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# Bridging differences by design: competencies and individual characteristics of boundary-spanning spatial designers in urban climate adaptation planning

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## ABSTRACT

Urban designers and landscape architects increasingly take up boundary spanning as part of their broadening role towards designing processes, policies, narratives and becoming design-led entrepreneurs. This study mapped the competencies and individual characteristics of boundary-spanning spatial designers in urban climate adaptation planning and revealed that in addition to 'known' boundary spanning skills, design-related skills and competences have strong boundary spanning potential. However, boundary spanning is conditioned by the position of the boundary spanner, as well as other organizational, institutional, and environmental factors. These insights are helpful for developing (re)new(ed) educational design-curricula, and aiding spatial designers in becoming competent boundary spanners.

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Climate change adaptation; urban planning and design; landscape architecture; climate resilience; skills and competencies

## Introduction

Traditionally, urban designers and landscape architects create tailor-made designs for a particular place, neighbourhood, district, city, or region. At the same time, next to this subject-oriented role, their ability to develop designs that address multiple issues and produce co-benefits (Carmona 2021; Thompson 2014) is to an increasing degree placing them in the role of facilitating and orchestrating design processes that include multiple stakeholders and actor groups (Kempenaar and Van den Brink 2018; Steinitz 2012). Moreover, designers are taking up stewardship roles (Nassauer 2011) in response to today's deeply rooted societal and environmental challenges (e.g., climate adaptation, energy transition, growing inequality, and loss of biodiversity) and combine visionary and transformative design with entrepreneurial leadership (Mörtenböck and Mooshammer 2018; Van den Brink, Van den Brink, and Bruns 2022).

In the process of reinventing the roles spatial designers play, they are broadening their focus beyond the traditional design of an object or physical space. Designing contexts (designing at the level of systems and services), institutional design, design of processes,

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and designing policies (Young 2008) is becoming a part of their work. This kind of designing is generally not done in isolation, but in multi-disciplinary teams and in collaborative and participative processes. It also requires a strong focus on, and ability to connect to others, to bridge differences, and to span, affect, and transform boundaries between sectors, disciplines, organizations, interests, and actor groups (Van Dijk et al. 2023).

Although the integration of different kinds of knowledge, interests and perspectives, as well as collaborative, transdisciplinary and participatory design are familiar concepts in the realm of urban design and landscape architecture, boundary spanning is relatively unknown (Van den Brink, Van den Brink, and Bruns 2022). Boundary spanning concerns linking networks, organizations and different kinds of knowledge and information to overcome barriers, and to drive innovation and collaboration (Collien 2021). The spatial design disciplines have much to gain by incorporating explicit knowledge and understanding of boundary spanning. Designers continuously encounter boundaries, are confronted with the challenge to bridge differences and to overcome conflicts in developing ideas for future situations. Their natural focus is on physical, spatial, or geographical issues and aspects, and, as such, on boundaries of this nature. However, particularly in their more process-oriented and entrepreneurial roles, designers also encounter many social and institutional boundaries. Considering this, it is remarkable that urban design and landscape architecture scholars have not touched upon the topic of boundary spanning more frequently and extensively. So far, scholars have focused on bridging the design/finance divide (Carmona, Gabrieli, and Bento 2023), space (or landscape) as a boundary object (Löfgren 2020; Nassauer 2012), and potential boundary-spanning roles for designers (Van den Brink, Van den Brink, and Bruns 2022; Van den Brink et al. 2019), leaving, among other things, the individual competencies and characteristics of boundary-spanning designers understudied.

Drawing on existing theoretical insights on the competencies of designers (e.g., Carmona 2021; Cross 2023; Lawson 2006) and insights on more generic boundary-spanning competencies (e.g., Jesiek et al. 2018; Van Meerkerk and Edelenbos 2021), this paper adds to urban design and landscape architecture literature an empirically grounded understanding of the individual competencies and characteristics that boundary-spanning designers employ in complex urban climate adaptation planning processes. Adapting to climate change is full of complexities and calls for transformative changes in how urban regions are planned, designed and organized (e.g., Brown et al. 2020; Grin, Rotmans, and Schot 2010). It is in these complex processes that spatial designers are called upon to perform more process-oriented and entrepreneurial boundary-spanning roles, requiring not only cognitive but particularly also social and emotional skills and competencies (Kempenaar 2021; Van den Brink, Van den Brink, and Bruns 2022).

The novelty of this research lies in the fact that it is the first study that systematically maps the expertise, skills, and competencies employed by spatial designers to span and mould boundaries. These insights first of all help to gain an explicit and in-depth understanding of why designers are equipped to bridge differences, something which for many designers might not be a revealing insight in itself, but which often remains implicit. Knowledge about boundary-spanning competencies and characteristics may assist design professionals to explore and further develop their full potential as boundary-spanners in design-driven planning processes. Such knowledge is also particularly

relevant for updating and renewing existing urban design and landscape architecture educational curricula and for developing new programmes to educate process-oriented and entrepreneurial spatial designers. Moreover, this study enables to contrast competencies and characteristics of spatial designers with the individual attributes of other (studied) boundary spanners. This will not only help to improve our understanding of the unique boundary-spanning potential of designers as well as their limitations, but will also help to explain to non-designers why, and in which contexts, designers can be particularly helpful in addressing complex societal challenges, and, as such, promoting sustainable transformations.

## Spatial designers

The design of streets, parks, neighbourhoods, districts, cities, or regions is taken up by a group of professionals who are specifically trained and educated to design such spaces. This group includes urban designers and landscape architects, and is complemented with others who have developed themselves in this direction. In the context of this study these designers are coined 'spatial designers', since they are engaged with the design of public spaces on various scale levels. The creative design skills and competencies that these designers bring sets them apart from other professionals working in the spatial domain while their spatial knowledge and expertise distinguishes them from other professional designers.

The education of designers focuses on training them to be competent in 'the playful creation and strict evaluation of the possible forms of something, including how it is made' (Lynch 1984, 290). In doing so, they develop the skill to integrate and synthesize or, in other words, to combine different sets of information to create a coherent set of ideas (Lawson 2006). They develop their abductive reasoning skills to envision possible and desirable future situations (Cross 2023) and learn to use the coevolution of problem and solution space (Dorst and Cross 2001) to induce creativity. They are furthermore trained to adaptively switch between the following activities in a design process (Lawson and Dorst 2013): 1) searching and selecting relevant information and researching topics to (re) formulate and (re)frame the design challenge, 2) developing ideas and proposals on what could be, 3) using visualization and other techniques to represent their ideas, 4) reflecting critically, and evaluating their (intermediate) results, and 5) managing, adjusting, and refining the design process along the way. Designing is a complex cognitive process in which knowledge and skills are further developed over years of practical experience from a novice level to an expert, master, or visionary level (Lawson and Dorst 2013).

The specific focus of spatial designers is on the design of urban spaces and landscapes (Carmona 2021; Thompson 2014). This calls for additional knowledge and skills. Spatial designers need to be able to develop a deep understanding of the spatial situation they are making the design for, as well as the socio-ecological system in which the situation is embedded, a way of looking at the world that aligns with 'Ecopractocology', the study of socio-ecological practice (Xiang 2019). This perspective includes the physical (urban) context, conditions, and (sub)systems (e.g., existing infrastructure and urban fabric, weather and climate conditions, soil types, water systems), as well as the socio-economic (e.g., land-use, ownership, inhabitants, and income) and institutional (e.g.,

governance, policy, zoning, laws, regulations) context, conditions, and (sub)systems (Carmona 2021). Spatial designers use a general knowledge and understanding of socio-ecological and urban systems to guide them in this process (Kempenaar and Van den Brink 2018).

Furthermore, to develop feasible ideas about the future situation, designers need to navigate various perspectives, interests, and interdependencies of owners, users, and governmental regulators (Madanipour 2006), and take them into account in their proposals and solutions. This calls for good communication skills and the ability to organize and facilitate participatory and collaborative design processes. Finally, as designers are focused on responding to social and environmental challenges, and, as such, on improving the spatial situation with their designs, they often feel a responsibility or stewardship towards the environment (Nassauer 2012), which gives them a specific drive and motivation.

The above described competencies and characteristics of spatial designers predominantly relate to their 'traditional' role of making high-quality and tailor-made design for specific places on various scale-levels. Currently, designers more and more take up additional roles, for instance as visionary narrator, process-based designer and as designed entrepreneur (Van den Brink, Van den Brink, and Bruns 2022), in which they employ a broad range of boundary spanning activities. The next section presents a framework based on 'known' boundary spanning competencies and individual characteristics to study the attributes of boundary spanning spatial designers in urban climate adaptation planning programmes.

## Competencies and individual characteristics of boundary spanners

A boundary spanner is a person who is engaged with linking different (internal and external) networks, organizations and kinds of knowledge and information (Collien 2021; Van Meerkerk and Edelenbos 2018). Generally speaking, a boundary spanner is a person who is 'especially sensitive and skilled in bridging interests, professions, and organizations' (Webb 1991, 231). Ideally, research on the competencies and individual characteristics of boundary spanners, whether these are designers or other professionals, would use a well-established theoretical framework on boundary-spanning competencies. However, such a framework does not yet exist (Jesiek et al. 2018). Van Meerkerk and Edelenbos (2021) distinguish between *cognitive*, *social*, and *emotional* competencies. In addition to these competencies, experience (Au and Fukuda 2002; Giaretta 2014), network ties (Jesiek et al. 2018; Van Meerkerk and Edelenbos 2018), and motivation (Yoo, Arnold, and Frankwick 2014) are additional *individual characteristics* that are considered relevant for boundary spanning.

Table 1 provides an overview of the of boundary-spanning competencies and individual characteristics derived from boundary spanning literature. As it is next to impossible to find all listed competencies and individual characteristics in one person, the overview must be seen as a landscape of competencies and characteristics associated with boundary spanning. Depending on the situation, the boundary-spanning activity, and -roles (e.g., Ancona and Caldwell 1992; Van den Brink et al. 2019), some competencies and characteristics are more relevant and employed than others. Furthermore, in complex situations, it often takes a team or network of multiple boundary spanners with

**Table 1.** Competencies and individual characteristics of boundary spanners.

Cognitive competencies	<ul style="list-style-type: none"> <li>● Information processing</li> <li>● Analytical thinking</li> <li>● Domain expertise</li> <li>● Organization expertise</li> <li>● Coordination skills</li> </ul>
Social competencies	<ul style="list-style-type: none"> <li>● Communication and listening skills</li> <li>● Conflict management skills</li> <li>● (Inter)organizational awareness &amp; sensitivity</li> <li>● Political savvy</li> <li>● Networking skills</li> <li>● Cross-cultural awareness &amp; understanding</li> <li>● Leadership</li> <li>● Teamwork/collaboration</li> </ul>
Emotional competencies	<ul style="list-style-type: none"> <li>● Empathy and otherness</li> <li>● Self-confidence and self-efficacy</li> <li>● Self-awareness, self-monitoring, and self-regulation</li> <li>● Conscientiousness</li> <li>● Achievement orientation</li> </ul>
Individual characteristics	<ul style="list-style-type: none"> <li>● Initiative/proactive</li> <li>● Experience</li> <li>● Network ties</li> <li>● Motivation</li> </ul>

complementary skills, competencies, positions, and roles to overcome differences (e.g., Harvey, Peterson, and Anand 2014; Marrone 2010).

### *Cognitive competencies*

Information processing and analytical thinking are important cognitive competencies of boundary spanners (Van Meerkerk and Edelenbos 2021) as boundary spanners have (to be able) to process a lot of information, select what is relevant and important, and be sensitive to salient information. In order to critically assess and select information, expertise is an important additional competency for boundary spanners (Jesiek et al. 2018; Van Meerkerk and Edelenbos 2021). Next to domain expertise, Curnin and Owen (2014) identified that organization expertise, or knowledge and understanding of the abilities of one's own or other organizations, is another kind of expertise relevant to boundary spanning. Jesiek et al. (2018) identified coordination skills as an additional cognitive competency for boundary spanning. Task coordination is one of the known roles of boundary spanners (Ancona and Caldwell 1992), which requires the ability to manage and divide tasks, and plan activities in conjunction with each other.

### *Social competencies*

Communication and listening skills are critical social competencies (Jesiek et al. 2018; Van Meerkerk and Edelenbos 2021) for establishing connections and building relationships. Transferring and translating information across boundaries, one of the activities undertaken by boundary spanners (e.g., Van den Brink et al. 2019), calls for knowing, understanding, and being able to speak the 'language' of different groups, and to be adaptable in communication styles and strategies. In addition, to be able to negotiate, mediate, influence, bargain, facilitate, or seek compromises, boundary spanners need to have

conflict management skills (see, e.g., P. Williams 2002). Boundary spanners, furthermore, profit from (inter)organizational awareness and political savvy, or in other words from having a sensitivity to both organizational processes and the political nature of decision-making (Van Meerkerk and Edelenbos 2021), as well as having the ability to mobilize and utilize political capital. Jesiek et al. (2018) and Tushman and Scanlan (1981) identified networking skills as a specific competency for the purpose of boundary spanning, which is important for building up and maintaining social capital. Jesiek et al. (2018) also found (cross-)cultural awareness and understanding as a social competency relevant for boundary spanning. Leadership and teamwork/collaboration complete the list of social competencies, which stem from a study by H. W. Williams (2008) on boundary spanning by outstanding urban school principals.

### *Emotional competencies*

Empathy and otherness, or the ability to understand and value the perspectives, experiences, and concerns of others, is an important emotional competency for boundary spanning (Jesiek et al. 2018; Van Meerkerk and Edelenbos 2021), since trust can only be built through connecting with others and when boundaries are softened or broken down (P. Williams 2002). The literature also points to self-confidence and self-efficacy as essential emotional competencies (Marrone, Tesluk, and Carson 2007; Van Meerkerk and Edelenbos 2021). It is beneficial if you believe in your own ability, for example to be successful in establishing relationships with important parties, or in managing developments that impact the organization or team. Self-efficacy also contributes to seeing uncertain, stressful, or challenging situations as opportunities and not as obstacles (Marrone, Tesluk, and Carson 2007). Furthermore, self-awareness, self-monitoring, and self-regulation are emotional boundary-spanning competencies described in literature (Jesiek et al. 2018; Van Meerkerk and Edelenbos 2021). Self-awareness comprises the understanding of your own needs, drives, and emotions, including strengths and weaknesses. Self-monitoring and self-regulation build on this awareness and refer to the active monitoring, regulation, and/or control of one's own behaviour attuned to what fits a situation (Van Meerkerk and Edelenbos 2021). From the aforementioned study on urban school principals (H. W. Williams 2008), conscientiousness, achievement orientation, and initiative also emerged as emotional competencies relevant for boundary spanning. Initiative aligns with proactive personality listed in the overview of Jesiek et al. (2018).

### *Individual characteristics*

In addition to the previously described cognitive, social, and emotional competencies, experience, network ties, and motivation are described as additional individual characteristics relevant for boundary spanning. Experience was found to play a determining role in two ways (Van Meerkerk and Edelenbos 2018). Firstly, having been exposed to various circumstances, and having had different positions increases boundary-spanning activities (Au and Fukuda 2002). Secondly, experienced people in an end-of-career position with adequate expertise and availability were found to be particularly capable of removing barriers and facilitating a constructive dialogue (Giaretta 2014). Their experience, in



addition to their expertise, also builds legitimacy and credibility in boundary-spanning situations (Jesiek et al. 2018).

Furthermore, experienced persons, having held various positions and/or being in an end-of-career position, can be expected to have strong and broad network ties (Van Meerkerk and Edelenbos 2018). Network ties, or internal and external linkages, are particularly relevant as boundary spanners often function as linking pins between different groups of people, and/or can span 'structural holes' (Jesiek et al. 2018) with structural holes being a direct or indirect 'separation between nonredundant contacts' (Burt 2021, 18) that can be connected via (the network of) the boundary spanner. The final individual characteristic that was derived from boundary spanning literature is motivation. Motivation, for example the desire to move upward in an organization, or to advance one's career, is a potentially powerful characteristic related to accomplishing achievements (Yoo, Arnold, and Frankwick 2014), and, as such a helpful characteristic for boundary spanning.

## Research approach and methods

To develop the understanding of the competencies and characteristics that spatial designers employ in boundary spanning, the study followed the logic of a qualitative and explorative multiple case study design (Francis 2001; Yin 2009) with three cases in the field of urban climate adaptation planning. In addition, two focus groups (Bryman 2016) discussed the findings of the cases. The reason for the focus on the field of urban climate adaptation planning and the selection of the cases was twofold. Firstly, urban climate adaptation is a complex field in planning as it involves cross-sectoral and interdisciplinary collaboration in the design and development of solutions, and includes the spanning of multiple boundaries. Spatial designers are employed in these processes to develop integrated designs and have been observed to take up boundary spanner roles and positions (Van den Brink et al. 2019), making urban climate adaptation programmes and projects a suitable field in which to conduct the study. The second more pragmatic reason to focus on urban climate adaptation was that it allowed to employ existing contacts and networks developed in previous research projects.

The three studied cases are the Sigma Plan in Belgium (see Meire et al. 2014), Rebuild by Design in the US (see, e.g., Lochhead 2017), and Water as Leverage for Resilient Cities Asia (see, e.g., Kempenaar et al. 2024). Each case concerned an overarching long-term programme from which one or more projects were studied in detail to gain a more granular understanding of boundary spanning by spatial designers. The cases were selected based on the involvement of multiple spatial designers in various roles and positions. Although all three cases are in the field of urban climate adaptation planning, they are also unique. They are tailored to their specific focus, their physical, institutional, and cultural planning context, and they are located in different countries. Furthermore, the programmes were each in a different stage, varying from the design/planning stage up to implementation. This allowed to study boundary spanning by spatial designers in a variety of contexts, which fitted the exploratory character of the study. An overview of the characteristics of these cases is given in Table 2.

The cases were studied by document analysis and interviews, which were held between March 2019 and June 2021. The document analysis provided valuable

**Table 2.** Overview of the studied cases.

	Sigma Plan	Rebuild by Design (RbD)	Water as Leverage (WaL)
Programme focus	Integrated river management of the Scheldt estuary focusing on flood safety, nature development, and economic use	Response after Hurricane Sandy. Improving coastal resilience along the New York/New Jersey coast	Development of urban climate resilience in three pilot cities in Asia: Chennai (India), Khulna (Bangladesh), and Semarang (Indonesia)
Planning stage	Implementation	Implementation started	Design/planning stage
Time	2005-present	2013-present	2018-present
Location	Scheldt region around Antwerp (Belgium)	New York/New Jersey (USA)	Southern Asia
Studied project(s)	- Droogdokkenpark, the redevelopment of a former harbour area along the Scheldt in Antwerp into a park, while also increasing the protection level from flooding	- Big U, the design of a multifunctional structure to protect lower Manhattan (New York) from flooding - Meadowlands (New Jersey), the design of a wetland and a surrounding raised 'ribbon' that both connects the surrounding urban areas and prevents flooding	- Semarang (Indonesia), in which two design teams were active in developing a comprehensive vision for a resilient Semarang and six concrete project initiatives focused on making various parts of the city more resilient to flooding
Number of interviews	10 (two with designers, and eight with other professionals)	13 (five with designers, and eight with other professionals)	9 (five with designers, and four with other professionals)
Period of interviews	Nov 2020–June 2021	Oct–Dec 2020	March/April 2019 and June 2020

information on the spatial planning processes and the setting in which spatial designers were active. It served to gain a general understanding of both the programme and the studied projects, and provided some basic information on the role and position of spatial designers.

The interviews, 32 in total, provided a more in depth understanding of the complex spatial planning processes of the cases, and boundary spanning by spatial designers. Moreover, they provided detailed accounts of the competencies and individual characteristics spatial designers employed in boundary spanning. The interviews included both designers and other professionals engaged at the programme and project levels of the cases. This enabled to cross-check between a designer and a non-designer point of view. Due to the COVID-19 pandemic, the interviews held in 2020 and 2021 were conducted online. All interviewees gave their consent for the interview beforehand and approved the use of the data and quotes for publication. The interviews were recorded, transcribed verbatim, and anonymized for further qualitative analysis.

The interviews were analysed on their content relating to the characteristics of spatial designers as boundary spanners via a protocol of coding, going back and forth through the text to align the coding. The analysis started with a round of deductive coding using a code scheme consisting of the competencies and individual characteristics as listed in Table 1. In consecutive inductive coding rounds, the quotes were further analysed and clustered, providing a rich and detailed overview of the characteristics of spatial designers as boundary spanners.

To triangulate and deepen the findings from the cases, two focus group discussions were organized in June 2021 with each five respondents working in the spatial planning

and design domain. The focus groups were organized in collaboration with a planning and design NGO. A senior representative of this NGO led the focus group discussions, ensuring a discussion among professionals, and, as such, a minimal influence of the researchers. Both focus groups were held online due to COVID-19 and each lasted around two hours.

In preparation for the focus group, all participants were asked to respond via email to two short questions. The first focus group participants were asked to describe three activities that spatial designers employ to bridge differences, and to give three key enabling conditions for boundary spanning by spatial designers. The second focus group participants were asked to indicate which boundaries are typically spanned by spatial designers by which kind of activities, and to give three key characteristics of boundary-spanning spatial designers. This initial input for the focus group was included in the analysis.

The focus group discussions were transcribed verbatim and then qualitatively analysed on their content, following a similar coding protocol as was used for the analysis of the interviews. Finally, the coding of the 32 interviews and the two focus group discussions were aligned to derive a final set of findings, and to compose a list of quotes illustrating these findings.

## Results

### *Urban climate adaptation planning: navigating collaboratively towards promising interventions*

From the three case studies and the two focus group discussions, a clear image emerged indicating that the spatial designers who are engaged in urban climate adaptation planning see the world as a (complex and evolving) system with strongly interrelated physical, technical, ecological, social, economic, cultural, and institutional dimensions and a plurality of perspectives and interests. It is this systemic perspective that underpins their boundary-spanning role and activities. Designers bring different ideas, interests, and perspectives together in (ideas for) interventions aimed at improving future situations. Furthermore, they aim to take an independent stance to be able to work in close collaboration with a wide variety of experts, communities, governmental bodies, and other stakeholders. This independency does not mean that spatial designers are neutral. On the contrary, in line with what is said in the literature, the ambition is to make a difference and improve the quality of places came to the forefront.

The interviews and focus groups also revealed that the road from co-creating promising interventions to formalized approval, financing, implementation, and realization is full of obstacles. This bumpy road is generally perceived as an interesting learning journey not just because you always learn from experiences, but because learning is necessary when dealing with uncertainties and unknowns and is seen to lead to better outcomes.

You really need to get knowledge from many, many, many places. And you really need to be fresh, and you really need to be prepared for challenging yourself almost continuously... it gives you training all the time. (Designer, RbD)

But I think over time we just get to understand more and more about what exactly ... the challenges are. (Designer, WaL)

Multiple respondents, particularly the designers, expressed an awareness of, and sometimes love for complexity in urban climate adaptation planning processes. Consequently, there is a necessity to learn and innovate the way of working, genuinely engage with communities, and develop new integrated solutions to create climate resilient cities and urban regions. However, these processes also come with limitations, for example in the number of participants, the inability to include literally everyone, or the struggle to include non-human elements and values. Furthermore, the respondents stressed the importance of teamwork, whether this is with the members of the (design) team, with external advisors, with communities, with governmental bodies, with businesses, NGOs, with experts or academics, or a combination of all:

I think every resiliency project requires collaboration, maybe even an unprecedented level of collaboration between agencies and sectors. (Governmental official, RbD)

There is a really great and strong social component to all this work. That's necessary because these are new types of problems that need new types of approaches that can only be developed by diverse coalitions that try to figure out together how to move forward. (Designer, WaL)

Based on what was encountered in the study, spatial designers are very much aware that they, together with others, are in the business of navigating the complexity of urban climate adaptation planning processes. As such, they engage in bridging differences and spanning boundaries, both geographically between places and locations, and between perspectives, interests, disciplines, institutions, cultures, and groups of people from an interrelated systems perspective.

### ***Competencies and individual characteristics of spatial designers in urban climate-adaptation planning***

Table 3 provides an overview of the boundary spanning competencies and individual characteristics employed by spatial designers in urban climate adaptation planning found in the study. In addition to 'known' boundary-spanning competencies and individual characteristics from the existing literature, 10 additional individual attributes emerged from the study, most of which strongly relate to specific spatial design competences and expertise. The following sub-sections elaborate the competencies and individual characteristics listed in Table 3 with a focus on the additional competencies.

As similarly encountered in boundary-spanning literature, various respondents stressed that the competencies and individual characteristics vary per individual designer, and that nobody possesses all. The attributes were discussed in relation to multiple spatial designers having different roles and positions in the studied programmes and projects, and who were collaborating with others (both designers and non-designers) in a network of boundary spanners.

**Table 3.** Competencies and individual characteristics employed by boundary-spanning spatial designers engaged in climate adaptation planning.

	'Known' competencies and individual characteristics employed by boundary-spanning spatial designers encountered in the study	'Additional' competencies and individual characteristics employed by boundary-spanning spatial designers found in the study
Cognitive competencies	<ul style="list-style-type: none"> <li>● Information processing</li> <li>● Analytical thinking</li> <li>● Domain expertise</li> <li>● Organization expertise</li> <li>● Coordination skills</li> </ul>	<ul style="list-style-type: none"> <li>● Integrating/Synthesizing</li> <li>● Critical thinking</li> <li>● Process expertise</li> <li>● Abductive reasoning</li> <li>● Visualization skills</li> </ul>
Social competencies	<ul style="list-style-type: none"> <li>● Communication and listening skills</li> <li>● Conflict management skills</li> <li>● (Inter)organizational awareness &amp; sensitivity</li> <li>● Networking skills</li> <li>● Cross-cultural awareness &amp; understanding</li> <li>● Leadership</li> <li>● Teamwork/Collaboration</li> </ul>	<ul style="list-style-type: none"> <li>● Storytelling</li> <li>● Translating</li> </ul>
Emotional competencies	<ul style="list-style-type: none"> <li>● Empathy and otherness</li> <li>● Self-confidence and self-efficacy</li> <li>● Self-awareness, self-monitoring, and self-regulation</li> <li>● Conscientiousness</li> <li>● Achievement orientation</li> <li>● Initiative/Proactive</li> </ul>	<ul style="list-style-type: none"> <li>● Optimism</li> <li>● Personal Resilience</li> </ul>
Individual characteristics	<ul style="list-style-type: none"> <li>● Experience</li> <li>● Network ties</li> <li>● Motivation</li> </ul>	<ul style="list-style-type: none"> <li>● Being there</li> </ul>

### Cognitive competencies

A striking insights that emerged from the study was that for the majority of the respondents, both designers and non-designers, spatial designing is always a kind of boundary spanning. Throughout the interviews and focus groups, the ability of spatial designers to integrate and synthesize ideas, functions, interests, and perspectives into a design, was frequently mentioned as a core competency beneficial for boundary spanning. Exploring if, and how different elements, functions, and land uses can be integrated belongs to the core of what designers are asked to do:

[We asked] can you – the designers of the master plan – actually already make a preliminary assessment of your master plan and see how this could be integrated? (Program Leader, the Sigma Plan)

One of the participants in the first focus group summarized the benefit of integrating or synthesizing elements and issues as follows:

By doing this [integrating/synthesizing] you know what you are talking about, the value of tasks and opportunities can be estimated, and the choices to be made (and considerations behind them) become visible. You can have a substantively founded conversation, in which all actors have the same information background as much as possible.

The ability to synthesize and integrate calls for strong information-processing skills and analytical thinking. In addition to these 'known' boundary-spanning

competencies, critical thinking emerged as an additional competency to ensure nothing is left out:

Looking at the right scale, are we looking at the right combination of hazards, are we overlooking stuff? That analysis is very, very important to move forward in a design process. (Consultant, RbD)

Wishes, interests, and ideas are synthesized, integrated, and spatially coordinated in ideas of future situations, adding coordination to the list of encountered competencies used by spatial designers in spanning boundaries. Designs play a key role in coordinating the use of space, and how different functions and land uses can effectively function together in future situations.

A typical design competency is abductive reasoning, as expressed by a participant in the second focus group as 'the ability to sketch an appealing and beckoning perspective', or:

[a design] shows you can imagine a future of which people say: 'I want that'. This is what happened to the cattle grazing farmers in the Dutch peat areas, which said [in response to a vision of the future] 'if this is possible, I want to participate'. (Participant second focus group)

This abductive reasoning came forward in the study as a cognitive capacity with a strong potential for boundary spanning. It was said that designs can connect different stakeholders when they see that one design solves both their issues and produces multiple benefits. It is, however, important to also acknowledge the limitations of design, as was also highlighted in several interviews and in the focus groups. Sometimes functions and land uses do not fit together, and institutional, formal, geographic, or other restrictions limit the options. In such situations, choices have to be made. Design then can play a vital role by informing the (decision-making) process through the development and visualization of multiple possible (and feasible) options.

Visualization itself was also frequently mentioned as a competency of designers helpful in spanning boundaries. Visuals, such as drawings, maps, cross-sections, artist impressions, and infographics, translate information and ideas into a visual 'language' that is understandable for various groups:

They [spatial designers] can pick it up and change that into nice visualizations. I thought that was a very strong part of the process of interacting with the client or the stakeholders. (Consultant, RbD)

Visual language can be used to connect disciplines that do not understand each other through spoken language. A common language can blur boundaries. (Participant second focus group)

In addition, visualizations were reportedly used in the design process to create a new perspective on things, and to bring varying and sometimes conflicting stakeholder perspectives together.

To work together around the table and design a sketch while the discussing issues helps to explore the ideas of the stakeholders and to get some common ground . . . by making these visualizations on what we are talking about or what everybody is talking about and thinking about. (Consultant, RbD)

Communicating via visualizations, though, also has limitations. One of the participants of the second focus group emphasized that not everybody is able to read maps well. This should be understood and acknowledged by spatial designers, particularly in participatory and collaborative (design) processes. Furthermore, one of the interviewees mentioned that the use of certain colours calls for careful consideration in multi-cultural settings, as colours carry different meanings in different cultures.

The interviews and the focus groups revealed a clear image of three fields of expertise employed by spatial designers while boundary spanning: domain expertise on the complex spatial systems of neighbourhoods, cities, regions, and landscapes; organization expertise on institutional structures, procedures, and (local) culture; and process expertise on how to organize design and planning processes.

With regard to domain expertise, spatial designers 'need to know enough about a lot' (Designer, RbD). They need to know when an expert is needed who can provide the specific knowledge and expertise on a particular issue or topic. Furthermore, spatial designers have, and employ, their own expertise:

Choices are made, input is weighed up and compared, and in the next step something is done with it, and that comes from something, from knowledge and skills. . . . it is never just a process, . . . it involves knowledge, . . . this also legitimizes the steps a designer takes in the meantime. [The designer] doesn't just do that, it is based on their own specific input next to the input of other experts. (Participant first focus group)

The organization expertise concerned knowledge on administrative procedures, governance, and institutional structures, and knowledge on (local) culture:

Within such an administration you always have a lot of pillars, I would say . . . silos. One of those administrations only deals with one sector . . . the environment, heritage, mobility, green areas, green maintenance or grey maintenance . . . [The city architect] has succeeded in designing a number of consultative bodies, the way in which they should work together and in what ways they should advise and intervene in projects. He has formed a device that would also outlast [him], a device that should actually guarantee quality. (Program Leader, the Sigma Plan)

All the studied cases had an international dimension, meaning that there were designers involved from other countries, or even other continents. It was considered essential to pair such international knowledge and expertise with local knowledge and expertise in order to bridge differences and have an impact.

You have to be very aware that you are working in another culture, you're working in another institutional setting and you're working in another physical setting. Be very careful with picking up concepts and bring them to another country. (Government official, WaL)

Next to domain and organization expertise, multiple references were made to knowledge on design and planning processes relevant for spanning boundaries, which were clustered under process expertise. They concern a specific category of cognitive knowledge related to the different stages in a design and/or planning process, the interaction and involvement of many different stakeholders, methods for organizing such interaction, and how to facilitate events.

We're an urban planning NGO ... we've worked in, I guess, like 18 cities now ... A lot of the work that we do is actually to try to bridge between different government agencies and the community to the government, between communities. (Designer, WaL)

### *Social competencies*

With regard to social competencies, multiple references were made by the respondents, both in the interviews and focus groups, to communication and listening, conflict management skills, (inter-)organizational awareness and sensitivity, leadership, cross-cultural awareness and understanding, networking skills, and teamwork/collaboration. One 'known' boundary spanning competency was not identified in the study, namely political savvy.

In addition to these more or less known social competencies associated with boundary spanning, storytelling came to the forefront in the study as a specific advanced communication competency that spatial designers employ for conveying their ideas.

It's a different way of telling a story and trying to move forward to a place where we can develop shared consensus and adopt a perception of what is good. (Consultant, RbD)

Furthermore, across the cases and the focus groups, translating was mentioned as a pivotal social competency of spatial designers when spanning boundaries. They actively translate to create a (new) shared 'language that can be understood by people with different backgrounds' (participant focus group 1). In the context of an international project, having various backgrounds in the team, as well as speaking multiple languages, were mentioned as being helpful:

... the other thing that was very helpful was the fact that our NGO also has an urban design planning background, so we had architects, urban architects and urban designers, and planners, and we're bilingual, so I think a lot of the communication just worked well. (Designer, WaL)

Moreover, spatial designers reported to 'translate' information, ideas, interests, and perspectives in order to create designs:

If you want to make sure that the complex project remains rich and it's not simplified, because otherwise all the different interest are not met, you need designers to translate this engineering thinking, which is still functional solutions, into this environment and to visualize that and visualize the opportunity. (Designer, RbD)

### *Emotional competencies*

All emotional competencies mentioned in boundary-spanning literature in the study on boundary spanning by designers (empathy and otherness, self-confidence, self-awareness, conscientiousness, achievement orientation, and initiative/proactive) also came to the forefront in the study. Optimism and resilience emerged as additional emotional competencies relevant for boundary spanning by spatial designers.

'I think the designer needs to come with a level of imagination and optimism' (Designer, RbD) is a quote from one of the interviews referring to the optimistic attitude of designers that helps in tirelessly aim for bridging differences and spanning boundaries.



Spatial designers were, furthermore, described to be tireless, and generally positively oriented in their search for possible solutions and connections.

This optimism can also come with disappointments, as was pointed out in one of the focus group discussions. Spatial designers therefore need a certain level of personal resilience to deal with obstacles, drawbacks, and disappointments. Both optimism and resilience are reflected in the following quote:

[Designers] encounter many disappointments and adjustments during the ride, they always have to process the newly introduced information with enthusiasm and courage in their spatial design. (Participant second focus group)

### *Individual characteristics*

In line with boundary-spanning literature, various interviewees and focus group participants referred to experience, network ties, and motivation as relevant characteristics for boundary-spanning spatial designers. Experience was considered, among other things, important for developing into an expert-designer who can be both flexible as well as pinpoint and guard decisions and agreements. One of the interviewed designers described this role 'as being the oil and the glue', and that this 'is not something that you learn in design school' (Designer, RbD).

Additionally, spatial designers often see themselves as professionals with a societal mission who want to contribute to a 'better' world:

... that we use that free, cultural space that exists, for example in competitions or at the universities ... that we use them as our labs to take a look at those kinds of issues, to show what can be done there. (Participant first focus group)

Strongly related to the ambition and motivation of spatial designers to make a difference, being there was said to be important. One of the designers involved in the design for the Droogdokkenpark (the Sigma Plan) travelled for every meeting with the commissioner from London to Antwerp, and a respondent involved in the Big U project (RbD) said: 'It's just really hard work. I needed to move to the United States to make this work'. Being there also concerned being available for people involved in and affected by the project:

I think if you would really be able to make a dent or an impact, you probably would really need to be there for a year and ... you need to connect with people, you need to build up your own network. People need to see you, need to talk to you to build up trust. (Designer, WaL)

However, in all cases, boundaries were met in relation to funding, time constraints, and other factors, which limited the ability to actually be there. This was also partly due to the international nature of the cases and design teams. Having representatives of local organizations in the design team was considered essential in bridging the gap between local and international boundaries and effectively connecting the various networks as best as possible.

### **Discussion and conclusion**

Not all spatial designers are naturally geared to be(come) boundary spanners, as some are more 'sensitive to and skilled in bridging interests, professions and organizations' (Webb

1991, 23) than others. However, boundary spanning touches upon the core of spatial design expertise since designers are trained to blend different sets of information into coherent sets of ideas (Cross 2023; Lawson 2006), and since a design for a street, square, park, neighbourhood, or other public outdoor space always includes the coordination of wishes and interests of multiple stakeholders, landowners and users (Alexiou 2011; Madanipour 2006).

Nowadays, spatial designers are increasingly called upon to play a major role in complex, interdisciplinary and design-driven collaboration processes (Kempenaar et al. 2016; Von Haaren et al. 2014). As a consequence, they take up more process-based and entrepreneurial roles (Steinitz 2020; Van den Brink, Van den Brink, and Bruns 2022), in which spanning organizational, institutional, and cultural boundaries is a significant element of the design process. Several designers who were interviewed for this study indicated that being able to bridge these kind of differences as a designer implied self-learning and experimenting in practice, and that it is not something that is an explicit part of many educational programmes in the field (see also Kempenaar 2021). The future education of spatial designers could benefit from more attention to boundary spanning skills and competencies in urban design and landscape architecture (post-)graduate curricula, including attention to organizational and institutional expertise, and to training social and emotional competencies (Steinitz 2020).

As 'urban design is inherently political' (Loukaitou-Sideris 2020, 3), a striking finding of this study was the absence of (reference to) political savvy as one of the boundary spanning competencies of spatial designers. It might be that most designers stay away from political savviness in their efforts to establish a neutral position in a web of (vested) interests, or that they depend on others to employ explicit political savviness. Another possibility is that designers avoid using power-related vocabulary and tend to report on events and processes using more neutral and descriptive terms. However, in bridging differences and spanning boundaries, some form of power is always in play, whether this is 'power over', 'power to', or 'power through' (Collien 2021). Future research is needed to pinpoint how, and which power sources are mobilized by spatial designers, as well as others to develop insights into the way in which boundaries are spanned, moulded, or transformed (Carlile 2004) in urban climate adaptation planning.

When we contrast the empirical results of this study with the theoretical overview of boundary spanning attributes presented in Table 1, one could argue that spatial designers bring specific and additional boundary spanning attributes, such as integrating/synthesizing, abductive reasoning and visualization. However, the found additional boundary spanning competencies and individual characteristics are not unique to spatial designers and it would be interesting to study how other boundary-spanning professionals employ integrating/synthesizing, critical thinking, process expertise, abductive reasoning, visualization, story-telling, and translating in their efforts to span and mould boundaries.

Furthermore, in the context of the rather extensive overview of individual attributes encountered in the study, another interesting angle for further research is the notion that many interviewees stressed that overcoming boundaries and bridging differences is a team effort (c.f. Marrone 2010) and is not done by designers alone. Multiple and varied boundaries can only be spanned by actors holding different roles and positions in different organizations. The complexity encountered in urban climate adaptation planning processes calls for a network, or ecology of boundary spanners who closely

work together (Van Lente et al. 2003) consisting of (local) stakeholders, (inter)national, regional and local experts, various governmental representatives, designers, and many others.

An additional observation from the study is that the options and possibilities for spatial designers, and others for that matter, to be(come) boundary spanners highly depend on conditional factors. The role and position of the designer in the overall project, programme or planning process can vary and was reported to limit or enable the extent to which boundary spanning can be taken up, as well as the kind of boundaries that can be addressed. Environmental, institutional, and organizational conditions were also referred to as enabling or limiting boundary-spanning. This taps in on the literature on conditions for boundary spanning (see, e.g., Lehtonen and Martinsuo 2008; Van Meerkerk and Edelenbos 2018) but calls for further research to pinpoint more precisely what hinders or enables boundary spanning in complex spatial planning.

Although the study has provided valuable insights and understanding regarding boundary spanning by spatial designers in complex planning processes and their competencies and individual characteristics, it has also highlighted the need for further investigation of the concept of 'bridging differences by design'. By adopting a boundary-spanning perspective in their research, urban design and landscape architecture scholars could advance this understanding while simultaneously connect to other disciplines that embrace and employ the concept of boundary spanning.

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