 29: ANN RADAR Prototype

Urban Testbeds "CITIES4People"

- In the district of Altona, the EU project "CITIES4People" was realised.
- The aim of the project was to improve urban mobility through sustainable mobility innovations developed in a cooperative process with citizens, mobility experts and other stakeholders.
- The ideas developed in the project and the findings as well as the stakeholders involved can be adaptable for MOVE21.

[Cities4People | Towards people oriented transport and mobility]

“For MOVE21 we see the potential of ANN RADAR in supporting the analysis of neighbourhoods in our partner district Hamburg-Altona.

Social infrastructure, previous or current urban testbeds, citizen engagement experiences and areas within the financial and social framework of urban planning (RISE) as well as traffic flows, accessibility and availability of space are important indicators that can support the identification of locations for our neighbourhood hubs.”

Julia Peleikis, Senate Chancellery, City of Hamburg, MOVE21

Municipal Energy Agency ZEBAU is one potential user of ANN RADAR

Fig. 30: ZEBAU GmbH

Introduction

ZEBAU GmbH was founded in September 2000 by Hamburg-based universities and three of their professors to establish and promote sustainable urban development, the construction of and conversion to energy-efficient buildings as well as the use of renewable energy sources.
ZEBAU GmbH acts in accordance with the mission statement of its current main shareholder, the Free and Hanseatic City of Hamburg, represented by the Hamburg Authority for the Environment, Climate, Energy and Agriculture, and in close cooperation with municipal authorities at various levels to implement national and local climate goals.
One area of activity is the development and implementation of climate action plans on municipal and neighbourhood level.

Main Home - ZEBAU

#climategoals
#climateactionplans
#sustainableurbandevelopment

What ZEBAU is doing

Development of Municipal Climate Action Plans

- Based on the national funded National Climate Protection Initiative (“Nationale Klimaschutzinitiative”)
- For four of the seven Hamburg boroughs and several municipalities in Northern Germany and Berlin
- One task: identification of areas for climate action plans on neighbourhood level (residential areas, commercial areas)

Development of Climate Action Plans on Neighbourhood Level

- Based on the national funded Energy-efficient Urban Redevelopment Programme (“Energetische Stadtsanierung”)
- Development of almost 20 concepts (developed,) mostly in Northern Germany
- Often involved in subsequent implementation (coordination, planning, communication)

Development and Management of Transnational Projects

- Main programmes: Interreg Baltic Sea Region and Horizon
- Development of project ideas as well as instructed by municipalities and others
- Participation as project partner
- Management of external projects

LowTEMP LowTEMP2.0

Interreg Baltic Sea Region

EUROPEAN REGIONAL DEVELOPMENT FUND
EUROPEAN UNION

I-HEROS

HORIZON 2020

For ZEBAU, there are various options to use ANN RADAR

Identification of Potential Areas for future Model Quarters

- Mapping of the built environment and technical infrastructure of focus areas (e.g. density of buildings, energy consumption, existing energy infrastructure, solar potentials)
- Mapping of ownership structure and potential stakeholders
- Identification of further or past support programmes and existing participation structures

Identification of Potential Areas for Urban Testbeds

- Mapping of current or past model quarters or actions plans on neighbourhood level (e.g. Energy-efficient Urban Redevelopment Programme or (Social) Urban Development Support Programme)
- Checking of already developed measures to identify promising approaches (like planned district heating grids, retrofitting plans, mobility concepts) to become potential "success stories"
- Reviewing of responsibilities and especially active actors to identify cooperation partners and demonstrators for the implementation of testbeds

Integration of Information of implemented Model Quarters and Testbeds

- Visibility of existing implementations for future developments and follow ups of model areas and testbeds

Bundesministerium für Wirtschaft und Klimaschutz

NATIONALE KLIMASCHUTZ INITIATIVE

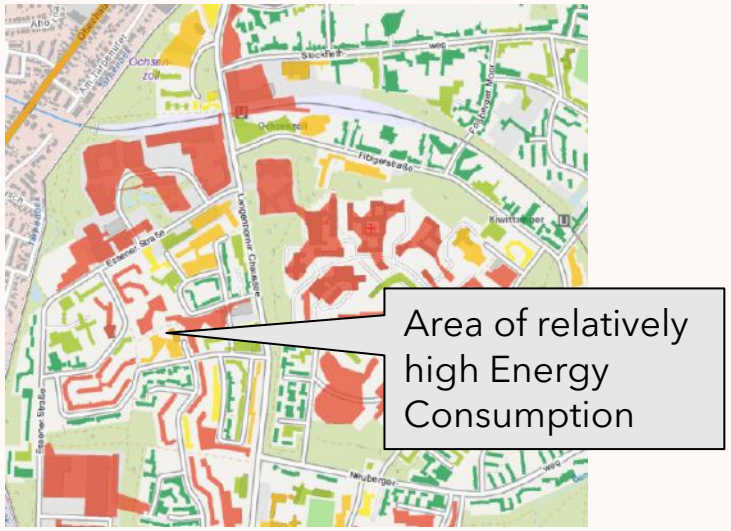
With the **National Climate Protection Initiative** (NKI), the federal government promotes and initiates climate protection projects throughout Germany and thus makes an important contribution to achieving the national climate protection goals.

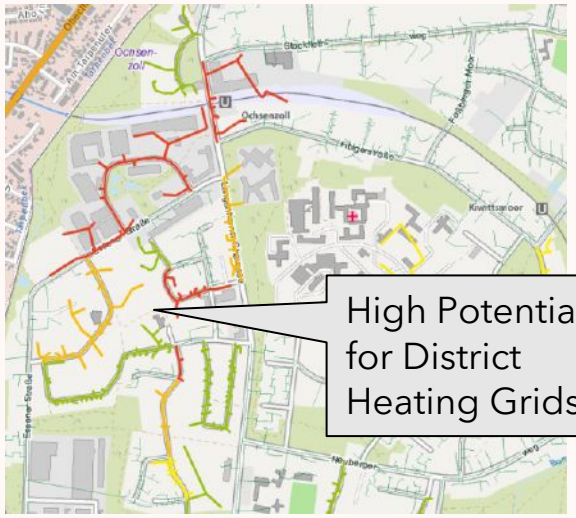
The creation of climate protection concepts by climate protection managers and the implementation of measures from the climate protection concept are funded.

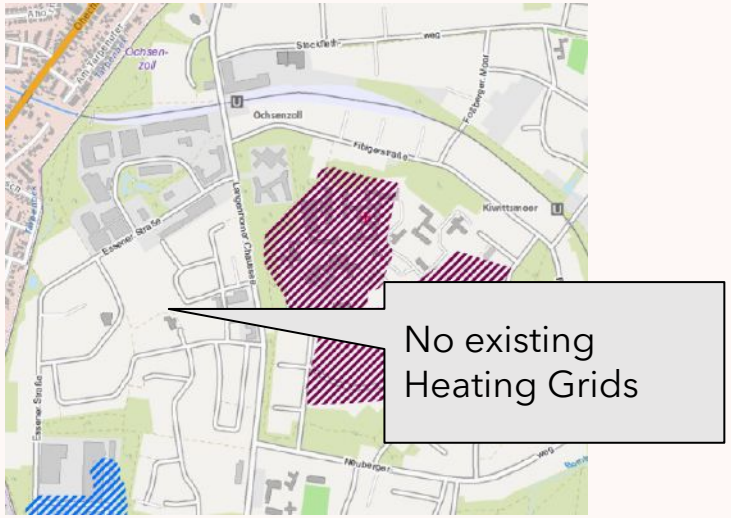
With the selected climate protection measure from the climate protection concept adopted by the highest decision-making body, additional exemplary measures can be promoted.

National Climate Protection Initiative

ZEBAU: Identification of Potential Areas for future Model Quarters







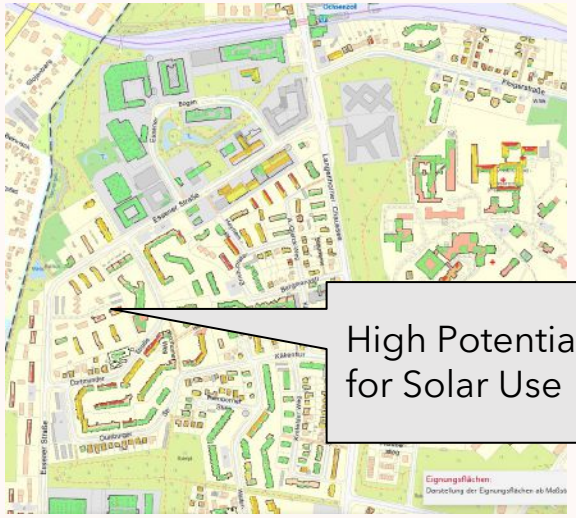


Fig. 31: Geoportal Hamburg/ Landesbetrieb Geoinformation und Vermessung

Availability of further Data Sources

The ANN RADAR prototype uses several urban data sources, e.g.:

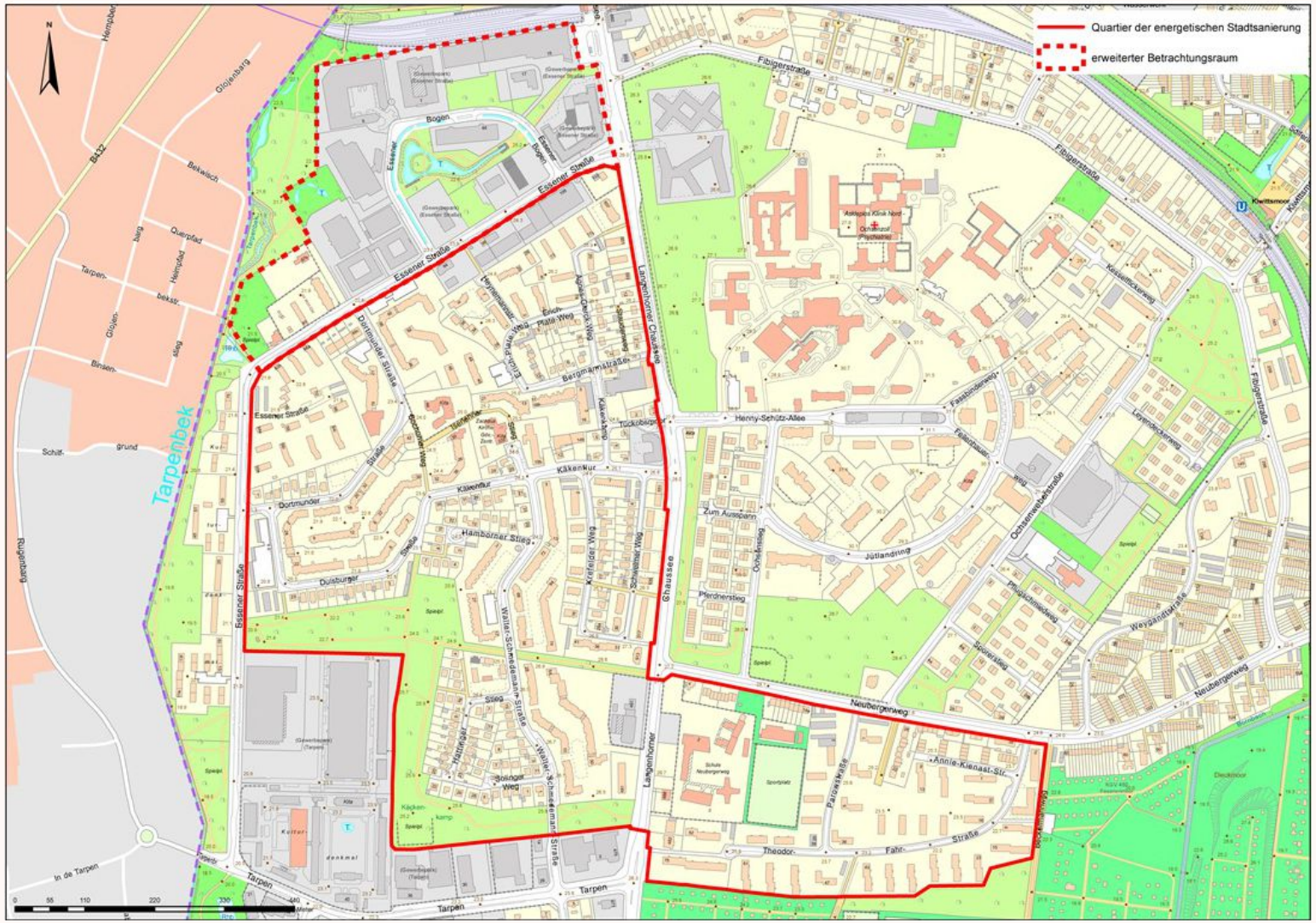
The **Hamburg Heat Map** is part of the Geoportal Hamburg / "Geo-Online", the web-based map service of the city of Hamburg.

It includes information about

- the energy demand of buildings and blocks
- existing district heating grids
- existing energy generation plants
- potential supply by district heating

The **Hamburg Solar Atlas** (Solar-Atlas) was developed by the municipal energy provider HamburgEnergie and is partly integrated in "Geo-Online". It identifies the usability and the potential solar energy production (both thermal and electric) of different roof areas.

ZEBAU: Identification of Potential Areas for future Model Quarters



Model Quarter Langenhorn / Essener Straße (Hamburg)

As a result of the climate action plan for Hamburg's district "Hamburg Nord", the residential area Langenhorn / Essener Straße was chosen to be one of the future projects of the national funded Energy-efficient Urban Redevelopment Programme (KfW 432 Energetische Stadtsanierung).

The main aspect has been:

- relatively high energy consumption
- no existing heating grids
- good potentials for district heating
- good potentials for solar use

In addition, the area was already included in the Integrated Urban Development Support Programme. The former participation structures still exists, and the main stakeholders proved their ability and emphasized their will to support the development and implementation of measures.

Fig. 32: Bezirksamt Hamburg-Nord; Kartengrundlage: Geoportal Hamburg/Landesbetrieb Geoinformation und Vermessung

ZEBAU: Identification of Potential Areas for Urban Testbeds

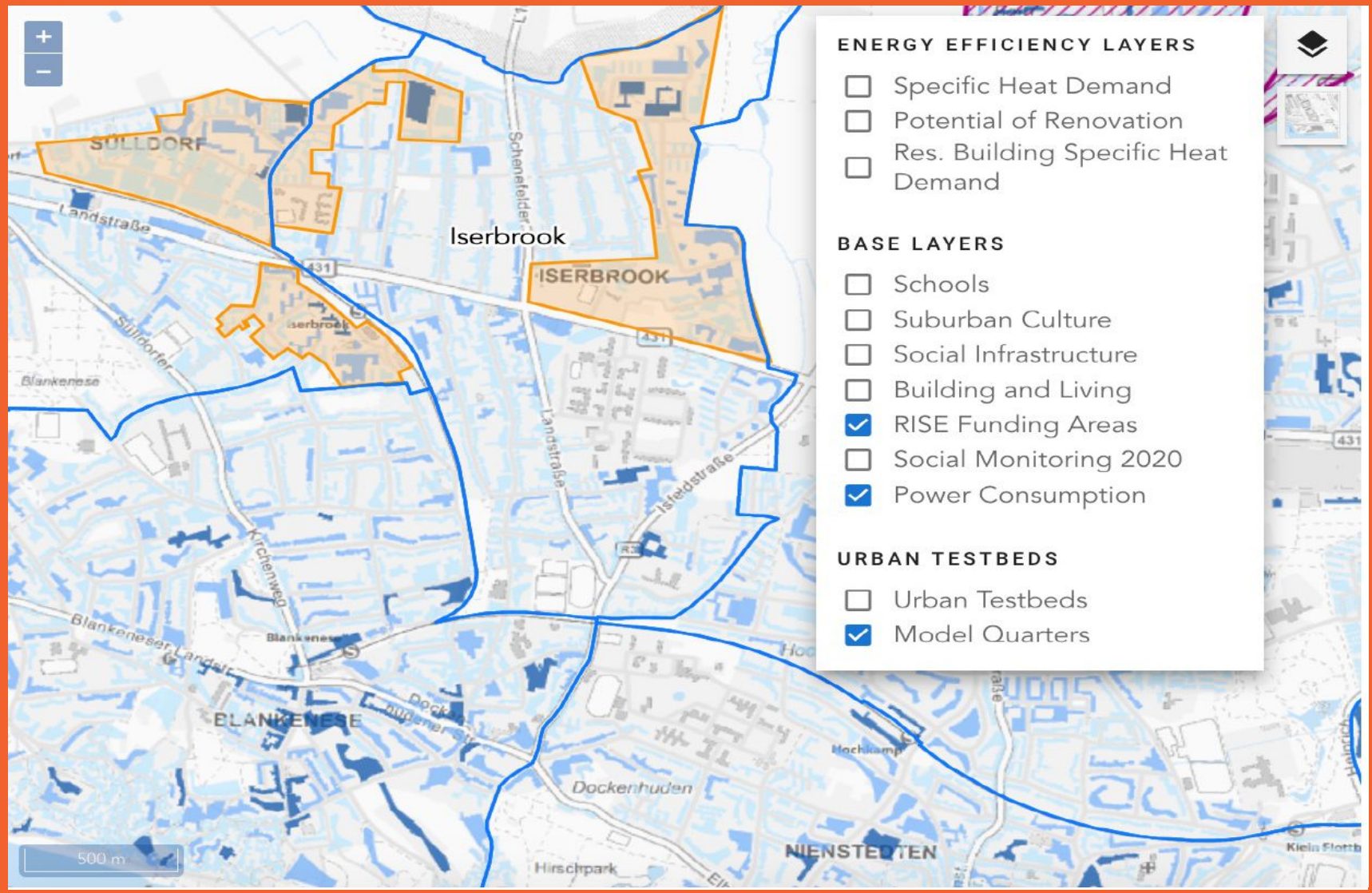


Fig. 33: ANN RADAR Prototype

Energy-efficient Urban Redevelopment Areas Iserbrook / Sülldorf (Hamburg)

As a result of the climate action plan for Hamburg`s District "Altona", two neighbourhoods were chosen ("Op'n Hainholt / Kamerstücken" and "Schenefelder Holt") to develop concepts for an Energy-efficient Urban Redevelopment have been developed. Since 2021, the implementation of the concept is coordinated by a municipal management.

The main aspects of the concepts and the current implementation status are integrated in the ANN RADAR prototype:

- Project Brief
- Partnership and Diversity (Quadruple Helix)
- Stakeholder Management and Commitments
- Sustainability Sectors
- Main Results and Measures
- Experimental Governance
- Public Resources

Based on this data, the suitability of the areas for various testbeds with different aspects and constellations can be evaluated.

ZEBAU: Integration of Information of Model Quarters and Testbeds

Integration of Information of implemented Model Quarters and Testbeds

- Final summary, preparation and integration of various concepts, developed by ZEBAU
- Research and summary of further concepts, model quarters and testbeds as service for municipal administrations

Already included Types of Concepts and Testbeds

- Energy-efficient Urban Redevelopment Areas / „Energy Improvement Districts"
- Climate Action Plans for Commercial and Industrial Areas
- Social Urban Development Areas (RISE)
- Mobility Concepts

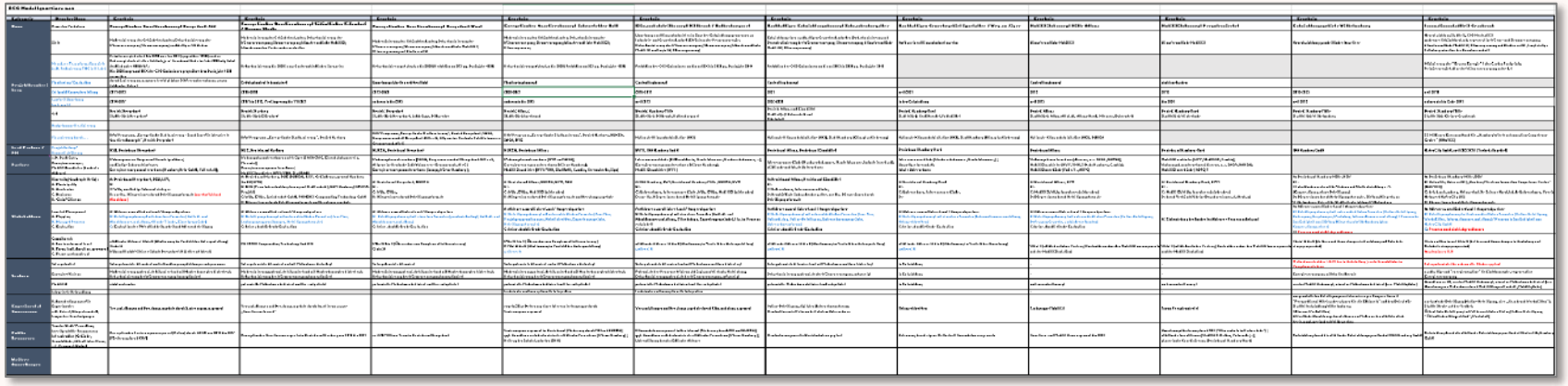


Fig. 34: ZEBAU GmbH

Energetische Stadtsanierung

The KfW programme **Energy-efficient Urban Redevelopment** (number 432) extends the energy upgrading of individual buildings to entire neighbourhoods. The programme combines standards for energy upgrades in buildings, efficient energy supply systems and the increased use of renewables with demographic, economic, urban design and housing considerations. A cooperative management process oversees and expedites implementation.

Energy-efficient Urban Redevelopment

Outlook & Resources

Outlook

Enabling: Documentation of Model Quarters

The most expedient approach of integrating model quarters in ANN RADAR is project-accompanying documentation. This means that relevant information and experience can be considered directly.
Subsequent consideration is also possible, if the available documentation contains all the relevant information.
The necessary data is related to the Balance Score Card dimensions and includes:

- Project description (including location, runtime and budget)
- Project goals
- Partnership and stakeholder structure according to quadruple helix
- Stakeholder Management (level of management and level of commitment
- Sustainability domains
- Experimental governance
- Public resources
- Sources and evidences

The most practical approach is to first use a template in the form of a Word or Excel file, to collect the data during the project inventory analysis. Afterwards the data can be integrated into ANN RADAR.
In addition, a map is required to display the quarter boundaries so that it can be integrated into GIS.

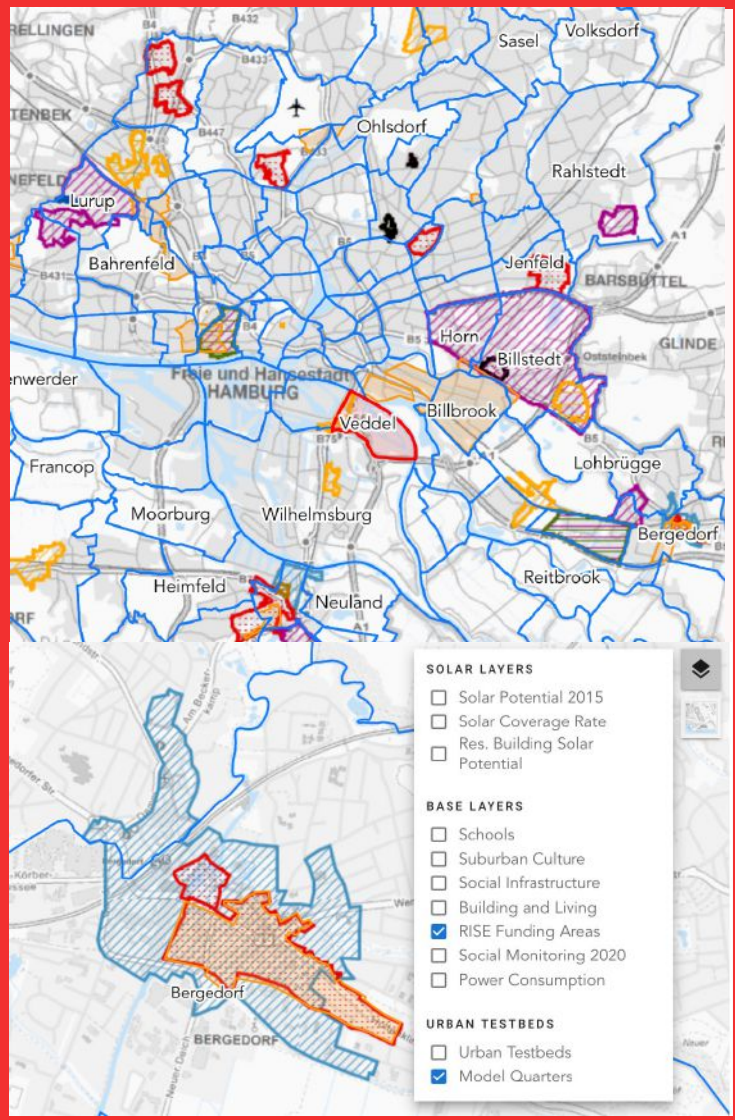


Fig. 35: ANN RADAR Prototype

Outlook: Mapping of Participation Processes and Structures

The mapping of stakeholder structures, participation processes and experimental governance is one essential requirement for the use of ANN RADAR and its four dimensions of the Balance Score Card.
An appropriate presentation of the participation structures in retrospect is often challenging. The scope of the participation measures depends on the type of the model quarter. The participation modules carried out are often not adequately represented in the final reports and concepts. A target definition with indicators and a subsequent evaluation are usually missing. In addition, a certain proportion of the participation is often carried out informally or bilaterally. Coordination like this cannot be presented due to their small-scale nature and for reasons of data protection and confidentiality.

In order to improve the quality of participation processes, several points are recommended:

- The elements of the participation process for model quarters, their objectives and evaluation should correspond to a basic structure and a minimum standard.
- The development and implementation of the participation process must be adequately considered in the scope of project development.
- The stakeholder mapping and involvement should cover all four sectors of the quadruple helix (government, academic, industry and citizen).
- The participation concept must differentiate between stakeholder groups, user groups and target groups and assign them the appropriate participation level.

Fig. 36: ZEBAU GmbH

Outlook: Mapping of Participation Processes and Structures

In order to increase comparability and meaningfulness, several processes are recommended:

- The documentation of the participation management process should be carried out during the project by the project manager, as this means that no relevant information is lost.
- The report should follow predetermined structures in order to ensure comparability between various model quarters.
- Subsequently, predefined quantitative indicators regarding the number of participants and the contributions made can be evaluated and tracked.
- In addition, the participation results should be evaluated regarding their level of detail, specificity and their binding nature (e.g., formal commitments).
- The implementation of the participation results should be evaluated regularly. This prevents participation frustration and fatigue, which arises when citizens cannot establish a substantive connection to the result after they have invested time in a participation process.

If a sufficient evaluation of the participation process is not possible during the project period, it should be done afterwards. For this purpose, it seems useful - in addition to a content research - to conduct interviews with the people involved in the project at the time, in order to achieve a qualitative depth.

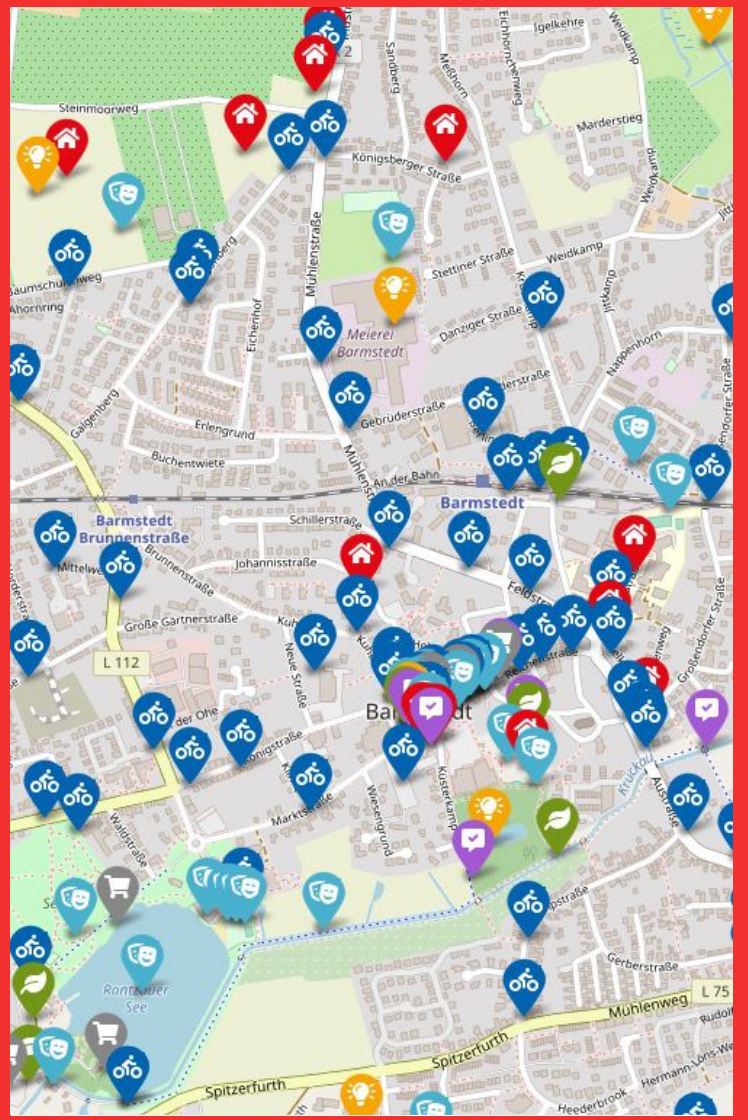


Fig. 37: ZEBAU GmbH / Stadt Bramstedt / tetraeder.com GmbH; Kartengrundlage OpenStreetMap

Outlook: Integration of further Model Quarter Categories

Additional Model Quarter cCategories

In addition to the already considered area categories, the following types might be integrated as well:

1. (Social) urban development funding program, in Hamburg “framework integrated urban development” (Rahmenprogramm Integrierte Stadtentwicklung (RISE))

2. Urban development areas by the municipal owned development companies HafenCity Hamburg GmbH and IBA Hamburg GmbH

3. Climate Model Quarters

4. Development areas with mandatory Energy Plans

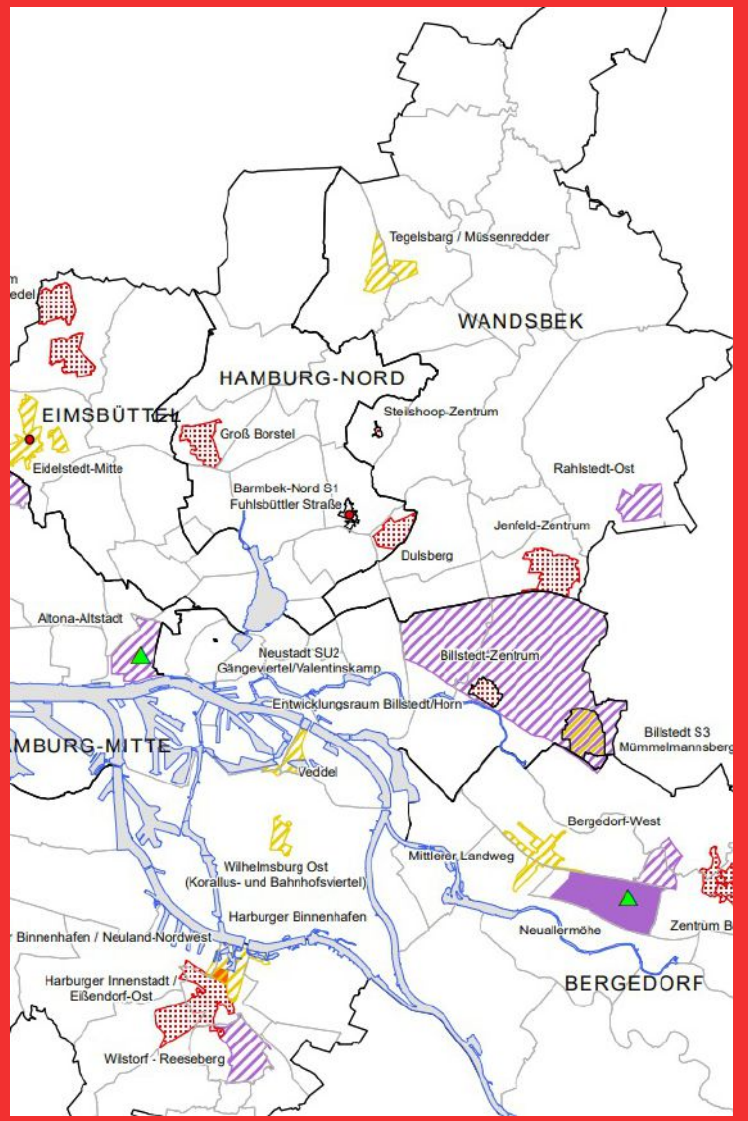


Fig. 38: Behörde für Stadtentwicklung und Wohnen Hamburg (BSW)

Outlook: Integration of further Model Quarter Categories

1. Urban Development Funding Program

To support cities to cope with the new tasks and challenges, the federal government is supporting the creation of sustainable urban structures with urban development funding programs. The federal government grants the federal states financial aid for this purpose. With the restructuring of urban development funding in 2020, municipalities can be funded in the "Living Centers", "Social Cohesion" and "Growth and Sustainable Renewal" programs.

In Hamburg, the urban development funding program is called **Integrated District Development (RISE) framework program**. The aim of the RISE program is to improve the quality of life in districts with special development needs through urban planning measures and to strengthen social cohesion.
Although, mobility aspects and retrofitting of social facilities and apartment buildings have been part of the integrated development concepts (IEK) from the beginning, it is mandatory since 2020 to include climate protection.
A central goal of integrated district development is to strengthen the opportunities to participate in the change processes in the neighbourhoods and to motivate the people living there to get involved. The planning of new projects is implemented in very close coordination with the participation committee of the respective funding area. Thus, the existing participation structure in the RISE program areas is suitable foundation for the development and implementation of future testbeds.

Hamburg. Deine Perlen.
Integrierte Stadtteilentwicklung

Currently, 29 RISE districts are supported in Hamburg, which are defined in the various programs of the federal and state urban development funding. A total of 36 eligible areas are counted, as some districts are specified in several urban development funding programs.

RISE program

Outlook: Integration of further Model Quarter Categories

2. Main Urban Development Areas

HafenCity Hamburg is Europe's largest inner-city urban development project. More than 7,500 residential units for around 15,000 residents are being built, as well as business premises offering around 45,000 job opportunities (of which 35,000 will be in offices). Furthermore, you can find educational institutions (child daycare, schools, universities), restaurants and bars, retail, cultural and leisure amenities, with parks, plazas and promenades. In addition, the HafenCity Hamburg GmbH is responsible for the development of the nearby **Grasbrook** and the **Billebogen project area** as well as the **Science City Bahrenfeld**.

With the experiences and tested concepts and criterias of the International Building Exhibition 2013, **IBA Hamburg** is developing new neighbourhoods in 10 districts with a surface area of over 440 hectares, offering space to live and work for a broad cross-section of society. The new areas are located in **Wilhelmsburg**, **Neugraben-Fischbek** and the new district of **Oberbillwerder**.

Both municipal development companies open pathways to innovative urban developments, especially relating to urbanity and sustainability. Sustainability aspects include innovative heat supply, a purpose-built sustainability certification scheme for buildings and sustainable mobility concepts, but also the development of an integrated and overall sustainable urban structure. The already developed concepts can serve as a base for new projects.

HAFENCITY HAMBURG

In 1995 a development company (GHS) was set up to manage the development of HafenCity – since 2004 it has been known as HafenCity Hamburg GmbH. In addition to this financing responsibility, it also clears and prepares sites, plans and builds public spaces as well as infrastructure, acquires and contracts real estate developers and users.

HafenCity Hamburg

IBA_HAMBURG
Stadt neu bauen

From 2006–2013, the IBA Hamburg GmbH was commissioned with the development, execution and implementation of the International Building Exhibition IBA Hamburg. Since 2014, it has acted as an urban development company in Hamburg.

IBA Hamburg

Outlook: Integration of further Model Quarter Categories

3. Climate Model Quarters

Around 2010, 19 climate model quarters have been developed and mostly implemented in the following years. The basic idea of the climate model quarters is to name ambitious projects about climate protection in the Hamburg city area. They can serve as a "model" for other projects about the knowledge and experience gained.
With this background, 19 climate model quarters were selected, which were developed under the leadership of the seven boroughs.
In addition to the implementation of high energy building standards (e.g., passive house standard) and the use of renewable energies (e.g., geothermal and solar thermal energy), the main focuses are energy generation from sewage water, sustainable construction and decentralized drainage concepts.

4. Mandatory Energy Plans

Since 2018, energy plans have been drawn up as part of the land use planning for large new building projects with more than 150 residential units in Hamburg. The successful model phase led to an energy plan which has been anchored in the Hamburg Climate Protection Act since February 2020. The aim of the energy plans is to identify and evaluate options for the most sustainable and economical feasible energy supply possible, and to use the results to improve future zoning plan process.

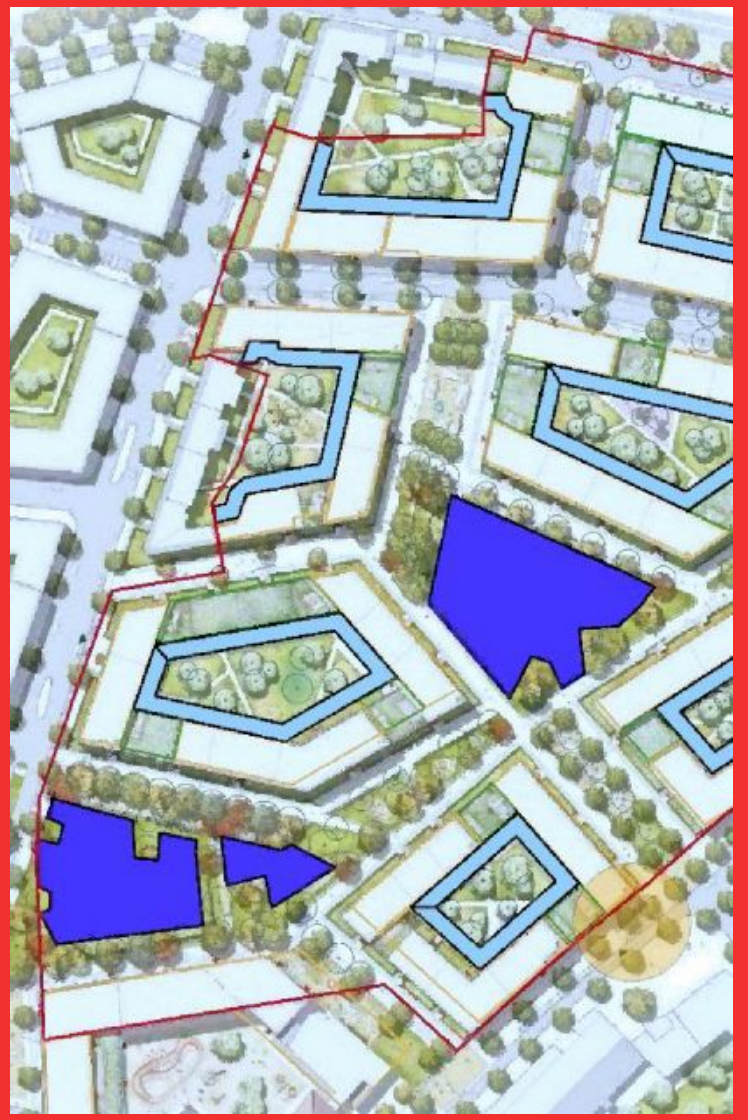


Fig. 39: Behörde für Umwelt, Klima, Energie und Agrarwirtschaft Hamburg (BUKEA) / Averdung Ingenieursgesellschaf

Outlook: Integration of further Criteria and Aspects

Additional Qualitative Criteria and Aspects

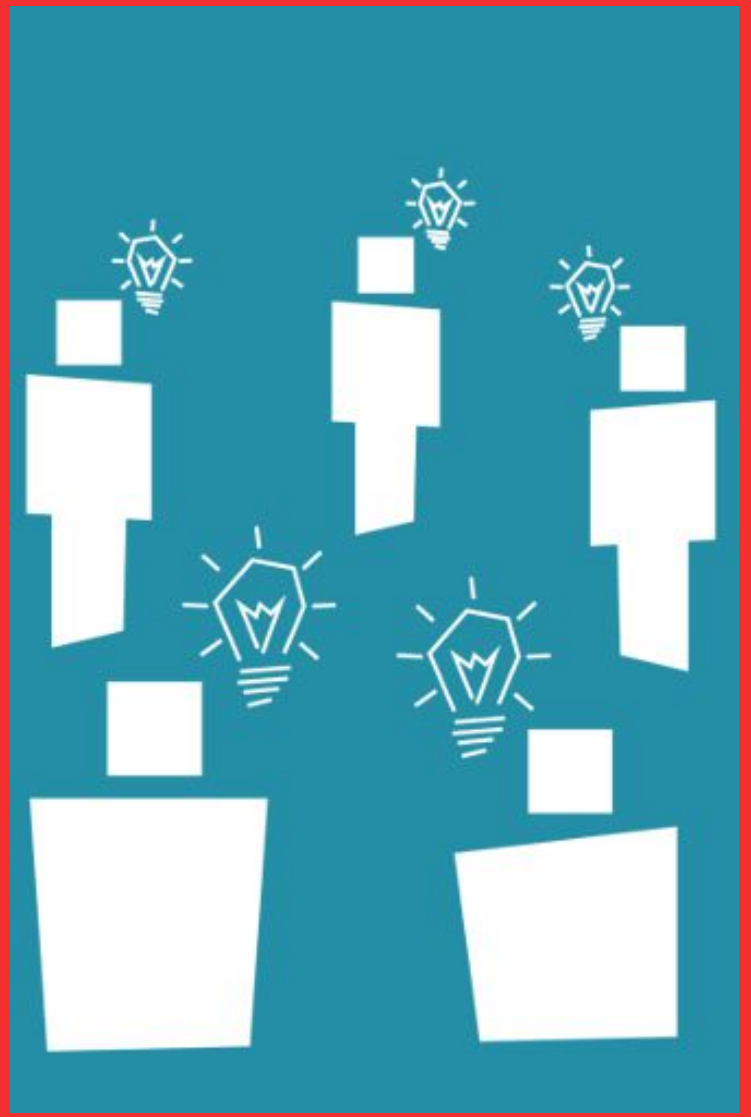
The following aspects and criteria are already integrated in the ANN RADAR prototype:

- Project description
- Partnership and Diversity (Quadruple Helix)
- Stakeholder Management and Commitments
- Sustainability Domains
- Main Results and Measures
- Experimental Governance
- Public Resources

As the success of projects and testbeds is highly depending on the successful implementation of pioneer interventions by committing actors, further aspects might be included in the presentation of the areas as well:

1. Success stories and demonstrators as potential starting points for testbeds and laboratories

2. Frontrunner stakeholders as potential project partners



Outlook: Integration of further Criteria and Aspects

1. Success Stories

The successful implementation of best practice projects demonstrate the potentials for the development of further projects and the possibilities for their realisation.
Therefore, “success stories” both emphasise the probability of the successful project development and create motivation for further actors to replicate the developed ideas.

So far, the ANN RADAR criteria only include the technical description of main results and measures. To support the useful identification of future testbeds, a report of the main case might be included. These success cases include the challenge, the solution and the result in clear language and are understood by everyone and not just by experts.

Possible “success stories”, which are not yet included in the project description are:

- Community driven planning and installation of photovoltaics
- Local sharing networks
- Common development and implementation of urban gardening by a housing company and its tenants

„Success stories“ have to be created during the implementation of the main project and by people involved in it as they need a deep insight into the case and preferably a personal relation to the main actors.

Outlook: Integration of further Criteria and Aspects

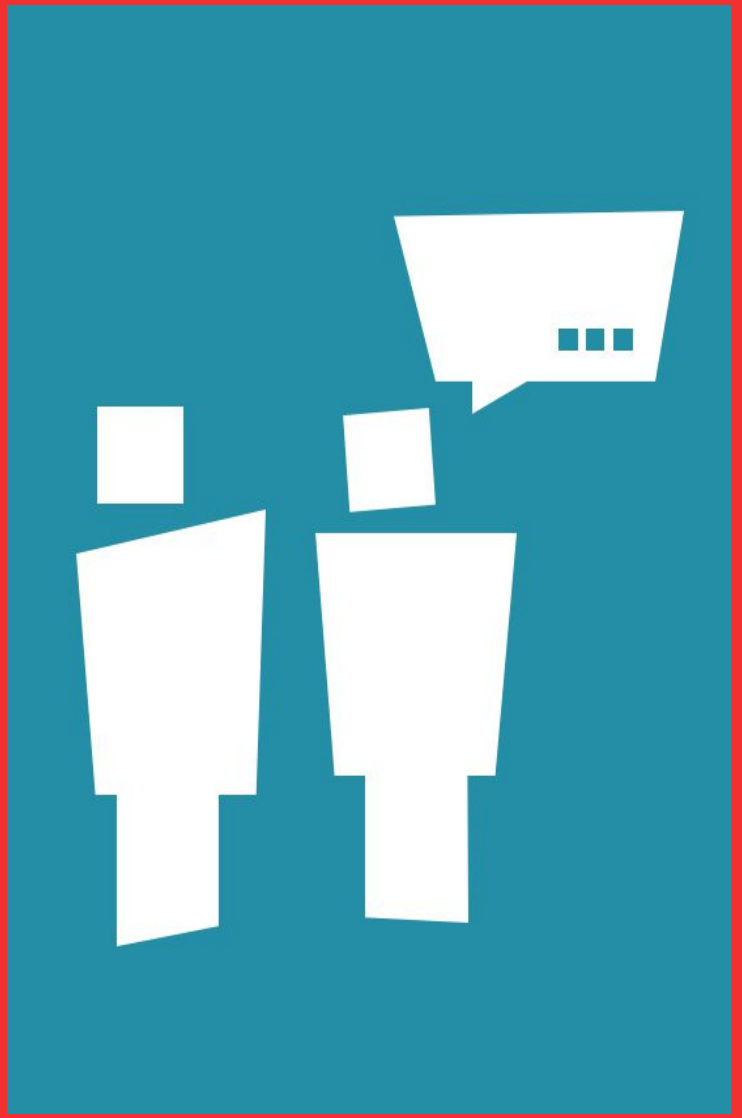
2. Frontrunner Stakeholders

The successful implementation of projects depend particularly on the active support by the main stakeholders. Even explicit arguments and clear data can not guarantee a successful development of a project, if the main actors refuse their support for personal reasons or because of differing priorities.

So far, the ANN RADAR criteria only includes the listings of involved partners and the description of the partnership. To support the useful identification of suitable constellations for testbeds, special actors and frontrunner stakeholders might be mentioned separately.

Examples are:

- Housing company with activities going beyond their core business
- Private businesses offering special services and organising activities together with their employees
- Neighbourhood associations and owner communities with special activities



Outlook: Integration of further Sustainability Domains

Additional Sustainability Domains

Based on the existing structure, additional sectors can be integrated in the ANN RADAR prototype. The aim is to cover and support further aspects of climate-friendly, resilient and liveable cities and neighbourhoods.

Regarding this approach, possible issues might be:

1. Structures and services of circular economies and sustainable consumer behaviour
2. Climate adaptation plans (prevention of heat, heavy rain, flooding)
3. Nature-based solutions and blue/green infrastructures

The additional information can be composed of:

- Existing urban data sources like “Geo-Online”, the web-based map service of the city of Hamburg
- Further web-based single data sources by several actors
- Related concepts and reports of testbeds
- Various information, to be summarized individually

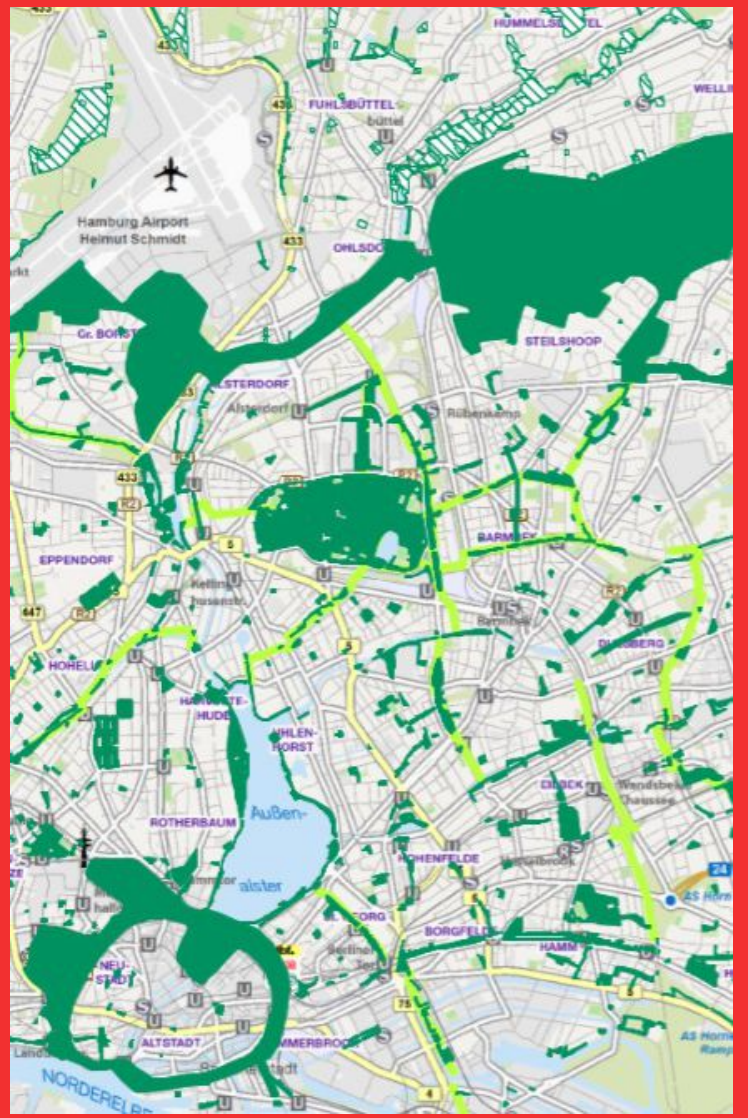


Fig. 40: Geoportal Hamburg / Landesbetrieb Geoinformation und Vermessung

Outlook: Integration of further Sustainability Domains

1. Sustainable Consumer Behaviour

Although it is mostly not included in local greenhouse gas balances, a sustainable consumer behaviour and climate-friendly nutrition are both relevant fields to reduce the individual carbon footprint. Additionally approaches to organise common activities to start local testbeds can be used.

Useful services to identify and integrate in comprehensive structures might be:

- Food sharing and food savings, both on private level as well as restaurants and stores
- Local sharing structures, e.g., for repair and garden tools
- Local "repair cafés" and bicycle workshops
- Cafés and restaurants offering reusable packaging (mandatory from 2023 for larger establishments)
- Locations with free services to refill water

The latter mentioned services are organised by private individuals, by associations, by social services or churches as well es by private companies and other businesses.
Therefore, the various services lead to many potential actors and stakeholders.
At the same time there are not many data sources available, leading to time intesive tasks when idenfying all services due to the varying constellation.

Availability of data sources

The **"Zero Waste Map"** by the Hamburg waste management (Stadtreinigung Hamburg) brings together different services to reduce the individual waste production in different sectors like:

- Secondhand stores
- Zero waste stores
- Stores with recycling and upcycling stores
- Public water dispenser
- Free water refill offers
- Cafés and restaurants offering reusable packaging

Similar locations can be found by using apps or web-based data sources like **RECUP, Refill, TooGoodToGo** and the local Hamburg service **KEHR.WIEDER**.

Outlook: Integration of further Sustainability Domains

2. Climate Adaptation Plans

In addition to mitigation measures to reduce carbon emissions, adaptation measures should not be forgotten. Adaptation measures reduce the already existing and the future climate impacts and consequences like heat waves, heavy rain or flooding.
Therefore, existing and planned climate simulations and adaptation action plans might form another relevant sector to be integrated in ANN RADAR.

Related information to be considered are:

- Simulations of high temperatures, heat islands and "tropical nights" identifying the need for adaptation activities, especially in locations and neighbourhoods with vulnerable individuals like elderly people or children
- Simulations of water levels resulting of heavy rains and flooding areas in the surroundings of vulnerable areas like creeks and rivers

Based on identified high risk areas, climate adaptation plans are developed both on the level of municipalities and neighbourhoods scale. As well as on social and medical institutions, all being supported by two national funding programs.
The developed concepts could be integrated in ANN RADAR similar to the concepts of Energy-efficient Urban Redevelopment Areas.

Zentrum KlimaAnpassung
beraten • vernetzen • gestalten

The funding program for climate adaptation **"Maßnahmen zur Anpassung an die Folgen des Klimawandels"** supports municipalities, municipal institutions and other actors in tackling the necessary adaptation processes to the consequences of climate change as early as possible, systematically and in an integrated manner.

With the help of the funding program for climate adaptation in social facilities **"Klimaanpassung in sozialen Einrichtungen"**, the BMUV helps to alleviate acute climatic stress in social facilities and to prepare for future climatic changes.

Both funding programs are supported by the Centre for Climate Adaptation "**Zentrum KlimaAnpassung"**.

Zentrum KlimaAnpassung

Outlook: Integration of further Sustainability Domains

3. Nature-based Solutions

Nature-based solutions (NBS) mean planning and designing natural features, such as trees, plants and green spaces, in a way that can help to address urban challenges.
Urban nature improves the environment, creates economic opportunities and creates healthier and more livable cities. Green spaces can engage resilience in the community as well as boosting urban resilience to climate change.
With projects like "CLEVER Cities" nature-based solutions are developed and implemented in several cities. The aim is to:

- increase and improve local knowledge of nature-based solutions,
- demonstrate that greener cities contribute to increasing livability for people and communities,
- promote and enable the uptake of nature-based solutions in urban planning.

Local teams including citizens, businesses, knowledge partners and local authorities have been formed. This collaborative structure will ensure that the urban transformation process is open, inclusive and tailored to local needs.
The existing blue/green infrastructures like rivers, lakes and parks as well as projects like "CLEVER Cities" and similar individual activities based on nature-based solutions might be integrated in ANN RADAR. The activities both have an impact on greener and healthier living conditions and are mostly community-driven which can serve as a basis a rich spectrum for the development of future testbeds.

CLEVER Cities

The **CLEVER Cities** project uses nature-based solutions to address urban challenges and promote social inclusion in cities across Europe, South America and China.
Hamburg, London and Milan are making nature-based interventions in key districts of their cities for urban regeneration. Through exchange between cities, inclusive collaboration and multi-disciplinary learning, the CLEVER Cities project aims to drive a new kind of nature-based urban transformation for sustainable and socially inclusive cities across Europe, Latin America and China.
Belgrade, Larissa, Madrid, Malmö, Sfântu Gheorghe and Quito share and learn with London, Hamburg and Milan on how to adapt nature-based interventions for the needs of towns and cities around the world.

CLEVER Cities

Outlook: Identification of Mobility Sites and Services

The reduction of carbon emissions in the mobility sector is one of the biggest challenges concerning our climate protection goals. Main approaches are:

- “Modal Shift” from motorized individual traffic to walking, cycling and public transport
- Shifting away from personally-owned modes of transportation towards “new” mobility concepts such as a carsharing, ride-sharing, ride-pooling and carpooling
- Use of low carbon drive types and fuels like electric mobility, hydrogen and e-fuels

To support these aspects, not only the construction of large-scale infrastructure like cycle paths is relevant, but also the offering of small-scale infrastructure like bicycle parking facilities and charging infrastructure and the introduction of mobility services.
Booming demand for more personalised transport services have created a market space and momentum for **Mobility as a Service (MaaS)**. The movement towards MaaS is fueled by a myriad of innovative new mobility service providers such as carpool and ridesharing companies, bicycle-sharing systems programs, scooter-sharing systems and carsharing services as well as on-demand "pop-up" bus services.
As a result of this development, the responsibility and opportunities to support sustainable mobility solutions no longer lie solely with the administration, but also with housing associations, corporate employers and shops. As mobility goals, they must be included in the planning of sustainable mobility, including the mobility structure.

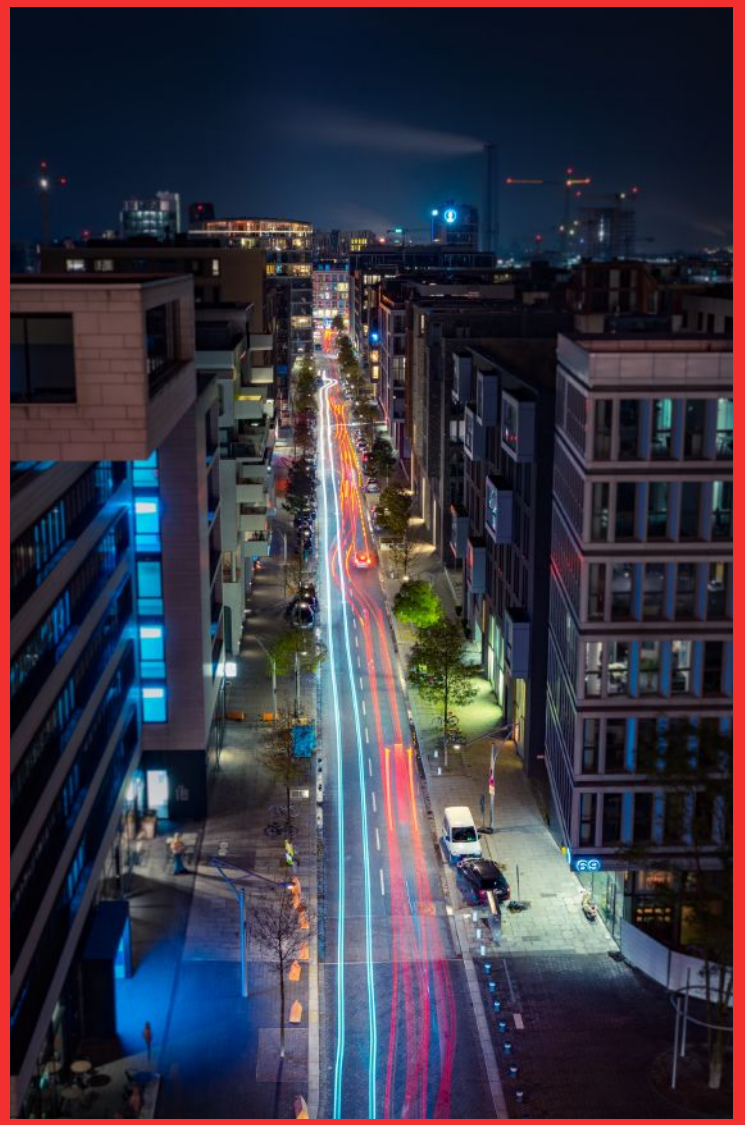


Fig.41: Mediaserver Hamburg / Lucas Pretzel

Outlook: Identification of Mobility Sites and Services

Examples of for mobility solutions are:

- A coordinated mix of charging infrastructure at people's homes, their workplaces, shops and private charging hubs
- Car sharing services financially supported by housing companies
- Cargo bike services at retail locations and housing estates to support the weekly shopping without private cars
- Locations for bike sharing sites or on-demand bus stops

Some of these services can be combined to form a mobility hub implemented by public administration and mobility companies, or by housing companies and other private enterprises.
Supplemented with information and a counselling by a mobility management, the mobility services can arrange a mobility stations.

Some of these solutions have been jointly developed and illustrated in the various model quarter concepts (e.g., Energy-efficient Urban Redevelopment Programme, urban development funding or sustainable development of commercial areas).
They can be integrated in the comprehensive mobility planning of municipal administrations and their mobility companies or can be the first approach of a new project or testbed.

Best practice
Since September 2021, anyone interested in the first mobility hub of Hamburg based housing company BVE has been able to use various sharing offers in the Heidrehmen district and move around the district sustainably. The mobility hub includes several station-based car sharing vehicles, an e-charging station, two e-cargo bikes, a StadtRAD bike station with 20 bicycles, bicycle houses and stands and a repair station. BVE has developed a modular system with various offers, which can be put together individually and flexibly expanded at any time.
BVE Mobility Hub

Fig. 42: Bauverein der Elbgemeinden eG; Yannik Willing, www.willing-holtz.de

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Data Sources - Hamburg

Demographic data (population, households and classification of social characteristics)

Statistikamt Nord, https://www.statistik-nord.de/

All other data (e.g. basic spatial layers, solar potential).

Geoportal Hamburg, https://geoportal-hamburg.de/geo-online/

The related metadata can be found on the METAVER website: https://metaver.de/startseite (look for Hamburg).

The derived data, which were used in the ANN RADAR tool, have been created from the above sources, e.g. Solar Coverage Rate, Potential of Renovation in Percentage.

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https://github.com/ANN-RADAR/ann-radar-prototype