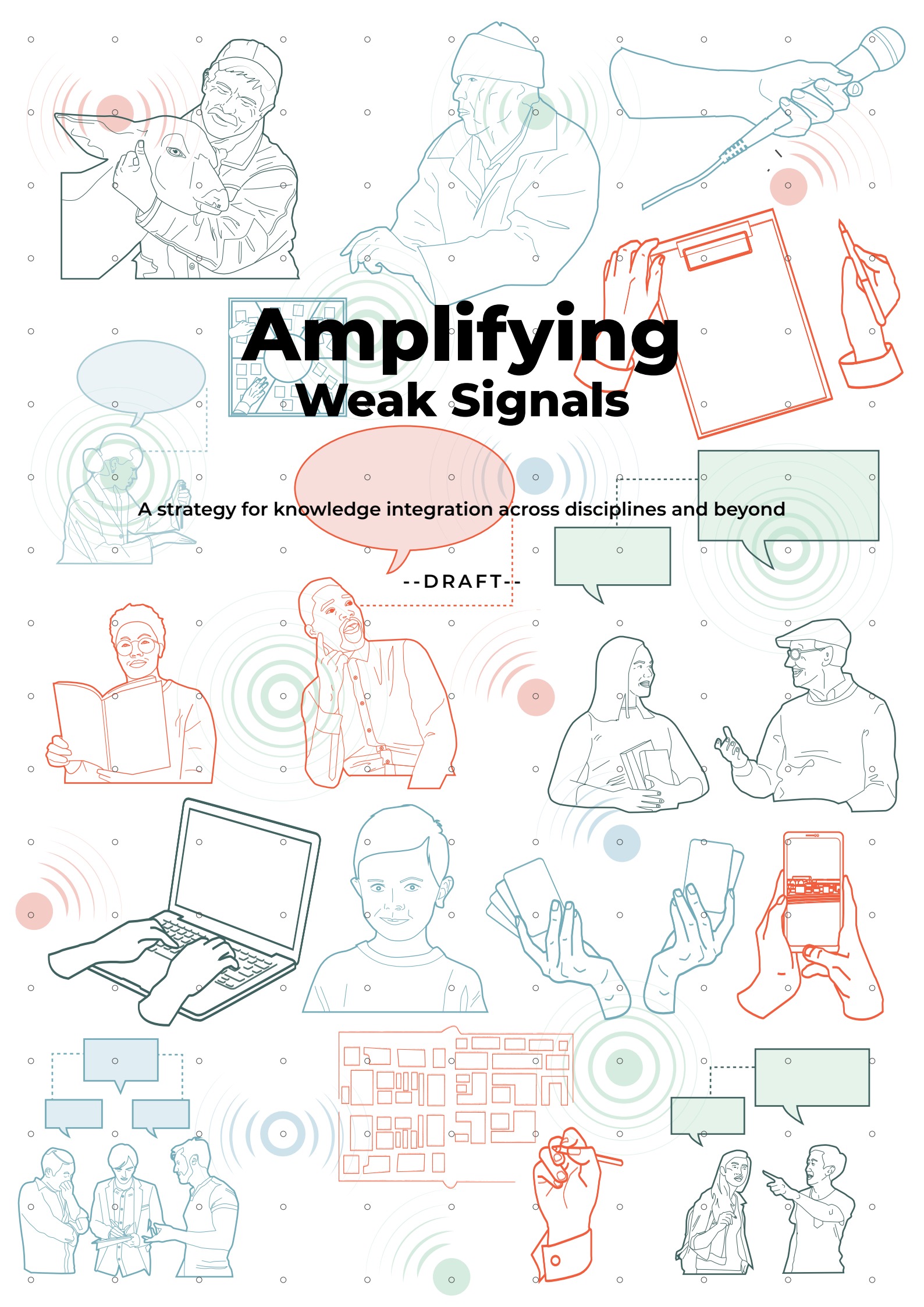


Amplifying
Weak Signals

A strategy for knowledge integration across disciplines and beyond

--DRAFT--

Preface

Faced with challenges of inter- and trans-disciplinarity, communities of practice concerned with deep societal challanges in urban areas realise that neither abstraction nor hyper-comprehensiveness are sufficient for achieving meaningful and effective knowledge integration. Perfect alignment of knowledge (e.g., common definitions, overarching models) is neither possible nor desired. Moreover, this alignment risks alienating actors and knowledge that are less conducive to convergence. To complement the shared concern or 'strong signals' that emerged from the RDI Methodology pilot workshops, we focus on weak signals. Weak signals provide early information about future strategic surprises or discontinuities for strategy making (Holopainen and Toivonen 2012). However, the knowledge needed to take action on them may be insufficiently concrete, prone to misinterpretation or difficult to integrate with other knowledge. Investigating weak signals provides a basis for developing alternative pathways that can lead to greater flexibility in strategies for dealing with societal challenges. The study aims to amplify weak signals by:

Adopting a network analytical approach to identify so-called weak ties (e.g., see Granovetter 1973) or links across groups in a decentralized manner. We seek to identify weak ties in the form of contingent knowledge. Contingent knowledge (Champlin et al 2018) is knowledge present across diverse knowledge networks surrounding societal challenges but that has not been picked up in the convergence process.

The guidelines support the development of methods to engage the knowledge of peripheral actors who are not typically present in the convergence process. These actors include (1) academics with deep disciplinary knowledge with an inclination towards interdisciplinary collaboration, (2) citizens who are often underrepresented or excluded from early-stage convergence (3) those who are not there yet (future actors) driven by considerations of societal challenges like socio-spatial justice and (4) ecosystem agents (nature).

The aim of this project was to develop guidelines and procedures for researchers and facilitators that aid in developing and conducting projects for actionable knowledge integration targeting weak signals.

Index

Guidelines for Peripheral Knowledge Collection

This chapter provides an overview of the process of knowledge integration and the structure that these guidelines provide. Besides that, the definitions for some key terms is explained and context of their use is provided. Lastly, the use of the guidelines and the different approaches to using the framework is explained.

Guidelines for Building a Method That Amplifies Weak Signals

The guidelines presented in this document propose a framework of concepts that are aimed at supporting the process of knowledge collection. This process is focussed on peripheral knowledge that has not yet been picked up in the convergence process, the so called weak signals. These signals are sent by actors that are not incorporated in main stream discussions and whose knowledge is considered to be difficult to integrate. The framework can be used for the modular construction of a method for identifying issues and pinpointing the peripheral actor(s) that can provide insight into this issue and develop a methodology for collecting this knowledge. This section provides more information on the core concepts of the framework and the set-up for using the guidelines in practice.

The Process

Collecting and integrating knowledge into a project can occur at many stages; however, some elements need to be clear before relevant information can be processed and lead to a more informed, shared goal. The trajectory of projects can be summarized in a sequence of diverging and converging information. A dynamic view of the strategy-making stages of project planning describes this sequence from a challenge to the intermediate points of finding a subset of issues, determining scenarios and, finally, a strategy. This approach is called the diamond model (Champlin et al 2018). These guidelines lead researchers in this sequence to develop methods that help integrate peripheral knowledge into their project.

Shared concern and issues

Before the first step of diverging and converging can be taken, the foundation for the project needs to be determined. This means that a shared concern needs to be defined. The shared concern summarizes the main problem that is sought to be addressed in the project. This description can be broad or specific, can span several disciplines and can take several forms. Usually, the definition of this shared concern is the result of a separate set of divergence and convergence that forms an additional diamond before the first one depicted in Fig below. A shared concern is most likely defined based on the so called 'strong signals' and is often lacking the insights from weak signals. Once the shared concern has been defined, the divergence process is focused on gathering information about this concern. Subsequently, the convergence that follows focuses on objective setting. This convergence process scopes the information collected during divergence and helps delineate the problem. The result of this activity is a subset of issues that lie at the core of the shared concern. The issues that are central to the shared concern form a subset of issues that mostly encompasses the shared concern and delineates the scope of the project. These issues are framed as specific threats to the resilience of the urban system, which is its ability to withstand shocks and stresses.

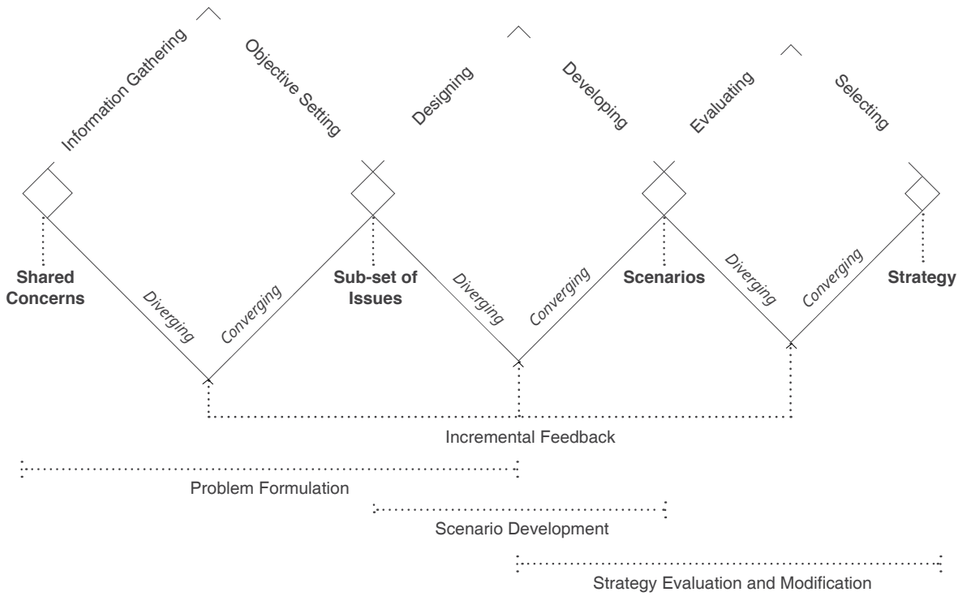


Fig: Dynamic view of the strategy-making stages of planning

The Framework

The guidelines are structured using a framework which comprises building blocks. Building blocks are elements that can be combined to create a method for (peripheral) knowledge collection. This term is used in describing the different elements that are central to creating a method and can be singular (one building block) or multiple (a combination of building blocks). A method created with these building blocks has varying characteristics dependent on the interaction between the singular elements. There are three types of building blocks: knowledge types, peripheral actors and design instruments. Each method is considered to be constructed of these three types of building blocks.

A knowledge type is central to collecting peripheral knowledge as different types of information can inform the project differently. When selecting a knowledge type, the researcher needs to keep in mind what kind of knowledge can inform the subset of issues. The types of knowledge used in this framework are: experiential knowledge, generational knowledge, expert knowledge, situated knowledge and relational knowledge. A more elaborate description of these building blocks can be found on pages 30-42

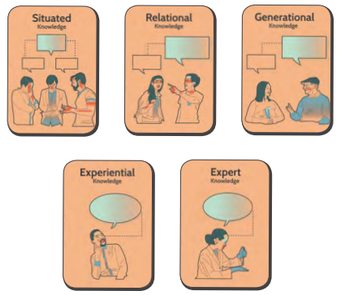


Fig: The five types of knowledge that can be collected

Besides the knowledge type that can inform the subset of issues, the peripheral actor that has this knowledge influences the characteristics a method is required to have. A peripheral actor is a person or entity within an environment who influences and is affected by the shared concern and subset of issues. As different actors have different needs and characteristics, it is key to a successful knowledge collection to approach them differently. The peripheral actors used as building blocks in this framework are: eco-system agents, deep disciplinary experts, future actors and citizens. A more elaborate description of these building blocks can be found on pages 21-28.

Fig: The peripheral actors who are generally excluded from covergence settings.

The last building block that is required to form a method is the design instrument. A design instrument is a tool that can be used for collecting knowledge. Different instruments result in knowledge that is represented in different types of data. Also, some instruments are more equipped for dealing with certain characteristics than others and can help in better approaching specific actor. A great variety of design instruments can be considered in a method. The design instruments that were considered in this research are explained in more detail on pages 48-66, but the framework is certainly not limited to this set.

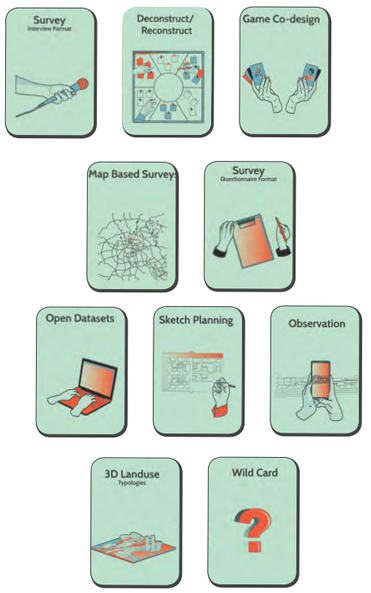


Fig: The design instruments used in this framwork to collect and visualise peripheral knowledge

Combining building blocks

In these guidelines, five knowledge types, four peripheral actors and nine design instruments were considered. This range of building blocks can lead to 900 combinations and, thus, to a broad spectrum of methods that can be created. Each method has specific characteristics that can be beneficial to the knowledge collection process. Even though the building blocks considered in these guidelines lead to an abundance of methods, the building blocks that are included are only a selection of the possibilities. This means that there are many more possible methods subject to creativity and innovation. Therefore, it should be noted that these guidelines are aimed at inspiring new insights and hope to encourage novel knowledge integration techniques. The steps that are presented are a framework that can be used to structure this process, aid in avoiding miscommunication and make actions concrete.

Creating a Method

Methods consist of a building block from each of the three categories. Each **method** helps collect peripheral knowledge that is likely unknown to inter-disciplinary strategists who are involved in making decisions about improving the resilience of urban environments. These are issues that threaten the urban environments ability to withstand shocks and stresses. Different combinations lead to different results and aims to collect peripheral knowledge that was not yet included in the shared concern and subset of issues.

Approaches to using the Guideline

When using these guidelines, two approaches can be taken in collecting peripheral knowledge. The first approach is an issue-driven approach in which the method that is developed aims to inform most of the core- and sub-issues. This approach can spark ideas for new methods by creating new combinations of building blocks.

The second approach is a method-driven approach. This approach places a method at the center of the process and inspires new issues that were previously not considered in the subset of issues. Both approaches can be implemented and will result in different outcomes.

The main goal of these approaches is to inspire researchers to new insights for peripheral knowledge collection. Besides that, the process of method development is guided through a structured set of steps that lay the foundations for more concrete knowledge integration. These steps can also be translated to a workshop setting in which the guidelines are converted to a physical game board.

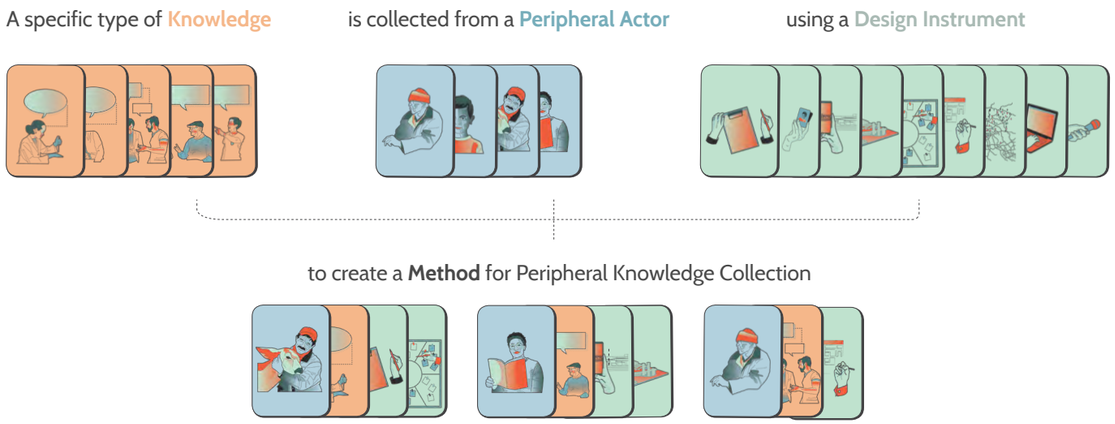


Fig: The selection of building blocks to create a method

Issue-driven approach

Structuring a knowledge integration process requires a shared concern as described in previous sections. the issue-driven approach selects a subset of issues that lie at the center of the shared concern. With this information, the combinations and their effectiveness in collecting information on a certain issue are compared with the issues in the subset. Through iteration and consideration of effective and less effective building blocks, a method that addresses the most issues can be developed. The goal of this approach is to find a method suitable to collect knowledge on the issues that are already known to researchers and facilitators but lack peripheral input.

Method-driven approach

As with the issue-driven approach, this approach first requires a shared concern to be defined. However, the method-driven approach then requires participants to select a combination of building blocks intuitively to create a method they would use to collect peripheral knowledge on the shared concern. The issues that are likely to be informed with this method can then be uncovered. This information can provide insight into issues that were not considered by researchers and facilitators but could be relevant to the shared concern as peripheral knowledge. The goal of this approach is to inspire participants in considering issues outside of their scope and integrate knowledge that, at first look, does not seem relevant.

Classifying Issues

To further describe the shared concern, it is crucial to determine a set of sub-issues that specify the core of the shared concern. As most shared concerns are typical to a certain topic or domain, a generalization of the issues is useful for comparison across topics. These guidelines are focused on issues that threaten the urban environments ability to withstand shocks and stresses. This chapter describes the classifications that are used to categorize the issues in the urban environment. This list of classifications is not exhaustive but serves as a structure on which the data collected during the study was projected. This structure can be used to classify issues into categories that allow comparison across cases.

Urban resilience is understood as the measurable ability of any urban system, with its inhabitants, to maintain continuity through all shocks and stresses, while positively adapting and transforming toward sustainability.

Shocks and stresses undermine the city's ability to function in a socially and environmentally equitable manner. Stresses refer to pressures whose cumulative impact over time weakens the city's ability to be resilient. Shocks on the other hand are sudden events that unfold over the time frame of a few days or hours. Both shocks and stresses can originate from within the urban system or be a result of external processes that exist outside the urban system. They can be broadly classified as shown below.

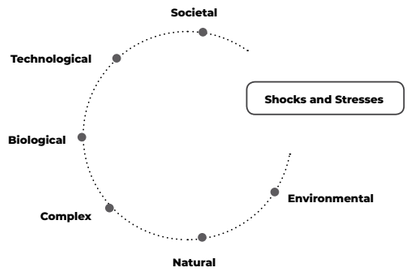
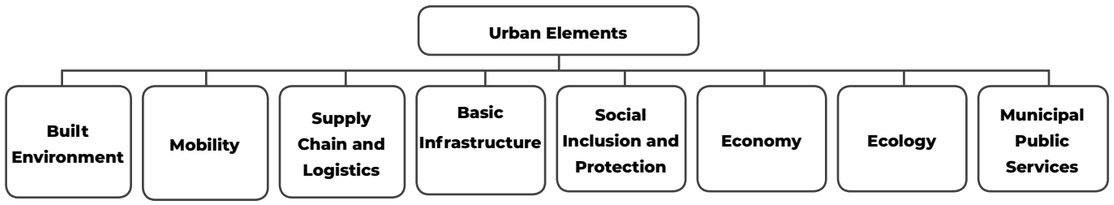


Fig: Types of Shocks and Stresses that affect the urban system's ability to be resilient.

The **Shared Concern** that you present may be largely affected by a specific stress like 'drought', a sudden shock like 'epidemics', or 'extreme weather events'. Both shocks and stresses can set off a complex chain of disruptions in various parts of the urban system that seem disconnected from each other. To form viable strategies to build resilience, the shared concern has to be broken down into specific issues that each affect a different component of the urban system.

The Urban System can be understood by collecting data about the identity of the city, the performance of local governments and stakeholders, and the urban elements that frame the urban area. These **urban elements** encompass not only the built environment, but also crucial components that enable urban life, such as ecology, supply chain and logistics, basic infrastructure, and mobility. By collecting data on these elements, we can gain insights into the complex dynamics of urban systems. The issues collected from peripheral actors are likely to directly affect one of the categories falling under an extensive classification of urban elements.



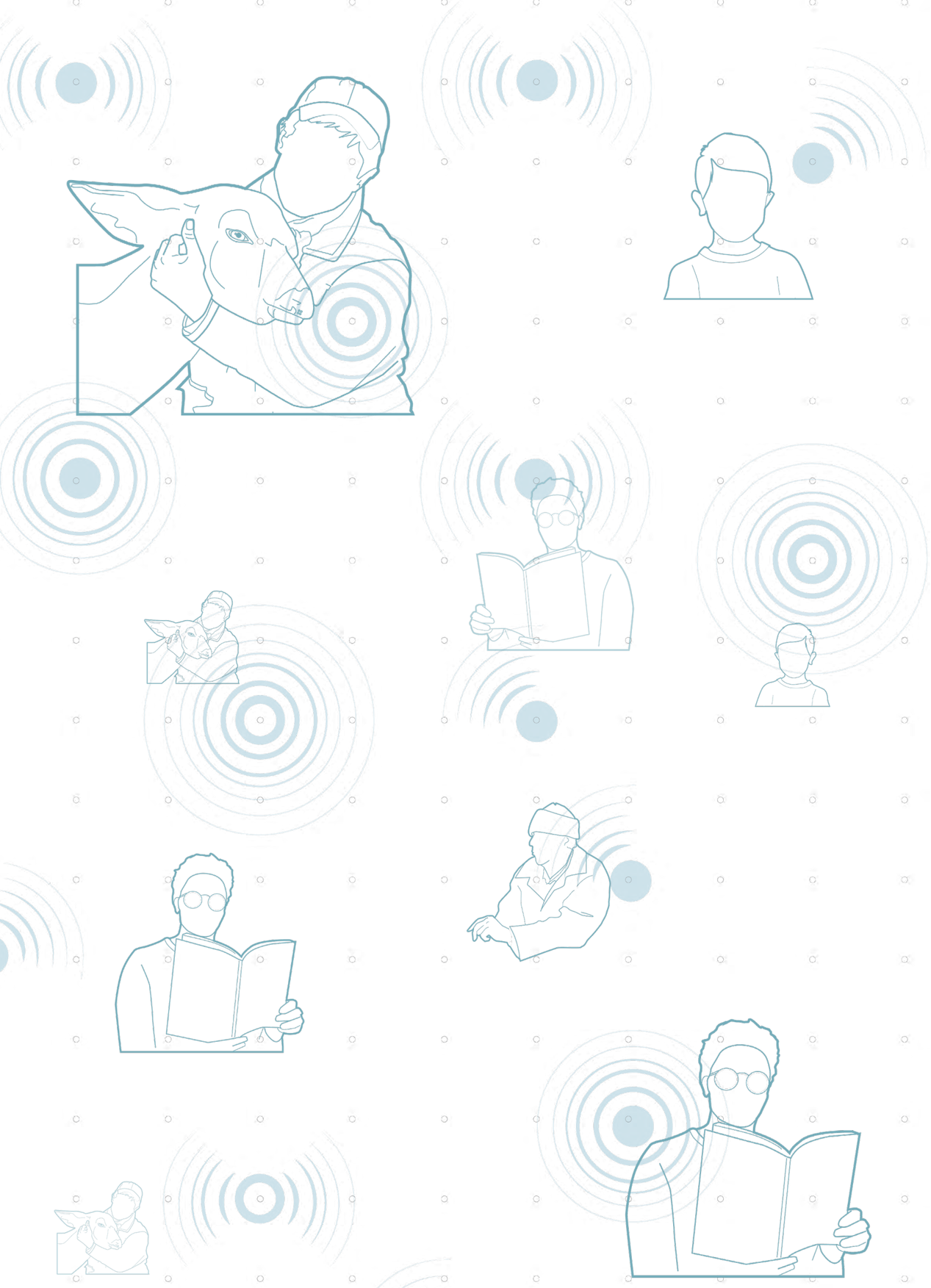
More information about the sub-categories that come inside this classifications and their definitions are listed in the following pages.

Mobility	**Urban Mobility**	Diversity and modal share, coverage of transport networks, access to transport including public and private modes,and continuity of operation
	Inter Regional Mobility	Diversity and modal share, coverage and capacity of main entry points, access, and continuity of operation.
Supply Chain and Logistics	**Water Resources**	Availability of water resources, consumption and resource balance, and integrated water resource management.
	Energy Resources	Different sources of energy allocated or produced locally, renewable share, capacity and efficiency of resources and supply operations.
	Food Supply	Availability and stability of basic food both imported and local, including management of food chain.
	Logistics	Capacities and management of the freight and logistics platforms for general materials and goods, including critical access and distribution points.
Basic Infrastructure	**Energy**	a. Buildings Supply: Diversity of access to energy supplies, coverage of network supplies, efficiency in the provision, supply operations, and maintenance and monitoring of supply networks. b. Mobility Supply: Coverage of network supplies, efficiency in the pr vision, supply operations, and maintenance and monitoring of supply networks.
	Water	a. Water Supply: Access to drinking water, water supply network coverage, efficiency and operational standards, maintenance and monitoring of supply network. b. Wastewater and Sanitation: Access to sanitation, wastewater ne work coverage, treatment and discharge methods, maintenance and monitoring of wastewater systems c. Stormwater: Stormwater collection systems, stormwater and flood management strategies, effectiveness of stormwater solutions and maintenance and monitoring of supply network
	Solid Waste	Network coverage and access to waste collection system, efficiency of treatment such as recycling and energy recovery, disposal and cont nuity of operations, including for non-municipal and hazardous waste
	Telecomunications	a. Phone and Internet: Access diversity, coverage of networks, and network operations. b. Television and Radio: Access diversity, coverage of networks, and network operations.
Social Inclusion and Protection	**Access to Social Protection Floors**	Status of poverty and economic deprivation, access to health care through appropriate insurance, income security for children (including the one guaranteeing the access to food), assistance for unemployed, undere ployed and poor people, and income security for elderly and disabled people.
	Access to Basic Social Services	a. Access to education: including coverage of education services and access, in line with SDGs targets. b. Access to health: including coverage with regular and emergency services, and access to health facilities for al categories of population in need. c. Access to social care and protection:including coverage with prevention and specialized protection services, and access of specific categories of people in vulnerable situations. d. Access to food: including coverage with nutrition programmes and the respective access
	Social Accountability	Consultation of citizens in development interventions, consideration of citizens' initiatives (bottom-up approaches), collaboration of civil society organization in local government's decision-making processes, collection of citizens' and/or beneficiaries' feedback, and use of grievance redress mechanisms in operations.

Built Environment	**Urban Form**	Urban growth model including land consumption and expa sion, open areas, public open space and street layout.
	Land Tenure	Land tenure systems and land rights, access to secure land, and capacities to administrate land.
	Housing	Availability and affordability of adequately located and constructed housing.
	Built Assets	Adequate location, construction and maintenance of critical facilities and other important built assets.
Economy	**Economic Stability and Diversity**	Analysis of economic diversity, fiscal stability, labour and real estate market imbalances, and the dependence upon certain industrial sectors .
	Economic Context and Market Efficiency	Evaluation of the attractiveness and efficacy of the local market, including its level of integration with formal financial systems and supply chains.
Ecology	**Ecosystem Services**	Condition, trend and maintenance of the ecosystem and the service.
	Eological Foot Print	Bio-capacity, ecological footprint of production and consumption: Ana ysis of the bio-capacity, and the footprint of production and consumption
	Biodiversity and Green Areas	Biodiversity in the city and protected natural areas in the region.
	Environmental Quality	GHG emissions and inventory; state of air, water, and other types of pollution; and monitoring of pollution.
Municipal Public Services	**Cemeteries and Creatoriums**	Diversity, coverage, access, and quality and safety monitoring.
	Civil Registerations	Typology of authorities, coverage, access and data management and dissemination systems.
	Criminal Justice and Law Enforcements	a. Violence and Insecurity: crimes against property, violent crimes, conflict related deaths and domestic violence. b. Law Enforcement: Diversity and typology of law enforcement institutions, coverage with local security forces, and continuity of operations. c. Correction facilities: Typology and quality of correction facilities. d. Access to Justice: Diversity and typology of justice institutions and access to justice.
	Cultural heritage and cultural activities	Diversity and typology of cultural heritage/institutions, access to culture, maintenance of cultural heritage
	Emergency and rescue services	Diversity and typology and continuity of operations.
	Food insepection and monitoring institutions	Typology of authorities, their responsibilities, monitoring mechanisms and data management, and dissemination and awareness raising.
	Communicable diseases surveillance and response system	Typology of authorities in charge, Capacity of surveillance system, Mechanisms of data collection and management, Emergency response nd Warning and awareness raising mechanisms.
	Municipal taxes and fines	Analysis of typology and responsibilities, coverage aspects, and access
	Public Lighting	Analysis of diversity of public lighting, coverage, maintenance, and continuity of operation

Introduction to Building Blocks

A knowledge collection method consists of a combination of fundamental elements called building blocks. These building blocks cover the knowledge type that is aimed to be collected, the actor that is targeted and the design instrument or combination thereof that is used as a tool for knowledge collection. This chapter provides a description for each of the building blocks that were used in the study to combine into methods. Furthermore, the building blocks are described based on literature review (knowledge types) and input from researchers with expert knowledge of the design instruments. Potentials and benefits are described using the collected in the study.. Potentials for using the method and challenges and barriers that should be considered for the actors and design instruments are described. Potentials are benefits of the potential use of the building block. Challenges are issues that can be overcome by taking measures that addresses the issue. Barriers are issues that can be mitigated but never entirely avoided. Lastly, the effectiveness of a building block in collecting a certain issue is described.



Peripheral Actors

A peripheral actor is a person or entity within an environment who influences and is affected by the shared concern and subset of issues. As different actors have different needs and characteristics, it is key to a successful knowledge collection to approach them differently. The types of peripheral actos considered as building blocks are: Ecosystem Agents, Citizens, Deep Disciplinary Experts and Future Actors. A more elaborate description of these building blocks can be found in the following pages

Ecological Agents

(Sentient) Living, non-humans occupying the selected area.

Examples Local wildlife, fish, insects, etc.

Animals and plants influence the landscape and are an integral part of the urban ecosystem. Ecological agents can affect the liveability and climate of the urban environment. Conversely, the urban environment has a strong impact on urban habitats and biodiversity. These actors can be classified as peripheral as they are naturally unable to engage in the discussion about urban design and are unable to share their knowledge. Often, these agents are represented by proxy ex-

Strengths

There were no strengths observed with this actor type employed in this study. However, this does not imply that the implementation of the actor type is entirely problem-free. It simply means no visible limitations were identified during the data collection for this particular res
earch, and based on the classification used in this analysis, no strengths were observed. It is worth noting that the collection and inclusion of knowledge from eco-system agents benefits the inclusivity and environmental awareness of a research. As these actors are unable to voice their own concerns, perceptions and needs, their knowledge is inherently peripheral to most research. Taking into account the limitations of collecting knowledge from eco-system agents can improve the inclusivity of research and expand the solution space that is considered.

Limitations

The challenges encountered with the ecosystem agents during the workshop were centred around a difficulty with locating the actor in the research area. Finding specific animals during a limited time can be challenging as habitats are often extensive and the actor can shy away from human activity. Besides that, locating the actor can be dependent on the existing knowledge of the researchers regarding the habitual preferences of the animal. This can be, when the knowledge is insufficient, increasing the difficulty for the researcher.

The main barriers lie with the accessibility of the actor group. Besides the challenge of finding the eco-system agent in its habitat, the communication barrier presents as an issue during knowledge collection. The researcher is unable to communicate directly with an eco-system agent and is always limited to the interpretation of behaviour and other environmental factors (e.g. location of habitat, interaction with the environment etc.). This barrier makes the knowledge collected from this actor susceptible to bias and distortion. This can be in the form of actors that are part of the data which do not belong to the site, but researchers would be unable to identify this. Besides that, the behaviour of eco-system agents is dependent on the context in which the presence of the researcher or other non-peripheral actors can influence. In general, the risk of results having lower reliability is present due to the distance between the researcher and the actor.

Conclusions

From these results, the design instrument for collecting knowledge from ecosystem agents should be able to gather knowledge without direct (verbal) communication with the actor. This could be through conversations with proxy actors, such as experts representing the actor's voice or general observed information regarding the actor. The latter can be either direct observation or interpretation of available data on the actor. Generally, the design instrument should be able to collect extensive and detailed information on the actor and include a large sample to mitigate the distortion of results. This should also include information that seems non-relevant as the actor is unable to explain their actions. Besides that, controlling for researcher bias in the results should also be considered

Strengths	Limitations	Requirements from Design Instruments
Inclusivity	Finding the actor in its habitat	Be able to locate the actor
Environmental awareness	Dependent on existing knowledge	Allow for indirect knowledge collection
	Interpretation of behaviour	Collect large sample sizes
	Biased and distorted data	Allow extensive, non-relevant and detailed data collection
	Context dependent	Control for researcher bias

Deep Disciplinary Experts

Experts of a niche domain are not included in the dominant discussion.

Examples Philosophy, social sciences, historians, physicists etc.

These actors include all experts that are either not considered to be relevant or themselves do not engage in the mainstream discussion. This can result from the expert being proficient in a domain that is deemed too narrow, or the field is initially considered unrelated to the general dialogue.

Strengths

This actor is instrumental in raising the alarm on essential issues in peripheral domains. These actors can bring attention to certain things and provide specific knowledge to the discussion.

Limitations

These actors exist in various categories with different characteristics and often belong to more than one actor group (e.g., deep disciplinary expert and citizen). This additional challenge of separating deep disciplinary knowledge from citizen knowledge should also be considered. This can cause challenges for researchers in collecting specific expert knowledge from the actors, as perceptions are often mixed. Also, reaching out to these actors, e.g. connecting to the right actor in the target audience and finding a person with expert knowledge in the selected discipline, can be a challenge. Besides finding actors with the collected knowledge, finding the experts generally can take time and effort. The availability of experts can be limited, which requires flexibility from the researchers.

Barriers for the deep disciplinary experts are related to barriers to participation. As mentioned, the availability of experts can pose an issue. Besides that, barriers to directly collecting knowledge from these actors have been reported. The characteristics of this actor group also increase the effects of this barrier. The limited number of people usually represents a broader group of actors, which can result in a limited perspective. This is specifically the case for actors not necessarily organised in groups or widely accessible networks. This increases the difficulty of connecting with a more significant number of actors in this group

Conclusions

From these results, the design instrument for collecting knowledge from deep disciplinary experts should be able to collect knowledge flexibly. This flexibility will allow researchers to adapt to the limited time available from the actor. It is also critical that the design instrument is efficient and able to collect knowledge in a short time. Besides that, the design instrument should be able to collect a specific type of knowledge and contextualise this in the other knowledge types that the actor may have. Lastly, a strategy for connecting with actors that are not strongly connected in a network should be possible with the design instrument.

Strengths	Limitations	Requirements from Design Instruments
Help raise the alarm	Belong to more than one actor group	Be flexible
	Mixed perceptions	Be time efficient
	Connecting to the right actor	Allow contextualisation in other knowledge types
	Limited availability	Connect with weakly connected actors
	Participation barriers	
	Limited perspective	

Future Actors

Humans expected to occupy the selected area in the future.

Examples Children, unborn actors, new residents etc.

This actor type is expected to reside in the researched area in the near or distant future. Their knowledge is not yet defined nor can individual actors be defined or delineated. These agents are often underrepresented in the design process as predictions and estimations bring uncertainties. Besides that, anticipating and designing for this actor group often relies on proxy experts that represent the voice of these future actors.

Strengths

The main strength identified when collecting knowledge from future actors is that these actors can bring attention to specific things that have not been included in the discussion. Specifically, the results from the workshop found that children are future actors that can uncover things that adults and experts overlook. Besides that, when combining this actor type with the citizen actor type, the communication with current citizens can reveal information about future citizens and their expectations, need and opinions.

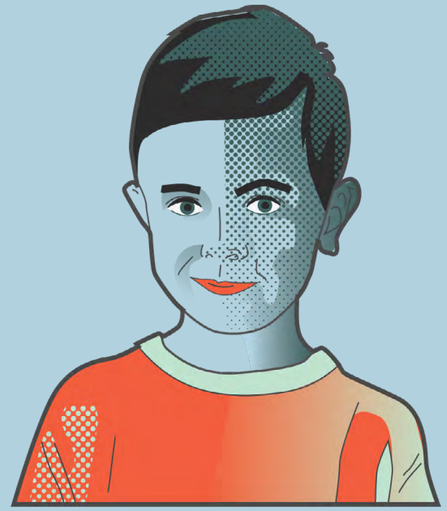
Limitations

There were no challenges observed with this actor type employed in this study. However, this does not imply that the implementation of the actor type is entirely problem-free. It simply means no visible limitations were identified during the data collection for this particular research, and based on the classification used in this analysis, no challenges were observed. It is worth noting that a challenge that can be encountered when collecting knowledge from this actor type is the layer of interpretation that has to be done before useable data can be collected. Using proxy actors or collecting knowledge from children requires the researcher to interpret the information that is collected. This translation can distort or bias the results which in turn can lead to skewed outcomes. However, the effects of this challenge can be mitigated or overcome by combining the information that is collected and cross-referencing the interpretation with peers or other data (e.g. open datasets or scenarios).

Even though these strengths can be beneficial and no challenges were identified, several unsolvable barriers to involving and accessing this actor have been identified. Accessing the actor is a barrier as the actor does not yet exist. Therefore, it isn't easy to find and reach out to the actors. Either the actor is a child, and the communication strategy needs to be adjusted, or the actor would be reached through other forms of knowledge collection that do not require contact with the actor. Besides that, there is a challenge of reaching future actors with different backgrounds that want to participate in the research. Depending on the actor, the information that is collected can differ vastly. Also, the behaviour or perceptions of the actor could be influenced by the researcher and change over time. The latter especially affects the results as opinions on the future are always biased by the current environment.

Conclusions

From these results, the design instrument for collecting knowledge from future actors should be able to collect knowledge without directly communicating with the actor. As the actor does not exist yet, the design instrument should be able to collect knowledge without direct communication with the actor. Besides that, the communication done with proxy actors or other data forms should be adaptable to specific actor characteristics (e.g. children or data extrapolations). Lastly, the design instrument should be able to collect different perceptions about the future but also be able to control for biases that are caused by interferences from the present.



Strengths	Limitations	Requirements from Design Instruments
Bring attention to new issues	Accessing actor	Allows indirect communication (possibly by proxy actors)
Proxy actors	Data is actor dependent	Allows flexible communication
	Perceptions can change over time	Collect different perceptions
		Control for biased opinions

Citizens

Humans currently occupying the selected area

Examples The elderly, working-class people, homeless people, etc.

These people live in the researched area and are users of the urban environment. These agents are often considered in the design process, but a mismatch between the represented group that is included and the individual citizens can exist. Besides that, the actor group is often too large, fragmented and has many characteristics. Also, some citizens are more vulnerable than others or can only be engaged through specific methods.

Strengths

A benefit of collecting knowledge from this actor type is that communication with current citizens can reveal information about future actors and their expectations, needs and opinions.

Limitations

Some challenges should be considered when collecting knowledge from citizens. First of all, there are challenges related to the actor's knowledge. Specifically, there is a high chance that the citizen part of the data collection does not have the knowledge that is being collected. Besides that, contradictions within the sample can occur due to different opinions from citizens with similar characteristics. Therefore, the design instrument should be able to collect a wide variety of information and reasoning from the citizens. With this reasoning, the researchers could compare and separate the knowledge to be included in the research.

Next to challenges involving the actors' knowledge, involving the actor in the research can also be challenging. Communication with the actor and uncertainties surrounding the actor should be considered. A significant challenge is guiding the citizen through the collection process and finding the right answers that limit bias but still collect relevant information. Also, accessing the actor can be a challenge. As there is a wide variety of citizens with different demographics, attributes and knowledge, the adaptability of the design instrument becomes more critical. This is specifically the case when only a limited sample size can be achieved with the available resources. Shaping the knowledge collection to accommodate these characteristics could help collect a more inclusive sample.

Furthermore, finding and connecting with citizens and achieving successful participation of the actor is something to consider when collecting knowledge from this actor group. Unwillingness to participate poses a challenge and requires design instrument that takes little effort for the actor can decrease the effects of this challenge.

Lastly, when collecting knowledge from citizens, certain barriers should be noted. First, the limited sample size and a wide variety of citizen demographics, characteristics and backgrounds result in a small group representing a whole. The limitation that not all knowledge can be collected should be considered. Though the effects of gathering knowledge from a heterogeneous group can be mitigated by developing an inclusive research method, there will inherently be a generalisation of results over a wider group of citizens. Besides that, there are participation barriers that need to be taken into account. These barriers can stem from the presence of the actor or an unwillingness to participate. Lastly, the collected knowledge often depends on the context in which it is collected. Specific environmental conditions can bias the perceptions and opinions of people and should thus be considered during knowledge collection.

Conclusions

From these results, the design instrument for collecting knowledge from citizens should be able to collect a wide variety of knowledge. This should also include the reasoning or perceptions of the actor about that knowledge. To account for citizens' different demographics, characteristics and backgrounds, the design instrument should be adaptable. Lastly, the design instrument should facilitate low-effort participation to improve the likelihood of citizens being willing to participate in the knowledge collection.

Strengths

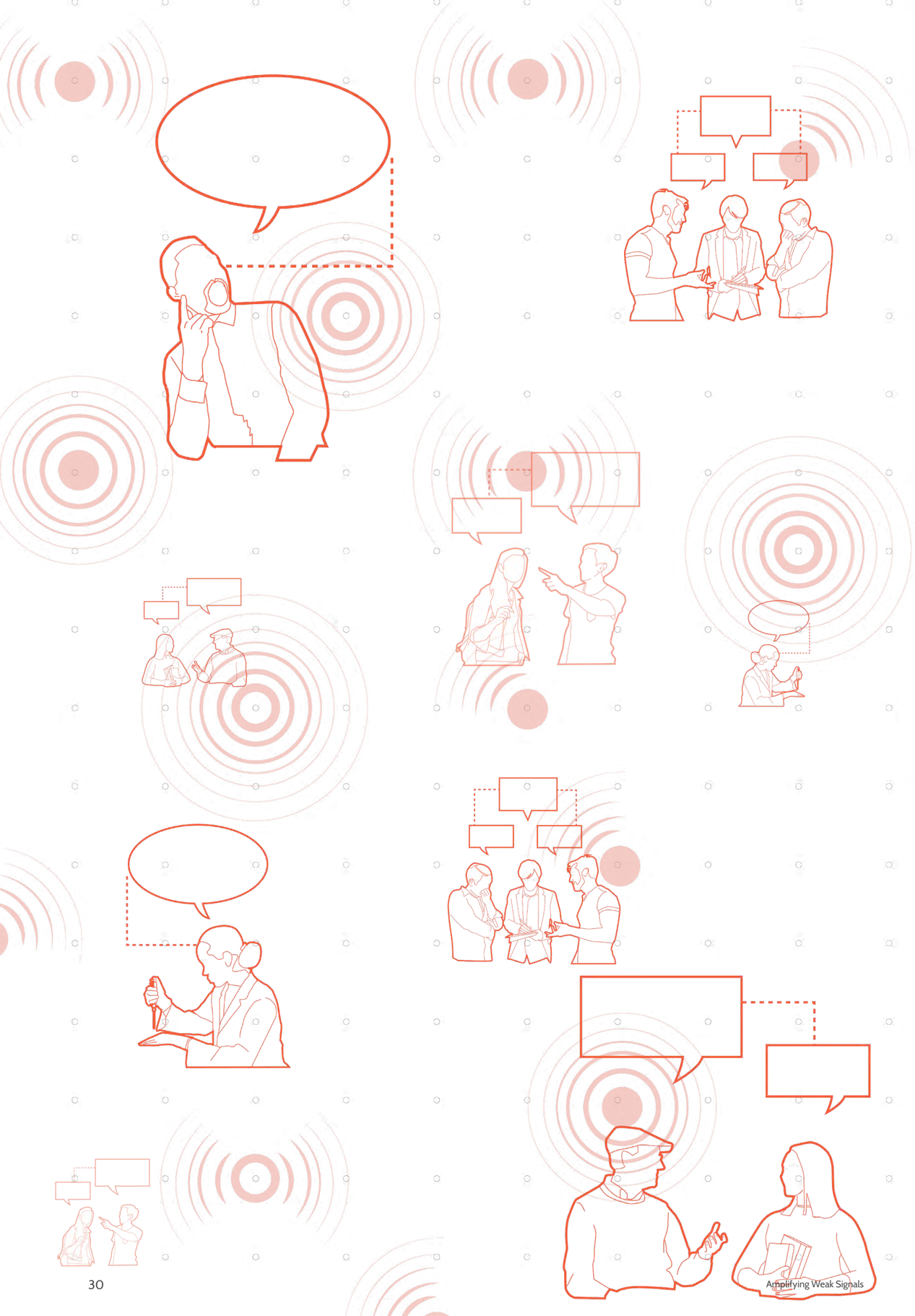
- Can be used as proxy actors

Limitations

- Lacking required knowledge
- Contradictions
- Challenging communication
- Uncertainty
- Lack of participation
- Accessing the actor
- Limited sample
- Finding and connecting with willing participants
- A small group representing a whole
- Participation barriers
- Context dependency

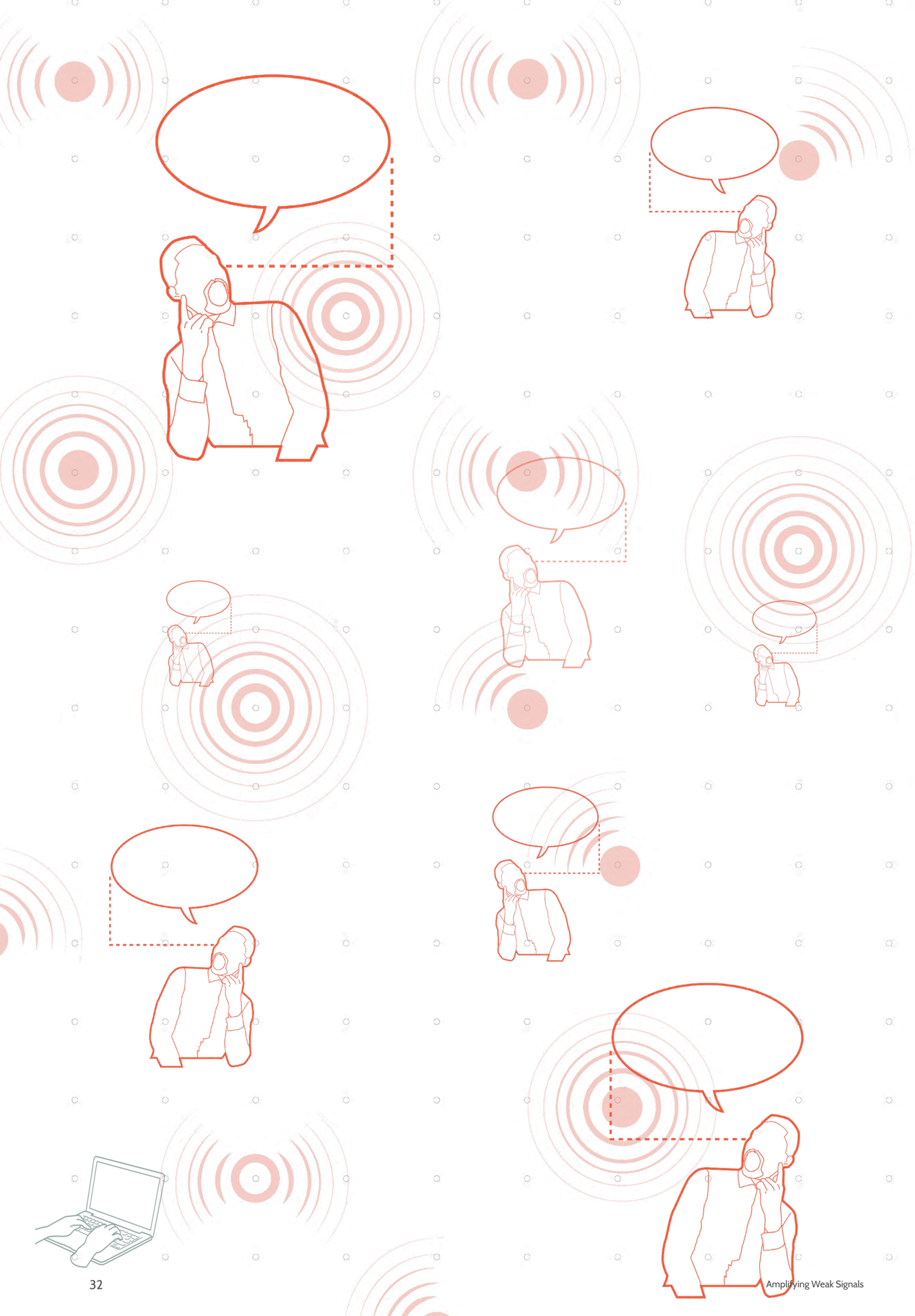
Requirements from Design Instruments

- Collect a wide variety of information
- Collect the reasoning of the actor
- Be adaptable to actor characteristics
- Be low effort for participants



Knowledge Types

A knowledge type refers to a distinct category of information that is essential in the collection of peripheral knowledge, as different types of information can provide varying levels of insight for a given project. When selecting a knowledge type, the researcher needs to keep in mind what kind of knowledge can inform the subset of issues. The types of knowledge that can be considered as building blocks are: experiential knowledge, generational knowledge, expert knowledge, situated knowledge and relational knowledge. A more elaborate description of these building blocks can be found in the following pages



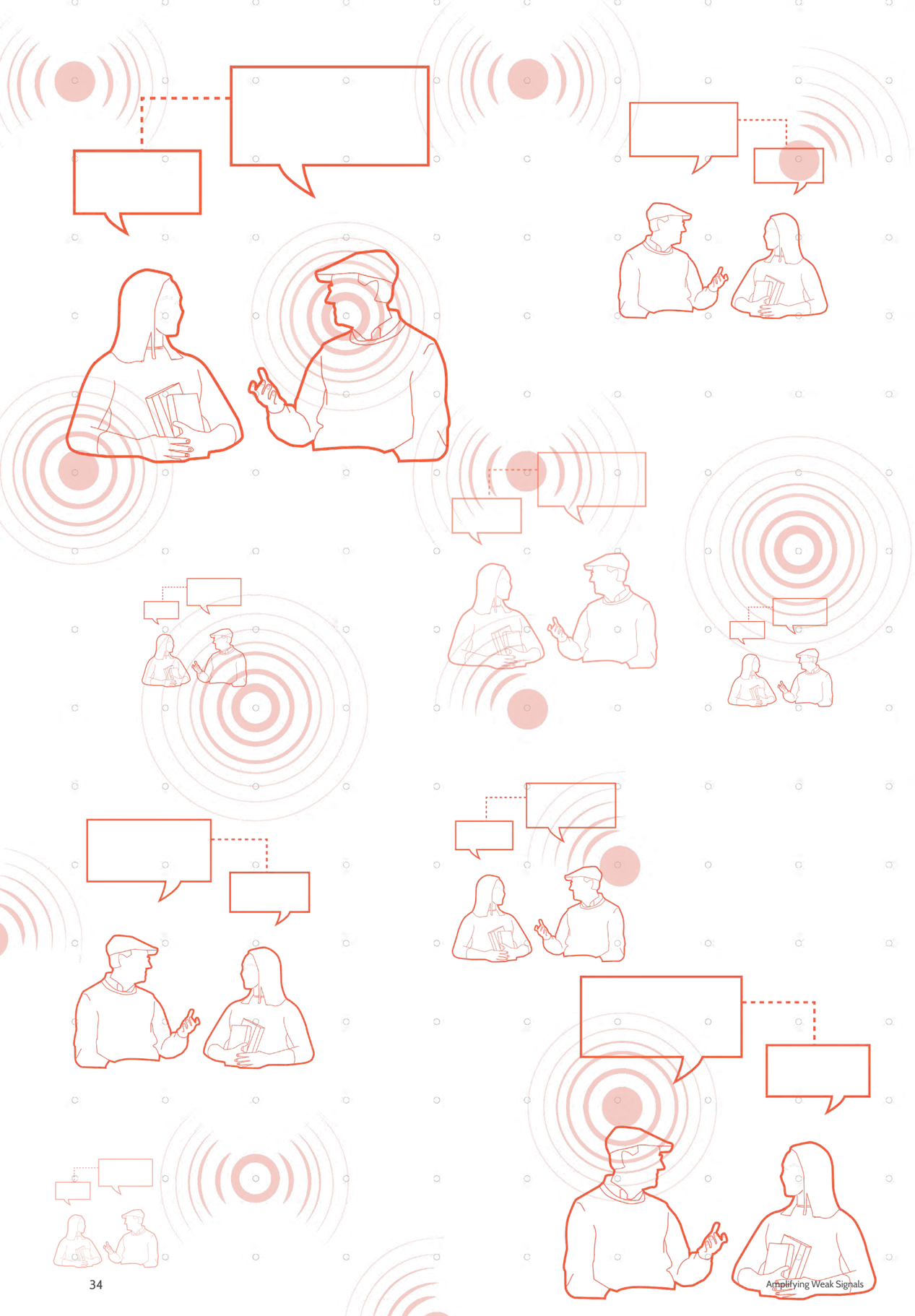
Knowledge Type

Experiential Knowledge

Characterised by being generated through experiences. This type of knowledge describes the experiences of actors at many levels of their life. These levels can be day-to-day, professional, practical, creative, leisure etc. Experiences lead to internalized actor preferences which influence the ideas on, implications of and use for the built environment. This type of knowledge is unique for each actor and is inherently subjective and non-transferrable.

Tendency

Experiential knowledge tends to be informal, implicit and exists in the minds of the actor, it can thus be characterised as a more tacit knowledge type. Consequently, the knowledge can be difficult to quantify or collect. Experiences can be made more explicit through surveys, stated preference experiments and interviews among others.



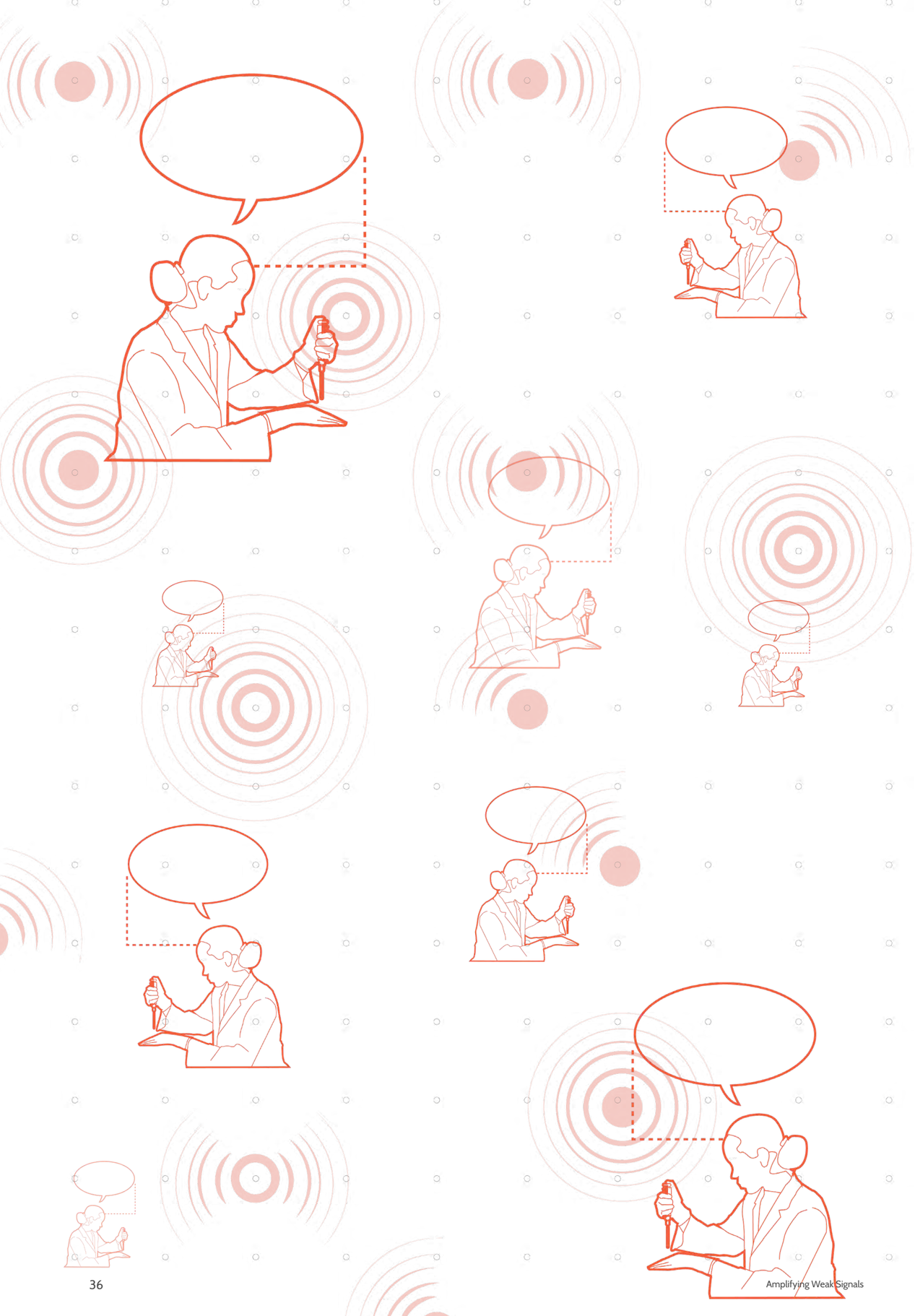
Knowledge Type

Generational Knowledge

Characterised by being passed along over generations. This type of knowledge describes the knowledge that is passed from one generation to another. Generational knowledge is often shared within families but can also transcend beyond familial limits. Integration of age groups is often a cause for the transfer of generational knowledge beyond families. This knowledge can be found in a wide range of actor types and settings.

Tendency

This type of knowledge tends to be implicit, informal and exists in the mind of the actor. However, the knowledge can be made explicit through articles, books and other literature. Therefore, generational knowledge also has an explicit component.



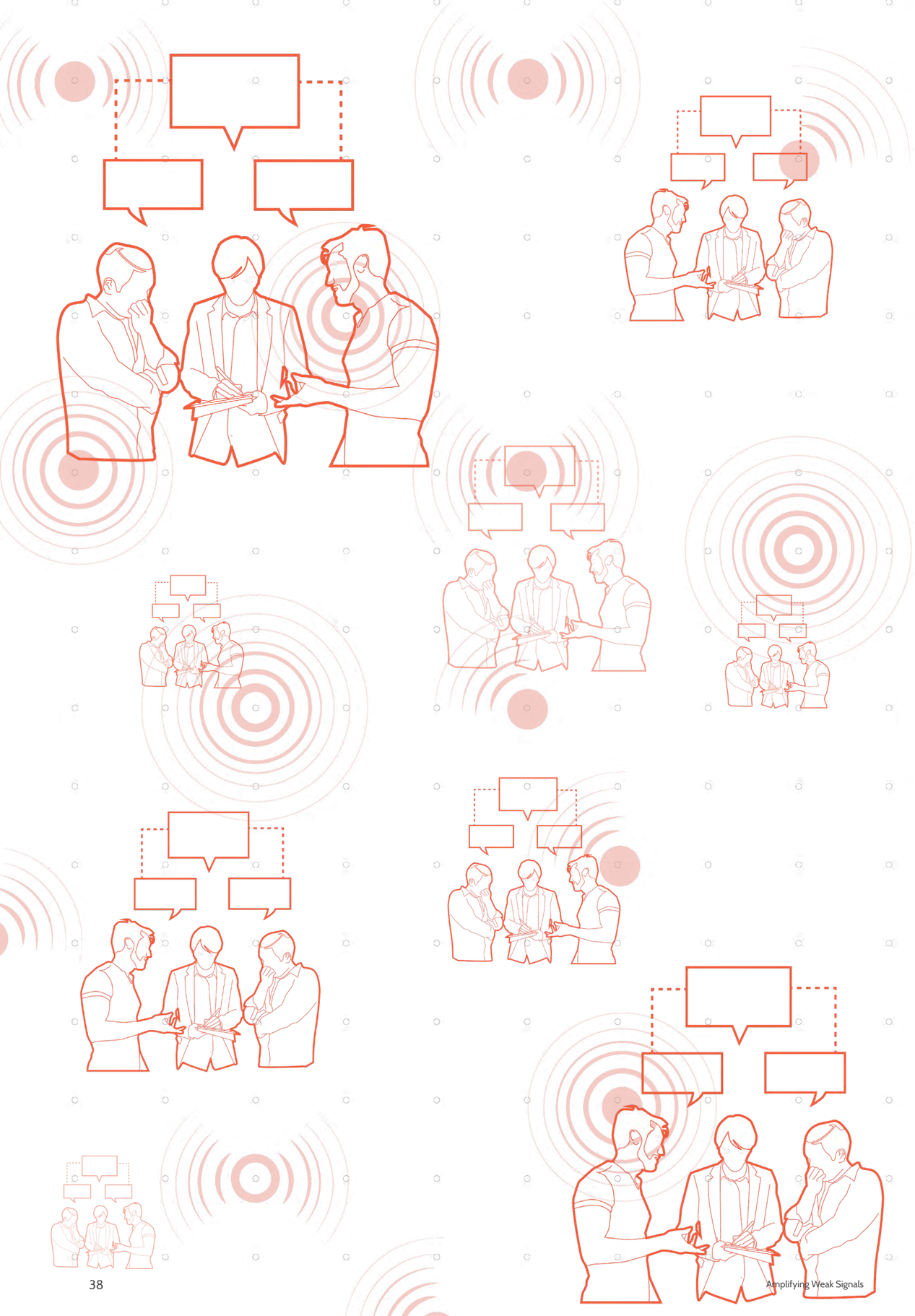
Knowledge Type

Expert Knowledge

Characterised by scientific and systematic methods. This type of knowledge is generated through research and scientific experiments. Actors that have this knowledge are often proficient in a specific domain that can be relevant to different types of projects. This knowledge can be both academic (i.e. scientific literature and research) and based on specific skills (i.e. training and skill development).

Tendency

This knowledge type tends to be explicit as experts are required to define, specify and quantify their knowledge to be deemed (academically) credible. The knowledge needs to adhere to standards and is often peer-reviewed.



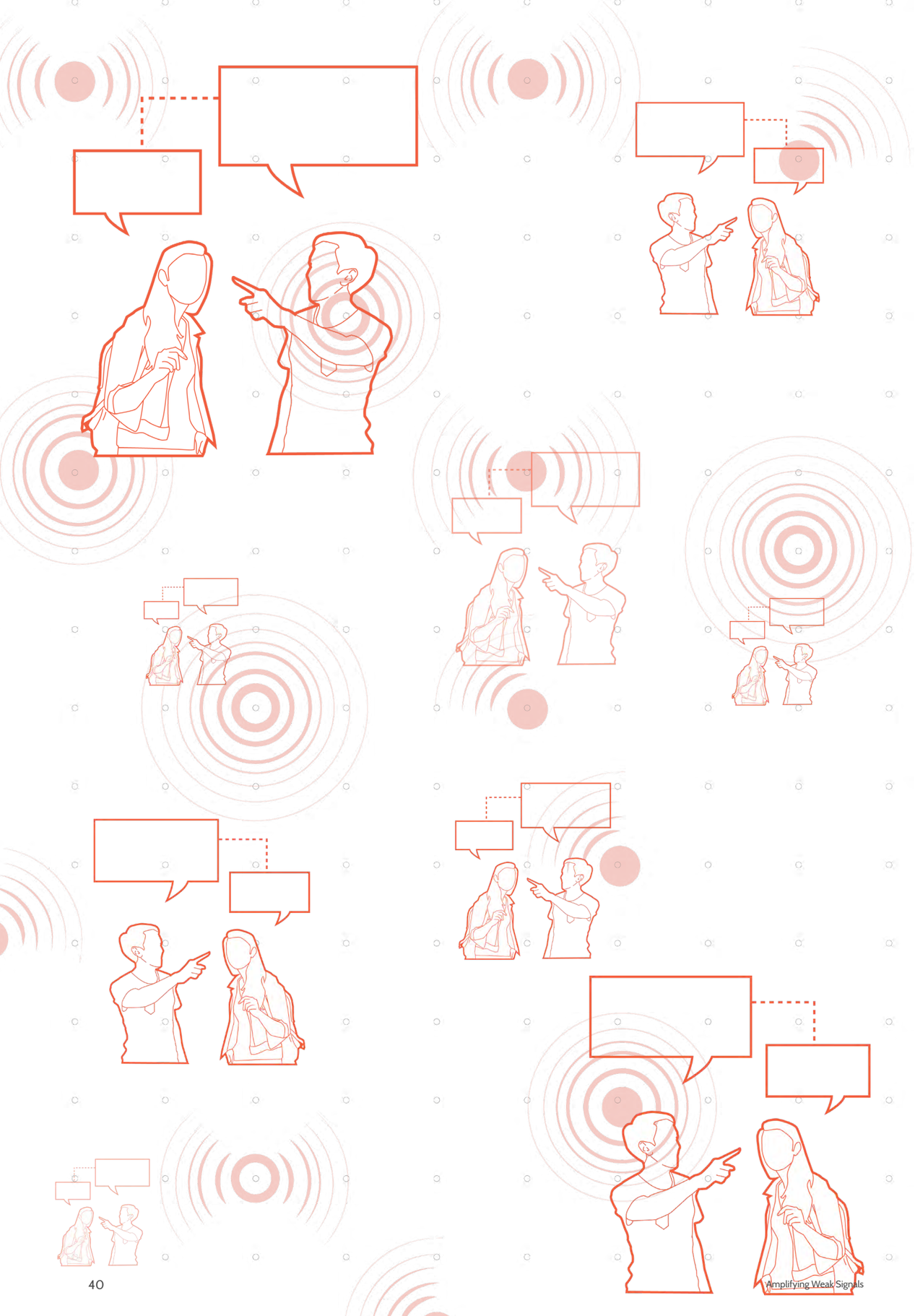
Knowledge Type

Situated Knowledge

Characterised by being limited to a specific area. This type of knowledge describes the local characteristics of an area. The urban environment and specific typologies are included in this knowledge. This knowledge affects various actors in different ways and is influenced by cultural attitudes and historical values placed on certain spatial aspects.

Tendency

This knowledge tends to be explicit, as urban typologies and characteristics are well-defined and specified. Also, the variety of environments can often be classified within delineated categories.



Knowledge Type

Relational Knowledge

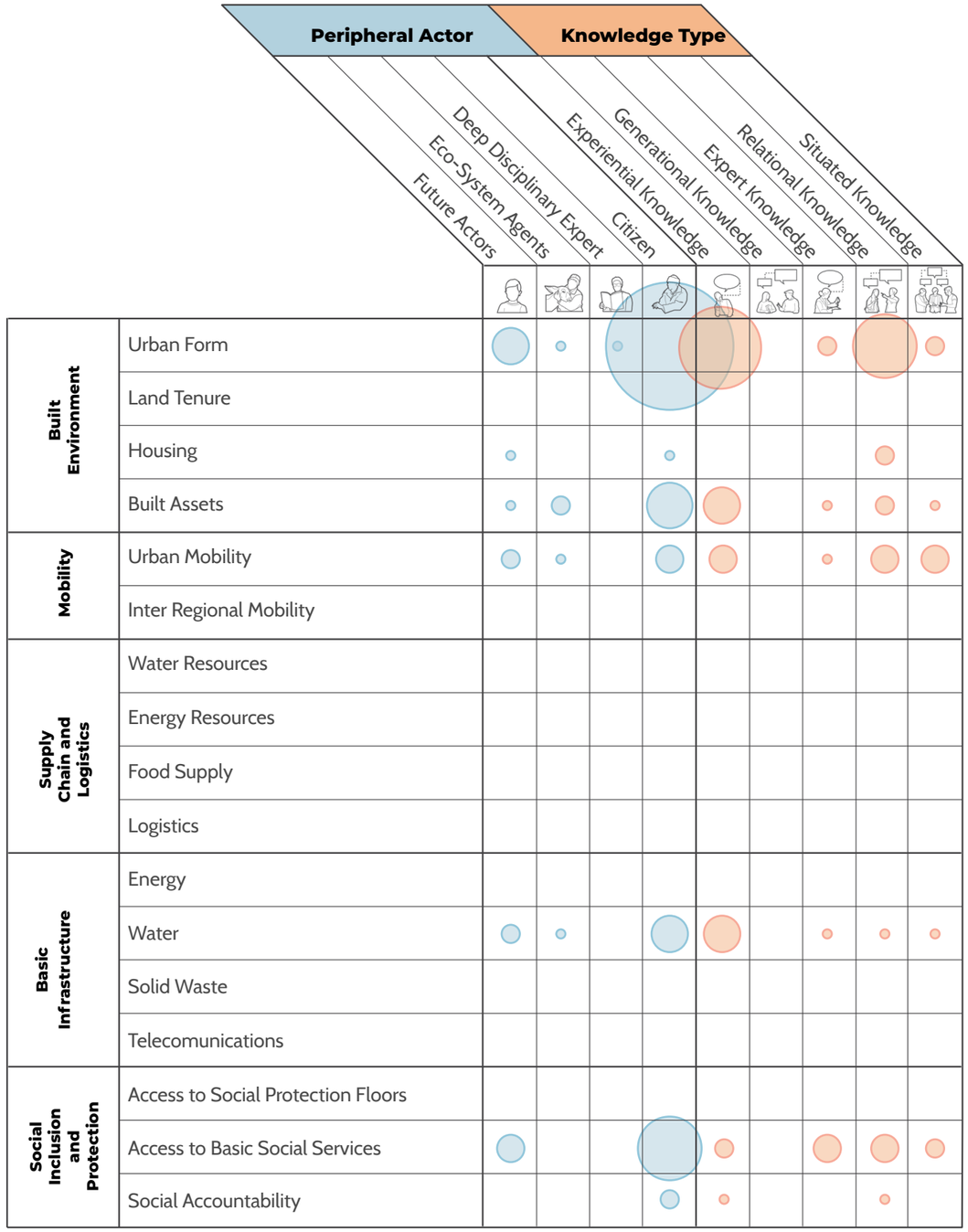
Characterised by the way actors interact with the urban environment. This type of knowledge describes the relational values and interactions of actors with the urban environment. This knowledge results in internalised values relating to urban design and perceived liveability. These internalised values are comparable for actors within a specific group and determine the attraction or repulsion to specific urban environments.

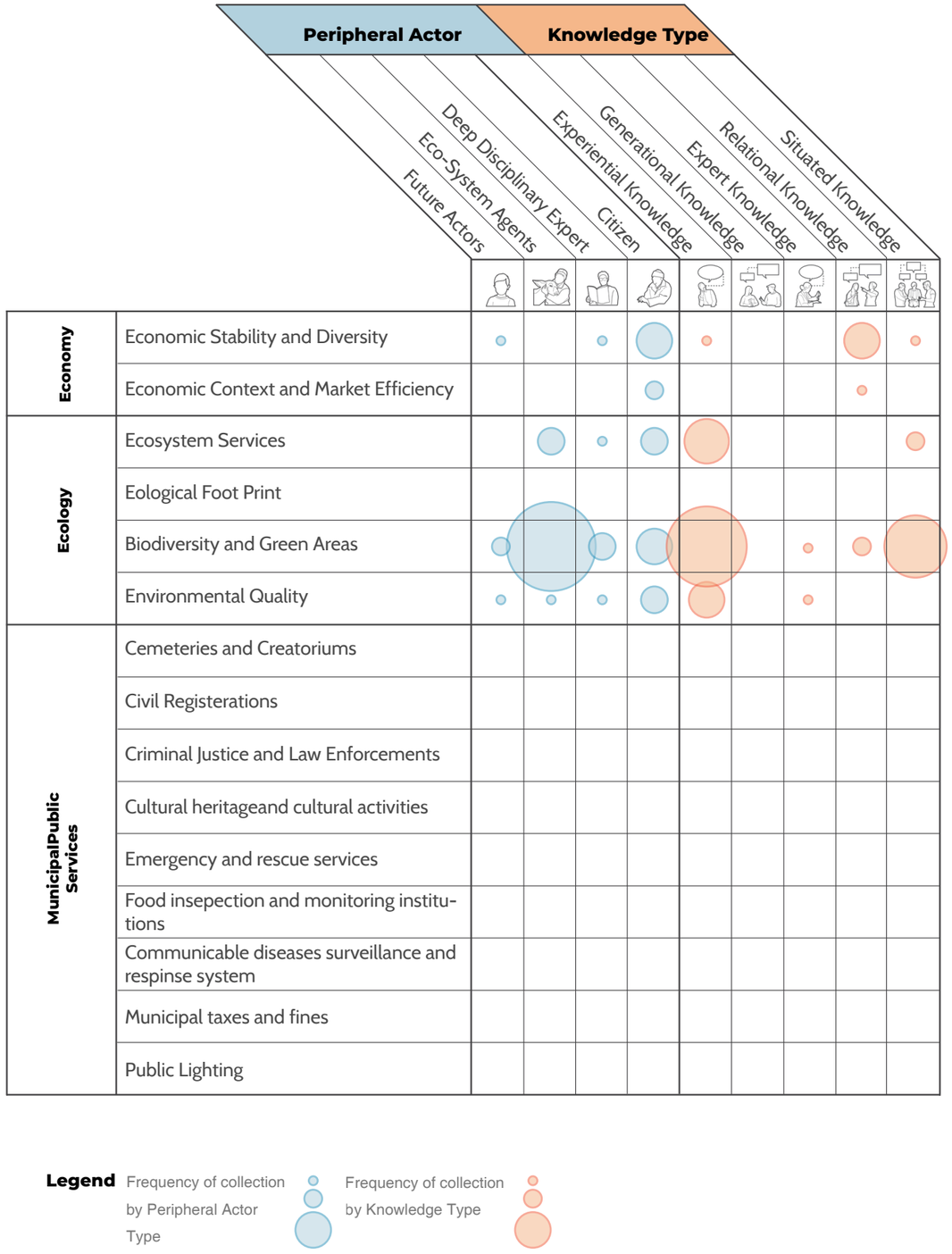
Tendency

This knowledge tends to be implicit and informal but can be generalised across actor types. Besides that, the knowledge can be made explicit through surveys and experiments. This specification of interactional knowledge can be viewed as more objective (compared to experiential knowledge).

Which Building Blocks are Most Commonly Used for Generating Specific Issues?

The following frequency table is a representation of which building block from the set of Peripheral Actors and Knowledge Types, is likely to help you generate a specific type of issue. The size of each bubble in the table corresponds to the number of times that issue was collected by one of the tested methods that contributed to our recommendations.





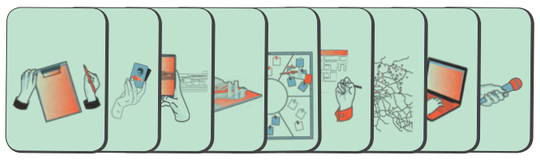
Legend Frequency of collection by Peripheral Actor Type — Frequency of collection by Knowledge Type

Navigating Challenges with Peripheral Actors: A Guide to Selecting Effective Design Instruments

Collecting knowledge from peripheral actors can be challenging due to specific communication difficulties or data collection limitations. However, using appropriate design instruments can help overcome these challenges. In order to assist in the selection of the most effective combination of peripheral actors and design instruments, we have gathered accounts and descriptions from other researchers who have tested various building blocks. The set of tables on following pages provide valuable insights to inform your decision-making process and ensure successful data collection from peripheral actors.

Each design instrument has unique characteristics that may or may not meet the specific needs of a given peripheral actor. To determine which instrument is best suited for your research project, it's important to carefully evaluate these characteristics and consider any challenges or barriers that may arise. The following pages also details the characteristics of each design instrument and offers an overview of their challenges and constraints to help determine which option is feasible for your research. Use this section to select the best design instrument for your needs and ensure successful data collection from peripheral actors.

For more information on each peripheral actor- refer to page



For more information on the design instruments and the challenges, barriers etc to using them - refer to page

Overcoming Challenges in Collecting Knowledge from Peripheral Actors: A Checklist to select the appropriate Design Intrument

The following checklist is an overview of the unique needs of each peripheral actor type, that must be kept in mind when selecting a design instrument to create a method.

What each Peripheral Actor Requires from a Design Instrument	Future Actors	Eco-System Agents	Deep Disciplinary Expert	Citizen
Adaptable to actor characteristics	✓			
Allows contextualisation in other knowledge types			✓	
Allows flexible communication			✓	✓
Allows indirect communication (possibly by proxy actors)		✓		✓
Collect different perceptions				✓
Collect the reasoning of the actor	✓			
Connect with weakly connected actors			✓	
Control for bias		✓		✓
Extensive, non-relevant, varied and detailed data collection	✓	✓		
Incorporate strategies for locating the actor in its habitat		✓		
Large sample sizes		✓		
Low effort for participants	✓			
Time efficient			✓	

Overview of the Potentials and Limitiations of each Design Instrument

Characteristic of each Design Instrument	Sketch Planning	Map-Based Survey	Deconstruct & Re-construct	Game Co-Design	Open Datasets	Observation	Survey Questionnaire Format	Survey Interview Format	3D Landuse
Actor interaction			✓	✓	✓			✓	
Classification tool					✓		✓		
Collects perceptions									✓
Collects variety of data			✓	✓			✓		
Comparison across variables						✓	✓		
Connects concepts						✓	✓		✓
Easily combined		✓							
Enriched contextual data	✓							✓	
Flexible							✓		✓
Inclusive design	✓					✓			
Increased empathy	✓	✓							
Increased understanding	✓								
Low interference		✓	✓						
No direct communication						✓			
No expertise required		✓		✓					
Priority setting		✓				✓			
Small scale				✓			✓		
Spatial data	✓								✓
Strategy assessment			✓						
Supplemental data	✓								
Versitile scale								✓	
Visualisation of data						✓			✓

Challenges to using each Design Instrument	Sketch Planning	Map-Based Survey	Deconstruct & Re-construct	Game Co-Design	Open Datasets	Observation	Survey Questionnaire Format	Survey Interview Format	3D Landuse
Bias								✓	
Context dependent				✓					
Data availability					✓				
Data validity				✓		✓			
Expertise required	✓				✓			✓	
Incomplete datasets						✓			
Locating actor					✓				
Losing context				✓					
Quality of scope					✓				
Sample diversity		✓		✓			✓		
Sample size				✓				✓	
Variable dependent		✓	✓						
Varying level of detail			✓						

Barriers in using each Design Instrument	Sketch Planning	Map-Based Survey	Deconstruct & Re-construct	Game Co-Design	Open Datasets	Observation	Survey Questionnaire Format	Survey Interview Format	3D Landuse
Bias	✓			✓	✓	✓			
Collects detailed knowledge							✓		
Communication				✓				✓	✓
Data interpretation							✓		
Effects of researcher presence					✓				
Inaccessible data						✓			
Lack of expertise					✓		✓		
No large scale				✓					
Required participation				✓			✓		
Subjectivity								✓	
Time intensive		✓		✓			✓		
Topic specific			✓						

Design Instrument

A design instrument is a tool that is utilized to collect knowledge, and is a crucial building block in the development of a method. Each instrument generates distinct types of information, and some are better suited for handling specific characteristics or approaches to certain actors. A wide range of design instruments can be utilized within a method. The types of design instruments considered as building blocks are: Open Data Sets, Sketch Planning, Game Co-Design, 3D- Landuse, Deconstruct- Reconstruct, Map Based Survey, Observation, Survey Questionnaire Format, and Survey Interview Format. The design instruments that were considered in this research are explained in more detail in the following pages, but is certainly not limited to this set.

Open Data Sets

Open Data refers to data that can be accessed, used, and shared by anyone. There are no limitations to how it is used, modified, combined, and shared. It can be used to understand social, economic, and environmental phenomena. It allows transparency in governance and is public evidence about how different projects and policies affect real-world conditions. Open data are rather abstract and lacks detail, so interpretation of insight they give needs to be done with a critical attitude and often needs to be validated with observation on a subset of cases.

Strengths

The workshop method descriptions found that open datasets can be used to make connections and relate information between concepts. The interoperability (e.g. comparing data across time, environments or other variables) is high with this more standardised information form . Besides that, the design instrument allows for visualising the present reality, predicting possible futures and displaying the findings easily (e.g. statistics, graphs etc.). Also, the open accessibility of the data makes it possible to supplement missing data in other design instruments. This feature makes the design instrument very compatible with other design instruments. Using open datasets can help to reveal information about a location in the context of environmental, social and economic aspects. This can aid in other design instruments, for example, in deciding strategic places to observe, establishing priorities according to who is prevalent in the location and setting priorities according to which actors are most affected.

Limitations

This design instrument's challenges are mainly related to the data itself. Often, assumptions and biases are difficult to uncover when using open datasets. This strengthly affects the validity of the data. Therefore, this aspect should be considered when using this design instrument. Besides that, the metrics can be incomplete or undefined in the dataset, or the units generally are not necessarily functional. Considering this challenge, the solution often lies in converting the data to the desired measurement unit. In terms of open datasets, some barriers should be taken into account when collecting knowledge. First, when the data required for the knowledge collection is not accessible or does not exist in general, this design instrument cannot be used for knowledge collection. The required data could be generated and made available using other design instruments. However, this often takes significant resources. Besides that, bias in the researcher can also affect the quality of the knowledge collected using an open dataset. This barrier can be present in the data itself and is caused by bias in the researcher generating the dataset. Both barriers should be considered when using this design instrument.

Conclusions

This design instrument can best be used in combination with other instruments to enrich or supplement the data collected. Open datasets allow for comparisons between concepts across different variables. It should be noted that the availability and validity of the data can significantly affect the usefulness of this design instrument.

Strengths	Limitations	Charachteristics
Can be combined with any design instruments to supplement missing data	Data validity	Relational knowledge (experiential knowledge)
Connects concepts	Uncovering pre-existing biases	Supplemental data
Compares across variables	Incomplete datasets	Enriched contextual data
Classifies locations	Inaccessible data	Spatial data
	Bias	

Sketch Planning

Sketch Planning represents complex scenarios through simplified diagrams. The instrument can be used to indicate spatial relationships in current or future states. Sketch planning provides groups with a visual means of communication when identifying the key features of a spatial system. Sketches can vary from highly detailed drawings and maps to abstract diagrams that only describe the key components of the system. It is used by planners and designers to describe key points in their understanding and proposals effectively. Visualization through sketch planning allows us to simplify complicated systems and explore future outcomes. It also helps communicate with actors who have no prior understanding of the issue.

Strengths

The workshop method descriptions found that sketch planning in knowledge collection can be used to identify and analyse on a small scale. The knowledge that is collected can be displayed easily as the information is collected in the form of sketches. The sketches that are collected with this design instrument convey perceptions and the spatial locations of the participating actors. This directly visualises the perceptions and interests of the actor and can also be used to envision possible solutions to issues actors are facing. Besides that, the instrument can be implemented in a flexible way and adjust to the needs and characteristics of the actor.

Limitations

A challenge that can occur when using this design instrument is the limited variety in the sample. Some barriers that should be taken into account are, first of all, that the instrument requires significant time from both the researcher and the actor. Sketching ideas and collecting a large enough sample size requires more time to be significant. This can be related to the representativeness of the sample when it is used on a small scale. This can be beneficial when focussing on detailed knowledge in a specific domain. However, the instrument is less effective on a large scale and is prone to not being representative for an entire actor group. Besides that, the interpretation of sketches also takes longer as the perceptions are drawn and not necessarily written out. Besides that, communication becomes vital when using this design instrument as the actor can be less easily corrected when they misinterpret a concept. This is also relates to the participation barriers that could occur with this design instrument.

When using sketch planning, actors often experience a higher barrier to participation as they are required to creatively express themselves. Lastly, the interpretation of the sketches can require specific expertise that has to be present in the researcher or has to be consulted on with an expert in the field. This forms a barrier to using the information that is gathered as peripheral knowledge in the research.

Conclusions

This design instrument can best be used to collect a visual representation of knowledge and actor's perceptions. These sketches can help establish a channel of communication with actors that are less communicative. Also, more latent information can be conveyed in a sketch compared to vocal communication as actors are less likely to self-censor their knowledge.

Strengths	Limitations	Charachteristics
Small scale application	Limited sample variety	Experiential knowledge (Relational and experiential knowledge)
Collects visual data about perceptions and locations	Time intensive	Situated knowledge
Flexible instrument	Collects detailed knowledge	Small scale application
	Data interpretation	Collects visual data
	Participation barriers	Flexible
	Specific expertise	Time intensive

Game Co-Design

Serious games represent real-world systems in engaging and fun ways. Like models, games represent available knowledge about actors, flows, regulations and resources. Involving stakeholders as co-designers of a game allows them to critique how the real-world system is represented in the elements and mechanisms of the game. This allows us to learn more about each stakeholder's priorities, interests and preferences.

Strengths

The workshop method descriptions found that the game co-design instrument allows data to be collected in an actor-friendly way. This means that the information can be collected to minimise the intrusion into the peripheral actors' life. The instrument mainly gathers data on the actors' perceptions, interactions, awareness, and surroundings. With this information and with the design instrument, the effectiveness of (policy) strategies can be evaluated. Besides that, co-designing a game with stakeholders results in a collaboratively created representation of the real-world system. This representation can inform decisions and strategies.

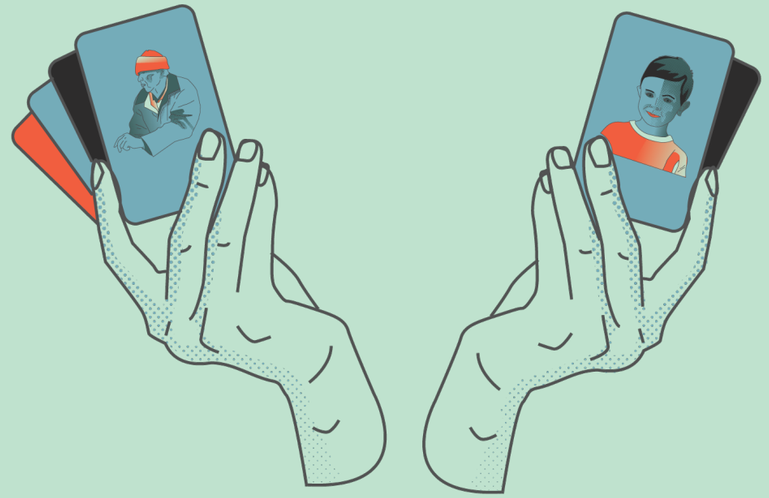
Limitations

When using this design instrument, it is important to note that the information that can be collected relates strongly to the context in which it is collected and can induce biased results. Collecting data with various contextual variables (e.g. time, place, demographics and circumstances) can mitigate these effects. Besides that, the information that can be collected with this design instrument can vary in specificity. Predetermined variables, scopes and units can aid in structuring these results.

Lastly, the design instrument collects information from actors that is focussed on a specific topic. This means that the game is focused on a specific question, area or event. The data that is collected can range significantly and often requires interpretation. Limited resources could impede the quality of the information collected.

Conclusions

This design instrument can best be used to collect a wide variety of information on a specific topic. These topics can include issues, areas or events and involve the actor in the data collection process. The wide variety of data that is collected can be implemented and combined with other design instruments.



Strengths	Limitations	Charachteristics
Can be combined with Spatial data and visualised over time	Dependent on many variables: Timing Context Knowledge type Actor	Experiential knowledge (Experiential knowledge)
Low interference in the actor's environment	Varying detail of information	Actor interaction
Collect data on Perceptions, Interactions, Awareness and surroundings	Focused on a specific issue, area or event	Wide variety of collected data
Assessment of the effectiveness of strategies		Topic specific

3D Landuse

Key features of the urban fabric are building heights, density and green components. These features underly ten land use typologies ranging from compact high-rise to sparsely built. When combined with socio-economic data, scientists can use these typologies to evaluate risk in different neighbourhoods during a hazardous event. 3D typologies enable scientists to study which areas are at risk, how various hazards may be experienced, and what can be done to mitigate risk by exploring what-if scenarios.

Strengths

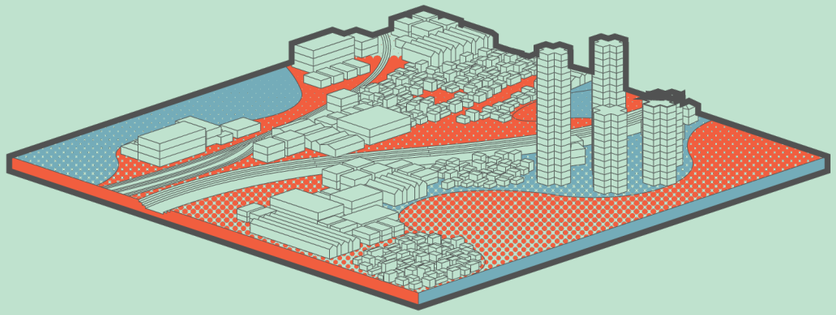
The workshop method descriptions found that the 3D land use typologies can be used to collect data on the spatial locations of respondents. This data can be observations made in the built environment or information on the behaviour of actors in urban space. This can then be combined with the local climate zone typology to find a correlation between the observed behaviour, how an area has been constructed, and its climate resilience implications. The method results in an interaction pattern of actors with the environment and can contribute to a better understanding of the actor. Incorporating this increased understanding in research can contribute to more empathy and inclusive design.

Limitations

When applying this design instrument, the researchers need to have ecological knowledge to determine critical observations and recognise behavioural patterns. This information could also be supplemented with expert information. Suppose the knowledge is not (sufficiently) present in the researchers, and there is a lack of access to expertise outside the research team. In that case, this challenge can inhibit the successful application of this design instrument. Lastly, a human researcher can't perform an observation that is free from bias. The effects of this bias can be mitigated by introducing other experts and researchers to the data collection process. However, the concept cannot be circumvented entirely. This should be considered when the data collection results through observation are presented. Moreover, the ecological knowledge represented in the typology (generic "greenness") is insufficiently detailed for non-human dwellers.

Conclusions

This design instrument can best be used to add situated knowledge that provides a deeper context to the data that has been collected through observation. This extra dimension, which primarily concerns the link between environmental and climate neighbourhood planning, can provide additional insights into the relationship between actors and their environment, especially during the occurrence of weather and climate hazards.



Strengths	Limitations	Charachteristics
Can be combined with Observation to find correlations between built environment and actor behaviour	Ecological knowledge is required when combined with observation	Relational knowledge (experiential knowledge)
Provides information on an interaction pattern of actors with their environment	Can be supplemented with expert information	Supplemental data
Spatial data	Bias, when combined with observation	Enriched contextual data
Provides increased understanding		Spatial data
Increases empathy		
Inclusive design		

Deconstruct-Reconstruct

Deconstruction is used to reveal hidden qualities of an existing or imagined place using a visual representation of it in a co-design setting in which relevant actors are involved. The method uses a printed graphical template with six deconstruction questions addressing a chosen case. The visual representation of the selected subject is placed in the middle of the template, and the questions are answered in sequence. For each question, answers are added with sticky notes. After the six questions are answered, the most important sticky note is identified for each question. Reconstruction is done by combining and translating the six selected items into a physical model representing an improved version of the deconstructed situation.

Strengths

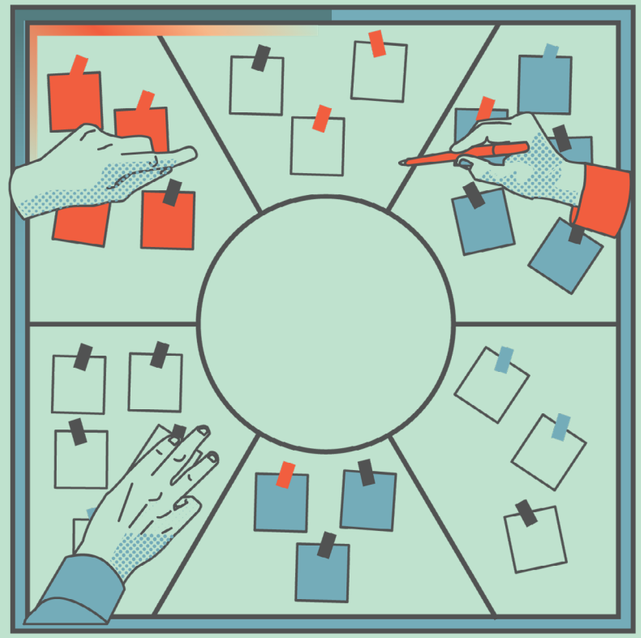
The workshop method descriptions found that the deconstruct/reconstruct design instrument is an interactive tool that enhances empathy and inclusivity in the peripheral actor. The instrument can be used without an extensive experience by the researcher and interacts with actors in an actor-friendly way, e.g. without much disturbance or inconvenience for the participant. This instrument can establish priorities regarding actors affected by an effect or generally present in an area. Combining this information with spatial data allows for simple visualisation of the impacts of circumstances or measures. These impacts can be visualised in both natural and hypothetical futures. Also, the deconstruct/reconstruct design instrument can be combined with the merit of other instruments to place the findings into a broader, more enriched context.

Limitations

What should be noted is that the information collected by the deconstruct/reconstruct instrument depends on timing and context. This means that the time, place, demographics and circumstances in which the instrument is used influence the results that can be collected from actors. This also holds for the type of knowledge or from whom it is collected. This can be mitigated by collecting a sample that has a large variety of these variables and considering these challenges in the context of the research and research method. Other methods for controlling for this dependency are combinations with other methods or data. These measures can also be implemented to minimise the distortion in results. : Lastly, using this design instrument requires a relatively long time before satisfactory results can be collected. The researcher's limited time and presence at the site can significantly impede the results' quality.

Conclusions

This design instrument can best be used to collect situated knowledge as it allows for context-specific information to be computed. Besides that, the instrument allows for combinations with a broad array of other instruments. These combinations further deepen the context in which the knowledge is placed and can enrich the data.



Strengths	Limitations	Charachteristics
Can be combined with Spatial data: allows visualisation of effects and impacts of circumstances or measures. Visualisation and comparison over time	Dependent on many variables: Timing Context Knowledge type Actor	Situated knowledge (Situated, expert and experiential knowledge)
Can be combined with other design instruments which help place the findings in a broader, enriched context	Sample diversity	Enriched contextual data
Helps mitigate challenges	Time intensive	Easily combined
Interactive participation		
Enhances empathy in the actor		
No extensive experience is required		
Low interference in the actor's environment		
Priority setting		

Map Based Survey

Map-based surveys are instruments for sourcing local knowledge directly from individuals. This survey type belongs to participatory mapping methods aimed at creating shared representations of reality. Their power is in capturing non-spatial information, like experiences and perceptions about the area in question. Digital map-based surveys (also known as Public Participation GIS) can be used to collect information in big-data formats from many citizens. Still, it is not easy to monitor the quality of the collected data. Non-digital map-based surveys, on the other hand, can be used to collect high-quality, thick data but are more resource and time intensive because the surveys are typically conducted in person and on paper.

Strengths

The workshop method descriptions found that the map-based survey design instrument can be used to identify and analyse small scales of spatial design. The instrument uses and interacts with the actor to collect information on the participants' location, preferences and perceptions. Besides that, recommendations from the participating actor group for developments or suggested actions can be collected. Applying the instrument requires little expertise from both the respondent and the researcher and is, therefore, easily implemented. It can be combined with and compared to other instruments, specifically larger quantitative information sets. Besides that, the information collected can be related to the space, perceptions, circumstances or other events which can be used for inclusive and emphatic design. Collecting information with this design instrument also allows for visualising actor interests, spatial data and hypothetical future circumstances. This aids the integration of the information into other data, research and reports.

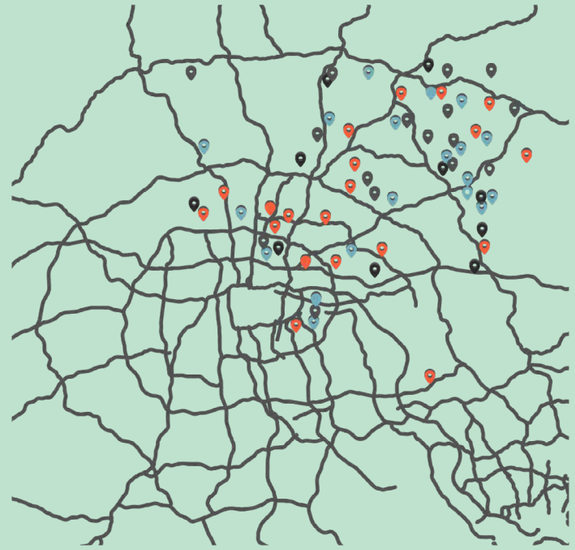
Limitations

When using this design instrument, it is essential to note that the collected information is sensitive to the context in which it is collected. This means that the data collected from the actor can be different due to different contextual variables. Collecting a large sample size or including the variables in the research setup can mitigate the effects. Besides that, generating a sizeable sample group is relevant for this design instrument in general, as the data needs to be representative of the entire actor group. When using this design instrument, there is a risk of losing contextual information as it generally uses a two-dimensional map. In contrast, in some cases, three-dimensional information should also be collected. This challenge can be overcome by selecting appropriate maps to represent the information required for the research.

This design instrument requires a significant time before sufficient data has been collected for a reliable sample. This large sample size ensures diversity in the sample and, thus, a better representation of the population. Nevertheless, implementing this method on a large scale can cause problems. Therefore, balancing this sample size and the general scale of the design instrument is a barrier that must be considered. Also, it is important to note the misconceptions that can occur during communication when gathering knowledge from participants. Misunderstanding of concepts and generally improper communication significantly affect the quality of the data collected with this design instrument. Besides that, the participation of actors in the process is vital to collecting data with this instrument. This means that a lack of participation forms a barrier to successful knowledge collection using map-based surveys.

Conclusions

This design instrument can best be used to collect situated knowledge on a small scale. Actors are able to share a wide variety of information regarding the context of the problem researched. Combinations with open data sets can help increase the validity of the collected data or can provide a comparison for more enriched contextual information. The mixed character of the knowledge that can be collected allows map-based surveys to be used as both a classification instrument as well as collection of qualitative data.



Strengths	Limitations	Charachteristics
Can be combined with Open datasets: facilitates the integration of quantitative and qualitative data	Dependent on context	Situated knowledge (Relational and experiential knowledge)
Can be supplemented with open datasets Increases validity Fills gaps Provides enriched context	Sample diversity	Relational knowledge
Small scale application	Sample size	Small scale application
Wide variety of information collected	Data validity	Variety of data
Actor interaction	Losing contextual information	Actor participation
No extensive experience is required	Time intensive	Time intensive
Location and issue classification	No large scale implementation	
	Balancing sample size and scale	
	Bias	
	Communication	
	Misconceptions	
	Participation required	

Observation

Observation allows us to gather data by simply watching events and behaviour and noting details about the physical setting and human and non-human agents using it. Observation can be covert or overt. Covert observation means people are unaware that they are under watch and tend to act more naturally. In overt observations, everyone is aware of the process, which is often required for ethical reasons. Observation allows data collection when respondents are unwilling or unable to communicate verbally. Observation notes can be in the form of text and drawing notations on a map or plan (e.g., observation of where people gather in a square).

Strengths

The workshop method descriptions found that the observation design instrument can connect and relate information between concepts. Besides that, comparison between concepts and across variables is possible with this design instrument. Also, the location and information regarding actor-environment interaction can be collected using observation. The knowledge from this collection method can trace the actor through the environment as they are not bound to the researcher through communication and can move freely. Furthermore, the results collected through observation can be used to determine patterns and inclusively deduce reasons for certain behaviours. The resulting strategies help establish priorities relevant for actors in the environment. Besides that, the findings, depending on the collected knowledge, can be easily displayed. Also, changes in actor behaviours due to environmental changes can be recorded and studied. Third, the knowledge can be recorded and visualised over time when combining observed and spatial data.

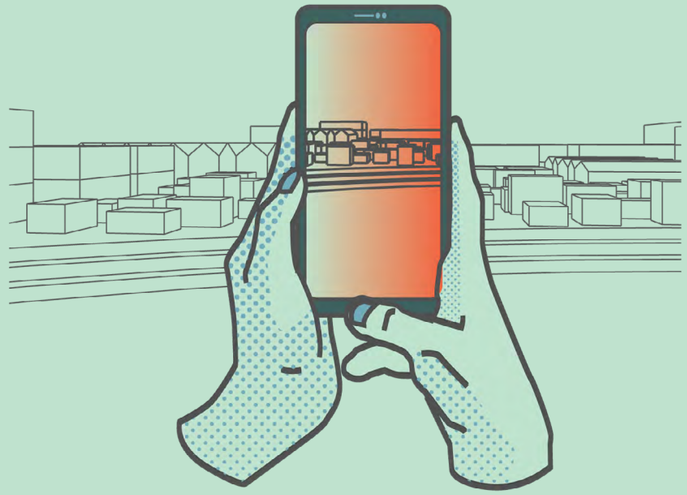
Limitations

Some challenges should also be considered when using observation for knowledge collection. First, there is significant contextual knowledge required on the part of the researcher to be able to determine whether the observed behaviour is of significance. This expertise can be present in the researcher or acquired through experts in the field. However, it is vital to consider the level of expertise of the researcher before implementing this design instrument for knowledge collection. Besides that, incomplete or undefined measurement units can significantly affect the quality of the collected knowledge. Finding this balance is challenging and should be noted when designing the research method. Furthermore, there are challenges with the availability of data in the actor and the ability of the researcher to extract this data from the actor. Finding actors to observe in their environment and the right questions to consider when performing the observation can pose a challenge for the research.

Lastly, some barriers are unavoidable when observing an actor. First, the challenge of a lack of expertise among the researcher could be considered a barrier when there is no access to experts with the required knowledge. This could be because the required contextual knowledge still needs to be created, or the researcher cannot reach the experts with this knowledge. Besides that, the researcher is always influenced by researcher bias. As the researcher's opinion always skews observations, it can significantly affect the observation results. This bias results in subjective data and could be unreliable. Though the effects can be mitigated by appointing multiple researchers and defining clear observation structures, the bias in the results can only partially be removed. Related to this, the actor's response in the observation can also be biased by the presence of the researcher, leading to skewed results.

Conclusions

This design instrument can best be used in research where actor communication is difficult. Observation can be combined with spatial data to enrich the data in the context and deduce the reasons for certain behaviour. Some expertise is required in terms of interpreting the significance of certain behaviours and avoiding the exclusion of latent behaviour deemed irrelevant to the research.



Strengths	Limitations	Charachteristics
Can be combined with Spatial data: relates observed information to context in which it is collected	Contextual and ecological knowledge required Supplemented through expert information	Situated knowledge (Situated, relational and experiential knowledge)
Visualisation over time	Quality of scope Risk of excluding latent behaviour	Relational knowledge
Relates concepts	Locating the actor	No actor interaction
Comparison across variables	Data availability	Concept relationships
No direct communication	Lack of expert access	Researcher bias
Inclusive deduction	Bias	
Prioritization	Effects of researcher presence	
Visualisation of data		

Survey-Questionnaire Format

Open Data refers to data that can be accessed, used, and shared by anyone. There are no limitations to how it is used, modified, combined, and shared. It can be used to understand social, economic, and environmental phenomena. It allows transparency in governance and is public evidence about how different projects and policies affect real-world conditions. Open data are rather abstract and lacks detail, so interpretation of insight they give needs to be done with a critical attitude and often needs to be validated with observation on a subset of cases.

Strengths

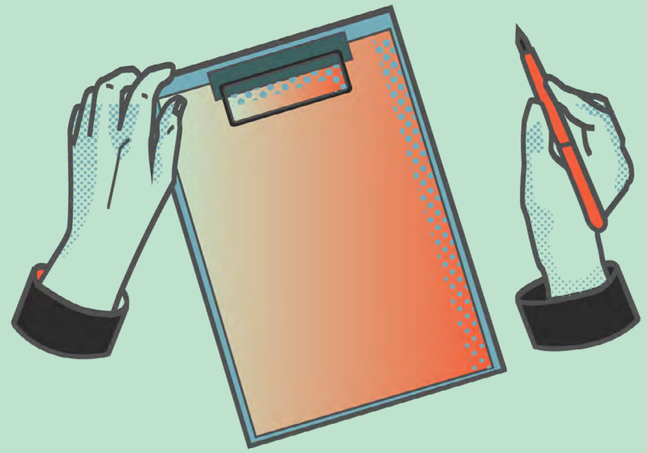
The workshop method descriptions indicate that employing this design instrument allows the researcher to collect spatial data and perspectives from actors in a flexible way. The results from the data can help envision possible solutions and scenarios and can be presented in various visual formats, making it easier to communicate findings to a broader audience.

Limitations

There were no challenges observed with the design instrument employed in this study. However, this does not imply that the implementation of the design instrument is entirely problem-free. It simply means no visible limitations were identified during the data collection for this particular research, and based on the classification used in this analysis, no challenges were observed. It is worth noting that questionnaires, as a data collection method, have certain limitations. Firstly, effective communication is critical to the success of data collection through questionnaires. If the participants do not fully comprehend the concepts or questions, the data collected lacks reliability. Moreover, actors must be willing to participate and invest time in completing the questionnaire for data collection. This phase necessitates a considerable amount of time and effort from both the researcher and the participant. Besides, to construct a questionnaire that gathers reliable data, access to specific expertise on the topic being researched is required, particularly whilst working with future actors and eco-system agents. Finally, it is crucial to follow the forecasting and back casting processes is crucial to determine whether the approach is suitable for the target knowledge type.

Conclusions

This design instrument can best be used to collect a large sample of spatial data and perceptions. Besides that, the design instrument is useful in visualizing data and providing input for open datasets. Questionnaires are often time intensive and require active participation from actors.



Strengths	Limitations	Charachteristics
Flexible	Communication	Experiential knowledge
Spatial data	Participation required	Relational knowledge
Perceptions	Time intensive	Expert knowledge
Data visualisation		Flexible
		Perceptions
		Data visualisation

Survey-Interview Format

Interviews are used to collect information from individuals in a structured, semi-structured or unstructured format. Semi-structured interviews are most common as they combine a structured set of questions that are asked from all interviewees with a set of open questions that can reveal information (e.g., knowledge, experiences) that is specific to each individual. Interviews are either transcribed or summarised in narrative form by the interviewer before analysis. This method of gathering information requires empathy, a good understanding of the characteristics of participants and the language they use (e.g., expert interviews differ from interviews carried out in a neighbourhood community).

Strengths

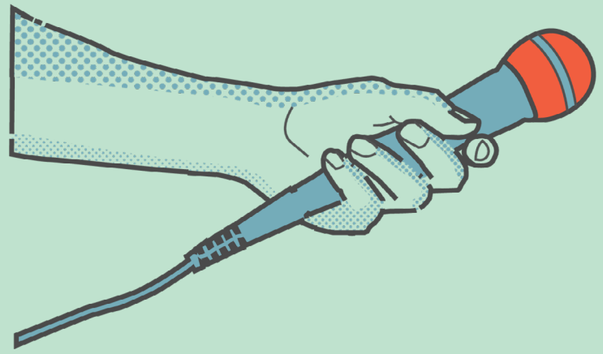
The workshop method descriptions found that using this design instrument enables researchers to collect a variety of data, including recommendations from citizen actors. Specifically, it allows for the participation of citizens and collects the knowledge and perceptions of participants. By using snowballing techniques, researchers can expand their interviewee network and collect context-specific knowledge and perceptions. Interviews enable the collection of contextual information and underlying reasoning of participants, as they provide a space for freedom of expression. This increases the likelihood of obtaining relevant latent knowledge for the research.This instrument can be applied at both small and large scales, with data collected through interviews aiding in location classification and strategy adjustments. Additionally, the knowledge gathered can be used to form relationships between different pieces of information, visualize these relationships, and synthesize actor interests to visualize potential realities and futures. This is supported by the documentation of the infrastructure, practices and unpredictable aspects of the environment of the actor.

Limitations

Challenges that should be taken into account mostly relate to the data that is collected and its analysis. First, a researcher requires contextual knowledge to construct a reliable interview that collects the peripheral knowledge relevant to the research. When this expertise is not present in the researcher, it should be supplemented through external experts or other expert sources. Pilot testing a protocol with experts can help to overcome this. Also, constructing the questions for an interview, the assumptions that are made during development can significantly influence the results. Mitigating bias in this process by finding the right questions is vital to a reliable interview. Sufficient time should be reserved for this process as well as for the collection of the required sample size. Besides that, the availability and interpretation of the data have an effect on the knowledge that is collected and the conclusions that can be drawn. The analysis method for interview is dependent on interpretation and not standardized, however, this analysis can affect the outcomes significantly. It should also be noted that not all actors have the knowledge that is being collected. Finding the right sample group can therefore be a challenge. Lastly, there are barriers that should be taken into account when using interviews. First, the response collected with an interview is prone to subjectivity on the actors' part as well as on the researchers'. Where the subjectivity on the actors' part is often the information that is aimed to be collected, the researcher bias in the form of biased questions can result in unreliable data. Furthermore, improper communication can lead to misunderstandings between the participant and the researcher, which can further amplify the effects of bias.

Conclusions

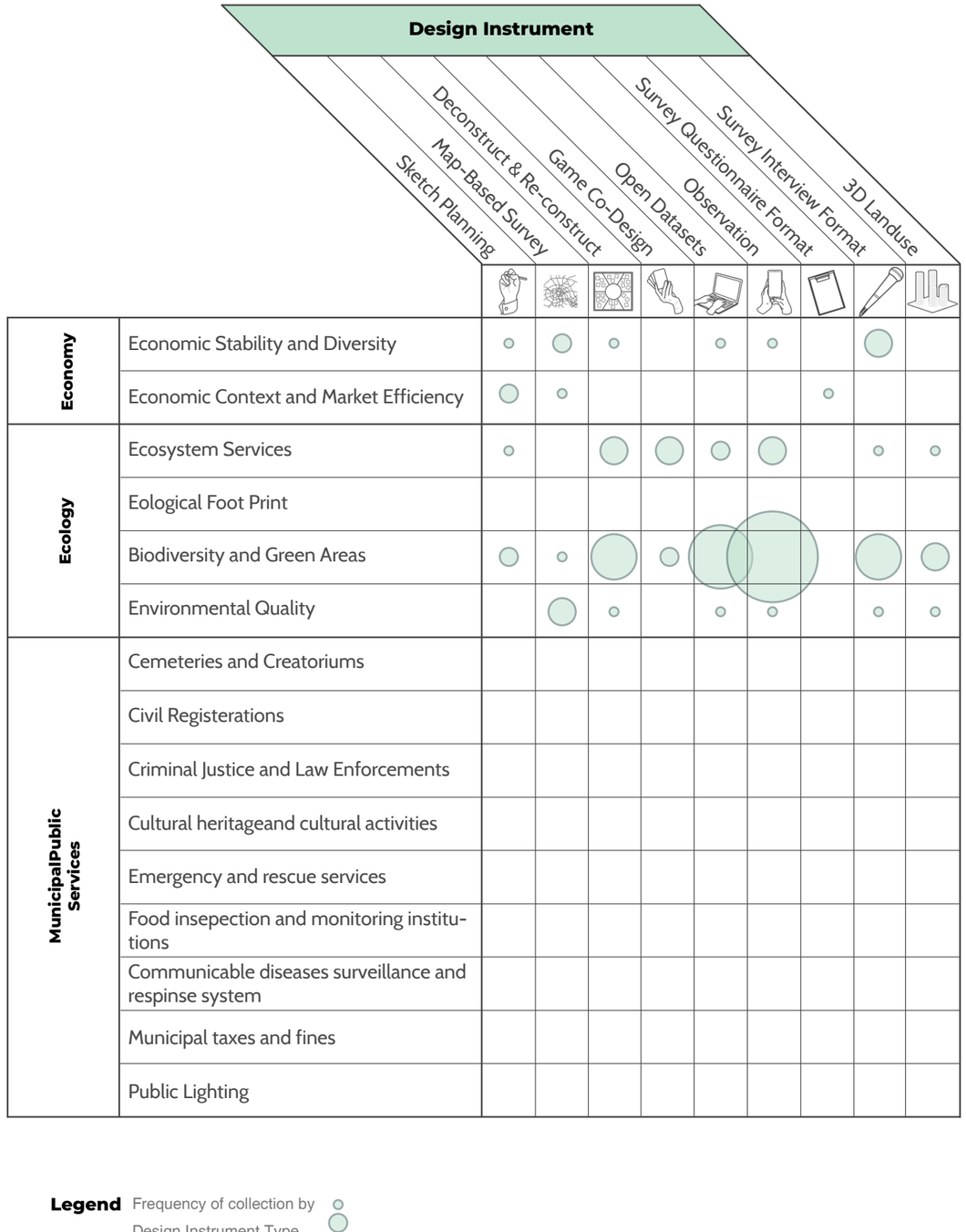
This design instrument can best be used to collect perceptions, experiences and latent arguments from actors. By asking questions and communicating with the actor, a deeper understanding of the actor's knowledge can be collected. Interviews are prone to subjectivity which can be beneficial to the research but bias should be considered.



Strengths	Limitations	Charachteristics
Actor interaction	Specific expertise	Experiential knowledge (Relational knowledge)
Enriched contextual data	Bias	Relational knowledge
Versatile scale	Sample size	Enriched contextual data
Connect concepts	Subjectivity	Connect concepts
	Misunderstanding	Subjectivity

Which Building Blocks are Best for Generating Specific Issues?

The following table is a representation of which design instrument is likely to help you reveal a specific type of issue. The size of each bubble in the table corresponds to the number of times that issue was collected by one of the tested methods that contributed to our recommendations.



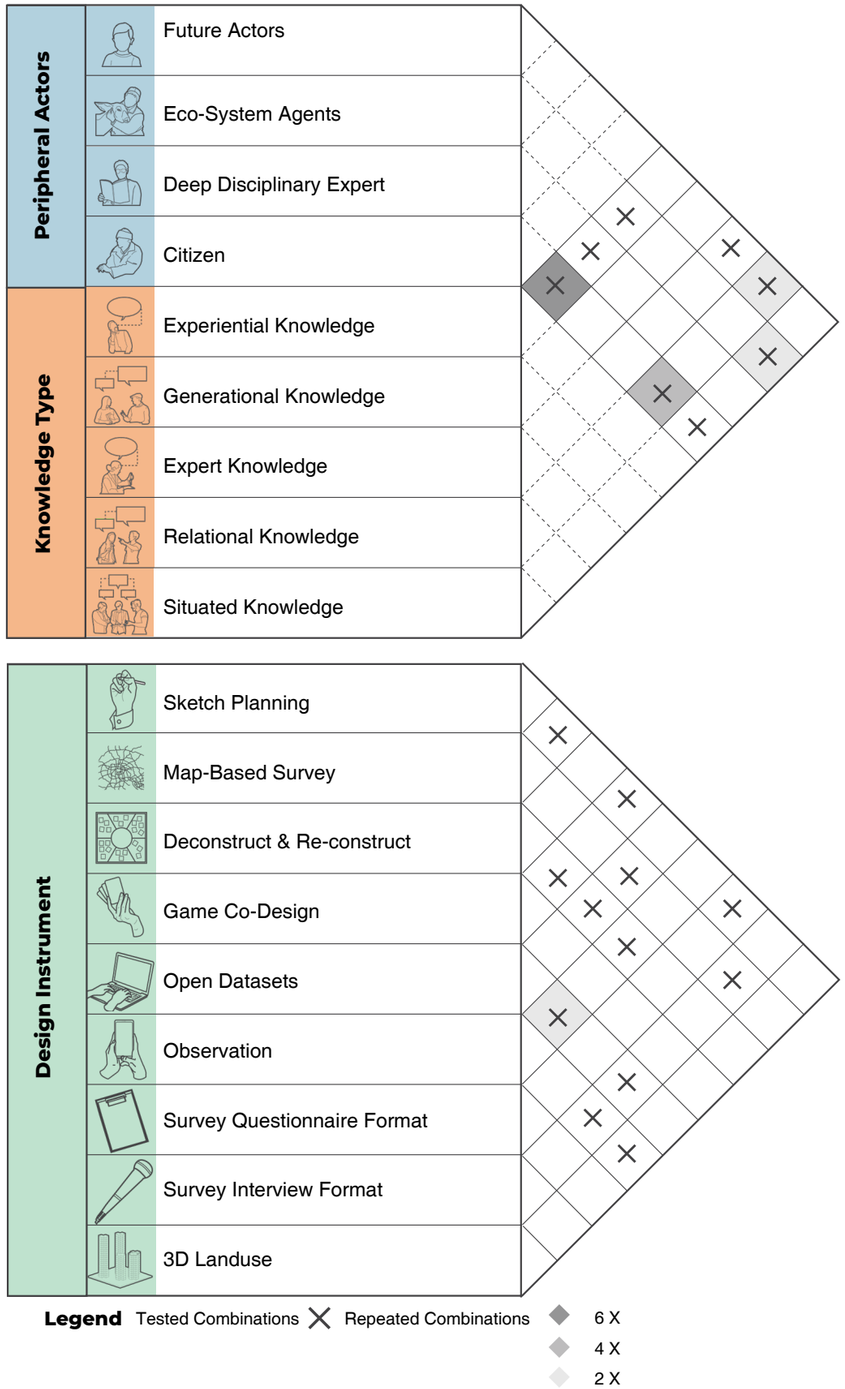
Legend Frequency of collection by Design Instrument Type

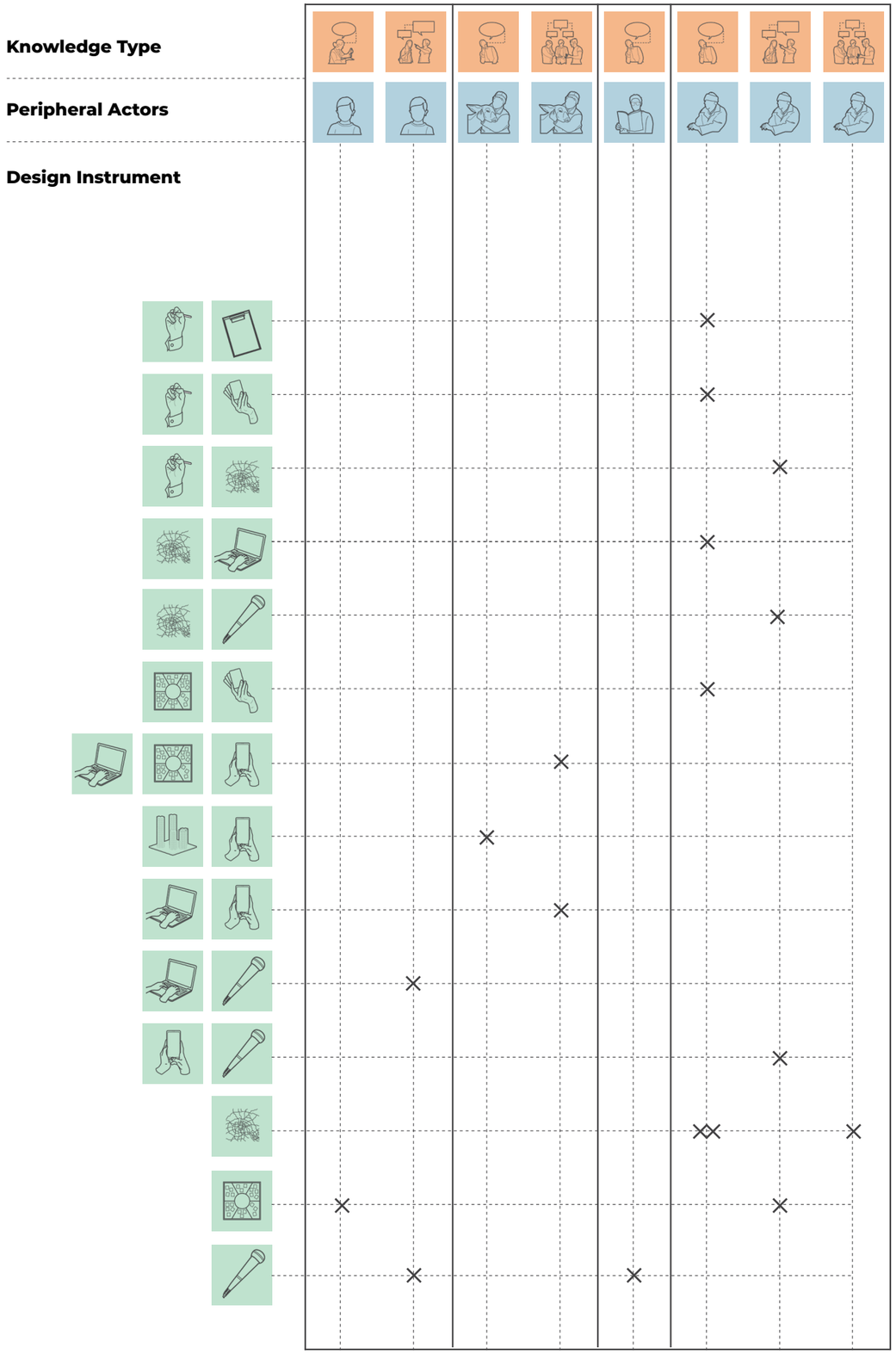
Inferences from Tested Methods

The study performed as the foundation for these guidelines yielded data on eighteen combinations of building blocks. These methods form 2% all possible building block combinations. Though this limitation is apparent, it can still provide useful insights in terms of common combinations or combinations that were not preferred. This chapter provides an overview of the eighteen combinations in the study. Next, the effectiveness of these methods in collecting specific categories of issues is presented. Not all issues were informed using the small sample of methods. However, the issues that were informed in the study do provide an insight on their effectiveness. Lastly, an overview of observations made from the method combinations and their result is provided. In general, the results of the study are limited and more data on the effectiveness of methods is imperative. Nevertheless, the framework of classifying issues from a shared concern and combining building blocks to form a method can be crucial to a more structured collection and integration of peripheral knowledge.

Method Development: How Building Blocks Were Combined to Create 18 Tested Methods

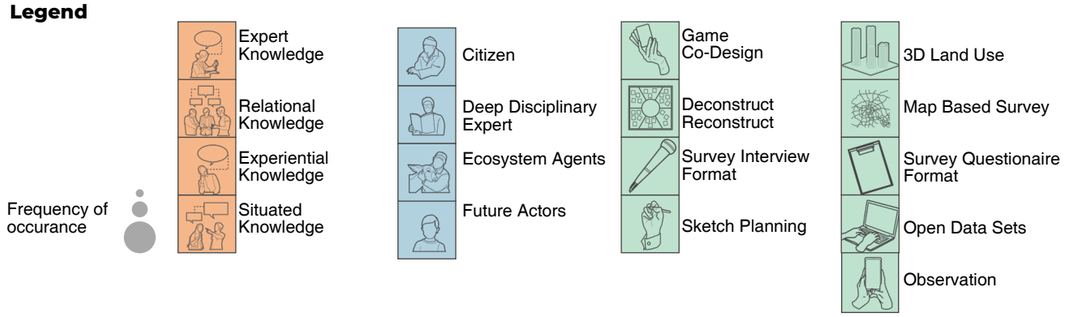
This section provides a visual representation of how different building blocks were combined to create the 20 methods that were developed and tested in our workshop. The combinations presented here inform the recommendations provided in previous sections of this guideline





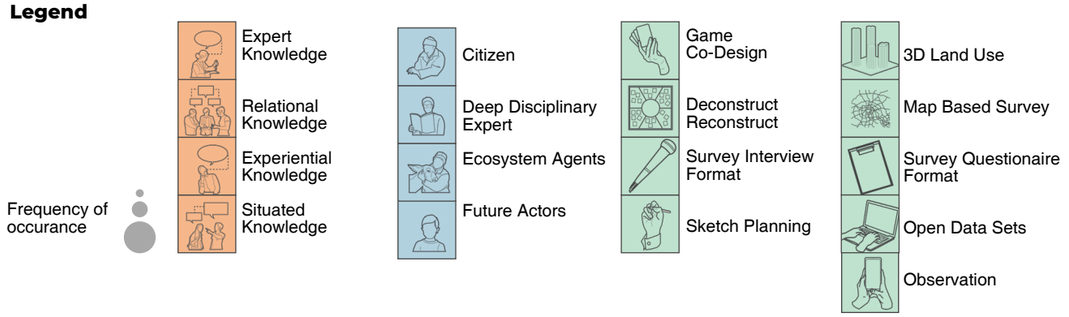
Bubble Chart Overview: Frequency of Issues Collected by the Tested Methods

Below is a frequency table that outlines the issues collected by each of the eighteen tested methods. The size of each bubble in the table corresponds to the number of times that issue was collected by the corresponding method. This visual representation provides a way to identify which methods may be most effective in addressing a specific collection of issues within your research.



Methods	**Design Instument**	
	Design Instument	
	Design Instument	
	Knowledge Type	
	Peripheral Actor	
Built Environment	Urban Form	
	Land Tenure	
	Housing	
	Built Assets	
Mobility	Urban Mobility	
	Inter Regional Mobility	
Supply Chain and Logistics	Water Resources	
	Energy Resources	
	Food Supply	
	Logistics	
Basic Infrastructure	Energy	
	Water	
	Solid Waste	
	Telecomunications	
Social Inclusion and Protection	Access to Social Protection Floors	
	Access to Basic Social Services	
	Social Accountability	

Bubble Chart Overview: Frequency of Issues Collected by the Tested Methods (continued)



Methods	**Design Instument**	
	Design Instument	
	Design Instument	
	Knowledge Type	
	Peripheral Actor	
Economy	Economic Stability and Diversity	
	Economic Context and Market Efficiency	
Ecology	Ecosystem Services	
	Ological Foot Print	
	Biodiversity and Green Areas	
	Environmental Quality	
Municipal Public Services	Cemeteries and Creatoriums	
	Civil Registerations	
	Criminal Justice and Law Enforcements	
	Cultural heritageand cultural activities	
	Emergency and rescue services	
	Food insepection and monitoring institutions	
	Communicable diseases surveillance and respinse system	
	Municipal taxes and fines	
	Public Lighting	

Summary of Inferences : Combinations of building blocks

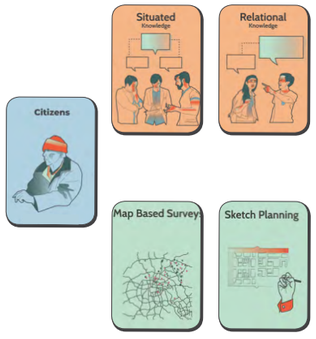
Citizens

The **experiential knowledge** of citizens was valued by a majority of the participants. This entails the experiences of citizens at many levels of their lives. These levels range from day-to-day to professional or creative experiences. These experiences provide an insight into the internalized preferences of citizens.

Besides that, **relational knowledge** was the second most collected knowledge type from citizens. Relational knowledge pertains to the interaction of citizens with their environment. This knowledge type also collects internalized preferences and values pertaining to citizens and their life in their environments. This knowledge type is also related to the attraction of citizens to certain areas and their reasoning for this preference.

Situated knowledge was also combined with citizens more than once. This knowledge focusses on a specific area in the urban environment, e.g. the street or block a citizens lives in or has another specific relation to. The spatial aspects that shape this type of knowledge can aid in the design of areas better suited to the preferences of citizens that use these spaces.

Design instruments that were mostly used to collect knowledge from citizens were **sketch planning** and **map-based surveys**. The strengths of these design instruments is that they are both applicable at a small scale and collect data on the perceptions of actors. Though these instruments are combined most with the citizen actor type, they have only been combined into a method once. Lastly, none of the methods combined citizens with **observation** or **3D land use**.

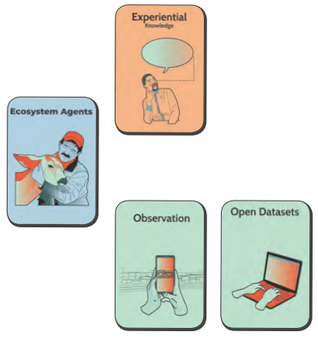


Eco-system agents

Knowledge collected from eco-system agents was mostly focussed on situated knowledge. This knowledge relates to the specific area in which the animal is present. The urban environment is a significant factor in this knowledge type as situated knowledge collects information about local characteristics and its effect on the animal.

Eco-system agents were mostly combined with **experiential knowledge**. This knowledge can be collected from animals by observing their behaviours in the environment and deducing certain experiences from it. The experiences include, for example, preferences in living areas and attraction to specific elements (e.g. green spaces, little people, buildings etc.). The preferences can be recognised as habitual patterns and inform the researcher on the animal's preferences in a space. These preferences can then be taken into account in inclusive design approaches.

Eco-system agents mainly depended on **observation** as a design instrument. This is likely a result of a lack of communication possibilities with eco-system (proxy) agents which only leaves design instruments that do not require direct communication. From the instruments offered in the set, observation is the only instrument that is capable of this requirement. Besides that, observation of eco-system agents was combined with open datasets more than once. **Open datasets** can aid in connecting concepts and comparison across variables. These concepts and variables can be collected from animals by observing them.

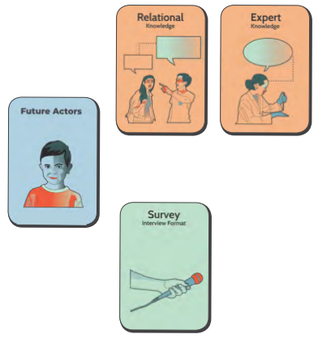


Future actors

Participants often chose to combine future actors with **relational knowledge.** The relationships of future actors with the environment can be collected through proxy actors. As the interaction with the elements of an environment can aid in exploring the perceptions and opinions on possible futures in these proxy actors.

Besides that, future actors were also combined with **expert knowledge**. This knowledge type is able to generate substantiated scenarios about future developments and the effects this would have on the actors that will occupy the space in the future. This knowledge type takes past data and developments into account to create a projection of the expected developments in the area. Though this is limited to scenarios, the information can be used as a base for the expectations of the future.

Methods choosing the future actors mostly chose **interviews** to collect knowledge from this actor type. The strength of this design instrument lies in the ability to collect a wide variety of information. Besides that, the researcher is able to ask follow-up questions to gain more insight into the underlying arguments and ideas that shape the knowledge that is collected from the actor.



Deep disciplinary experts

Deep disciplinary experts were chosen by one group and combined with **experiential knowledge**. This knowledge type describes the experiences of these experts in their environment.

The knowledge was collected using **interviews**. This way, the group could collect the perceptions, experiences and underlying ideas from the deep disciplinary experts.

General inferences

No groups decided to choose **generational knowledge** as their knowledge type. This knowledge type describes the information that is passed over generations of actors. The expectation is that no group chose this knowledge type because of the unfamiliarity with this type of knowledge and the area.

Only one group chose **expert knowledge**. This is expected to be a result of the time restrictions in the workshop setting. As groups had a very limited timeframe and were unfamiliar with the area, finding experts that would have this type of knowledge was more challenging than collecting other types of knowledge. The one group that chose expert knowledge collected it from future actors and collected knowledge from a proxy actor who could provide this knowledge.

Most groups focussed their method on **citizens.** It is expected that this actor type was most popular due to a familiarity with and accessibility of the actor. Due to time pressure, groups did not get a chance to familiarize themselves with the area which most likely lead to a less explorative approach. Groups that did have some knowledge of the area and culture were more likely to choose more explorative combinations of building blocks. Besides that, the citizen actor type is an actor type groups could sympathize with more easily as they all can identify with this actor type. Though the goal of creating a method is to elicit peripheral knowledge from all actors that have a stake in the issue, the dominance of citizens in the workshop setting was expected.

Only one group chose **3D-land use**, also, only one group chose **questionnaire.** This is likely due to groups' unfamiliarity with the 3D-land use design instrument and the more extensive time required to generate responses to a questionnaire. These design instruments were less popular but not entirely excluded from the methods included in the sample. Also, most groups chose either **observation** (combined with eco-system agents) or a **map-based survey** (combined with citizens).

Patterns in building block combinations are visible within actor groups but do not traverse across actor groups. This means that the combination of eco-system agents and observation is common within its actor group but does not translate to the other actor groups. The patterns are limited to the actor group and to not occur in other actor groups.

Summary of Inferences : Contributions to Issues

Building block contribution to issues

(combining with elaborate explanation on what the issues were and why we think this combination lead to this issue. Refer to pages 11-12, and pages 44-45)

Citizens contributed to knowledge collected about issues related to the built environment, social inclusion and protection, economy and ecology. **Future actors** also mostly contributed to issues related to the built environment, social inclusion and protection and ecology. **Eco-system agents** mostly contributed to issues related to the built environment and ecology. **Deep disciplinary experts** contributed to issues related to economy and ecology.

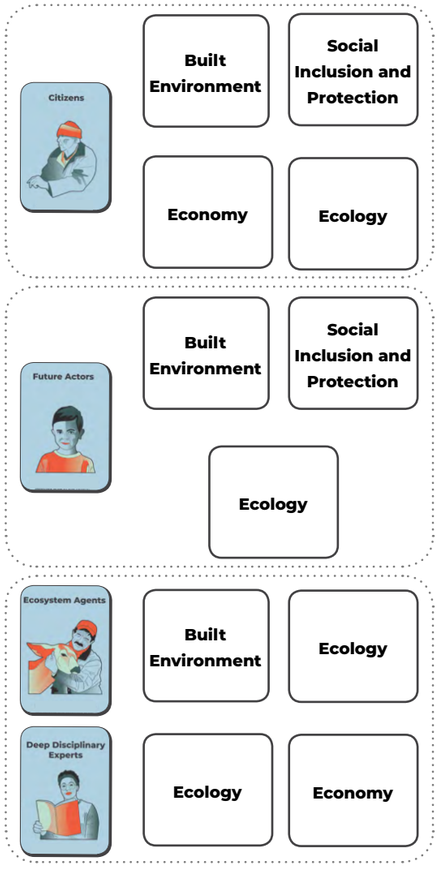


Fig: Issues collected by each Peripheral Actor Type

Method contribution to issues

Urban form issues were mostly collected from citizens and future actors using map-based survey and deconstruction/reconstruction.

Build assets issues were mostly collected from citizens and eco-system agents, related to experiential and situated knowledge respectively. The knowledge on these issues was collected using game co-design and sketch planning for citizens and observation and open datasets for eco-system agents.

Issues related to access to basic social services was collected from future actors and citizens using deconstruction/reconstruction.

Issues related to ecosystem services were collected from citizens using game co-design. This instrument was combined in one method with deconstruct/reconstruct and in another method with sketch planning. Both methods aimed at eliciting experiential knowledge.

Eco-system agents provided information on issues related to biodiversity and green areas. All methods used observation as a design instrument and combined this with datasets, 3D land use or deconstruction/reconstruction design instruments. The methods aimed at eliciting either experiential or situated knowledge.

Deep disciplinary experts mostly provided issues related to biodiversity and green areas. This knowledge was elicited through interviews and focussed on experiential knowledge.

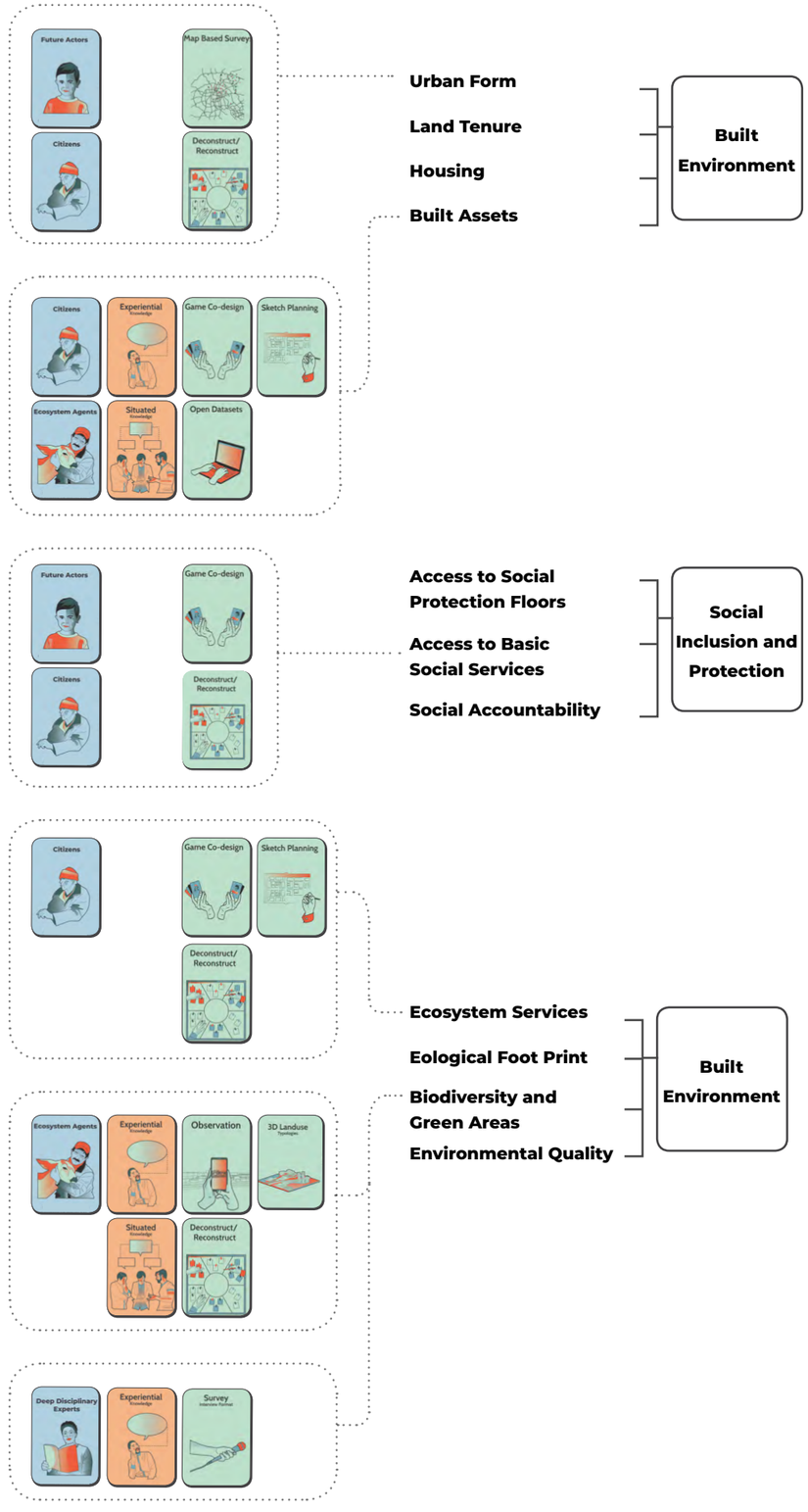


Fig: Issues collected by different tested methods

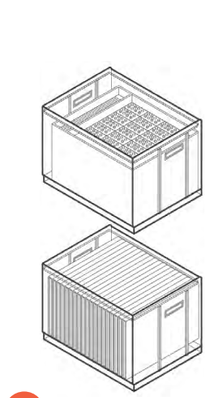
Workshop Proceedings for Data Collection

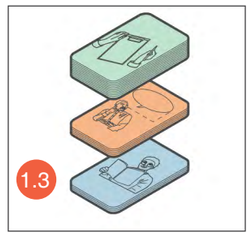
Workshop 1:

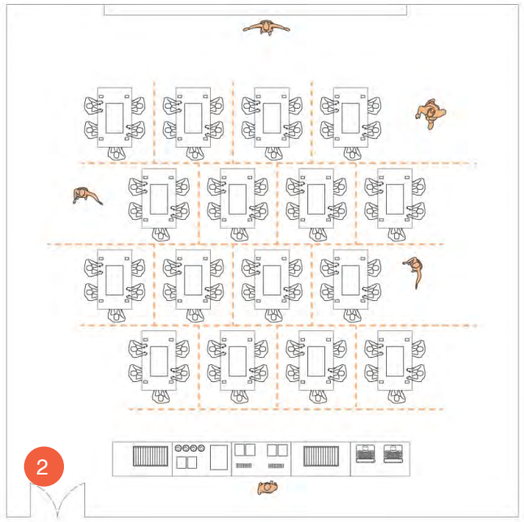
The Divergence Workshop

The Divergence Workshop aimed to introduce the concept of Weak Signals and allow groups to create methods of knowledge integration using the building blocks of - Peripheral Actor, Knowledge Type, and Design Instrument.

Preparing for the Workshop



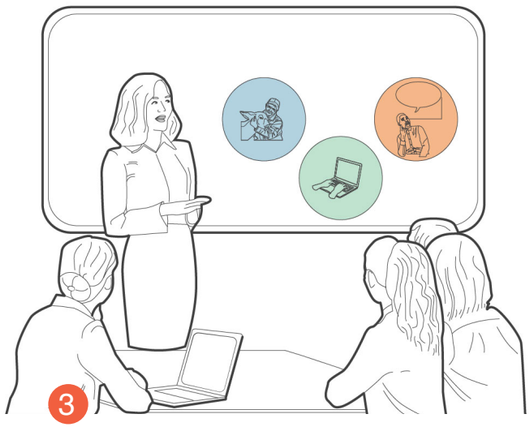




Playing Cards with descriptions of the building blocks of the method, along with physical materials like stationary and scrap material, and a printed booklet with links to online resources were made available to the participants.

The room was arranged as shown, with each participating group assigned a table. A larger table with more materials was present at the rear end of the room.

Picking the Buildings Blocks



All the groups were given a presentation about the project and goals for the workshop. Additionally, the case study for the exercise - the problem of heatwaves affecting the Scheveningen Haven and the strategy proposed by the municipality of the Den Hague was presented by an expert studying the issue.

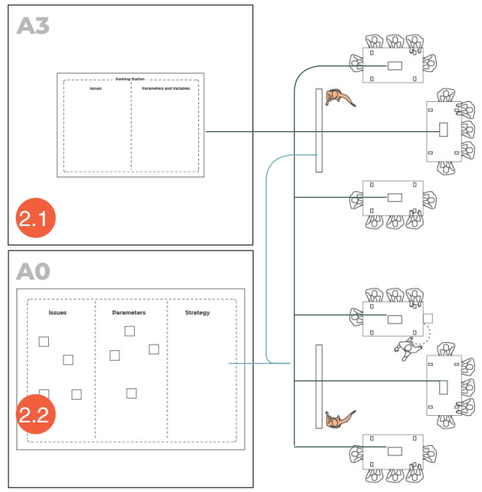
The groups discussed amongst themselves and picked building blocks to create a method that would integrate peripheral knowledge into the strategy accepted by most experts in the field. Following the workshop, they went to the site to engage with the peripheral actors using the design instruments they picked.

Workshop 2:

The Convergence Workshop

The Convergence Workshop aimed at bringing three groups with three different methods into a meta-group to discuss how the peripheral knowledge they each collected using their design method can be integrated into the existing strategy proposed by experts in the field.

Forming Meta Groups



Before the Convergence process, the facilitators prepared meta-groups to combine knowledge collected from three groups into the strategy proposed by the expert - which formed the baseline for the convergence process.

Each group was provided an A3 sheet to organize the knowledge they collected from their fieldwork into issues with quantifiable parameters related to it on sticky notes. Each meta-group was provided an A0 sheet to map out the convergence process, with sticky notes describing the issues and parameters acknowledged by the experts and the baseline strategy they produced on it.

Facilitating Convergence

A facilitator was assigned to each meta-group to oversee the proceedings. The meta-groups were informed about the goals for the second workshop. Each group in the meta group was assigned a color to keep track of the workshop proceeding. The workshop began with each group working amongst themselves to consolidate their fieldwork into the issues and parameters format mentioned. The facilitator timed the process.

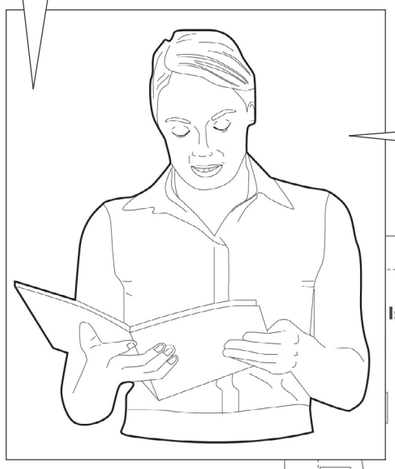
A delegate from each group in the meta group was then invited to the board to stick their notes near the appropriate note describing the baseline process. The facilitator reads instructions on what needs to be considered when mapping out the convergence process on the A0 Sheet.

1. Are there group issues that frame the baseline issues differently? - eg the perspectives, priorit, preferences of your actor.
Cluster these near the baseline issue
2. Do you have knowledge that is in a codified format?
This should be placed under parameters and variables
3. Are there issues missing?
Move them from the parking lot to the board
4. Are there groups that have the same issues?
Stack them on top of each other

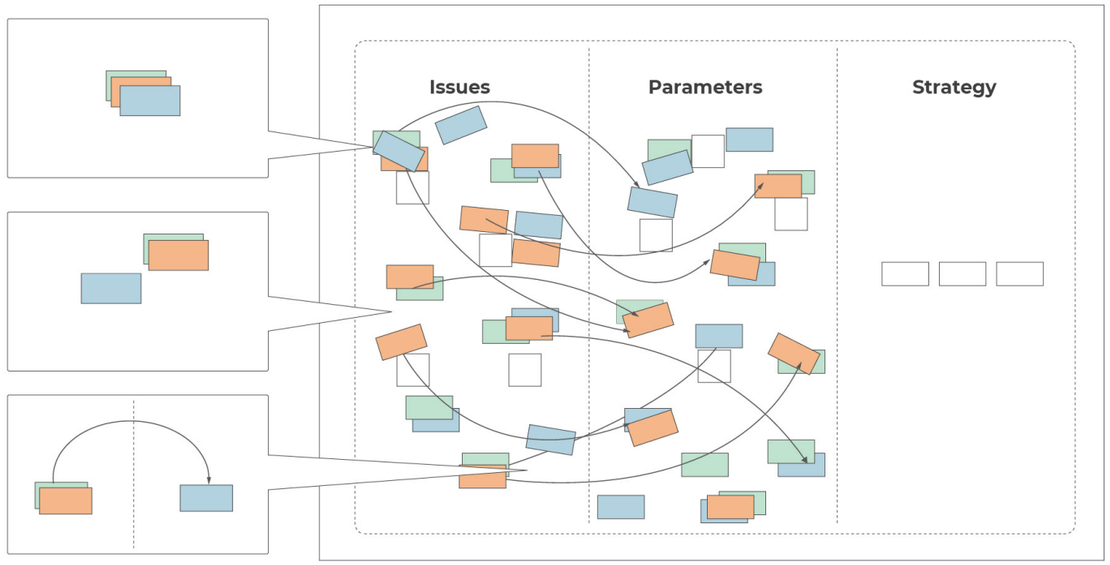
4.1

1. Are there group parameters and variables that frame the baseline knowledge differently? - perspectives, priorities, preferences of your actor.
Cluster these near the baseline parameters & variables (or link to issues in Step 1).
2. Are there parameters and variables missing? Move them from the parking lot to the convergence sheet
3. Are there groups that have the same parameters and variables? Stack them on top of each other
4. What parameters and variables are missing?
Move them from the parking lot to the board
5. Are there groups that have the same parameters?
Stack them on top of each other
6. Can we link these parameters & variables to the issues and to relevant baseline knowledge? This action is about creating a red line between the peripheral knowledge and the alternative strategy.

4.2

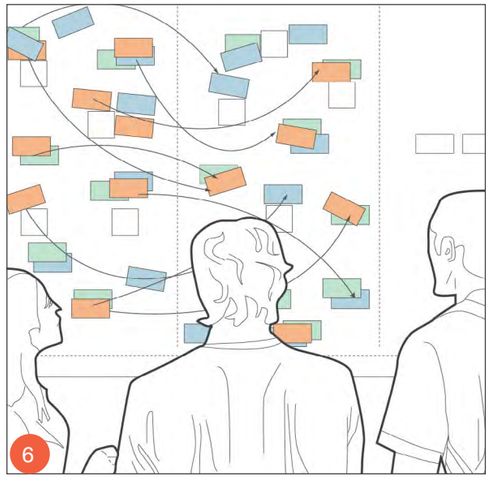


Creating a Strategy



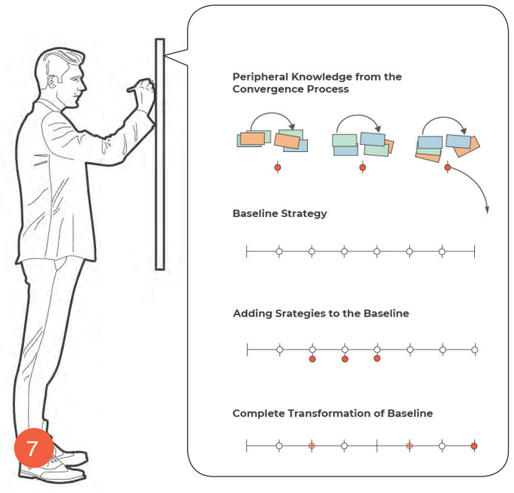
5

The figure shows what the A0 sheet looked like at this stage. If the same issue or parameter came up across groups they were stacked. If similar issues or parameters came up, they were placed near each other. The groups and stacks of issues were then linked to corresponding parameters groups and stacks that could help quantify them.



6

The meta-group as a whole discussed what was made apparent from the pattern of stacking, grouping, and linking.



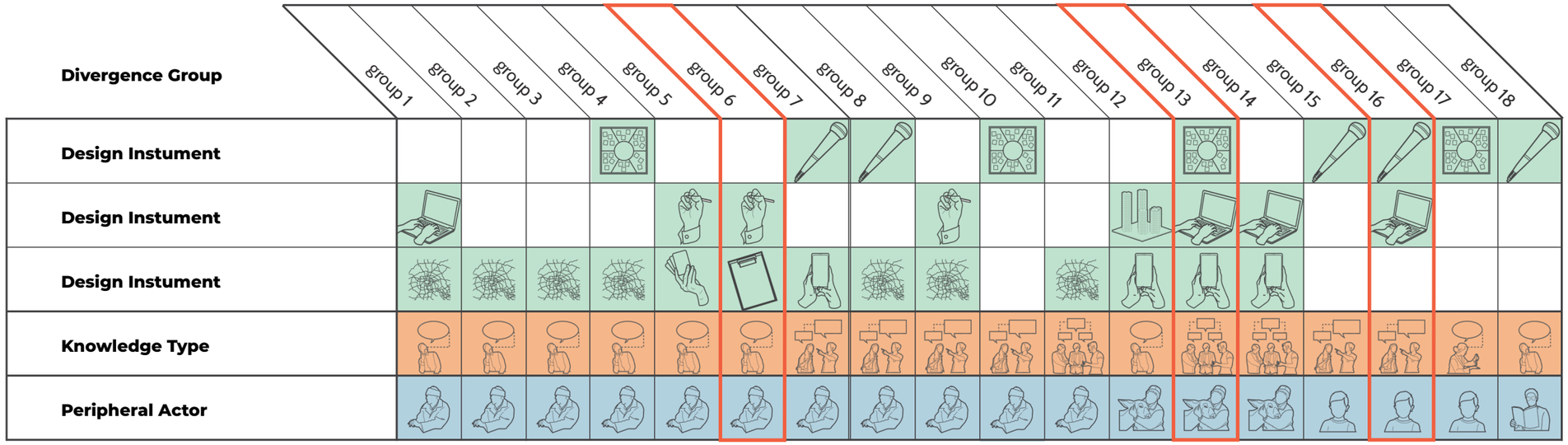
7

Finally, they integrated the knowledge on the board with the baseline strategy presented. Groups were able to either add additional strategies or transform the existing strategies to include peripheral knowledge about heat-waves.

Example of the Results

Example of the Results

The example explores how the three teams used their created methods during workshop 1 and how the peripheral knowledge was integrated during the convergence process at workshop 2. As a showcase, three divergence groups were chosen (groups 6, 13 and 16) that were later assigned to the meta-group A.

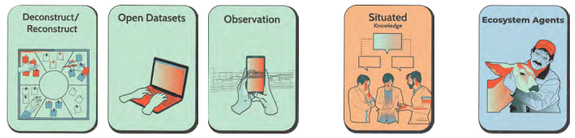


Group 6

The goal of this method is focused on collecting knowledge from **citizens** on different levels of their life. The knowledge that is collected is **experiential** and is focussed on the values and perceptions of the actor group.

To collect this knowledge, the team chose to combine a **survey questionnaire** with **sketch planning**. The design instruments would present different scenarios in simplified diagrams and ask citizens to explain their opinions. The results collected from the survey were translated to concept sketches and diagrams that helped envision possible solutions and scenarios. This way, the citizens' answers could be corroborated by their sketches. This could help the team interpret and contextualize the answers collected from the questionnaire and aided them in collecting the experiential knowledge from citizens.

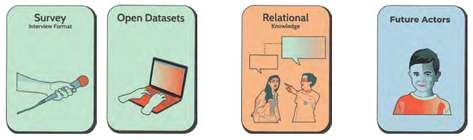
Group 13



The goal of this method was to document the interrelation between animal species and their environment. The knowledge that is collect is **situated** in the environment, this describes the knowledge of the actor within the situation, is specific to the actor and describes how they are affected. An example of this knowledge is how human interaction with the environment affects animal species and interactions between species. The focus of this method is placed on the **eco-system agents** that are present on site. The human interaction with the environment is mostly considered an external factor (e.g. built structures, leisure activities and general human presence).

The team planned to **observe** their chosen site by documenting the human activity, other species that are present and may not necessarily belong to that environment. Their aim was to document their interactions and observe the quality of the site (e.g. different forms of pollution that affect the area). To formalize their observations, the team chose to combine their observations with **open datasets**. This design instrument was mostly chosen to confirm the documented observations. Examples of this validation are land use, temperature rise etc. Finally, the team chose to use the **deconstruction and reconstruction display** to prioritise the most prevalent and affected species on site. This was placed in the context of the established environmental factors like temperature and water accessibility. Besides that, this design instrument was chosen to more easily plan and visualise the information and findings they collected.

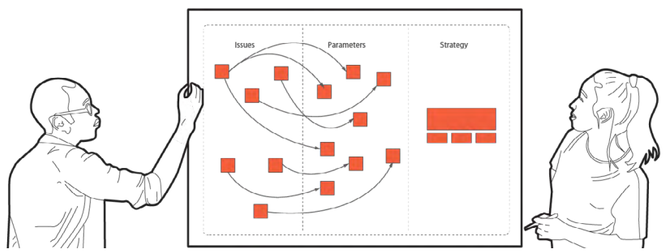
Group 16



The goal of this method was to explore **relational** values and interactions between **future actors** and the urban environment. The challenge was to collect knowledge from an actor group that did not exist yet. By collecting relational knowledge from this actor group, the team would be able to estimate how actors that will inhabit the area in the future will interact with the environment.

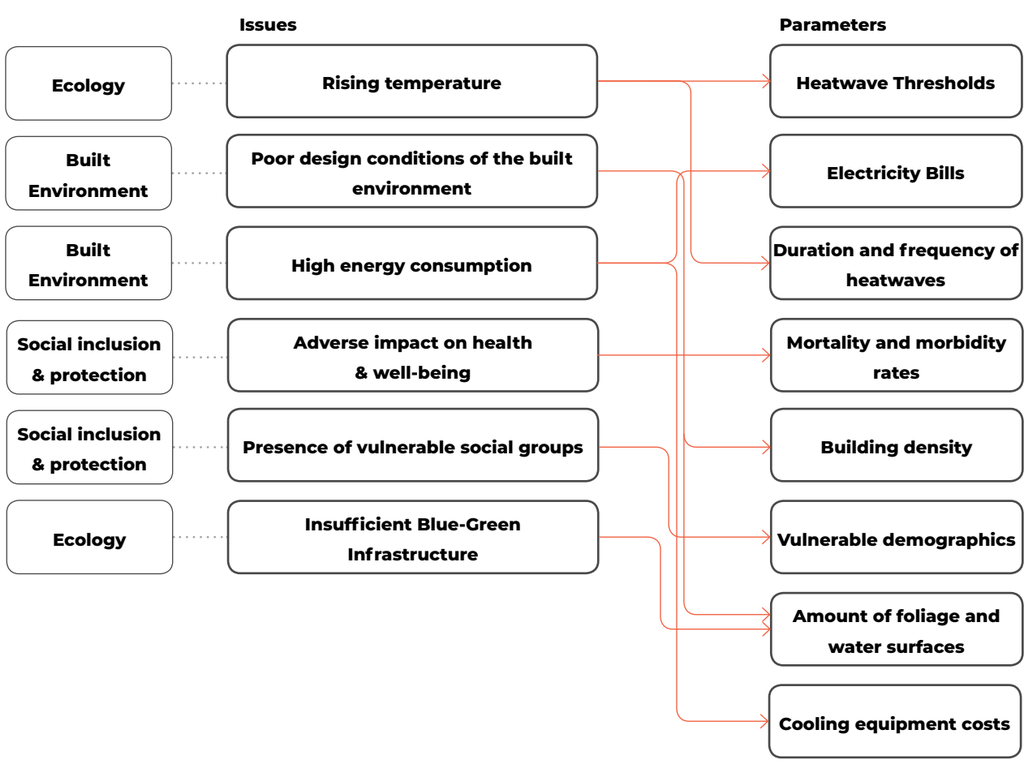
To ensure the possibility of knowledge collection, open datasets were chosen as a design instrument. These data sets could inform estimations, future trends and scenarios which could be explored by the team. This would help them determine the relationships that are expected to emerge between the future actors and their surroundings. To gain better insight in values, informal interviews were conducted. In these interviews, the team asked current residents about their visions for the future. For example, parents were asked what they wished for their children in the future in the area.

At the beginning of the Convergence workshop, the baseline strategy was presented by the expert on heatwaves. The baseline strategy was based on current actions implemented by different municipalities and literature. Moreover, baseline issues and parameters were given as a starting point for the groups to add collected issues and parameters.



Baseline issues and parameters

The Baseline issues were given to the teams as well as related parameters. Those issues can be classified into three main categories: Ecology, Basic Infrastructure and Social inclusion and protection (categories are explained on page 12). Most of the ecological and infrastructure-related issues are directly addressed in the strategy, however, social ones are less covered by the baseline strategy.

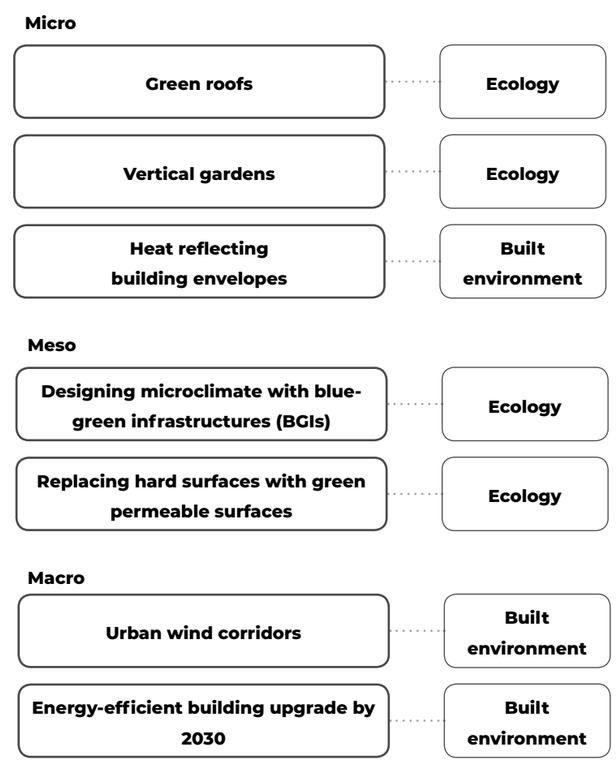


The Baseline Strategy

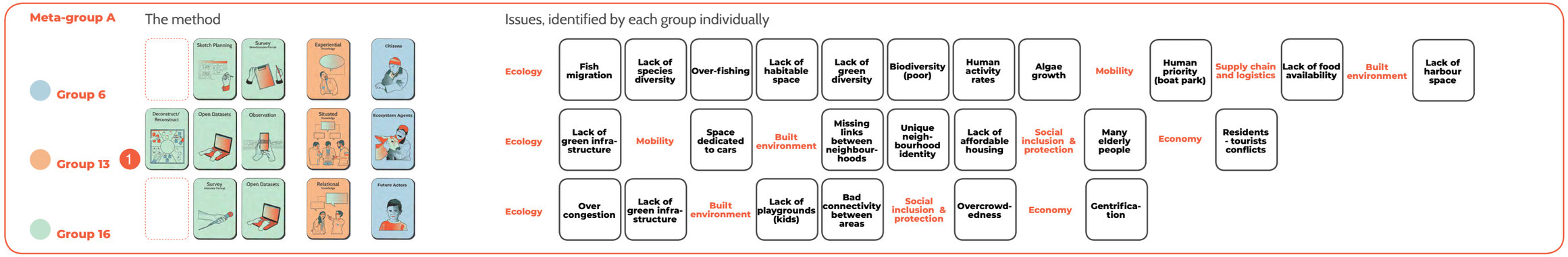
The city of Den Haag plans to launch a long-term, multi-scale strategy to combat Urban Heat Island (UHI) effects. This strategy, comprised of interventions at the micro, meso, and macro levels, will deploy urban heat adaptation strategies ranging from the building scale to the city scale. The primary goal at the micro level will be to minimize solar heat gain in buildings through the use of green roofs, vertical gardens, and heat reflecting building envelopes. Reducing heat gain may improve thermal comfort for building occupants while also benefiting the surrounding urban environment. The meso level interventions include designing microclimate with blue green infrastructures (BGIs). Also replacing hard surfaces with green permeable surfaces where possible. Finally, at macro level, there is a masterplan for creating urban wind corridors which is basically a long-term strategy for channeling cool air from the North Sea across the UHI hotspots of the city. In addition, by 2030, a substantial energy-efficient building upgrade will take place throughout the city, ensuring a healthier and more sustainable future for everyone.

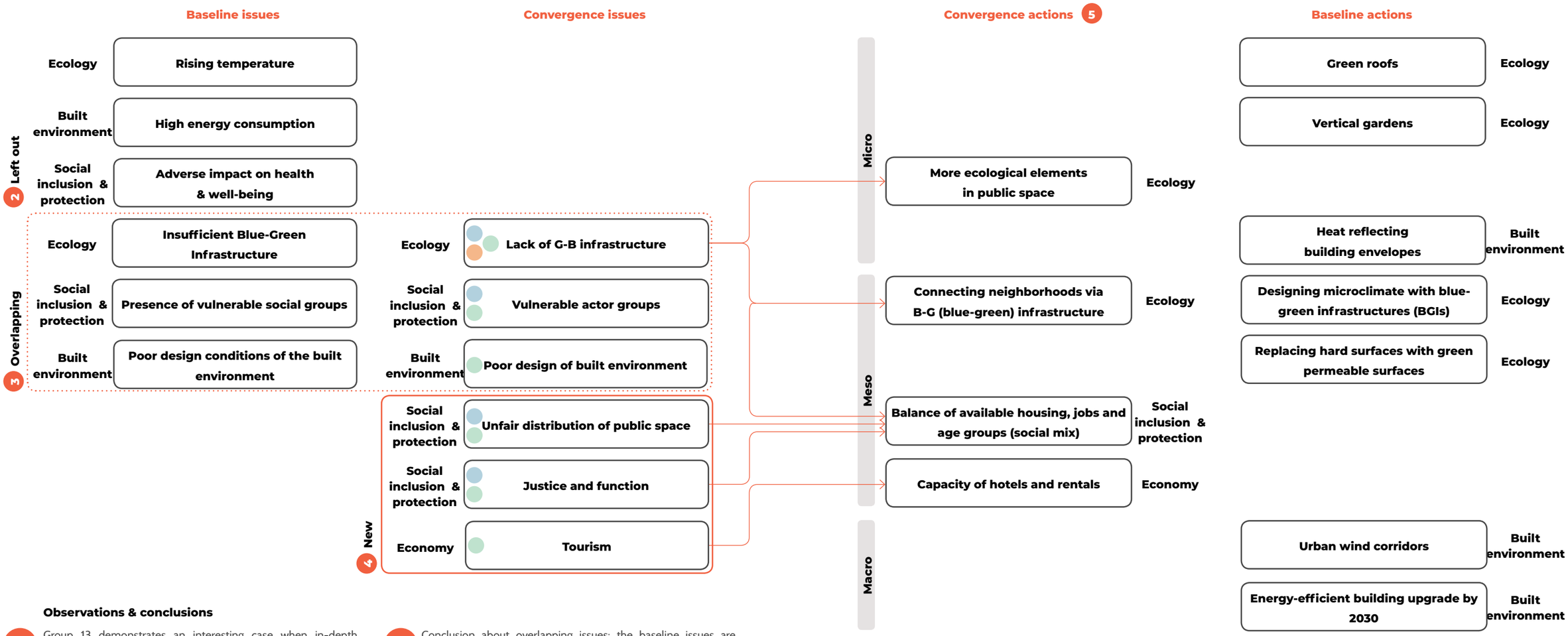
Strategic actions

The baseline strategy can be reduced to the main actions, acting on different scales: micro, meso and macro. The extraction of the actions allows us to compare the baseline strategy to the proposals of the meta-groups. Moreover, the actions are also classified according to the Urban Elements classification on page 12. It is noticeable, that the baseline strategy covers only two categories: Ecology and Built Environment.



Workshop 2: The Convergence Workshop





Observations & conclusions

1. Group 13 demonstrates an interesting case when in-depth knowledge is brought through the convergence process. As their chosen Peripheral Actor was Ecosystem Agent, elicited knowledge strengthens the need for high-quality blue-green infrastructure for both humans and nature.
2. Issues that were left out in the set of convergence issues tend to be systematic, and related to the knowledge of acknowledged experts.
3. Conclusion about overlapping issues: the baseline issues are mostly quantitative, whereas the convergence issues can bring in more detailed qualitative information about the same issue.
4. Conclusion about new issues brought in the convergence process: depending on the actors and knowledge types involved, new issues might shift emphasis to include other types of knowledge about social or ecological issues that are not necessarily considered by experts in the baseline.
5. The question here: would we have formulated these actions based on the baseline or are these influenced by the new issues brought in through the convergence process? We see here that the new issues at least shift emphasis or add depth to baseline knowledge.

Resilient Delta

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Amplifying Weak Signals

A strategy for knowledge integration across disciplines and beyond