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Amsterdam Centraal train station . Photo by R. Rocco.


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Methods Tools & Teaching

Mind-map made by students of Urbanism at TU Delft. Photo by R. Rocco. Printed with permission.

Teaching Theories of Urbanism

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This chapter introduces the theories of urbanism courses offered at the Urbanism Department in the Faculty of Architecture and the Built Environment, TU Delft. Urbanism is a discipline which has a crucial impact on how humans interact with the built environment. Understanding its theories is important and will be increasingly so in the twenty-first century as the world's population becomes ever more urban. This chapter begins with a brief introduction outlining its contents. Section two then asks the question What is urbanism? and answers it by looking at how cities developed before going on to describe the discipline of urbanism itself. Section three highlights three theories of urbanism courses run by the Urbanism Department, showcasing their teaching methods, and showing how they are targeted to students' different levels. The course deliverables, which are essays, are also explained here, including how they are graded and the feedback given. Section 4 deals with the courses' learning objectives, explaining both explicit and implicit ones: the former being about understanding theories of urbanism and demonstrating that understanding; the latter being about professionalism more generally, e.g. how to communicate, meet deadlines, and write academically correct English. Finally, a brief conclusion recapitulates the importance of urban theory in the twenty-first century.

URBANISM, THEORY, HISTORY, TEACHING, LEARNING

1. Introduction

This book is intended as a handbook for the teaching and learning of concepts, theories, tools, and methods related to spatial planning. Its audience is anyone interested in this discipline, one that has a crucial impact on how humans and the built environment interact, which is something that will be examined in Section 2. But first, let me explain the main aim of this chapter, which is to outline our approach to the teaching and learning of theories of urbanism in TU Delft. This will not be an introduction to actual theories – to go into any one theory in detail, let alone a number of them, would require more space than this chapter allows. And to try and make broad generalisations about urban theory in general would probably require a book. Indeed, this is something that has already been done, and by people better qualified than I, and the reader will find a brief list of some recommended reading at the end of this chapter. In keeping with the aim of ***this*** book, however, I will give an outline of how we approach teaching and learning of theories of urbanism.

Most, if not all, the courses in the Faculty of Architecture and the Built Environment (and indeed TU Delft) have theoretical components. This chapter will focus on three courses dealing with theories of urbanism that are routinely offered as part of masters, post-masters, and PhD education in the Department of Urbanism. They are: History and Theory of Urbanism, for first-year masters' students; Theories of Urbanism, for second years beginning their graduation project – this course also forms an integral component of that work (as does the Methods of Urbanism course, which we will see in Section 3.2); and finally, History and Concepts of Urbanisation, which is for post-masters and PhDs but also attracts practitioners from outside the university: professionals who wish to broaden or improve their skills set.

These courses will be explained in detail in Section 3, and their learning objectives, both explicit and implicit, will be explained in Section 4. The chapter ends with a brief conclusion reminding us of the importance of urban theory in a rapidly urbanising world.

2. What is urbanism?

Cities emerged in Mesopotamia, in what is present-day Iraq, almost 10,000 years ago. Cities also appeared independently in the Indus Valley and China, as well as, later on, in Central America and Africa, but Mesopotamia was the front-runner. When they emerged, cities were already in a mature form that we can recognise today. The first cities, located in the rich river floodplains of the Tigris and Euphrates, had what Lewis Mumford calls an ambivalent character, one which they never wholly lost, because, according to Mumford, they combined the maximum protection with the greatest incentives for aggression; they offered the widest possible freedom combined with the most drastic systems of control and regimentation (Mumford, 1989: 4).

Why was this? One explanation is because of the place where these cities first emerged: Mesopotamia (Greek for 'between the rivers'). This area was, until recently, known as the Fertile Crescent. The name changed recently to the Fragile Crescent because we now understand that the rivers which provided such rich agricultural land also had a tendency to sweep everything away in periodic flooding. People realised they had to work together if they were to harness the life-giving power of the rivers, but also tame their more destructive aspects.

This new social organisation saw components of village life carried forward and incorporated into new city life, recomposed in more complex and unstable ways. But, as Mumford points out, it was this complexity and instability that promoted further transformation and development leading to the emergence of specialisation (Mumford, 1989: 29). Kings, aristocrats, and priests, merchants and soldiers created a higher-order urban unity that grew out of this new social complexity. This also allowed for an explosion of human capability because the city could mobilise manpower, it could command long-distance transportation, and it became a hotbed of invention, which in turn promoted agricultural improvement, leading to larger populations, and larger cities.

The city's rise was built on older, pre-existing cultural elements. What gave it its power to effect change was the way in which these were brought together. This was the 'urban revolution' of V. Gordon Childe (1950). A revolution where small but important portions of humanity first became urban.

Civilisation emerged in the city, and created much of what we now treasure in society, including the written record, education, culture, democracy, and justice. All cities have the capacity for civilised life; some have even attained dazzling heights, like Periclean Athens, Tang dynasty Chang'an (Xi'an), or Florence under the Medici. But what separates a city that has attained a high level of civilization from one that has not? I think it is the capacity for allowing its citizens to flourish.

As cities grow in size and complexity, so too should their capacity to provide civilised life, with peace, justice, and a meaningful contribution to government for all. And this is something that is going to be even more important in the twenty-first century, since already more than 50 percent of us live in urban environments, and that figure is expected to grow to 85 percent by the end of the century. We are, in fact, experiencing what could be called a second 'urban revolution'. And understanding what that means for us as a species, and for the planet we inhabit, will be one of the key concerns for urbanism in the twenty-first century.

But what is urbanism, exactly? The term seems to be used as a catch-all for any discipline related to urban life (including, but not limited to, architecture, geography, the social sciences, and others). Even though cities have been around for almost 10,000 years, urbanism itself is a relatively new discipline. And this is despite the fact that people have been planning cities since the very beginning: the ancient Greeks and Romans laid out their cities according to strict grids, as did the Chinese, with the Rituals of Zhou. Americans even revived this system in the nineteenth century. In the Renaissance, Sixtus V reorganised parts of Rome, cutting great axes through the city's ancient fabric, anticipating Haussmann's Parisian boulevards by three centuries. Georgian-era Dublin saw the foundation of the Wide Streets Commission (1758-1849), widely seen as the world's first urban planning body. Yet these plans and interventions were either too rigid, in the militaristic grid, or too *ad hoc*, in the Baroque and Georgian interventions.

Just as there is a difference between vernacular architecture and the products of professional architects, so too is there a difference been *ad hoc* city development, no matter how rigorous, and the emergence of urbanism as a profession.

Urbanism, as a profession, first appeared in the early twentieth century. Initially, it was associated with the rise of centralised manufacturing, mixed-use neighbourhoods, and social networks in what came to be seen as a convergence between political, social, and economic citizenship. Architects, urban planners, and sociologists investigated ways in which people lived in densely populated urban areas. Urbanism itself, however, came to mean the study of characteristic ways in which the inhabitants of urban areas interact with their built environment, and is concerned more with place-making and identity creation than with simple zoning or planning.

Space is not empty; it is never simply something left over between buildings. Space is active, and its activity comes into being through people's uses. It is people who turn space into place, and this is done over time, which is almost like a fourth dimension bringing it into being, uniting its users on a daily, seasonal, or longer-term basis. The urbanist and, to a lesser extent, the architect focus on the larger-scale built environment. It is the point of departure for their work as designers, planners, and builders. But to do so without taking into account the people who use the places they design and plan for is to miss the point. The most important thing anyone can understand about a city, no matter what their disciplinary background might be, is that a city is its people. Our job as urbanists is to facilitate people's networks of interaction and allow them to flourish as individuals.

3. Teaching theories of urbanism

This book is about what we do in the Spatial Planning and Strategy section, but we have a much wider reach than merely what goes on in our section. For example, the theories of urbanism courses (to give them a simple collective descriptive term – we will come to their actual names in a moment) have a much wider scope than any narrow sectional interest.

These courses go to the heart of what we teach in Urbanism: helping students understand theories related to the disciple (and related disciples), but also introducing students to ways of approaching and using theory intelligently.

The three theory course are attended by all masters of urbanism students, as well as post-masters and some PhDs. The masters' students, in fact, attend two of the courses, one in first year and another in second year. I happen to be uniquely placed to write about these courses as I have the privilege of being coordinator (or co-coordinator) of all three of them.

Each course has a different format, designed to engage students at different levels of experience or ability. The first years have a course called History and Theory of Urbanism; followed in second year (the graduation year) by Theories of Urbanism. We also run History and Concepts of Urbanisation. This was originally one of the three support courses for the studio run by the European Post-master in Urbanism (EMU), a long-standing collaboration between TU Delft, KU Leuven, UPC Barcelona, and Università IUAV di Venezia. This course is also open to PhD candidates and to professionals seeking to broaden their skills set.

3.1. History and Theory of Urbanism

History and Theory of Urbanism (AR1U121) is run once a year beginning in September. The course's main coordinator was Birgit Hausleitner (now Taneha Bacchin). The course itself lasts for approximately two months and consists of lectures, formal debates, and informal discussions culminating in a 3,000-word essay. The lectures introduce students to urban history and theory, with topics like Paradigms, Reading the City, Urban Landscape, Form of the City, Open City, and Town Planning in the Netherlands. Each of these topics has a list of required (and also recommended) reading, which include such diverse authorities as Neil Brenner, Matthew Carmona, James Corner, Margaret Crawford, Michel Foucault, Bill Hillier, N.J. Habraken, Batty Marshall, Ian McHarg, and David Grahame Shane. Students are expected to demonstrate the ability to gather and present research, situate it in various discourses, and communicate their ideas clearly. They are also expected to show that they have reflected on what they have done. The coordinators and teachers involved in this course grade the essays and give the students feedback. The students also receive feedback on draft versions of their essays during the course. This is true for all the courses, and there will be more details on that feedback in the next sub-section.

3.2 Theories of Urbanism

The Theories of Urbanism course (AR3U023) is for second years, these are students who are doing their graduation project. The course used to be run every semester, beginning in September and February. Due to a recent reorganisation, it is not being run at the moment but will (hopefully) be reconfigured to run again in the not-too-distant future. The September intake was always considerably larger than that of February, with up to four times the number of students, making the spring course more of a seminar series.

Like the first-year course, it also lasted for about two months. The first half of the course consists of lectures introducing the various studios to the students to help them make better-informed decisions about which one to join to do their graduation project. There is also a general introduction to different theories of urbanism. The aim is not to go into any one theory in detail, but to make students aware of the wide range of topics available to study so that they can use the best and most appropriate ones in their own graduation projects.

The students are also encouraged to use their projects as a way of critiquing the theories they have used. This circular approach, enabled by the iterative method of learning encouraged during the masters, means that theory is seen as a support and framework informing empirical research, with the empirical research in turn interrogating that theory, leading to a synthesis that enriches both.

In the second half of the course, students are divided into groups according to themes they wish to explore (e.g. sustainability, citizen participation, transit-oriented development, etc.). Here, under my guidance, they pick research readings and are helpful to one another in analysing them. These discussions in small, focussed groups greatly enhance the students' understanding of the theories they are examining. It also improves their ability to interrogate or critique them as they have to present their findings to their classmates.

The students are also required to produce an essay (3,000 to 5,000 words). They pick their own topic and the readings and theories that support it, but these must have relevance for their graduation project because the essay becomes the theory chapter in their Graduation Report.

Essays are reviewed and graded by a team of teachers, each of whom grades three to four essays. The teachers who act as mentors do not grade their own students' work. Reviewers use a rubric and follow guidelines to ensure consistency of grading. Students have access to the grading rubric before they submit their essay so they know exactly what the reviewers are looking for (as is the case for all the theory courses).

The course used to be run in parallel with the Methods of Urbanism course (AR3U013), and was complimentary to it (this has also disappeared in the recent reorganisation). Methods helped students decide ***how*** they were going to do their research, while the Theory course helped them answer ***why*** a given theory is important.

The essay is not the end of the course, because towards the end of the graduation project students are expected to reflect on the processes they have gone through to produce their proposals. This reflection is important, not only for a critical appraisal of the processes they went through, but also as a useful way of revisiting the theories they used. Here they can take the opportunity to critique their own theoretical work, since they should have a deeper understanding of the issues involved thanks to their empirical research and analysis. Often, the students rewrite their theory chapter at this stage to incorporate their new insights.

3.3 History and Concepts of Urbanisation

The third and final course is History and Concepts of Urbanisation (ABE004). Originally set up as a support course for the European Post-master in Urbanism (EMU), it had also attracted increasing numbers of PhD students, which raised its level. It also occasionally attracted practitioners from outside the university. Sadly, TU Delft is no longer part of the EMU network, so this course has stopped.

The course was run once a year in the autumn and was coordinated by myself with Wil Zonneveld. In its last year, Wil was replaced by Rodrigo Cardoso. Its structure is modelled on the seminars I attended while doing my own PhD in Architecture Theory in TU Delft. The course ran for eight weeks, with anything from eight to sixteen students (although there were on occasion as many as twenty-four – but I find twelve to sixteen an ideal number for this sort of seminar).

The first session was an introduction, where I made a presentation on how to write English to academic standards (which I will return to in a moment). There then followed six sessions where students made short presentations based on set readings. There were two readings per week (and this changes year on year). The readings followed a trajectory that covered the emergence of the city, and how they formed networks, to the emergence of the world economy and the role cities play in it. The readings also examined city regions and other related topics, such as theories of mapping. Students were split into two groups, each presenting one of the texts to the other. There then followed a discussion on the text before moving onto the second group. There were six of these sessions, with a break in the middle for students to present essay ideas.

The essays were graded by the course coordinators, giving detailed written feedback with not only a breakdown of the grade (e.g. use of sources, originality of ideas, development of these, etc.), but also feedback on how the essay was written (i.e. hints on what could have done better, and how – this has no bearing on the grade, it was just an extra we provided).

4. Learning objectives: explicit and implicit

The aim of all three courses was and is the same: to help students arrive at their own understanding of key concepts relating to spatial planning and urbanism. This is something that has already been highlighted in the companion to this volume: Celebrating Spatial Planning at TU Delft 2008-2019 (2019).

The courses were and are tailored to students' different academic levels, and enable them to define (and redefine) theoretical concepts. This helps them take a critical stance towards what they are learning and it also enables them to better establish parameters for their research.

The learning objectives are both explicit and implicit, and these are clearly communicated to the students throughout the courses. The explicit learning objectives are that students should demonstrate knowledge of various theories and communicate them effectively. The implicit objectives are for them to show that they can work to deadlines, organise themselves, and write well. In other words, act professionally.

Each of the courses has a section focussing on improving students' written English. The vast majority of the students are not native English speakers. Being able to write good English, with clarity and concision, is a vital skill – brilliant ideas are useless unless they can be communicated clearly. Each course began with a Writing Academic English presentation. These are tailored to the different levels of the students, and with my own background as a native speaker, as well my editing experience, this helped give a valuable extra dimension to these courses.

To sum up: the aim of all these courses is twofold: 1) in the short term, to help students use theory to make informed decisions about their research, and to show that they can evaluate it; and 2), in the longer term, to prepare them for professional life, where habits of punctuality, the ability to meet deadlines, and write good, clear English, will stand them in good stead.

5. Conclusion: the relevance of urban theory today

As we saw in the introduction to this chapter, the world's population is now more than 50 percent urban and that figure is set to rise to 85 percent by the end of the century. With so many people inhabiting urban environments, it is increasingly important for us to understand them. And that is one of the main tasks of the urbanist.

Making sense of things includes looking at what has gone before. The attentive reader will have noticed that two of the three courses have 'history' in their title. This is because we need to look at what has gone before, the better to understand the present, and, by that understanding, plan for the future.

Theories help us make sense of the world; they help us to reflect, and, through that reflection, make better plans for the future. But, as we have seen in the theory courses, it is not just about what is happened, important and interesting as that is, it is ***why*** something is happened this is important. Once we understand the why then we will have the key to understanding what we can do about it.

Looking at history, looking at theory, are both important, but what is most important is seeing ***how*** we look at them. Theory not a thing in itself, its real value comes from enabling us to approach learning, and that is the main aim of all of these courses. It is not knowledge itself, although that is of course valuable, it is the understanding of ways of apprehending knowledge that we wish to impart to our students. In order for them to get their degrees, students have to demonstrate the ability to do certain things. No theory is more important than any other in this regard, it is the process the students use in deciding whether they are important or not, and what to do with this knowledge, that is key. Once we see them demonstrate these knowledge and skills, both theoretical and empirical, in planning or design, or both, then we know that the student is ready to go out into the world.

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Delft Winter Scene. Photo by Marcin Dabrowski.


Delft

Visual Storytelling

Assessing the power of maps in planning

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There is an abundant use of visualisation in spatial planning. This chapter is particularly concerned about planning on the regional level and beyond. On these higher levels of scales maps form the dominant visualisation mode. To fully comprehend and evaluate the content of these maps this chapter first discusses a set of theoretical concepts and considerations under the heading of maps as constructs. This is followed by the main part of the chapter: a discussion about the techniques which map makers seek to use. The main objective of this particular section is to provide a number of tools to interpret and assess the stories told by maps and to look beyond the visual style and seductive image of maps. We round off with the conclusion: the unity of text and maps in (supra)regional planning.

MAPS, VISUAL STORYTELLING, PLANNING, DESIGN, SEMIOTICS

1. Introduction

One can define spatial planning in many different ways. In this particular chapter the emphasis is on planning as spatial design. We then enter the domain of spatial images (see also Zonneveld, 2021a). The range of such images or 'visuals' which are used in spatial design is bewildering: photographs, drawings, diagrams, and schemes to name just a few (for examples see for instance Thierstein and Förster, 2008). Certainly, the most widespread imagery is that of the map. Briefly a map can be defined a schematic, reduced depiction or representation of a territory where there is at least some sort of connection between the territory in question and what has been selected and imaged on the map. At first sight this short description looks rather neutral. However, what is depicted on maps is most certainly not. We know from literature, especially the literature known as 'critical cartography' that the so called 'correspondence theory of mapping practice' is profoundly flawed: there is no direct relationship between a map and the territory it supposedly represents (Crampton, 2001). In fact, maps are socially constructed (Harley, 1989). With spatial planning in mind, we can even say that maps are politically constructed.

What this chapter seeks to do is twofold. First, to arrive at an understanding of the role of maps in planning. Second, to provide handles and levers to interpret and critically discuss the content of spatial planning maps. These two objectives basically structure this chapter. In the next section we discuss a number of theoretical concepts and considerations under the heading of maps as constructs. This is followed by the main part of this chapter: a discussion about the techniques which map makers seek to use and methods to identify and assess the stories told by maps and to look beyond the visual style and seductive image of maps. We round off with a short conclusion.

2. Maps as constructs

2.1. Framing and storytelling

In Dutch academic discourse the use of maps in spatial planning has been approached in its own unique way. There is distrust that comes very close to the title of Mark Monmonier's well known book 'How to Lie with Maps' which got its first edition in 1991. In fact, the book is an evergreen; the third edition dates from 2018. Other scholars take a more neutral stance. They look at how maps can lead to controversies but how they can also be used to reach consensus (Carton & Enserink, 2006; Carton, 2007). Abroad, Throgmorton became widely known as he interpreted planning as persuasive storytelling about the future where persuasion is based on power and the use of verbal as well as visual languages in discourse (Throgmorton, 1992; 1996; 2003).

Let us first look at what might be called the 'Dutch school of distrust'. In a paper in the Journal of the American Planning Association, Van Eeten and Roe (2000; see also Zonneveld, 2005) attack the Dutch Green Heart policy in an unprecedented way. For the readers who are not familiar with the Dutch concept of the Green Heart: preserving the openness of this large rural landscape amidst a wide circle of fast-growing cities known as the Randstad was a cornerstone of Dutch national spatial planning for decades (Zonneveld, 2021b). It only came to an end when the policy was handed over to local government about two decades ago (see Zonneveld & Evers, 2014).

The main argument of Van Eeten and Roe is that the spatial planning concept of the Green Heart is a fiction but nevertheless has become immune to criticism. They argue that alternatives to the Green Heart policy have not given a fair chance. In trying to explain this hegemonic position of the Green Heart they point to the communicative power such a metaphor can have and conclude that planning must renounce that which has proven to be the most powerful weapon in planning discourse, namely mapping. Certainly not ill disposed towards using metaphors for their own rhetorical purposes, they reject any planning strategy which uses maps as nothing less than an 'iconographic gaze' (Van Eeten & Roe, 2000: 64). Following Denis Wood's well-known book, The Power of Maps (1992), Van Eeten and Roe conclude that maps are by nature fictional if for no other reason than that they exclude certain details of what is present 'on the ground', which of course is a truism. Indeed, maps are useful and powerful precisely because they always have to leave out detail, even the most detailed ordnance survey maps (in literature, see Lewis Carroll, Jorge Luis Borges, Adolfo Bioy Casares, and Umberto Eco for interesting discussions on drawing maps at a scale of 1 to 1; see also 'exactitude in science' on the Internet). As alternatives to the seemingly hegemonic Green Heart policy have all used mapping strategies, 'there is no mapping our way out of the deadlock [...] One way out of the controversy is to adopt planning approaches that depend much less directly on maps and cartographic imaging' (Van Eeten & Roe, 2000: 65). To summarise their conclusion: let us plan, but please try to do this without maps.

Does the proposal of Van Eeten and Roe make sense? Not really, I would say. Simplification, stereotyping, and hegemonic discourse could also be reached through mere verbal language. Being critical towards the societal groups or governmental agencies using maps and metaphors makes far more sense. On top of that, is the making of spatial plans possible without making maps? In a response to Van Eeten and Roo, Christopher Alexander, well acquainted with Dutch planning, and familiar with the Dutch planners' predilection for spatial imagery, strongly rejects this idea, but not because he wants to protect the Dutch style of spatial planning or the protagonists of the Randstad/Green Heart 'doctrine'. Alexander asserts that 'some form of graphic representation [...] is essential for communicating any ideas that have a spatial dimension, as planning concepts and doctrines must have; and [...] the fact that all metaphors are essentially fictions in their relation to reality in no way diminishes their usefulness in conceptualising and communicating planning ideas.' (2001: 98). Similarly, Faludi argues that what sets planning apart from other policy fields is its focus on spatial dispositions and activity patterns, and that space is best depicted visually, saying that the 'most common way in which this is articulated is by means of a plan in the classic sense: a map' (Faludi, 1996: 96). He relates imaging, or figuring, to framing. Hence the title of his journal paper: 'Framing with Figures'. Problems are never objectively given, but socially constructed 'through frames in which facts, values, theories and interests are integrated' (Rein & Schön, 1986: 4).

Power, hegemonic discourse and a variety of different sorts of languages come together in what the

American scholar James Throgmorton calls planning as persuasive storytelling about the future (Throgmorton, 1992; 1996; 2003). This interpretation of what planning in essence is and how it works drew a lot of attention at both sides of the Atlantic. Many recognised that persuasion is highly important to get any planning message across. Some criticised Throgmorton because his nutshell like description of planning seemingly underestimated power. In fact, he was highly interested in the rhetorical and often manipulative sorts of storytelling: power comes first and stories second (Throgmorton, 2003). One of the interesting dimensions of Throgmorton's analytical approach is what may be called the unity of text and images. Texts which may include imaginative but often also manipulative metaphors and tropes combined with visuals together constitute a storyline.

2.2. Agency

The combination of mapping, other sorts of spatial representation (like photographs, satellite images, and schemes and diagrams) and verbal expressions have acquired certain names in the relevant literature. Examples include 'imagery' (Van Duinen, 2004; 2021), 'imaginaries' (Davoudi, 2018) or 'spatial concept' (Zonneveld, 2007; Balz, 2019). The visual language of the map and the verbal language surrounding it come together in its legend. A legend explains in a concise way the signs which have been used to create the map. There is another word used interchangeably with legend (which is in fact a metaphor!) and which is rather meaningful in understanding the map: the key. As a thing a key unlocks a door, and the map key unlocks the map. This does not necessarily mean that all maps in planning or regional design have a key. There is an abundance of maps which are not 'unlocked' via a legend but through a supporting explanation in a text or storyline. According to Van Dijk (2011) this combination can be very powerful, much to the chagrin of some of the observers we have met above.

Mapping as part of a design strategy is not necessarily to depict possible or desired futures. Design through mapping can also have understanding as its prime goal; to grasp, for instance, the structure of a region or how a particular place is positioned in its wider setting and what determines this position. Whatever sort of mapping is applied, according to Corner 'the function of mapping is less to mirror reality than to engender the re-shaping of the worlds in which people live' (Corner, 2011). In fact, 'mapping is the most formative and creative act of any design process, firstly disclosing and then staging the conditions for the emergence of new realities' (Corner, 2011; see also Zonneveld, 2021a). Corner calls this the agency of mapping. However, in which direction map agency works is not easy to foresee: 'designers' of visualisations and maps, 'like designers of anything, cannot anticipate all the ways people will understand and use their design' (Tversky 2019: 193). One example is given by Van Duinen (2004) when she wrote an interesting analysis of the (former) Dutch National Spatial Planning Agency's blundering when it sought to introduce a novel perception of the spatial structure of the Randstad in which there was no longer a place for the city of Utrecht. The agency completely underestimated the intrinsic power of an existing spatial concept and its adherents, both in the national parliament and among a regional advocacy coalition (i.e. Utrecht). This example shows that being on a map (Jensen & Richardson, 2003) can be as contentious as being omitted from one.

2.3. Constructed realities

Before we turn our attention to a variety of interpretative tools to analyse the content and meaning of planning maps, we have to say a few words about the question: is there any objectivity in cartography? Is there a clear dividing line between planning maps, overwhelmingly the result of political decision-making combined with designerly knowing (Cross, 2001), and the cartography to be found in, for instance, atlases?

It seems that cartography must deal with more persistent demands for objectivity than other areas (Zonneveld, 2005). The introduction of new seemingly clean technologies like the Global Positioning System, remote sensing, or Geographical Information Systems may lead to a belief that such technology could lead to a sort of new objectivity in cartography, or at least intersubjectivity; a sharing of subjective experience. There is a parallel here with photography and its introduction in the ninteenth century, namely that photographs could show reality as it is. We now know that photography is not ‘innocent’ (Verweij & Boie, 2000). A photographer constantly makes decisions on focus, distance, and framing, not to mention the possibilities for manipulation in the darkroom, or on the computer. Likewise, Robbins (2001) shows us how emergent technologies, like remote sensing and geographic information systems, are not the impartial tools we may expect them to be. Satellite images always have to be interpreted and, in the process, one must make decisions about, for example, in Robbins's case, what exactly constitutes a forest in India which then becomes an element on a map legend. Frames like this are inextricably linked to the institutions in which the interpreters operate, their practices, and their interests. In the case of forest policies in India, Robbins explains how state authorities used their power to produce outcomes that were detrimental to local farmers. Robbins calls this the hegemonic position of state-fixed categories (Robbins, 2001: 163) and speaks of the ‘politics of categorisation’ (Robbins, 2001: 172). By fixing certain interpretations of the environment, certain forms of management are forced, reengineered to suit technical means (Robbins, 2001: 175). This is perversely reminiscent of the computer term ‘what you see is what you get’. As a counter strategy Robbins advocates the creation of competing maps to break through the hegemonic practices of state institutions (Robbins, 2001: 162). In planning, this may translate as multiple visioning: creating a diversity of possible futures supported by different sorts of cartographies.

According to Crampton (2001), one of the leading figures in an area called critical cartography (see various essays in Dodge et al., 2011) it is only fairly recently that cartography seems to have broken with the ‘correspondence theory of mapping practice’, based on the assumption of a direct relationship between a map and the territory it represents. Maps, as Wood (1992) points out, construct and do not reproduce the world. According to Crampton, quoting the cartography theorist Harley: ‘Cartography has never been an autonomous and hermetic mode of knowledge, nor is it ever above the politics of knowledge. My key metaphor is that we should begin to deconstruct the map by challenging its assumed autonomy as a mode of representation’ (Harley quoted in Crampton, 2001: 24). On this basis, Crampton infers that maps are social constructs. A map is not objectively ‘above’ or ‘beyond’ that which is presented; one cannot use the representation to trace back to some ultimate object, knowledge, or thought. Maps should be accepted as rhetorical devices which dismantle the arbitrary dualism of propaganda versus true maps, or scientific versus artistic maps. Or, we would also like to add, planning maps.

3. Reading maps

There are all sorts of possibilities for reading and interpreting maps. Various levels of abstraction are possible. The guidelines below are arranged in a particular order. We start with guidelines addressing major, contextual issues. Gazing at maps and trying to understand their logic and connections with textual elements is not enough. What is needed, first, is to arrive at an understanding of the nature of the carrier of maps, the strategic plans, as well as their makers. Only after that can map analysts apply guidelines to identify the linguistic structure of a particular strategic plan, and how to make sense of the particular graphics to be found on concrete maps. Four elements form the structure of this section.

3.1. Understanding the nature of a strategic plan and explicit or hidden objectives

Strategic plans may have all sorts of formats on different sorts of scales and can be written and compiled by a wide range of actors which may have

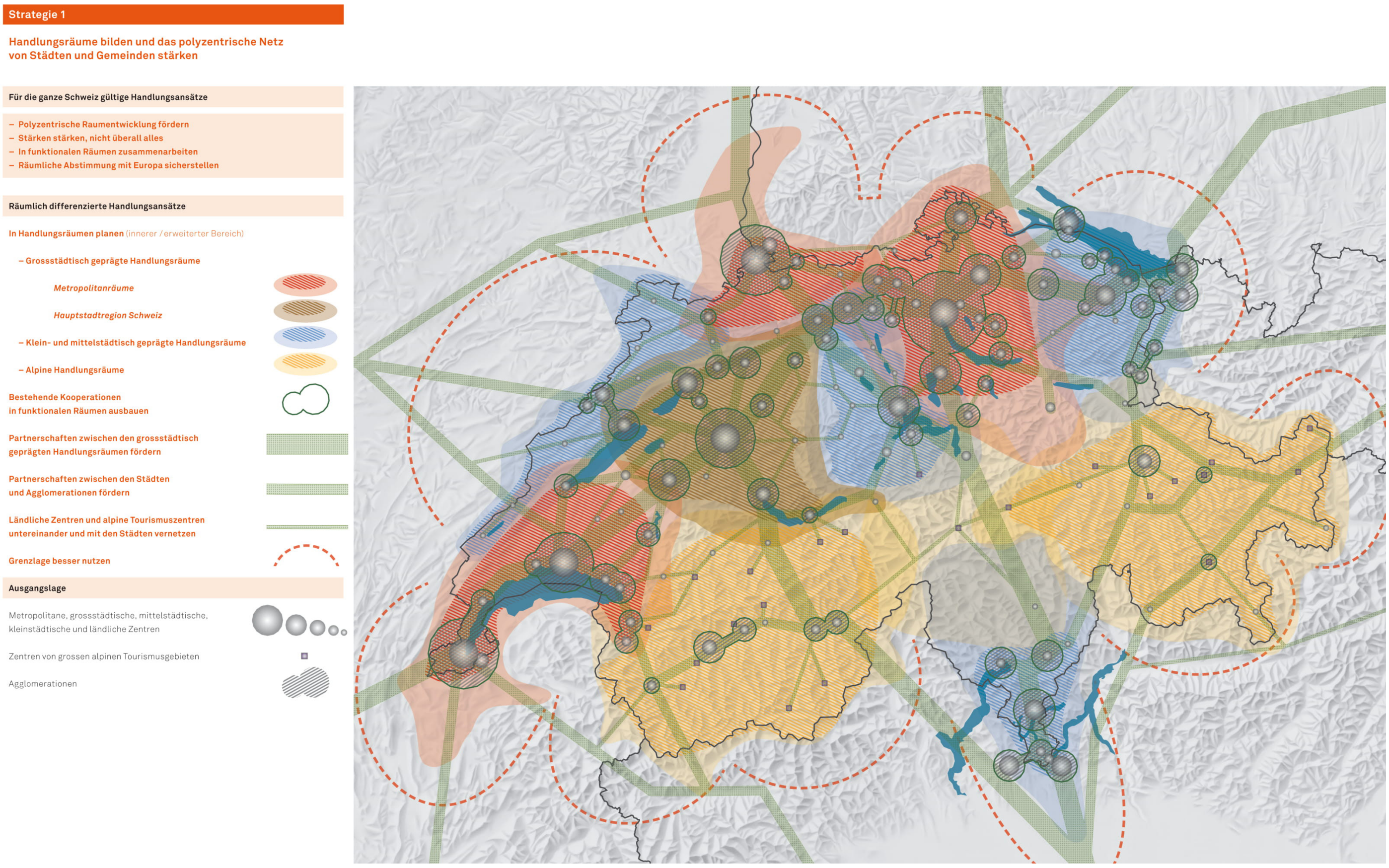

Figure 1: "The Swiss Territorial Project presents a common strategy in favour of sustainable territorial development, in which partnership reflection and action in terms of intervention areas take on a priority role". The Swiss Territorial Project, Development and Planning, Swiss Confederation. Consiglio federale svizzero, CdC, DCPA, UCS, ACS (2012): Progetto territoriale Svizzera. Versione rielaborata, Berna. Available at: https://www.are.admin.ch/are/it/home/sviluppo-e-pianificazione-del-territorio/strategia-e-pianificazione/progetto-territoriale-svizzera.html. Printed with permission

particular repercussions on the sort of visuals and maps. Several distinctions can be made and it is up to the researcher to determine the sort of correlation between the nature of a planning document, i.e. its particular form and anticipated effects, and how space is mapped.

First, the nature of the match between a strategic plan and a particular sort of administrative level needs to be determined. If there is a match, the question needs to be asked whether the strategic plan is formal or informal. Formal means: based on a concrete (planning) law, regulation, or directive. In most cases this means that the plan is focussing on the territory of a specific administrative authority with planning competences. Imagery may zoom out beyond the borders of this territory to determine the nature of all sorts of connections ranging from infrastructure to functional relationships between, for instance, cities. Imagery may also zoom in on certain sub-areas. Why is that?

An informal sort of plan often means that the plan in question is based on a sort of political agreement between actors; for instance, between representatives of various administrative levels as strategic plans are often created in a sort of multilevel governance context (Zonneveld & Stead, forthcoming). Often, such a plan maps indicative interpretations of spatial structures which may serve as a kind of framework for decision-making by planning authorities on each individual level. In Europe, such multilevel strategic plans are common in countries with a federal structure: Germany, Switzerland, and Austria.

There may also be national plans which are not prepared in a multilevel setting but serve as a framework for how national governments (this may be a particular national agency or a specific ministry) perceive the national territory. In a follow-up process, spatial perceptions may be used in operational decision-making. One can think of policy programmes for specific areas or regions or particular sorts of investments in particular places (often in the field of infrastructure) or yet changes in certain legal frameworks. An informal strategic plan may also be prepared and published by a particular administrative agency to start a political debate or to test certain proposals as a sort of kick-off of a process which is expected to lead to a formal strategic plan. In such a plan, maps often present novel interpretations of spatial structures. The general idea of this particular sort of informal plan is to test whether consensus within and outside administration can be reached which can then function as a sort of foundation to prepare formal strategic plans and/or policy frameworks. This sort of approach is known in many countries. Terms used here are, for instance, reconnaissance, outline, Leitbild, spatial vision, or scenario (see also Dühr, 2007: 55-70).

Informal plans may be prepared by a wide variety of actors, for example, (statutory) advisory bodies, academic institutes, NGOs, or even individuals. Often agenda-setting is the prime motive. Classic examples dating from late 19th and early 20th centuries include, for instance, the famous 1909 plan of Chicago prepared by Daniel R. Burnham and Edward H. Bennett under the direction of the Commercial Club of Chicago (Krueckeberg, 1983). At this time, plans formed a sort of elaborate plea towards government to become active in the field of urban, regional, or national planning. The level of scale determines to a high degree the sort of imagery and maps. The 1909 plan for Chicago includes a bird's eye view of the (future) city plus a wide range of other imageries, including photographs, while the America 2050 report of the Regional Plan Association contains somewhat abstract maps of the entire country and a call for a federal approach towards spatial development. So, again, agenda-setting is the prime motive.

3.2. Identifying the 'authors' of a strategic plan

Next, and highly connected to the sort of strategic plans briefly discussed above, is the identification of what may be called authorship. This is relatively easy in the case of a formal plan as it explicitly refers to an administrative level. But even then, certain difficulties may arise. For instance, a specific sort of national plan may be prepared by a ministry with its logo on the cover, but this may not say a lot about the planning competences or political weight of that particular planning ministry, and similar questions may arise at sub-national levels.

To determine authorship is often far more difficult when the map interpreter has to deal with informal plans, in particular those which have been prepared in a multi-level setting. For instance, a plan or planning document may be obtained from just one of the participants, or from a specific publisher, printer, or website. It then becomes quite critical to have a careful look at the first few pages or, alternatively, at the rear pages to determine who made the plan.

Mistakes are easily made. An example from the recent past is illustrative: the 1999 European Spatial Development Perspective (ESDP) was published by the Office for Official Publications of the European Communities in Luxembourg. This office normally prints material from the European Commission. Academic literature referring to this document invariably refers to the European Commission as the author but this is not correct. In fact, the Commission did not make the ESDP it just participated in its making. One has to read the document to find out that it has been prepared by a committee and agreed upon by national ministers responsible for spatial planning and that neither the European Union nor the Commission have any sort of competence in spatial planning (the full story of the making of the ESDP can be found in Faludi & Waterhout, 2002). This absence of such a competence explains why the ESDP does not contain any sort of policy or analytical maps presenting spatial structures on the European level. What it does contain are rather abstract icons illustrating aims and options (note the language) which may inspire national and sub-national decision makers on spatial planning issues. The present Territorial Agenda 2030 is just text, so this is certainly no framing with figures. It is up to the analyst to find out why a spatial planning document does not contain any sort of map. The answer may be impossible to deduct from the document itself. Secondary literature may help, including professional journals or newspapers. If these do not give any sort of clue then an answer really is needed and finding spokespeople to interview seems an obvious route.

So, questions about authorship of planning documents may lead to all sort of follow-up questions on the content of these documents and the use of visuals and maps. Yet another illustrative example is the so-called Finger Plan for Copenhagen, which is widely known internationally because it has been consistently applied in spatial and infrastructural decision-making over a number of decades. The most recent 2015 planning document bears the title: The Finger Plan: A strategy for the development of the Greater Copenhagen Area. The responsible government actor is the Danish Nature Agency which, on the surface, seems rather surprising. The obvious question is: Why? Does a nature agency have a say in urban development? and, if so, to what extent in relation to other governmental agencies and departments and towards municipalities in the capital region? The analyst has to find out. For the curious reader, the document contains a highly stylised image of the capital region (indeed, this map looks does show a sort of hand). The resolution of the map is very low, however. If one were to increase the map resolution would the finger shape of the urban structure of the capital region be as distinct as the maps pretends to suggest?

3.3. Unravelling the structure of storylines: text and maps

Above we briefly discussed the linguistic structure of (in our case) a planning document. A general method to analyse this structure has been introduced by John Pickles (1992) and adapted by Stefanie Dühr (Dühr, 2007: 82-84). Before we discuss principles and suggestions, it is important to emphasise a critical difference between a verbal and a visual image. Although there are people who have the intellectual capacity to understand what is in a text through scanning techniques, most people will read a text word by word, sentence by sentence, and paragraph by paragraph. Most visuals, however, can be read at a glance. A map, for instance, is one single whole, although one needs movement of the eyes to fully comprehend what is on it.

A first step in the analysis of the linguistic structure of a particular planning document is the assessment of the relative weight given to text and maps. Dühr rightfully assumes that the more use is made of visual language in general and maps in particular the better what she calls planning actors are able to read and communicate through maps. But who are planning actors? In a narrow sense we are talking about those who prepare drafts of a planning document and, in a wider sense, those who finally decide what can be found in a document (a minister, an alderman, member of parliament, or councillor). Skills in reading maps may differ substantially.

In many cases it is highly interesting to find out what sort of maps appear in the very first drafts of a planning document, and what ends up being allowed to stay in the final version. So, comparing various versions can guide the researcher in follow-up investigations: why have some maps disappeared? or, the opposite, why have some been inserted? Are there key differences between various versions of the same map? And, if so, why?

Healey, in discussing the imaginative power of strategic spatial planning (Healey, 2006), assumes that the number and cartographic qualities of a map give an indication of how spatially conscious a planning tradition is (Dühr, 2007). On the one hand, this is about the capacity to unravel spatial structures and make sense of those structures (which of course can be highly normative). On the other hand, certain competences are needed to broadly assess potential spatial impacts of policy aims and options as well concrete policy decisions.

The above may give quite a bit of room to all sorts of speculations by the map interpreter. Some concrete aspects may contribute to a more rigid interpretation (these are partially based on Dühr's suggestions: Dühr, 2007: 83):

- The number of pages with text compared with the number of maps

• The difference between analytical and policy maps. One has to realise that although the dividing line between these two categories is rather thin and porous, one may also assume that the insertion of any sort of analytical map has a purpose which the map reader needs to detect through connecting the map with the text (and follow-up research techniques). Also, if one category outnumbers the other there is something else to find out

• The relationship between the themes and, if present, the policy options discussed in the plan text and those that are pictured on policy maps. According to Dühr, this may give insight into the spatiality of such options and, again, into the sensitivity of plan makers in this field

• Finally, the plan analyst has to find out what are the dominant policy themes in texts and maps. Is there some sort of selectivity or bias? If plan makers speak (write and draw) in terms of comprehensiveness (remember, this claim is often made) what is included or excluded?

The above is about relationships between text and images. One can also try to unravel the linguistic structure of a map. Dühr mentions two critical aspects (Dühr, 2007: 82-84):

• Visual hierarchy. What are the most dominant visual elements in the cartographic representations of spatial policy? Obviously, the door to speculation is wide open here. Some sort of intersubjectivity can be found in a proper analysis of the map legend. What elements are to be found here? Is it possibly to identify themes behind a legend? What is actually pictured on the map? Does a map show some sort of interpretation of the present or desired spatial structure of territory? or does it only show the location of projects? If the latter sort of map is the most important or even the sole map in a strategic plan, then this may lead to the conclusion that some sort of refined reasoning about spatial structure was probably absent in the making process. Triangulation through interviews or the analysis of internal documents may be needed

• Visual representation of the planning context. This is (or should be) an important element in any sort of strategic plan because this is about the conceptualisation of the position of a particular place or territory in its wider spatial setting. If this sort of thinking cannot be found in a plan, in most cases everything outside the planned territory is simply kept white or left blurred, therefore it is relatively easy to detect. A next level for this analysis may be reached through an identification of key relationships, and how they are visualised. Here we enter the field of semiotics (see more on this below). The use of arrows is widely applied in regional and national planning documents. Some sort of exaggeration of the strength of such relationships can often be found (big and bold arrows which – depending on the scale of the map – may be tens of kilometres wide) to substantiate claims for the funding of new infrastructure (see various examples in Davoudi & Strange, 2009)

3.4. Probing the semiotics of maps

Maps created in planning processes usually do not follow clear standards, like (for instance) atlas makers do. For this reason, the possible choices map makers can take are bewildering. Let us discuss a few possibilities (using words) (Zonneveld, 2021a).

A key choice is the frame of the map: where does a map begin or end? What kind of cropping is used? An example of how this might work is a map in the 2001 Dutch fifth spatial planning report which shows

Europe with a range of squares and rectangles on top of each other; each shape, each cropping stands for a different set of planning issues (Ministerie van VROM, 2001: 10-11). So, planning in connection with the North Sea and its coast (OMA, 2008) is about different issues compared with, for instance, a frame which connects the Netherlands with Belgium or the Flanders Region (de Vries, 2015).

Closely connected to cropping or framing is the use of scale. Many maps in strategic plans take an aerial perspective. On an intermediate scale, the projection can be tilted. The bird's eye view, heavily used in urban design, with some famous examples like the 1909 plan for Chicago, mentioned above, as well as Le Corbusier's 1925 Plan Voisin for Paris.

Rotation can also vary. North has become standard, but sometimes the rotation is deliberately turned around. Van Duinen (2021) gives an interesting example taken from Dutch planning discourse. An informal plan for the western part of the country was made to influence political agendas by planners and designers outside the government. This used an image of the Dutch Deltametropolis (framing with words!) but turned it clockwise 90 degrees. The resulting map shows a massive landmass criss-crossed by rivers on one side with a 'seamass' opposite; an interesting combination of cropping and manipulating projection.

The combination of frame, scale, projection, and rotation together is called the 'field' by James Corner, whom we already met above: 'The design and set-up of the field is perhaps one of the most creative acts in mapping, for as a prior system of organization it will inevitably condition how and what observations are made and presented' (Corner, 2011: 94)

Map makers have a lot to choose from when the field is determined. Dots, lines, and planes, as well as triangles, squares, diamonds, and other shapes belong to the basic graphic language, but even here a lot of decisions can be taken. There are some regularities, however. For instance, cities and towns, depending on scale, are often pictured like circles. Questions which map readers may pose are: which cities are shown? and for what reason? and how big are the symbols? Presumed relations between cities are often visualised through lines, which causes visualisations of urban networks to look like molecular visualisations in chemistry text books. Of course, map readers may (indeed, should!) question the true existence of relationships and their nature.

Other map decisions include the use of colour (see also Dühr, 2007: 80). Questions to be posed: what colours have been used? are the colours strong or pale? do they follow certain conventions (for instance, urban is red, non-urban green) or deliberately do not? is the transition from one colour to another strong or faint? and what suggestions may arise from that? Often, the use of colours (or shading, if the map is grayscale) refers to land use. The map interpreter needs to assess whether the differentiation, as well as the chosen resolution, match reality. Overall, there is a need to analyse the legend (key!) of any map and critically question various legend elements.

Typically, spatial planning maps today are created with computer graphic programs which generally gives them a smooth character. There is one class of maps which is nearly always made by a spatial designer: hand-drawn maps. They have become quite exceptional, however, as many maps in strategic plans are made as the outcome of political discussions, while hand-drawn maps are regularly produced in earlier phases of such discussions, or in informal sorts of plans. Drawing, i.e. holding a pencil, is seen by some (Palmboom, 2018; Lyn & Dulaney,

2009) as rather powerful because it brings the map maker closer to the design object in a state of 'reflective conversation with the situation' (Schön, 1983).

4. Conclusion

Often, planners (particularly those with a social science background) tend to regard maps and other visuals commonly used in strategic plans and planning reports as mere illustrations which can be ignored or, as we have seen, should even be deleted! Indeed, there are (strategic) spatial plans which do not have any sort of future-looking map. This is not to say that those plans are completely beside the point because, in many cases, such plans (or better, the plan makers) followed a distinct planning principle which we may call the objectives approach. This is an approach which first of all seeks to reach consensus about the underlying goals of spatial planning. When such consensus has been reached, and diffuses across different societal actors and administrative levels, other planning principles come into the picture which focus on particular places and spaces.

The main message of this chapter is that the verbal and visual languages used in strategic plans and plan making form one single storyline. Plan makers, as well as plan analysts, need to focus on the connections between these two languages as well as arrive at a proper understanding of the construction of maps. Students may use the content of this chapter to evaluate plans and come up with recommendations and alternative strategies in their graduation reports. Planning maps are utterly fascinating!

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Winter scene in Delft. Photo by Marcin Dabrowski.

Space Syntax in Spatial Planning

A short introduction to its methods, theory development, and application in practice

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This chapter gives students an introduction to space syntax in spatial planning. The first section gives an overview over various research traditions in carrying out spatial analyses on the built environment and clarify which tradition it belongs to. Various definitions of urban space and spatial elements are given in this part. In the second section, an introduction of various analyses techniques of the space syntax method is given. For urban studies on metropolitan and city scales, axial and segment analyses are presented. In the third section, various techniques for correlating the results from the various space syntax analyses with socio-economic data are demonstrated – methods such as gate counting, static snapshots, and snail trailing. Finally, a presentation of theories and general understandings developed through space syntax research is given. These theories are essential for applying space syntax into urban design and planning with the purpose of evaluating the various spatial and socio-economic impacts of each proposed planning alternative.

SPACE SYNTAX, ANALYSES TECHNIQUES, THEORY DEVELOPMENT, OPTION TESTING

1. Introduction

The spatial properties of the built environment play an active role in the way activities in society take place. However, the spatial drivers are often forgotten during planning processes and discussions. The reason might be that various spatial analyses methods and tools have been undergoing large changes in the last two decades, and software skills are required to conduct these analyses. Moreover, the spatial elements used in the discussions often lacks precision, and therefore becomes un-operational in evaluating and testing out various proposals.

So far, there exist three established research traditions in analysing the physical aspects of built environments: 1) the school of urban morphology, 2) the place-phenomenology tradition, and 3) the urban network tradition. Often their methods and focus overlap. The space syntax method differs from those used in urban morphology and place phenomenology in the way it focuses on the spaces between physical objects and their spatial inter-relationships. Whereas research from the urban morphology tradition focuses on spatial pattern, space syntax researchers deal with spatial structure (van Nes & Yamu, 2020).

In the past three decades, space syntax methods have been applied to urban studies. Originally, the space syntax method was applied in analysing small settlements and buildings (Hillier & Hanson, 1984). Later, more advanced computer programs made it possible to analyse the complex spatial relationships larger cities accommodate. The results from the spatial configurative analyses can be compared with societal activities, like the flow of pedestrians, land use patterns, dispersal of crime, etc. Results from research have contributed to theories and understandings of how cities are built up spatially as an effect of societal activities and how space is a generative power for societal activities (Hillier et al., 1993; 1998; Hillier 1996; 2016; van Nes 2021; Ye & van Nes 2014; van Nes & Yamu, 2020).

According to Hillier, space syntax in urban studies consists of four parts. Firstly, space syntax has a concise definition of the spatial elements at issue. Secondly, space syntax is a family of methods and techniques for analysing cities as networks of space formed by the placing, grouping and orientation of buildings. These techniques make it possible to analyse how a street interrelates spatially to all other streets in a large city. Thirdly, space syntax provides a set of empirical methods for observing how networks of space relate to functional patterns such as vehicle and pedestrian movement flows through cities, land use patterns, area differentiation, crime dispersal, property prices, migration patterns, and even social well being and malaise. These methods and techniques have been applied to a large number of cities in different parts of the world. A substantial database now exists of cities which have been studied using space syntax. Fourthly, generalisation and theory building derived from the research results of the first two elements have contributed to theories and understandings of how cities are constituted spatially as an effect of social, economic, and cognitive factors and how urban space functions as a generative power for societal and economic activities and cognitive factors (Hillier et al., 2007).

Studying the spatial outcomes of activities in society requires a concise definition of space (Yamu

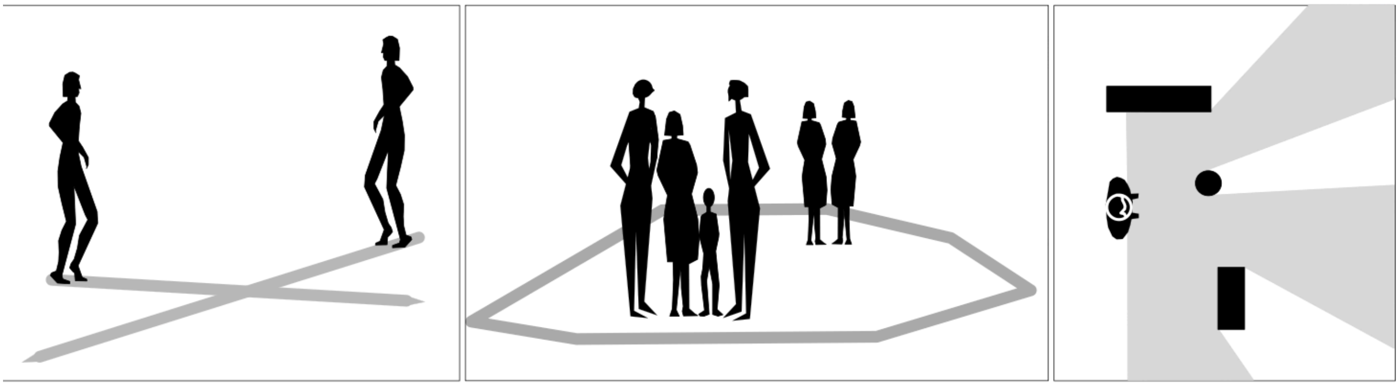


Figure 1: Three basic elements used in space syntax. Illustration by A. van Nes.

et al., 2021). As regards research on built environments, Hillier distinguishes between intrinsic and extrinsic properties of space. Extrinsic qualities determine how spatial units relate to one another; here settlements are regarded as sets of spaces. In this perspective, primarily topological issues become relevant. Volumes, textures, and size are not taken into consideration. When regarded in purely extrinsic terms, spaces are shape-free. It is just their inter-relational aspect or structure that is taken into consideration. In this respect, each space has one or more functions either in terms of occupation or with regard to movement (Hillier, 1999).

Intrinsic properties of space determine both built form and its possible function. While extrinsic properties of space consist in invisible, structural relationships, intrinsic properties relate to visible ones. They depend on aspects of things we can see, i.e. shape, size, volumes, and texture of physical objects or built mass. They present themselves mostly through geometrical properties. They account for the articulation of social meaning via built form (Hillier, 1999). We have many words for describing the extrinsic properties of space. Words like 'narrow street', 'large square', 'massive building', etc. make it possible to describe the artefacts of a city.

It is difficult to describe the extrinsic properties of space with words. Language seems unable to spell out complex spatial relationships. Therefore, abstract models or maps are often used to present or grasp such complex systems of space. These kinds of overall pictures of larger parts of our world seem to be necessary to explain spatial relationships. In the development of the space syntax method, Hillier and his colleagues set forth a number of basic terms suitable to describing intrinsic properties of space in settlements in a rather systematic manner. Hence, describing intrinsic properties of space requires considering the city as a set of spaces.

Being able to compare built environments with one another requires precision regarding the spatial elements used. Space syntax operates with the following three basic spatial elements: 1) axial line, 2) convex space, and 3) isovist (see Figure 1). In urban studies, the axial line is the element mostly used, and will be discussed in a moment.

In terms of how we name things, urban space is recognised being mostly linear. Apart from squares, we dispose of several names for the routes between them. Examples are alleys, streets, roads, avenues, boulevards, highways, paths, pavements, subways, bridges, stairs, etc. All these kinds of urban spaces shape a network – a potential pattern of movement. The urban street network is defined to be ‘the pattern of public space linking the buildings of a settlement, regardless of its degree of geometric regularity’ (Hillier, 2001: 02.1). Regarding the sort of city maps that tourist offices distribute to visitors, the street network is the most detailed part, important buildings and squares may be indicated on these maps, but not in such a detailed scale as the whole street network.

The rule for building an axial line map of a built environment is to represent the street and road network as a set of the longest and fewest sight lines in a system. The next step is to present the various analytical techniques for calculating spatial interrelationships.

2. The space syntax analyses techniques

Independent from cultures and architecture, all built environments have the fact in common that they consist of private and public spaces. Public spaces are open to movement, from everywhere to everywhere. Private spaces are those inside buildings and gardens and connected to the public ones in differing degrees. In urban studies, the focus is on analysing the public spaces of a built environment.

Up to 2005, the most used calculations were the global and local axial integration analyses. It consisted in calculating the total number of direction changes from each axis to all other axes (global integration analysis) and to its direct neighbour axes (local integration analyses). The global and local integration analyses is able to show how spatially integrated or segregated a street axis is in relationship to all others. Thus, the more integrated a street, the shorter topological distance it has to all other streets. Likewise, vice versa, the more segregated a street, the longer topological distance to all other streets.

Around 2005, the angular weighting of the lines and metrical distances were taken into account in the spatial analyses (Hillier & Iida, 2005). In order to conduct the angular analyses successfully, the axial map needed to be broken up into segments at every junction. There is a function in the Depthmap software that converts axial maps to segment maps (van Nes, 2020). In addition, the segment length is now taken into the calculations. When applying metrical radii, it is possible to analyse the degree of spatial integration of a segment within a radius of 500 meters, 5,000 meters, etc. As it turns out, the results from the segment analyses with these new measurements had a much stronger correlation with the pedestrian flow data than the axial integration analyses. Even though the axial map is still the basis for all space syntax analyses, there are currently experiments going on to use the road centre lines from GIS files for processing the segment-based analyses (van Nes & Yamu, 2021).

On the one hand, space syntax measures the to-movement, or accessibility potential of each street segment with respect to all others. On the other, it measures the through-movement, the potential each street segment has with respect to all others. Each of these types of relational patterns can be weighted by three different definitions of distance. The metric distance measures the city’s street and road network as a system of shortest length paths, while the topological distance calcu-

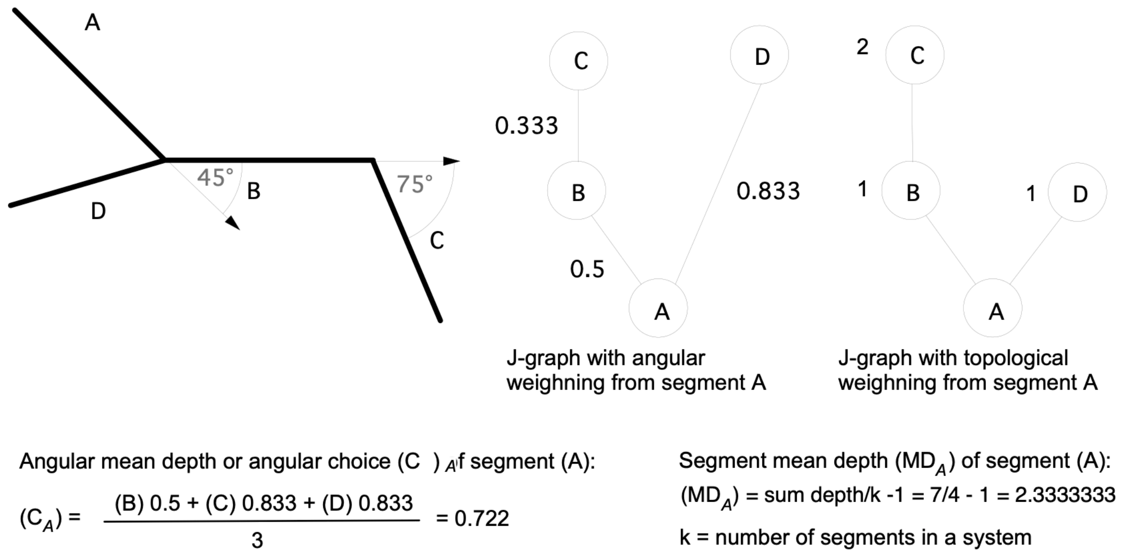


Figure 2: Two different justified graphs describing the spatial relationships of four street segments. Illustration by A. van Nes.

lates the city's street and road network as a system of fewest turns paths. Finally, the geometric distance gives a picture of the city's street and road network as a system of least angle change paths. Each type of relation can be calculated at different radii from each street segment, defining the radius in terms of shortest length, fewest turns, or smallest angle change paths (Hillier & Iida, 2005: 557-558).

The basis of space syntax is built upon graph theory. Figure 2 shows two different weightings of the spatial inter-relationships of four streets. Here, each graph presents how street segment A is related to B, C, and D, in terms of angular weighting and segment direction change. These two different calculations show the basis for the through-movement and to-movement potentials of a street and road network.

For showing the difference between a high and a low metrical radius, Figure 3 (left) shows an angular choice analysis of the city of Delft in the Netherlands with a high metrical radius of 5,000 meters. The highest integrated streets are coloured in orange and red. Here, the main routes running through and between various urban areas are highlighted. These routes have the highest through-movement potentials on a city scale. Figure 3 (right) shows an angular choice analysis of Delft with a metrical radius of 500 meters. Now the most vital pedestrian areas are highlighted, which shows the through-movement potentials on a local level.

Regarding the to-movement potentials, Figure 4 shows a segment integration analysis of Delft with a high metrical radius of 5,000 meters. Here, the main centre with the largest to-movement potentials on a city scale is highlighted. In the case of Delft, the car-based shopping centre in the modern areas of Delft are highlighted. Figure 4 (right) shows a segment integration analysis of Delft with a metrical radius of 500 meters. Here, the various local centres are highlighted, which shows the to-movement potentials on a neighbourhood level. And here, the old city centre of Delft is highlighted.

When comparing all these four maps with one another, the historic centre has the highest

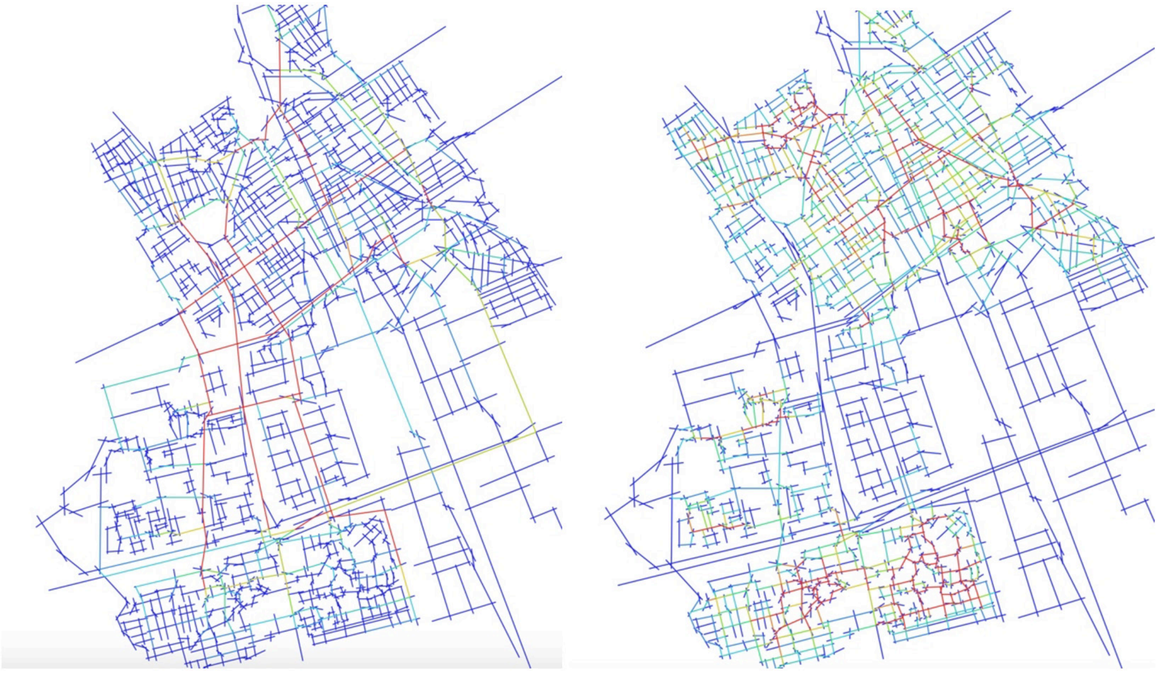


Figure 3: Angular choice analyses of Delft with a metrical radius of 5000 meters (left) and 500 meters (right). Maps by A. van Nes.

through-movement on the city as well as the local scale. A main route runs through the centre and is well connected to local streets that have high values with a low metrical radius. Conversely, the modern city centre has high values on both the choice and segment integration analyses on a city scale level. However, on a local level, the streets have low to- and through-movement potentials for pedestrians.

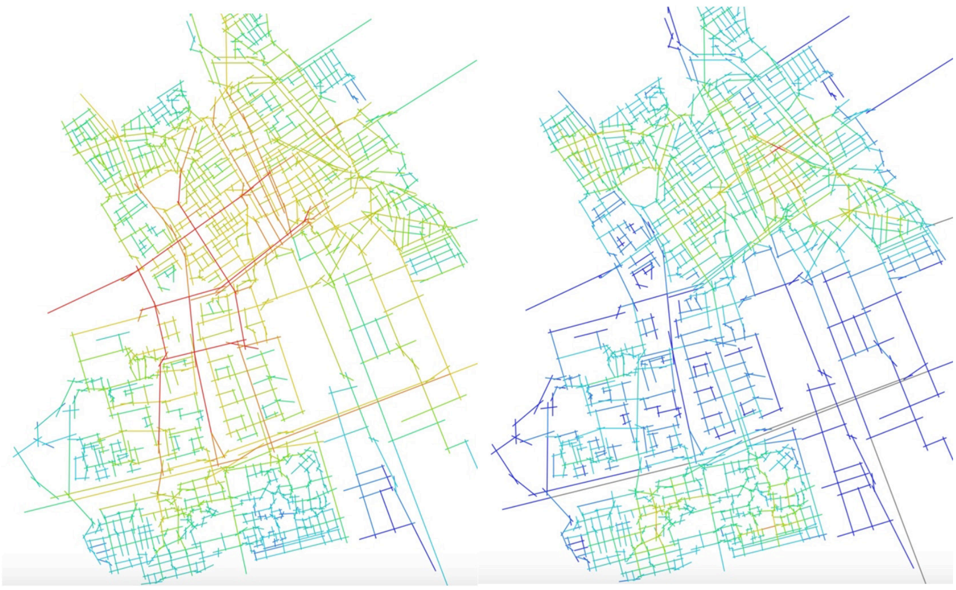
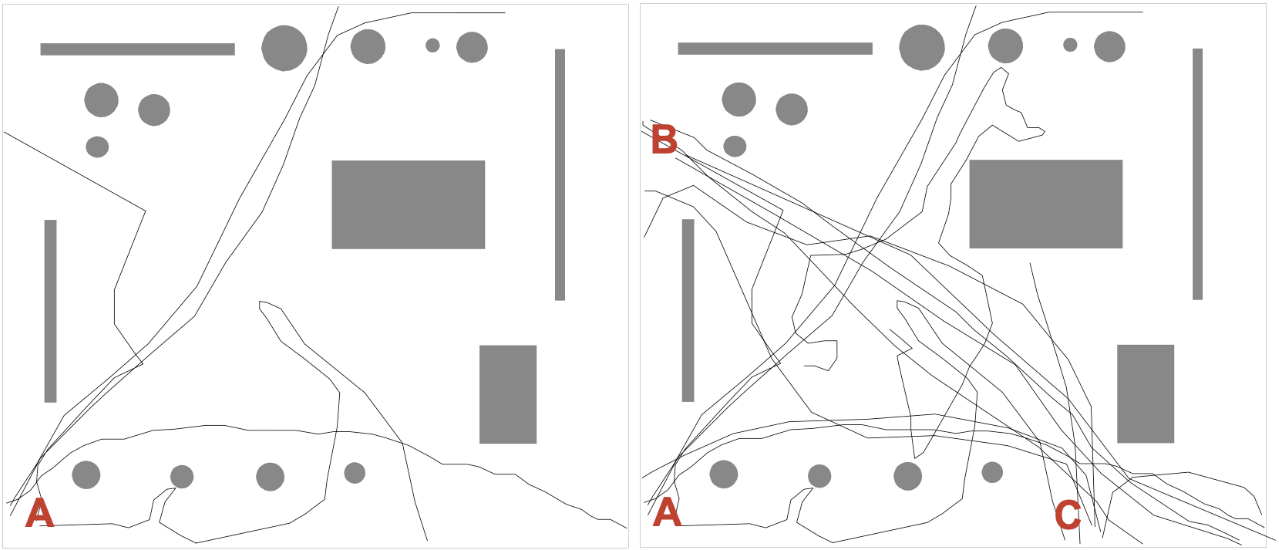


Figure 4: Segment integration analyses of Delft with a metrical radius of 5000 meters (left) and 500 meters (right).



Movement routes of people for a limited time period from point A

Movement routes of people for a limited time period from point A, B and C overlapped

Figure 5: Example on snail trailing. Illustrations by A. van Nes.

3. Correlating spatial analyses with socio-economic data

Registering where and how people behave in urban spaces contributes to an understanding of the spatial conditions for certain kinds of human behaviour in the built environment. Whereas methods in the social and behaviour sciences are lacking spatial analysis tools, a space syntax approach can analyse the spatial set-up independently of the registration of human behaviour. In many cases, the results from the space syntax analyses can be correlated with various socio-economic data, such as land use prices, distribution of crime, location of commercial activities, distribution of various urban functions, etc. (the list is endless). Here in this section, three well-known methods for gathering primary data on human behaviour in urban space are presented.

So far, the most commonly used method is bar-counting. It consists in registering the flow of human movements through all streets in an area. One way is to make a 'bar' on each street segment and register the number of pedestrians, bicycle, and cars passing through it for five minutes. One or two hours later the flow of people is recorded for five minutes again at the same bar. This way gives indications of the number of people for the next one or two hours. The two-hour time slots are mostly used between 8 a.m. 8 p.m. Naturally, the choice of time slots depends on the research question at issue (van Nes & Yamu, 2021). The bar-counting method has been applied to provide evidence that highly integrated streets consist of high flows rates of human movement (Hillier et al., 1998: 59), while highly segregated streets have low number of people frequenting them (Hillier et al., 2007).

Snail trailing consists in 'stalking' randomly chosen persons and tracing their movement routes in

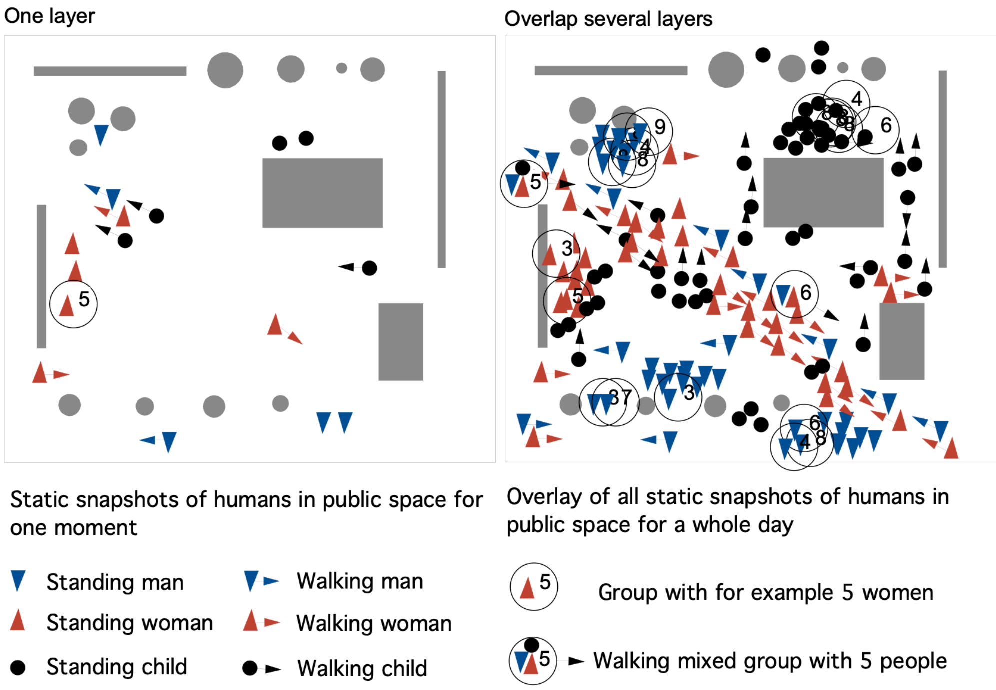


Figure 6: Example on static snapshots. Illustrations by A. van Nes.

a built environment in a given time period. When finding out where people move or which direction they prefer to choose when they exit, for example a railway station, different persons can be followed for 10 minutes, for example. After tracing the movement patterns of, say, 60 different persons, a certain structure of a movement pattern will emerge on a map (van Nes & Yamu, 2021). The snail trailing method (see Figure 5) is mostly used for visualising people's movement pattern in relationship with the spatial set-up in built environments.

Finally, the static snap shot method (see Figure 6) is an effective method for registering human beings' various types of social interactions in urban spaces. It is carried out in the following way: at a given moment the places where people sit, stand, and walk in a street or a square are registered on a map. One or two hours later the same registration is done on the same location. Like the bar counting, static snapshots can be done within different time periods. Later, all the registrations can be plotted on one map. A difference can be made between gender, ethnicity, and age. Likewise, a registration of where people sit, stand, or walk can be added. It all depends on the size of the area, the available time, the scale, and the proposed research question. Overlaying the registrations from the static snapshots gives an overview over which areas of a square, park, or in a housing estate are most or least used, and how different types of people use urban space (van Nes & Yamu 2021).

The results from the snail trailing and static snapshots can be used in statistics for correlation between human behaviour in urban space and the various integration values from the spatial analyses.

4. Theory development

Space syntax develops constantly. New development in computer sciences allow for improvements to the formal application space syntax tools relies on. In particular, the increasing number of context dependent case studies calls for a refined application and adequate interpretation of space syntax methods. Continuous research and its lasting results depend on methodologically reliability and on a systematic account of the conditions under which the claims could turn out to be false. This is what theory development on built environments is dependent on, and hence, how various space syntax methods has been improved and developed during the last three decades.

While disciplines like sociology were well-established during the last century, theory development and understandings on the role of the spatial components in the field of urbanism is in its beginnings. There is a lot that still needs to be done in terms of refinements of the definition of spatial components, empirical testing, and making generalisations and theories applicable in urban design and planning.

The application of space syntax has contributed to an understanding of the spatial structure of the city as an object shaped by society on the one hand and, on the other, how this object can generate or affect certain socio-economical processes in society. To some extent, space syntax is able to predict some types of economic processes as an effect on urban interventions (van Nes, 2007; 2021; Kayvan, 2012). Likewise, space syntax provides understandings on the spatial possibilities for certain social activities such as crime (van Nes & López, 2010; Hillier & Salbaz, 2005), social segregation (van Nes & Aghabeick, 2015), and anti-social behaviour (Miranda & van Nes, 2020). It is all about how spatial integration and segregation conditions social integration and segregation.

Results from systematic space syntax research has contributed to three descriptive theories that are able to explain the relationship between cause and effect: 1) the theory of spatial combinatorics (Hillier, 1996, Chapter 8), 2) the theory of the natural movement economic process (Hillier et al., 1993), and 3) the theory of the natural urban transformation process (Ye & van Nes, 2014).

The theory of the spatial combinatorics is based on four principles that are connected to the geometry of urban blocks, to where they are placed in space, and in what kind of street they are located. Together with the placements of physical objects in urban space they influence the degree of inter-accessibility, which is again connected to degree of centrality, urbanity, or anti-urbanity of an urban system.

The four principles are: 1) principle of centrality: a centrally placed object in a public space increases the topological depth more than one placed at the edge, 2) principle of extension: partitioning a longer line (or street) increases topological depth more than partitioning a short line, 3) principle of contiguity: large, continuous urban blocks increase topological depth more than smaller, separate ones, and 4) principle of compactness: straight long buildings increase topological depth more than ‘curved’ long ones.

As regards the theory of the natural movement economic process, the configuration of the street network influences the movement rates through an urban street network and where economic activities take place. Attractors, such as shops and large

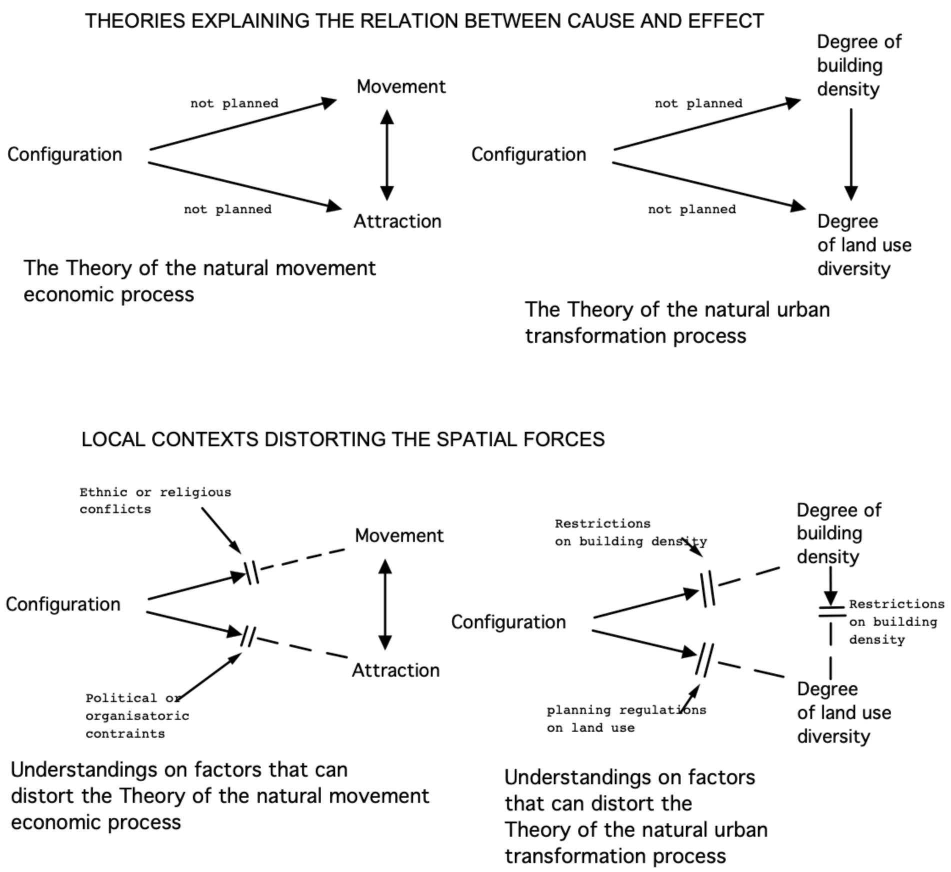


Figure 7: Two space syntax based theories and their distortions. Diagrams by A. van Nes.

firms, tend to locate themselves along the most integrated streets (Hillier et al., 1993: 31). The more people in a street, the more it attracts shops to locate along these streets. The more shops locating along a street, the more they attract people into this street. It gives a multiple effect process. After all, movement and attractors do not influence the street network's spatial configuration, it is the street network's spatial configuration that affects the flow of movement and the optimal location for economic activities.

The theory of the natural movement of economic process provides the basis for the theory of the natural urban transformation process (Ye & van Nes, 2014). This theory states that the spatial configuration of the street and road network influences the degree of building density and the degree of multi-functionality of land use. The higher the overall spatial integration of the mobility network on various scales, the higher the building densities (both for the Floor Space Index (FSI) and Gross Space Index (GSI)) and the higher the diversity in land use. Seemingly, the spatial configuration of the street network, as the foundation for steering urban transformations, influences the degree of building density and land use diversity. Likewise, the degree of building density influences in the long term the degree of land use diversity. This theory contrasts with current planning practice in the United States and in several European and Asian countries (van Nes & Yamu, 2020).

Sometimes there might be distortions on these abovementioned theories. Shops do not always locate themselves along the highest integrated street, and therefore the local planning context needs to be investigated in these cases. Likewise, the flow of human movement does not always correspond with the degree of spatial integration. This yields a representation of the local cultural or political context. Highly integrated urban areas do not always have a high degree of building density or a high degree of land use diversity. Likewise, high building density does not always entail multi-functional land use (van Nes & Yamu, 2020). Figure 7 shows the distortions in the theory of the natural movement economic process and the theory of the natural urban transformation process. Gaining understandings of all of these distortions depends on each local or national context. There might be rigid restrictions on the local planning regulations, restrictions from conservation authorities, or laws and rules that block the desired intentions in the planning process. These aspects have to be taken into account when the results from the spatial analyses do not correspond with the results of socio-economic data.

5. Conclusion: the application of space syntax in urban planning and design practice

When applying space syntax into strategic spatial planning and urban design practice, one has to solve the spatial arrangement before the urban form. Regarding space syntax theories, the mobility network is the spatial armature of a built environment. Already some urban renewal projects have been implemented with the space syntax method. The most well-known example is the renewal of Trafalgar Square in London (Dursum, 2007).

First of all, the present situation has to be analysed and correlated with the relevant socio-economic data. The space syntax method is able to describe the spatial features of a present urban context. Then the next step is to test out various options and to describe the spatial potentials for each proposed solution. It is about asking what happens if we do this or that.

Consider if we want to improve the connection between the modern shopping centre and the TU campus in Delft by adding one line. What would happen if we make this new connection over the canal? Figure 8 shows a before and after situation. Here the segment analyses with a high metrical radius is used to test out the impact of the to-movement potentials. As can be seen on the map, this link will improve the to-movement potentials on a city scale on the campus as well as the modern shopping centre. However, on a local scale, no changes can be seen. The reason is that both areas lack a fine-grained and well-connected street network on the local scale.

Using space syntax in spatial planning consists in presenting the spatial outcomes of each proposed alternative and to discuss the advantages and disadvantages for each planning proposal. The spatial impacts, as well as to some extent economic and social impacts can be predicted for each proposal (Yamu et al., 2021). This gives a platform with less need for guesswork about the various impacts before each alternative is proposed for discussion with various stakeholders, NGOs, and other participants in the planning process. In the United Kingdom, space syntax has turned out to be a useful tool in the decision-making process for several urban renewal proposals. The most famous examples being the location of the Millennium Bridge and the regeneration of Kings Cross in London.

Figure 8: Before (left) and after (right) situation of a new bridge. Maps by A. van Nes.

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Street scene in Amsterdam. Photo by R. Rocco.

Regression Analysis

Quantitative exploration of interactions between the built environment and spatial behaviour

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In many graduation projects in Spatial Planning and Strategy (SP&S), empirical research and spatial design are intertwined. This chapter introduces regression analysis; a 'family' of related models of quantitative statistical analysis in empirical research. It is very appropriate to study interactions between the built urban environment and people's spatial behaviour in a project location at a high level of quantitative precision. The outcomes of such quantitative studies can be very useful in urban design or planning, either in preliminary empirical research, i.e. prior to design, or in the iterative cycles of Research by Design. There are several types of regression models; which one is most appropriate for your project (if any) depends on the specific questions about that interaction you want to answer, and on the empirical data that is available for that answer.

REGRESSION ANALYSIS, QUANTITATIVE METHODS, SPATIAL BEHAVIOUR, SPATIAL QUALITIES

1. Introduction

As a student (or practitioner) in Spatial Planning & Strategy (SP&S), you might plan to study the interactions of the built environment and people's spatial behaviour in an urban area. Most students use a broad kaleidoscope of methods to collect and analyse data on these interactions, including literature review, interviews, on-site observations, policy analysis, case studies, and mapping. With the aim of 'deep understanding' of processes that influence these interactions in their project areas, they usually assess obtained data at face value in a qualitative manner.

For sure, these analyses yield insights for interventions in built environments to better adjust their qualities to people's behaviour. Great! that is what spatial planning or urban design graduation projects are about! But these analyses rarely lead to detailed insights on the variety of spatial behaviour by different groups of (potential) users in that built environment. Not uncommonly, there is only some implicit notion of an undefined 'average user'. Hence, spatial interventions based on such implicit notions are not optimal from the perspectives of most users.

This chapter presents various models of a specific type of statistical technique, regression analysis, that you can use to study spatial behaviour by users of the built environment, at a high level of quantitative precision. This behaviour can be either revealed or stated, i.e. being either actually displayed or planned intentional behaviour. To study these different types of behaviour, regression analysis can fit in different stages of your project; either in empirical research prior to design or in the iterative cycles of research by design. Regression analysis is being used, yet in many different academic fields it appears rather unknown among graduates (and even practitioners) of SP&S. That is a missed opportunity because it can yield key knowledge that you can use for appropriate spatial interventions.

This chapter starts with sections two and three that present elementary features of the data that is required for regression analysis. Next, sections four and five discuss two key principles of regression analysis: 1) it explores causal relations, such as qualities of the built environment as explanation of people's spatial behaviour, and 2) it reaches conclusions on these causal relations for an entire population based on analysis of only a subsection (sample) of cases from that population. If you are primarily interested in the types of research findings that regression analysis provides you can skip sections two to five. Section six presents the simplest model to explain the essence of regression analysis. Next, sections seven to nine present more advanced models by means of examples of their application taken from literature. If you are afraid of the word 'statistics', do not worry, there is no reason to fear the word. Any mathematical explanations as to the basis of these models is limited to a basic minimum. Finally, section ten summarises in a very general manner the practical usefulness of regression analysis for spatial interventions by urban design or planning. But in spite of its usefulness, it ends with the conclusion that regression analysis is just one among various methods, including qualitative ones, that are required in complex multidimensional graduation projects.

Case ID	Age ratio	Gender nominal	Education ordinal	Place of Residence nominal	Frequency of Visits ratio
1	12	1	1	2	4
2	23	2	2	1	2
3	47	2	2	1	5
4	21	2	2	1	1
5	34	1	3	2	0
6	25	1	1	3	4
7	60	2	3	1	6
8	18	1	2	1	2
9	57	1	2	1	5
10	25	1	3	1	3
11	35	2	1	2	1
12	42	2	2	3	0
13	15	1	1	2	0
14	52	1	3	2	4
15	29	2	3	1	2
...	..	.	.	.	.

Table 1: Structure of the SPSS dataset.

2. Database

Regression analysis requires an adequate quantitative database. This database has the form of a matrix: it consists of rows, columns, and cells (see **Table 1**). These three elements correspond to the fundamentals of a database: cases, variables, and values. *Cases* are the individual members of the population in your project that are in the sample. They represent the *unit of research* of the project. In SP&S graduation projects, the unit of research is mostly either built-up areas in the city – for instance postal code areas – where spatial behaviour takes place, or the individuals who practice spatial behaviour in these areas.

The *variables* in the database are the features of the unit of research that are relevant in the project. In the case of built-up areas, variables can be building density, building typologies, population size, available amenities, or level of liveability. In the case of individuals as units of research, variables can be socio-demographics like age, income, and educational level, use of amenities at specified hours, or frequency of visiting the postal code areas in the project location. Finally, a *cell* is the intersection of a specific column and row that contains the *value* of the variable in the column measured for the case in the row.

Statistical analyses like regression are mathematical operations that require numerical data. Therefore, all values in the database are encoded by a number even when the corresponding variable is not numerical in nature. For example, the codes of gender in **Table 1** (names of variables in this chapter are in capital letters) are 1 = male and 2 = female. The mathematical operations are carried out by statistical software. A rather user friendly and comprehensive package that is often used by researchers in social sciences, SPSS, is useful for SP&S graduation projects.

	Nominal categorical	**Ordinal** categorical	**Interval** continuous	**Ratio** continuous
Order of values	No	Yes	Yes	Yes
Distances between values	No	No	Yes	Yes
Zero point	No	Yes/No	No	Yes
Examples	Gender Province of residence	Type of education Spatial entity	Temperature	Population size Areal surface Annual Income

Table 2: Scale of measurement of variables.

3. Types of variables

One essential feature of the variables that are included in the analysis – their *scale of measurement* – is critical for the choice of the appropriate regression model. There are four different scales of measurement: nominal, ordinal, interval, and ratio. They differ in three aspects: 1) the indication of order (ranking) of values, 2) distances between points on the value scale, and 3) meaning of the zero point on that scale (see **Table 2**). The scale of measurement of each variable in **Table 1** is mentioned at the top of its column.

Nominal variables are *categorical*. The values of nominal variables take on only a few possible discrete categories in words or names. Examples in **Table 1** are gender and province of residence in the Netherlands, e.g. Groningen, Zeeland, or South Holland. There is no order of these values in terms of large versus small or more versus less. Further, nominal values have no unit of measurement, like € or $ of the variable annual income. Without a unit of measurement, calculations with values are not possible and, hence, quantitative distances between values cannot be computed. Finally, the value scale of nominal variables has no zero point. After all, that would mean that a case (person) has no gender or lives in no province.

Ordinal variables are also *categorical*. But unlike nominal variables, the values of ordinal variables have an indication of order: a secondary level of education is higher than a primary but lower than a tertiary level **(Table 1)**. But distances between these values cannot be computed in numerical terms. Some ordinal variables have a zero point (like Level of Education) but most have not. A common type of ordinal variable is measured on a Likert scale, for instance, a five-point scale on which people score their satisfaction with quality of public space in their residential neighbourhood: 1) very dissatisfied, 2) dissatisfied, 3) neutral, 4) satisfied, 5) very satisfied. Mind that neutral is not a zero point!

Whereas nominal and ordinal variables have to be encoded by numbers to be included in statistical analysis, *interval* and *ratio* variables are *numerical* by nature. There is a difference between these two types **(Table 2)** but that is irrelevant for the choice of the appropriate statistical technique. Therefore, SPSS does not distinguish between them and takes them together as *scale variables*. Scale variables are *continuous*: whereas nominal and ordinal variables take on only a few discrete values, interval and ratio

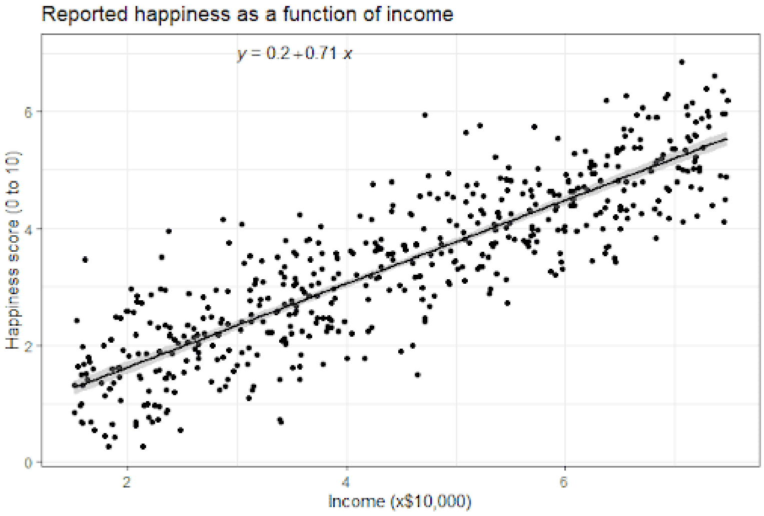

Figure 1: Linear regression of Income on Happiness. Source: Bevans, R. (2020), Simple Linear Regression | An Easy Introduction & Examples, Scribr, Statistics. Retrieved from: https://www.scribbr.com/statistics/simple-linear-regression/ Printed with permission.

variables can take all possible values on a continuum: natural numbers or even decimal places. In addition, scale variables have an explicit unit of measurements: number of residents, square kilometres, and currency (e.g. €, £, $ for the examples in **Table 2**). Due to their units of measurement, values of scale variables have an unambiguous order and distances between these values can be computed precisely.

4. Causality

Regression analysis is a type of statistical analysis that explores causal quantitative relationships between variables. In statistics variables in a causal relationship are habitually expressed by X and Y: X is the independent (cause) and Y the dependent variable (effect). In the conceptual model of research projects, the causality is presented by an arrow from X to Y. A conceptual model is a scheme that presents the set of supposed (!) causal relations between all variables that are selected by the researcher. Regression analysis, then, will test these relations: do they occur, how strong are they and are they positive or negative? It is recommended in quantitative research of causal relations to sketch a conceptual model of these relation. **Figure 2** shows the conceptual model that can be tested by a basic regression model of one dependent and independent variable (section 6). Figures 3 and 4 contain more independent variables: they represent conceptual models that could be but are not included in the papers by Lu et al. (2019) and Li et al. (2015). These two papers are used to illustrate two more complex regression models that the basic one (sections 7 and 8).

Causality means that changes in the values of X result in a systematic increase or decrease of the values of Y. Imagine level of education and annual income: in the causal relation between these two variables level of education is X and annual income is Y, not inversely. In the case of four-digit postal code areas in inner cities as a unit of research, a causal relationship might be found between the proportion of total length of streets that are Pedestrian Only (X) and the Degree of Liveliness (Y). As section seven shows, this is only possible when the broad concept Degree of Liveliness is first operationalised by a single measurable quantitative indicator.

Figure 2: Conceptual model of basic regression model

Individuals with the same level of education rarely have exactly the same annual income. But to make regression analysis worthwhile, a certain trend of systematic association between the values on both variables of all cases has to be visible in a scatterplot. Each dot in the scatterplot in **Figure 1** presents the score of one case (an individual person) in the sample on two variables (Level of Education and Annual Income). Regression analysis estimates both the strength and the direction of causal relationships between variables. The more narrow the point cloud in a scatterplot, the stronger the relationship between X and Y. The direction of the cloud indicates if the relationship is either positive (upward from left to right) or negative (downward). The relation between education and income in **Figure 1** is positive: an increase in educational level causes an increase of income.

5. Inferential statistics

Sometimes ready-to-use databases can be obtained from (semi-)public institutions. If that is not available for your project, you unfortunately need to gather data yourself. That is mostly done by means of a self-prepared survey (questionnaire). Most often the survey has to be conducted with a sample of respondents from the population by means of a well-considered sampling procedure. A sample is inevitable either when the population is too large to be included entirely in the survey or when the population is unknown, i.e. when you can't know exactly who does and who does not belong to it prior to the questionnaire. The entire adult population of a city is too large for a survey and the population of visitors of an urban tourist bubble on a predefined day in the holiday season is unknown in advance.

Regression analysis is an inferential statistical technique: it infers quantitative properties of the entire population from the data obtained with the sample. In statistical language, such an inference is called an estimation. A sample of, say, 500 adults from the civil registry of Amsterdam already yields pretty accurate estimations of the strength and direction of causal relations between variables in the entire population of the city.

6. Basic regression model

The basics of regression analysis can be best explained by the *binary linear model* (equation 1). This model contains one dependent (Y) and one independent variable (X). Both are scale variables and the relation between them is assumed to be linear, meaning that the regression function that defines the model is a straight line. The key numerical parameters of the model are the constant or *intercept* (a) and the *regression coefficient* (b). The third parameter, the *prediction error* (e), is key in the mathematical process of estimation of a and b but can be ignored here.

$$\mathbf{Y = a + bX + e}$$

(Equation 1)

Take for the example the relation between the two scale variables level of education (X) and annual income (Y) of **Figure 1.** The unit of scale of X is the number of completed years of education starting with the first year in secondary level and that of Y is €10,000/year. **Figure 2** shows the conceptual model of this relation.

The parameters of the regression line in Figure 1 are estimated by statistical software, such as SPSS: a = 0.2 and b = 0.71 (equation 2).

$$Y = 0.2 + 0.71X$$

(Equation 2)

The regression coefficient b predicts the increase of Y if X increases by one unit on its value scale, i.e. one more year of secondary or tertiary education causes an increase of income by € 7,100/year. The intercept a is the value of Y for X = 0: a person with less than secondary education has an estimated income of only € 2,000/year, reflecting that it is most probably earned by an unskilled job. As said, a regression line can also be defined by a negative value of b. In that case, increases in X causes decreases in Y.

7. Multiple linear model

The multiple linear regression model (equation 3) is an extension of the basic model with additional independent variables. A regression analysis includes one and only one dependent variable Y, but the number of independent variables (X_1 to X_n) is limited for practical rather than theoretical reasons. In the multiple linear model, Y is also a scale variable. The independent variables X_1 to X_n are often scale variables but can also be ordinal or nominal.

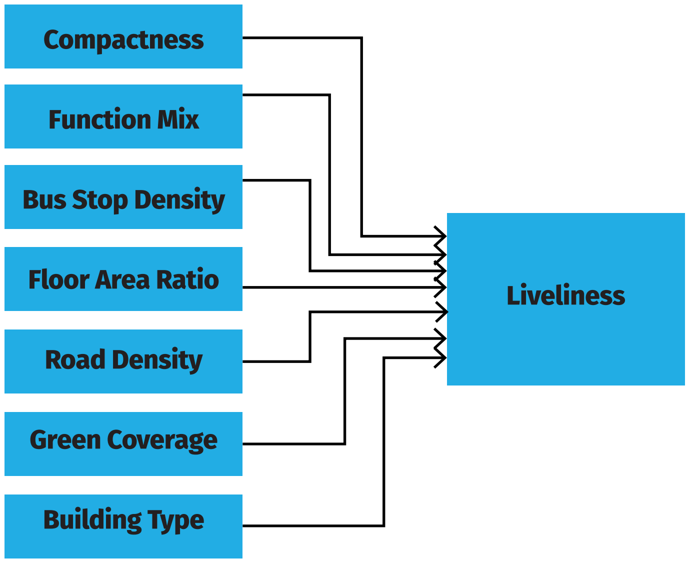

Figure 3: Conceptual model for Lu et al. (2019).

$$Y = a + b_1X_1 + b_2X_2 + ... + b_nX_n$$

(Equation 3)

Multiple linear regression is explained here by an edited version of the output of a study by Lu et al. (2019). The study analyses the impact of seven features of the built environment (X_1 to X_7; **Figure 3**) of the inner city of Beijing on its liveliness (Y).

The cases are 113 RPMUs (Regulatory Planning Management Units); small areas in Beijing's inner city. Liveliness is a multidimensional concept that includes, for instance, available amenities, numbers of people out on the streets and outdoor activities. Because there can be only one Y in regression analysis, the authors choose the scale variable Number of Check-ins on the micro-blog *Sina*, a major social media platform in China. This variable indicates human behaviour. The locational data of check-ins that is required to know in which RPMU people exactly check in is accurate to a single meter. The sample of check-in data covered the first week of

Independent variables	Scale of measurement	Standardized regression coefficients
Compactness index	ratio	-2.09
Function mix index	ratio	1.25*
Bus stop density index	ratio	1.63*
Floor area ratio	ratio	0.46*
Road density index	ratio	0.05
Green coverage index	ratio	0.03*
Building type	(nominal)	
office towers	dummy	-0,95*
modern shopping	dummy	1,25*
Adjusted R^2		0.52

* p < 0.10

Table 3. Output of linear regression of built environment features on urban vitality, Beijing. Based on Lu et al. (2019), authors' adjustments.

September 2016 and amounts to a total of 124,658 recorded check-ins spread across the 113 RPMUs.

Table 3 presents the key data of the regression analysis: regression coefficients of the independent variables, the level of statistical significance of each independent variable (the asterisks with its coefficient) and the 'explanatory power' (Adjusted R^2) of the seven independent variables together. The intercept is not included in the Table. It depends on the research question how relevant the intercept is, but mostly it tells nothing really relevant.

Each regression coefficient estimates the impact of the corresponding independent variable on the number of check-ins while controlling for all other independent variables. Controlling means holding these other variables constant. Note that the regression coefficients in **Table 3** are standardised. Standardisation is a mathematical operation that makes the magnitude of impacts of all X on Y comparable, i.e. independent of their distinct value scales. They allow to conclude that the compactness index has the strongest negative (-2.09) and bus stop density the strongest positive (1.63) impact on the number of check-ins. Furthermore, the impacts of road density and green coverage are positive but very limited in strength.

Crucial for the interpretation of a regression coefficient is the asterisk with it. **Table 3** shows that the coefficient of each independent variable has one, except compactness index and road density index. An asterisk shows that the regression coefficient is *statistically significant*. Statistical software estimates a value, the *p-value*, for each independent variable that indicates the probability that the impact of that variable on Y occurs not by a true effect in the population but 'by chance'. 'By chance' is possible because the estimation of the coefficient is based on only a sample of cases from the population. A lower p-value means a higher probability of a true effect in the population. The researcher her- or himself decides on the maximum *p-value* that (s)he accepts. These are commonly either 0.10, 0.05 or 0.01, meaning that (s)he can be respectively 90%, 95%, or 99% sure that the independent variable in question has a true effect on Y in the population. Lu et al. (2019) decided to put that threshold at the 0.10 level ($p < 0.10$). Because inferential statistics infers quantitative properties of the population on the basis of a sample, this threshold cannot be as low as $p = 0.00$, i.e. 100% certainty.

Adjusted R^2 indicates the explanatory power of the regression model. In statistical terms, the higher adjusted R^2 the higher the proportion of the variance of Y, a statistical measure for variation of it, that is explained by the set of independent variables. The value 0.52 in **Table 3** means that 52% of the variance of the number of check-ins across the RPMUs is explained by the seven selected independent variables. This may seem a disappointingly low proportion but the explanation of more than half of its variance by only seven features of the RPMUs built environment is in fact a good result! The value of the adjusted R^2 increases with the addition of more explaining independent variables. The value 1.00 means that all explaining independent variables are included in the model: an ideal but highly unlikely situation.

Independent variables in multiple linear regression models can be nominal and ordinal. To estimate their causal effects on Y, these have to be transformed into dummy variables or *dummies*. A dummy is a categorical variable with the values 0 and 1. A nominal or ordinal variable with n categories (values) is converted into (n-1) separate dummies. The remaining category is the *reference category*. In **Table 3**, the nominal variable 'building type' indicates the dominant building type in an RPMU. It has three categories: traditional residential buildings, office towers, and modern shopping streets and mall. If we define traditional residential buildings as a reference category, the two (3-1=2) dummies estimate the effect on the number of check-ins of, respectively, office towers and modern shopping spaces as dominant building types relative to that of the reference category. With 1,000 check-in records on *Sina* as unit of scale, the regression coefficient -0.95 of office towers predicts 950 records less in RPMUs dominated by office towers than in RPMUs where old residential buildings are dominant. On the other hand, the regression coefficient 1.25 predicts 1250 records more in RPMUs dominated by modern shopping spaces. Hence, RPMUs dominated by office towers are less popular and RPMUs dominated by modern shopping spaces are more popular to visit than those dominated by traditional residential buildings.

8. Logistic regression model

In the logistic regression model, the dependent variable Y is a categorical one, usually nominal. In case it has two values, logistic regression is binary and if it has more than two values it is *multinomial*. This section is about the binary one. Equation 4 shows its basic model. The two values of the nominal dependent variable are coded 0 and 1.

$$\ln(p_1/p_0) = a + bX + e$$

(Equation 4)

The term $\ln(p_1/p_0)$ that serves as the dependent variable is a *logit*: i.e. the natural logarithm (ln) of a probability ratio. In Equation 4 this is the ratio of the probability that a case in the sample scores the value 1 of the dependent variable (p_1) divided by the probability that it scores 0. A probability is a number between 0 and 1 (Equation 5) and p_0 and p_1 are mutual exclusive (Equation 6).

Independent variables Presence in 500 m radius around hotels	Type	B	Exp(B)
Commercial Floor Space (x 1000 m^2)	ratio	.98**	2.66
Number of Metro Stations	ratio	-.02	0.98
Land Use Mix Index	ratio	.54*	1.72
Number of Cultural Attractions	ratio	-.15	.86
Number of Shopping Attractions	ratio	.85**	2.33
Topography			
False flat	dummy	-.21	.81
Hilly	dummy	-.95	.39
Steep gradients	dummy	-2.18**	.11
Nagelkerke Pseudo R^2		.232	.269

** significant at 0.05

* significant at 0.10

Source: based on Li et al. (2015) authors' adjustments

Table 4: Output of logistic regression of features of built environment on hotel location, Hong Kong. Source: based on Li et al. (2015) authors' adjustments

$$0 > p_0 > 1$$

(Equation 5)

$$p_0 = (1 - p_1)$$

(Equation 6)

Like the multiple linear regression model, the binary logistic regression model can – and usually does – include more than one independent variable (Equation 7).

$$\ln (p_1/p_0) = a + b_1X_1 + b_2X_2 + ... + b_nX_n + e$$

(Equation 7)

Equation 7 shows that the multiple logistic regression model is also additive: contributions of the independent variables are simply added up to predict the value of the logit.

The case study by Li et al. (2015) uses a logistic regression model to analyse how the spatial distribution of types of hotels in Hong Kong are explained by a number of features of their urban environment. **Table 4** is an edited and simplified version of the output of that analysis. The dependent variable Hotel is reduced to an ordinal one with two values: upper- and lower-grade. These grades differ in service levels and room rates. The independent variables are six different qualities of hotels' surrounding urban environments within a radius of 500m. Five of these are scale variables – either absolute numbers or indices. The sixth, topography, is an ordinal variable with four categories: flat land, false flat, hilly, and steep gradients. It is split into three dummies with flat land as the reference category. The conceptual model of this analysis **(Figure 4)** has the same structure as that of the multiple linear model.

The overall objective of the analysis is to examine if the existence of different types of clustered tourist districts can be conceptualised. It is assumed that the two different types of hotels are

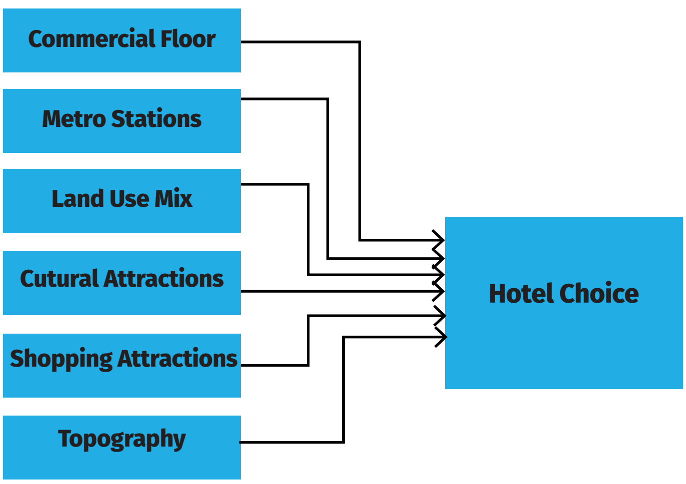

Figure 4: Conceptual model for Li et al. (2015)

visited by types of guests, i.e. tourists with different preferences of service levels set against room rates. Starting from that assumption, the logistic regression analyses if these two different types of hotels are surrounded by built environments with different values of these six qualities, i.e. values that fit better with these different types of guests' demands and budgets.

The regression coefficients B in **Table 4** express the impact of the six independent variables on the logit ln ($p_{\text{upper grade}}$ / $p_{\text{lower grade}}$) of hotel choice. It is practically impossible to know what a change in this natural logarithm means for changes in p1 and p0. To get rid of the natural logarithm, Exp (B) expresses the change in just the probability ratio ($p_{\text{upper grade}}$ / $p_{\text{lower grade}}$). Every additional amount of 1,000m2 of commercial floor space closely around a hotel increases the probability that it is an upper-grade hotel divided by the probability that it is a lower-grade one by a factor 2.66. The number of shopping attractions has a highly similar effect (2.33) on this probably ratio. The effects of both variables are statistically significant at the 95% *level of confidence*. In reverse, the probability that a hotel that is surrounded by steep streets, compared to flat land as the reference category, is an upper-grade one is nine times as low (0.11) as the probability that it is a lower-grade one. This indicates that lower budget guests accept the inconvenience of steep streets much more easily to save on the room rate in a hotel.

In linear regression models, adjusted R^2 indicates the amount of explained variation of the continuous variable Y by X_1 - X_n. For logistic regression with a categorical dependent variable, a few pseudo R^2 measures are available. Pseudo indicates a lower level of precision than of adjusted R^2 in linear regression. The advantage of the nagelkerke pseudo R^2 that is used by Li et al. (2015) is the range of its values between 0 and 1, just like adjusted R^2. The value of the nagelkerke pseudo R^2 (.232) is moderate, demanding for some more independent variables to explain hotel choice.

9. Discrete choice models

The types of regression analysis presented so far explain revealed human behaviour as being triggered by existing spatial qualities of the built environment in a specific location. That knowledge can be useful to evaluate the appreciation of qualities by users of the built environment. Discrete choice analysis that is presented in this last section analyses stated, i.e. planned intentional behaviour. Discrete choice models are based on multinomial logistic regression (MNL). Discrete choice analysis is largely unknown in urban design and spatial planning: a great pity because it can hit on the preferences of (potential) users for desired future spatial qualities of project locations. These qualities can already be existing in that location, or maybe not. The opportunity to include knowledge of users' appreciation of not yet present spatial qualities adds an important dimension to the utility of regression analysis for an urban design or planning process.

One of the rare examples of the use of discrete choice analysis in urban design is a project by Susanne van Rijn (van Rijn, 2020) in the municipality of Westland, the Netherlands. The objective of the project is to identify the appreciation of spatial qualities of outdoor public space by adolescents in the age range twelve to seventeen to take exercise, i.e. to become healthier.

Based on an extended literature review, van Rijn

No.	Attributes	Explanation	Level
1	Vegetation	Amount and variation	0 = little to no vegetation; little variation 1 = much vegetation and variation in the public space
2	Barriers	Physical barriers that hamper accessibility	0 = broad busy traffic roads often causing waiting times 1 = only quiet street rarely causing waiting times
3	Facilities	Facilities for sports and play	0 = none or few 1 = many, diversity of types
4	Paths	For cycling and walking	0 = only around public space 1 = around and through public space
5	Proximity	Walking distance from home	0 = more than 5-minute walk 1 = at most 5-minute walk
6	Lighting	Quality of lighting	0 = large parts of public space not illuminated 1 = public space is sufficiently illuminated
7	Seclusion	Spots where one is invisible from surroundings	0 = present 1 = absent
8	Water	Water features	0 = absent 1 = present
9	Seating	Open air furniture to sit	0 = absent 1 = present
10	Toilets	Public toilets	0 = absent 1 = present

Table 5: Selected attributes for physical activity in public space. Source: based on Van Rijn (2020), author's adjustments.

first carefully selected ten key attributes of public spaces that are supposed to influence physical activity behaviour of adolescents **(Table 5)**. Attributes in discrete choice analysis are equivalent to categorical variables in the above discussed regression models. The categories (values) of attributes are called ‘levels’.

Each attribute in **Table 5** has two levels: 0 and 1. One level is assumed to be positively associated with taking exercise and the opposite holds for the other level. Attributes in discrete choice analysis can have more than two levels, but for reasons of validity and interpretability these are rarely more than three.

Next, sixteen different alternatives were composed: A to P in **Table 6**. Alternatives are imaginary constructs: deliberately composed combinations of levels of the ten selected attributes. By means of an online questionnaire with the software Qualtrics, a sample of adolescents was asked to make choices between alternatives as they would do in the real world, i.e. in case these alternatives would really exist. Each respondent answered five questions. In each question two alternatives out of the sixteen (A to P) were randomly combined and the respondent was asked which of these two (s)he prefers to take exercise in. The option ‘neither of the two’ was also possible. To enable them to choose, the alternatives were made visible with drawings, including a brief explaining text to emphasise some features of the alternatives (see Figures 5 and 6 for examples). These are in fact simple spatial designs for the project location. The questionnaire yielded a dataset of 309 valid cases (N in **Table 7**).

Sixteen alternatives is a very low number if one realises that the total number of different alternatives in case of ten attributes with two levels each equals 1,024 (2^{10}). In general, over one thousand

	Attributes	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
		Alternatives															
1	Vegetation	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0
2	Barriers	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
3	Facilities	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
4	Paths	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0
5	Proximity	0	0	1	1	0	0	1	1	1	1	0	0	1	1	0	0
6	Lighting	0	1	0	1	1	0	1	0	0	1	0	1	1	0	1	0
7	Seclusion	0	1	1	0	1	0	0	1	1	0	0	1	0	1	1	0
8	Water	0	1	1	0	0	1	1	0	1	0	0	1	1	0	0	1
9	Seating	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0
10	Toilets	0	1	0	1	1	0	1	0	1	0	1	0	0	1	0	1

Table 6: Designs of imaginary public spaces. Source: based on Van Rijn (2020).

alternatives are far too many in the practice of a project. Substantial reduction of the number of alternatives, without losing the possibility to estimate parameters with MNL, is made possible by using the appropriate basic plan that matches this 2^{10} situation as developed by the American mathematician Sydney Addelman in the 1960s (Steenkamp, 1985).

As Equations 8A to 8P show, the MNL model in discrete choice analysis is not one single equation, but one for each of the sixteen alternatives in the study

$$V_A = ASC_A + \beta_1 X_{A1} + \beta_2 X_{A2} + \ldots\ldots + \beta_{10} XA_{10}$$

(Equation 8A)

$$V_B = ASC_B + \beta_1 X_{B1} + \beta_2 X_{B2} + \ldots\ldots + \beta_{10} X_{B10}$$

(Equation 8B)

-

$$V_P = ASC_P + \beta_1 X_{P1} + \beta_2 X_{P2} + \ldots\ldots + \beta_{10} X_{P10}$$

(Equation 8P)

Figure 5: Alternative O with the highest calculated utility. Source: Van Rijn (2020, 80)

Figure 6: Alternative J with the lowest calculated utility. Source: Van Rijn (2020, 80)

Attributes	Level of reference	β	Statistical significance
Vegetation	little to no vegetation; little variation	-0.403	0.000000846*
Facilities	none or few	-0.368	0.0000142*
Barriers	only quiet street rarely causing waiting times	0.255	0.00275*
Proximity	home is further away than 5 minute walk	-0.169	0.0458
Lighting	public space is sufficiently illuminated	0.152	0.0733
Water	water feature present	-0.125	0.123
Seclusion	visible throughout entire surroundings	0.097	0.239
Paths	only around public space	0.062	0.463
Seating	seating furniture absent	0.049	0.556
Toilet	public toilets present	-0,015	0.871
Sample	309		
Rho squared	0.223		

Table 7: Estimation of attribute parameters. Source: van Rijn (2020: 78).

The values of X_1 to X_{10} equal the levels of its 10 attributes in each alternative as defined in **Table 6**. The MNL analysis that was carried out with the software package Pandas Biogeme estimated two types of parameters: ten regression coefficients (β1 to β10) over all sixteen alternatives and one alternative specific constant (ASCA to ASCP) for each alternative. Together, these estimated and predefined values can be used to calculate the total utility of each alternative (V_A to V_P: **Table 8**).

Table 7 shows the output of MNL. The values of the βs represent the relative contribution of each attribute to the appreciation of public space for physical activity by adolescents. In absolute value, the relative contribution is highest for vegetation (-.403). Its negative sign indicates that the reference level as defined in Table 7, i.e. abundant and highly varied vegetation, contributes negatively to the appreciation of outdoor public spaces by adolescents 12-17 years of age to take exercise. The sign of β for the attribute 'toilet' shows that the presence of public toilets in public space is not appreciated positively by the adolescents to go there to take exercise. However, its very low absolute value (0.015) indicates that the weight attached to their absence is in fact very limited. Moreover, its p-value (.871) is much larger than 0.10, showing that it is not 90% sure that 'toilet' has any effect at all on adolescents' appreciation of public space for exercise. The same holds for the attributes 'water', 'seclusion', 'paths', and 'seating'. It is important, finally, to realise that the β values only give relative comparisons of the weight of attributes: they are categorical and lack a unit of measurement (section 3).

Table 8 shows the calculated total utilities for the alternatives A to P that are defined by the 2^{10} basic plan. Figures 5 and 6 show, as examples, the alternatives with the highest (O) and the lowest (J) total utility. You may think that full implementation of the alternative with the highest utility is the basis for the best possible spatial design or plan in the real world. That is, however, not necessarily the case. Because the basic plan that defines alternatives is based on mathematics and has no empirical connection to any urban design or planning context, the one with the highest total utility can include attribute levels that contribute negatively. Moreover, it is possible that local conditions make it impossible to realise a specific attribute level, despite how highly that might be appreciated. Imagine that the absence of Barriers appears important but the site is located at a major road which cannot be altered. In

Alternative	Utility function	Utility value*
O	V_O	3.13
C	V_C	2.30
A	V_A	1.94
D	V_D	1.88
K	V_K	1.63
E	V_E	1.62
M	V_M	1.47
B	V_B	1.40
G	V_G	1.36
P	V_P	1.26
L	V_L	1.13
N	V_N	1.06
I	V_I	0.69
H	V_H	0.50
F	V_F	0.34
J	V_J	0.31
0	V_0	0

*: rounded to two decimals

Table 8: Estimated utility values of alternatives. Source: van Rijn (2020: 78)

fact, the β-values give more specific information of the attributes and are therefore often more valuable for use in urban design or planning.

To conclude, the results of the MNL show the relative importance of selected attributes for use in an urban design as expressed by their β-values. But that still does not mean that 'the one and only' design follows straightforwardly. In fact, it still says little about how that design should be realised. The way in which attributes are combined into a composition of space in the real world is where the expertise of urban designers like you play a key role.

10. Conclusion

Master's graduation projects like yours would result in well-elaborated and highly integrated proposals for spatial qualities in urban designs or spatial policies for your project location. If so, in your case it is highly likely that you would want to base your proposal for spatial qualities on users' revealed or stated spatial behaviour. Regression analysis accurately estimates the quantitative amount of contribution of each separate feature of spatial quality to the explanation or forecasting of users' spatial behaviour. The examples of the use of regression models that are discussed in the sections seven, eight, and nine explain revealed spatial behaviour (visiting specific places in central Beijing and types of hotels in Hong Kong) or stated behaviour (physical activity in Westland) by selected spatial features of these locations' built environments. This type of knowledge can be significant for appropriate urban design or spatial policies in your project as well.

Not included in the examples are personal socio-demographic characteristics, like age, gender, or educational level, as independent variables. Including these characteristics might show that the relationships between built environment and behaviour is quantitatively different for different subgroups. That can be done in two ways. First, such characteristic can be included as additional independent variables in the regression model or the discrete choice model. Another way is to split the sample of users into subgroups according to such characteristics and run a regression analysis for each subgroup.

It should be noted that the use of regression analysis as a quantitative method is not mutually exclusive from qualitative research methods: it is not a matter of choosing one or the other in your urban design or planning project. On the contrary, if you consider using regression analysis it is still essential to first construct an adequate conceptual model and then think very carefully about which variables in that model should be inserted into your regression model. Hence, a thorough review of relevant international literature on our research topic is required. Overall, qualitative methods like the review and also analysis of policy documents or interviews with key persons are crucial (!) in all stages of the iterative cycle of research and design during the project.

In a 2013 paper by Emeritus Professor of the Faculty of Architecture and the Built Environment, Taeke de Jong, commented that 'the specialised probabilities or even "truths" of empirical research [...] cannot be successfully integrated in [a design of] one spatially, ecologically, technically, economic, cultural and managerial unique case' (de Jong, 2013: 22). Key features of regression analyses are unidirectional causal reasoning, inclusion of only a limited number variables, and single moment bound data collection. Hence, it is not a panacea in its own right in dealing with the complexity of interwoven multidimensional challenges of designing unique locations. But the fact that it 'cannot be successfully integrated' underestimates the usefulness of empirical research techniques like regression analysis in urban design and planning projects. Just like yours!

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Rotterdam Centraaal train station, Rotterdam. Photo by R. Rocco.

Planning as Critically Engaged Practice

Consequences for studio education

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Space, people, and time are all intertwined in the city, a complex system in which planners intervene. Their strategic plans and neighbourhood designs impact the daily lives of city dwellers. This emphasises the point that spatial planning and urban design are not technical disciplines. The everyday use of space and its symbolic meanings must be incorporated. Planning as an engaged practice involves explicit engagement with the Habitat III goals and, more specifically, the New Urban Agenda (NUA) goals. This commitment to sustainable urban development means we are working to create integrated and just societies for the future. The NUA paved the way for the right to the city to be incorporated into planning. This chapter discusses incorporating both aspects (socio-spatial complexity and the right to the city) into planning education, specifically the design studio. It begins by questioning the design studio's current functioning. It then shows a resurrected studio setting, where socio-spatial complexity and the right to the city can be gradually integrated meaning that the studio will no longer be about what is, but about what is 'yet to be'.

CRITICAL THINKING, DESIGNERLY WAYS OF KNOWING, ENGAGED PRACTICE, STUDIO PEDAGOGIES, ENGAGEMENT

1. Introduction

The strong entwinement of space, people, and time is ubiquitous in modern cities. Spatial planners are called upon to intervene in this complex system. With their strategic plans and neighbourhood designs, planners affect the daily life experience of the city's inhabitants. Thus, spatial planning and urban design cannot - and should not - be mere technical disciplines. We must incorporate the everyday experience and use of space and the associated symbolical meanings into how we imagine planning practice. This chapter proposes an engaged planning approach that is normative in nature and grounded in critical thinking. This engaged approach stands in opposition to previous technocratic approaches and current managerial practices. Planning as an engaged practice also requires an intentional engagement with the Habitat III agenda's goals, particularly those outlined in the New Urban Agenda (NUA). This commitment to the sustainable and just development of cities, towns, and human settlements means that we are working towards building future socially integrated and just societies. The NUA has cleared the way to integrate the right to the city in spatial planning.

The right to the city is a concept that came into existence in the late 1960s. The uprisings and student protests externalised the dissatisfaction with the uneven distribution of resources and goods at that time and with the processes that created an uneven urban situation.

In broad terms, we can understand the right to the city as twofold: it is first about the full use of the city and the right to appropriate it, but more importantly, it is also about a collective right to take part in the making of the city. Alternatively, as David Harvey phrased it:

> *The right to the city is far more than the individual liberty to access urban resources: it is a right to change ourselves by changing the city. It is, moreover, a common rather than an individual right since this transformation inevitably depends upon the exercise of a collective power to reshape the processes of urbanization (Harvey, 2008: 23).*

Thus, the right to the city is ultimately a strong political principle that should lead to action in which the dispossessed, the neglected, and the discontented can claim back the city and shape it to their needs and aspirations.

Introducing both these aspects - socio-spatial complexity and the right to the city - in planning education, and specifically in the design studio setting, is the topic of this contribution.

The chapter starts with a discussion on the origins of the design studio as a tool in higher education, questioning its current functioning. Next, it presents a renewed studio setting in which the **integration of the socio-spatial complexity and the right to the city happen at different stages**. Therefore, the studio is no longer about what is, but about what is 'yet to be'. The pedagogical approach presented below is grounded in the work of Peter Marcuse (2009a) in order to foreground the critical approach and the right to the city. It also uses Henri Lefebvre's (1991) trialectic understanding of space to capture the socio-spatial complexity.

2. Design studio pedagogy

The design studio has become a popular method of teaching architecture and urban design in the twentieth century. The origins of this pedagogical model, whereby various aspects of the discipline are discussed in one exercise, can be traced back to the Ecole des Beaux-Arts in nineteenth-century Paris and even further back to the Académie d'Architecture. Established in 1635, the Académie was the first and only school dedicated to architects' education. Its impact on subsequent institutions both in Europe and globally can hardly be underestimated. An atelier (the studio), was run in parallel to the lectures and hosted by a master architect (referred to as the Patron). These ateliers became famous for the quality of their teaching and the success of their students. This success was demonstrated by the students successively winning the Prix de Rome (Griffin, 2020), perhaps the most significant prize for the arts in Europe in the nineteenth century.

Here, the foundation was laid out for the organisation of architecture education until today. Both the existing shortcomings and potential strengths of current design studio teaching are heavily influenced by the first approaches of the seventeenth and eighteenth centuries.

Before we demonstrate (in the next section) how this studio setting supports a critical spatial design and planning education, we will take a more critical look at highlighting some deficiencies of the design studio approach. Howland notes that when he looks back on his own educational journey

The long hours of work in a common studio space forged us into a close-knit group of men and women who were marked by our dedication, endurance and talent. We shared the excitement of learning to see the world in a new way, of learning to distinguish between well and poorly designed glasses while our friends were drinking coffee unaware from styrofoam cups. We were the imaginative professionals with certified taste (Howland, 1985).

Furthermore, he felt that '[w]hat the architectural tradition and our mentors suggested and what we students were teaching each other was that boring and conventional people produced boring and conventional designs. We encouraged eccentric dress, hyperbolic speech and unconventional behavior' (Howland, 1985).

Both quotes illustrate how, already during the years of education, architects set themselves apart from others and developed an 'architect-artist' identity expressed in clothing style (see, for example, Rau, 2017), aesthetic taste, and behaviour. Professors and teachers reinforce this culture, nurturing the students' ambition and their assumed possibility to become the starchitect who will leave their mark on the world.

Secondly, an over-emphasis on the teacher (rather than attention to the student) poisons studio-based learning. This is detrimental for a constructivist pedagogy in which both student and teacher are on an equal footing throughout the design assignment (Webster, 2006).

Thirdly, the emphasis on the design outcome, along with the importance placed on evaluation moments during which students are judged, demands that students prepare for a final presentation in front of a jury of 'experts' or 'masters'. These one-off events not only harm a healthy student life (e.g. late nights, high levels of stress), but they establish a 'skewed' power hierarchy in which students must justify their work and thoughts to the teacher (and the experts), frequently in a spatial setting that reinforces this hierarchical relationship and frequently accompanied by a discourse in which the experts demonstrate their expertise while simultaneously questioning the student's (Koch et al., 2002; Webster, 2006).

Thus, studio settings run the risk of creating a toxic environment, forming architects as experts, as masters of creation and architecture, and putting them high above the 'average man'. This Architect (with a capital A) is assumed to possess the knowledge and expertise necessary to create designs that are both reason and art. The interaction of these two facets – the architect as expert and the architect as artist – contribute to the architect's strengthening of his or her reputation as 'artist – genius', upon which 'the architectural culture to the outside world' (Till, 2009: 160) is built.

Research by the American Institute of Architecture Students in 2002 showed not much difference in the 'studio culture' between architecture schools in the country. There is an intense emphasis on the design outcome rather than the design process, and the context in the assignment is being reduced to a brief description in which, for example, the customer or the community at large are no longer of interest but are only marginal influences (Koch et al., 2002). This is a particularly worrying evolution because it fosters the illusion that architecture is an autonomous and artistic discipline, while Till (2011) has shown that 'architecture depends' (2009: 178). Architects are largely responsible for the outcomes of their work, and understanding the design intent is critical (Till, 2009: 166). Raising and fostering this awareness is crucial in today's studio-based education.

The organisation of the design studio gives students the chance to think and work holistically. As an exercise, they start by studying the design challenge presented to them, then putting their expertise in practice. In ideal circumstances, students gather knowledge from a wide range of disciplines and areas of interest and process them as a whole. Alternative solutions are addressed and discussed with the teacher or with peers. Thus, students are encouraged to critically engage with their subject of study and leave the beaten track when searching for alternative possibilities. This setting, in which students learn-by-doing and are asked to reflect on their process and actions, is what Schön has called 'reflective practicum' (Schön, 1985: 89). Studio-based learning thus has the potential of facilitating learners to inspire and educate themselves. This hypothesis is based on the theories of Rancière (1991) and Freire (1970). Education, as both authors emphasise, is more than merely instruction; it is all about giving students control over their own learning.

Another point highlighted by Schön is that studio education is training in making things (Schön, 1985: 94). When designing, students are actually creating spatial arrangements, whether these are architectural objects or urban transformations. They have to be aware that, after graduating, the outcomes of their design process will have tangible implications in the real world. Evaluating the effect of the spatial interventions on the daily life of people, on the creation, or obstruction, of opportunities for urban dwellers, needs to be part of the design studio pedagogy. Schön (1985: 97) stresses that the work of the (architectural) design studio is a normative one, designing imagined futures and reflecting on their desirability.

In conclusion, studio education is thus about learning how to master a design process that is 1) anchored in research (on the topic and the location), 2) creates a representation of the (desired) future situation, and 3) is cognisant of the impact of its outcome on the context in which it is placed.

3. Critically engaged planning

A critically engaged planning approach is deeply inspired by the work of Peter Marcuse (2007; 2009a; 2009b; 2009). Whereby, investigating the world as it appears before our eyes should go beyond accepting it as it is, but be about looking for the hidden potentials, exploring and unravelling in order to try and understand challenges and see opportunities for where change can be made. Thus, being critical is more than a negative criticism. Using a wide array of perspectives to analyse and scrutinise the world as we see and experience it, critical theory offers an opportunity to develop counter approaches, actions, and ideas that allow us to question the current organisation and management of our society (a good example of this being acts of counter mapping). It is then essential to act upon these things, following Marcuse's (2009a) call to expose, propose, and politicise.

As with critical theory, critical design is a way of designing that questions the existing ways of doing things (things that acknowledge the dominant thoughts of a society). This way of design is in opposition to a design that conforms to dominant ideas and anchors these ideas in the built environment. The design of the waiting bars at bus stops in London is an obvious example. By designing bars that people can lean against when waiting for the bus instead of benches to sit on, the designer also ensures that the homeless cannot use it as a sleeping place. This speaks a lot about the kind of society we live in and the decisions made by local governments and institutions with decision-making power.

Critical design questions these dominant modes of living. Design becomes an act that exposes the given, dares to provoke, and triggers debate. Next to this, it can also imagine and represent the unthought of, spark enthusiasm for previously unconsidered possibilities, ignite the belief in another possible future.

4. The design studio's potential for critical design

Marcuse stressed the possible contributions of critical theory to current challenges; more specifically, he pondered how architects, designers, practitioners, activists, and urban intellectuals could establish a critical urban practise that promotes the right to the city for all. He proposes establishing a course of action that includes revealing, then suggesting, and eventually, politicising.

In a first step the root of the problem is examined and then the problem's results are introduced explicitly. Next to collecting information and analysing the current situation, injustices are explicitly exposed. Accordingly, the second stage is research-based strategy development. The strategies aim to respond to the problems the first step revealed, and plan desired outcomes. The techniques would likely include physical as well as social and legal components. The third step is to politicise. The ideas for future activities, political actions, and action plans need to be shared through the appropriate platforms, and support should be sought through various media and within the communities we belong to. Marcuse (2007) pointed out the importance of clearly disclosing the limitations of the planning process in order not to raise ex-

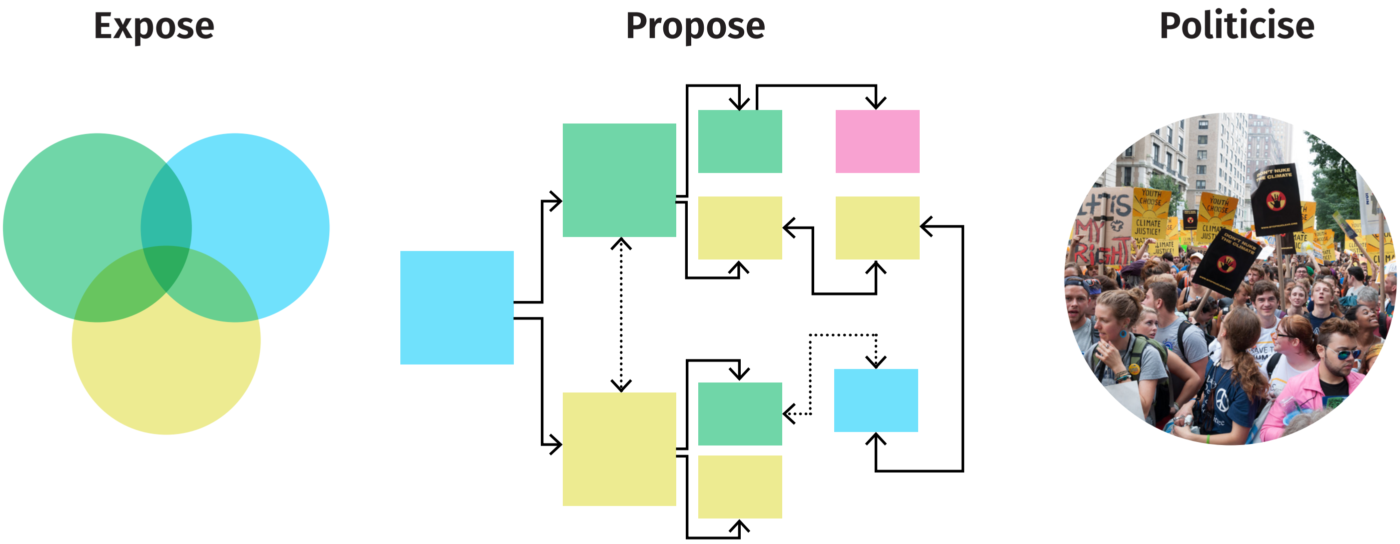

Figure 1: The design studio as a catalyst for critical thinking and engaged planning. Diagram by R. Rocco. Photo: The People's Climate March rally in New York City, Sept. 21 2014. Photo by Alejandro Alvarez - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=47718309

pectations which planning cannot deliver. But importantly, Marcuse stresses that this does not mean that planning needs to limit itself to merely formulating immediate and short-term answers to the problems posed. Critical planning, according to Marcuse, 'looks to the roots of problems as well as their symptoms and pursues a vision of something beyond the pragmatic and beyond what is immediately doable today' (2007: 10). **If the design studio is empowered with this proposition, then it can transform from being a problem-solving exercise concerned with that which is, to a truly projective design that is about that which is yet to be.**

The organisation of the design studio has the potential to be the ideal locus for teaching planning as a critical engaged practice. The basic structure is empowered by **acknowledging the normative character of urban design and spatial planning** and by using the critical lenses and approach suggested by Marcuse.

4.1 Exposing phase

The design studio starts from an in-depth analysis of the challenges presented. It does so not only by a typical spatial mapping, by a morphological analysis, understanding the functional zoning or the relevant policies, it also looks into the socio-spatial issues and more importantly it uncovers the injustices and inequalities that are present within the context in which we will be intervening. We make use of Lefebvre's trialectic understanding of space to do so.

Space is a complex social construction, not an abstract or neutral given (Lefebvre, 1991). Lefebvre's theory gives a helpful insight for considering how people and their environments interact, and how people's perception of these spaces functions. He suggests understanding space through a triad (conceived, perceived, and lived spaces), in which each part has a specific and explicit role in the reproduction of society and in securing the hegemony of a dominant system (Lefebvre, 1991: 32–33).

First, the **conceived representations** of space are created by professionals and experts, such as planners, architects, and scientists. The representations of space have the experience of these experts infused within them, along with their normative positions and ideological perspectives. Space is often portrayed in an abstract manner, and as a result, it is difficult for lay people to understand. Experts use the objects that are representations of space, such as the maps, to highlight their knowledge and influence in society.

Second, Lefebvre speaks about the **perceived space**. In this case, he is referring to the spatial habits of the public. Space has a big effect on how people use it. The physicality of space, the morphology of the city, and the material nature of elements all influence how people use a space. The everyday routines of people are defined by the space in which they live. Consider these two examples: a car-free city centre where pedestrians can easily cross the street after the centre has become one wide pedestrian area; and the other: a gated community that obstructs straight routes, causing shortcuts and straight connections to be impaired.

Finally, Lefebvre speaks about the **lived space**. Urban spaces are both tangible and concrete, but they are also intangible, imbued, and informed by imaginaries, feelings, and personal experiences as well. Different individuals or groups can assign different meanings to the same space. The third aspect in Lefebvre's triadic model is important in helping people comprehend their environment.

In summary, the three Lefebvrian dimensions of space help us understand how urban spaces work and how inequality can be generated within them. Injustice will occur at any of the three levels in the triad, from red-lining to physical checkpoints, or the absence of quality outdoor spaces, and the prohibition of cultural and/or religious gatherings.

4.2 Proposing phase

We need to move beyond the mere debate of a sustainable development for our cities. We need to think how to make **resilient cities** and neighbourhoods. Cities that are able to live through (thus be prepared for, respond to, and recover from) societal and environmental pressures that will increasingly become visible, whether these challenges are coming from demographical changes, climate change, natural disasters, or other threats. **The transition towards resilient cities** needs to take place within the transdisciplinary approach explained above. The relationship between planning and politics underpins an emerging debate about the political engagement and/or the possible complicity of planning and design. Recognising the importance of planning and design practices for the (co-)creation of knowledge (in societies characterised by scarcity and crisis) and seeking to reassert their relevance, designers are becoming more interested in social issues. Design is often projective and propositional; it uses the projection of possible future outcomes to explore and assess the different parameters and possibilities to reframe the investigative realm.

Scenario building in urban planning are explorations of possible futures that are constantly moving between interrogating the current and imagining the future, between the known and the unknown, between the familiar and the alien (inspired by Cook, 2013: 87). If we observe on the one hand and create on the other, the potential for questioning and developing alternative ideas and strategies can flourish.

4.3 Politicising Phase

As argued above, design and planning are not autonomous disciplines. The realisation of proposed ideas and concepts have a tangible impact in space and the everyday lives of people. Coming up with beautiful plans and ideas is not enough, ideas must be discussed in the public realm. So, the third step is to politicise. The future operation, political campaign, and action plan proposals that are needed to realise the plan need to be communicated through the right platforms, and support should be pursued via different media and among peers.

A crucial tool for the urban designer and strategic planner at this point is the drawing. Drawing is inherently a multi-layered form of communication, and is able to move from observational to investigative to propositional in seconds. This provides many benefits, including the ability to express concepts, as well as the development and the convincing communication of counter-hegemonic or alternative ideas and strategies.

Conceptual sketches of potential technologies and possible urban futures also motivates officials and civil society to act. If we can envision alternate worlds, we can create progress. As Harvey has argued, ‘A global anti-capitalist movement is unlikely to emerge without some animating vision of what is to be done and why’ (2010: 227).

5. Conclusion

As argued elsewhere (Newton, 2013), architects and urban planners need to reflect on their role in planning and design processes. The practice of the urban designer needs to be deconstructed and recalibrated in order to gain a better understanding of how to deal with the urban project and to dare to shift the question from ‘where do things belong’ (classical modern and functional planning) to ‘to whom do things belong’. This search for a counter hegemonic planning (maybe what Miraftab (2009) would call ‘insurgent planning’) is imperative if we want to bring Lefebvre’s right to the city back to centre stage. As stressed in the beginning of ‘The Right to the City’, it is ‘the right to centrality, the right to not be excluded from urban form, if only with respect to the decisions and actions of power’ (Lefebvre, 2003: 194).

In this renewed context, the role of the designer is put under scrutiny. **The focus in the whole (urban) design practice is no longer on the ‘expert’ planner, but on the process, grounded in a community base and the accompanying strategies and activism that have the ability to transform the city in co-creation with people.**

The studio setup as the pedagogical setting for this engaged approach helps students to develop a socio-spatial cognition; a knowledge and understanding of the socio-spatial intertwinement, not only through learning, but also through exploration, experience, and critical thinking. Students then translate this into strategies and actions that allow people, citizens, communities to take ownership of their right to the city.

Central in this reasoning is the idea of **critical design** as a ‘mediation of theory and practice in social transformation’ (Friedmann, 1987: 391).

In this recalibrated role, we, as practitioners, urban planners, or architects, take a more active role. In other words, we are open to being surprised by the urban reality we meet and refuse to be swayed by easy-to-understand answers and conventional thinking in our efforts to handle the challenges ahead. Innovation in urban design practise requires a new mentality and a reconfiguration of design, transforming the practise into a catalyst for change.

The studio pedagogy presented above allows students to approach design challenges from the perspective of the people, or the perspective of a community without losing sight of the need to facilitate the re-appropriation of spaces for collective action.

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Old industrial buildings in Rotterdam. Photo by R. Rocco.

Vision and Strategy Making

Teaching spatial planning in design education in a situated learning environment

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This chapter introduces the pedagogical approach of guiding vision and strategy making in university design studios. This is a unique way of teaching spatial planning in design education, bridging research, planning, and design. It will use one of the master's courses at the Urbanism Department of TU Delft as an example: the regional design studio 'Spatial Strategies for the Global Metropolis'. This approach is based on the tradition of planning schools with design education – using the design studio as a key method for teaching. This tradition has made spatial planning in design education different from other planning schools that focus on policies or social/environmental sciences. The approach being introduced is not only evidence-based/scientific but also explorative at the same time, prone to search for the more plausible and desirable future scenarios. It is in line with the role of regional design in practice, in the context of collaborative planning. To teach such practice-related skills, an authentic assignment from and the interaction with the 'real world' are needed, namely a situated learning environment, which mimics the actual situation and collaborative efforts of spatial planning. Spatial vision and development strategy are both tools of spatial planning in practice, meant to frame and steer the development towards a more sustainable future, with the involvement of stakeholders. In design education, they are also seen as design products students could and should work on to understand the roles of these tools in spatial planning and how to use them to develop regional design proposals.

COLLABORATIVE PLANNING, PLANNING EDUCATION, SITUATED LEARNING, SPATIAL VISION, DEVELOPMENT STRATEGY

1. Introduction

This chapter introduces a unique way of teaching spatial planning in design education, focusing on vision and strategy making in university design studio settings. As many authors suggested, one of the problematic issues with traditional ways of planning, more specifically blueprint planning, is that it cannot cope with the complexity (Healey, 2003; Amenta & Qu, 2020) or uncertainty (Balducci et al., 2011) brought by the current and future challenges cities and regions are facing. These challenges often involve global scale social, economic, and environmental risks, such as economic globalisation, migration, and climate change, which result in the loss of planning control in spatial development at the local level. The conflicts of interests in the use of space have turned spatial planning into a collaborative effort (Jabareen, 2006), which calls for tools to facilitate such a new way of planning. To enable and engage all stakeholders involved in the journey towards a more sustainable future, visions and strategies are needed to guide the collaborative processes of planning and development. One role of planners and designers in this new setting is to facilitate the making of these visions and strategies. Design is seen as a tool to experiment and visualise the possible and desirable future scenarios in spatial terms – the spatial development trends, including spatial structure, functionality, spatial quality, as well as the socio-economic and environmental performance. The question to educators at universities is: How to train future planners and designers in developing such skills within a short period of time in the classroom?

The answer can be straightforward: creating a situated learning environment for students and guiding them through the planning and design process with hands-on practices. Learning by doing? Learning is doing! Design studios could contribute to this unique way of teaching spatial planning, particularly in universities that offer design education, provided that timely systematic input on spatial planning and scientific research skills is given. This chapter demonstrates this method with the example of a master's level regional design studio at the Urbanism Department of TU Delft.

The structure of the chapter is as follows: after the introduction, section two introduces the main concepts, including a thorough discussion on vision and strategy making in planning schools with design education, one of the various types of planning schools worldwide. This is to provide an overview of the disciplines involved within planning education and position the method to be introduced in this chapter. Section three analyses theories related to collaborative planning and situated learning to deepen the understanding of the nature of strategic spatial planning, the roles of spatial visions, and development strategies in it, and the importance of learning by doing in teaching the skills involved. Section four explains the teaching methods used at TU Delft for guiding vision and strategy making in research and design studios, using the master's level regional design studio as an example. The intention here is not to showcase the 'Delft method' because even within TU Delft there are multiple ways of approaching it. Instead, based on this case, the section discusses fundamental notions of teaching spatial planning that are applicable in other schools with design education. Section five discusses the author's interpretation and ideas concerning collaborative planning in practice and the roles of vision and strategy making in it, as well as how to mimic the situation in education to facilitate learning. It is followed by conclusions on the method of guiding vision and strategy making in university design studios and the situated learning environment that is needed.

2. The world landscape of planning education

In regard to spatial planning at the regional level, vision and strategy making are both seen as part of regional design (Lingua & Balz, 2020; Colombo et al., 2018). In the context of European countries (Albrechts, 2004), regional design as a tool for spatial planning has regained its importance along with the revival of strategic spatial planning. This is because the regional scale is becoming essential in tackling many challenges mentioned earlier, which calls for spatial strategies that match the regional scale (Neuman & Zonneveld, 2018). Generally speaking, regional design is about guiding the spatial development within the regional territory according to demands and claims, spatially connect interests from various stakeholders, delineate more sustainable and desirable future scenarios for the region, as well as correlate action plans.

For the global audience unfamiliar with the term ‘regional design’, there might be a tendency to relate it to regional planning or urban design in a regional context. This has to do with the type of planning education one has received or the planning context one is situated in. The teaching of spatial planning in different schools can vary, some focusing on geography and planning (e.g. Sun Yat-sen University in China, Cardiff University in the UK, University of Toronto in Canada), some on land use planning and management (e.g. the State University of Land Use Planning in Russia, China Agricultural University), others on urban planning (those situated in schools of architecture and planning worldwide, such as Tsinghua University in China, National University of Singapore), or planning and governance (those located in schools of public administration, such as Renmin University of China, Erasmus University Rotterdam in the Netherlands).

Such a variety of planning education existing in the world of universities reflects the transdisciplinary nature of spatial planning, which indeed involves knowledge from (social and environmental) science, (urban and landscape) design, and technology. At the same time, it creates different vocabularies among these disciplines when addressing notions related to spatial planning. Therefore, the discussion of vision and strategy making in this chapter needs to be positioned within this landscape of worldwide planning education, which is, as indicated in the title of the chapter, more relevant to the schools that offer design education. This means, when talking about vision and strategy, they refer to the spatial dimension of envisioning and strategising, and are seen as design products in the university studio settings. These terms might be understood differently in the planning schools that focus on policies, where design is not at the core of the discussion. Nevertheless, the methods of vision and strategy making to be introduced in the following sections involve knowledge and skills from other planning domains, particularly geography and governance.

3. Situated learning environment mimicking collaborative planning

In the last section, I discussed vision and strategy making in the realm of planning education and positioned the method to be introduced in this chapter within that realm. This section elaborates collaborative planning theories (Healey, 2003; Albrechts, 2004), the planning context in which these two terms are situated, and the situated learning environment (Brown et al., 1989) in university design studio settings that mimic the collaborative effort of spatial planning in practice.

First of all, the terms ‘vision’ and ‘strategy’ need clarification, as they might be understood as the blueprint plans and the implementation of such plans in traditional perceptions. There used to be conceptions that development plans could be directly implemented, such as the construction of the British New Town Programme in the 1950s (Healey, 2003). However, as Healey (2003) stated in the context of the UK, since the emergency of policy plans, the delineation of the plans represents mainly the spatial specification of principles and norms to guide the development process, while the ‘implementation’ of the plans mostly refers to the take up of such principles and norms in projects, through the interactions among actors.

This is a visible trend of paradigm change in spatial planning. The unpredictable, complex world has led to the incapability of planning control in spatial development. The shift from hierarchical control from the state to new governance modes that involve networks of broader ranges of actors is seen, particularly in established democratic societies. Within such a context, collaborative planning is described as an ‘emerging paradigm’ (Innes, 1995). Vision and strategy making then become a collaborative decision-making process, in which the stakeholders involved jointly envision the possible and desirable future scenarios and identify strategic interventions that stimulate the transformation, aiming for win-win situations. As these decision-making processes often involve multiple scales of interventions, the importance of the regional level is increasingly recognised. The vision and strategy making are actually components of regional design that reflect spatial conditions, political agendas, and planning regimes of the regional context. Within such a comprehensive setting in practice, design as a tool contributes to the continuous (re-)interpretation of the spatial structure of the region, visualising spatial qualities of the future scenarios and spatial implications of the development strategies. In this case, design education’s job will be to cultivate the next generation of planners and designers capable of participating in such collaborative efforts.

Therefore, as stated earlier, enabling learning by doing is an essential method in teaching spatial planning when it comes to vision and strategy making. This is in line with the tradition in design education. When students are assigned authentic regional design tasks extracted from the real-world of practice, the university design studio setting transforms into a ‘simulated’ planning context, a situated learning environment in which products of visions and strategies for the chosen areas are created and can be used in the real regional context. From the perspective of cognition, this is not only useful but essential for learning (Brown et al., 1989).

4. Vision and strategy making in design education

Following the theoretical discussion above on collaborative planning and situated learning, a regional design course at the master's level at TU Delft is introduced in this section – the research and design studio 'Spatial Strategies for the Global Metropolis'. It is viewed as a case study for reflection on a variety of issues, most notably the degree to which a situated learning environment focused on regional design could be developed within a university studio setting, and the characteristics of vision and strategy making in practice and design education.

In recent years, a further development of the Delft tradition of 'research by design; design by research' is seen in the interdisciplinary approaches applied in the research and design studios at TU Delft, experimenting with planning and design solutions that can tackle complex challenges, such as climate change and flooding issues, scarcity of resources and competing demands for land uses, etc. The regional design course at the master level is one of them. In the past five years, the course has collaborated with stakeholders from practice, such as The Deltametropolis Association (Vereniging Deltametropool) and the Province of South Holland. The Deltametropolis Association is a strong network organisation and inspiring knowledge institute in which the professional community, public interest groups, research institutions, and governments come together, conducting independent research in metropolis development in the Netherlands and the Eurodelta (https://deltametropool.nl/vereniging/english-summary/). The Province of South Holland is a Dutch province located in the south part of Randstad, a key actor responsible for coordinating regional planning and development, collaborating with various stakeholders within the region and the national government. Both of the social partners are heavily involved in the regional design practice, and contributed to the creation of situated learning environment for the regional design course at TU Delft by defining the thematic focus of the assignments, giving knowledge input on the challenges of spatial planning in the Dutch regions, as well as feedback to student work and further dissemination of the final products.

Such a learning environment has generated enthusiasm and a positive atmosphere in the studio, equipped students with knowledge, skills, and facilitated learning by doing. However, it does not make vision and strategy making 'easier' within the studio setting. The making of spatial visions and development strategies in practice engages various disciplines and stakeholders, which usually take years to make real progress. In the educational setting, this is challenging due to the limited timeframe of university courses (usually two months for a design studio at TU Delft) and access to relevant data and stakeholders. In this regional design course, these issues were tackled with the support through additional course elements and from partners. Next to the design studio, there are lecture series that provide students timely knowledge and skills needed for the analysis of spatial development trends and development of regional design proposals. Besides, students get access to sources of data and direct contact with key stakeholders, thanks to the partners from practice.

In this ten weeks' course, students worked in groups on developing visions and strategies for the Amsterdam Metropolitan Area (2017, 2018, 2019),

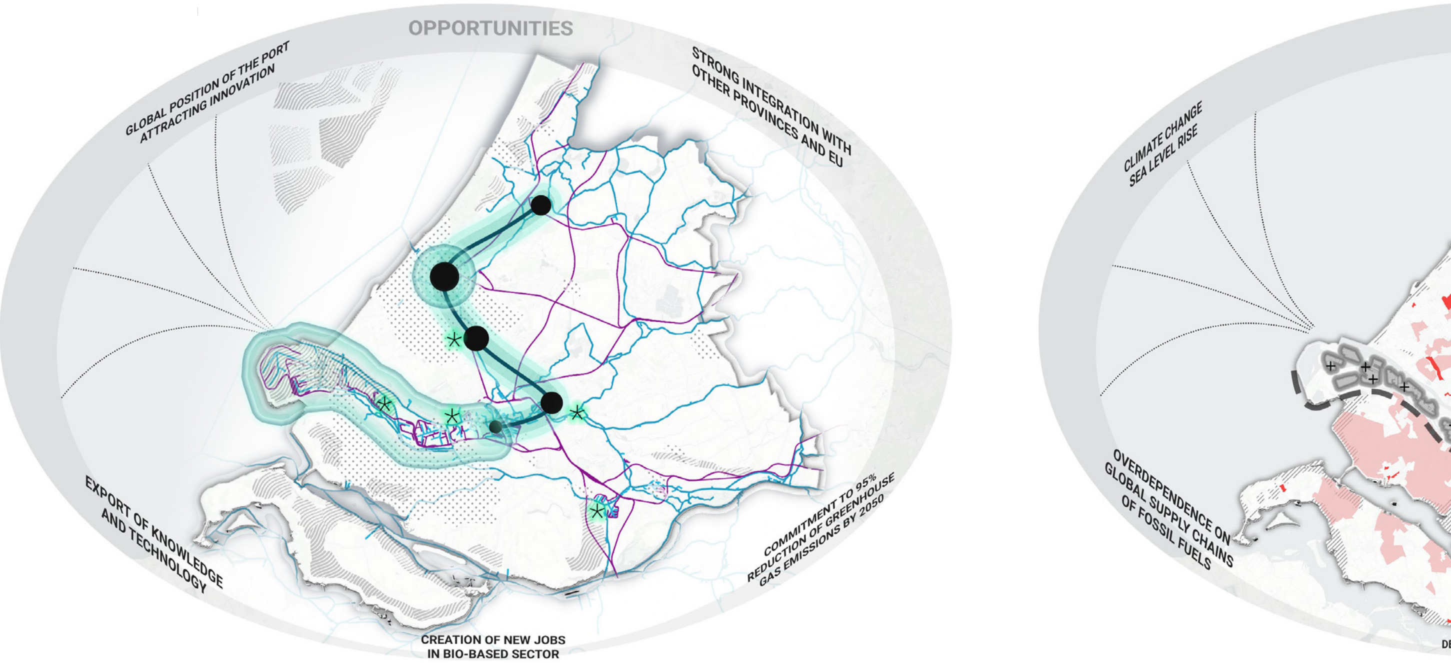
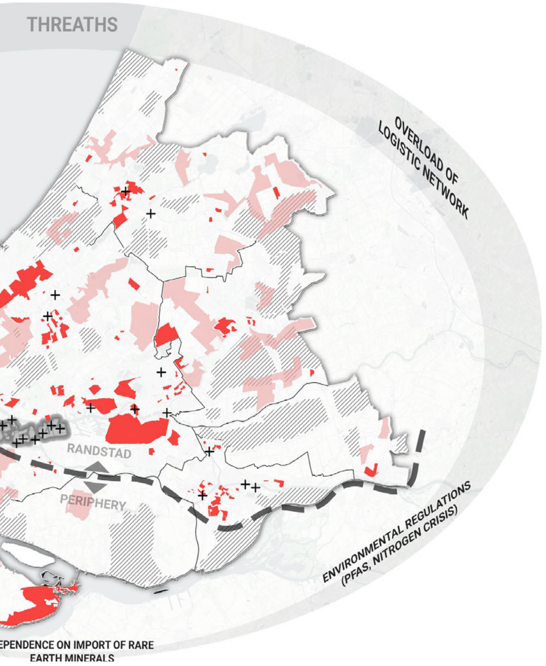


Figure 1: Examples of student work showing evidence of spatial development trends, on opportunities and threats related to energy transition in the Province of South Holland. Authors: Ramaiah Perumalsamy, G.B., Górz, M. & Aerts, M. (2020). Source: Energy Commons, A group report from the course "R&D Studio Spatial Strategies for the Global Metropolis". TU Delft. Printed with permission.

and the Province of South Holland (2020, 2021). The theme was regional design stimulating the transition to a circular economy in these Dutch regions, with a particular emphasis on socio-spatial justice. In the syllabus, both the spatial vision and development strategy are defined as 'design products'. The spatial vision is described as a normative agenda in spatial terms that describes a desirable future. It is expected that the spatial vision is persuasive, seeks to convince, enable, and engage actors involved. What is slightly different from the types of spatial visions developed in practice is that, in the design studio, we encourage students to explore extreme scenarios, as well as those nuanced ones that can be implemented within a timeframe. The second product – development strategy – identifies a timeline of strategic interventions to be implemented in line with the spatial vision, with an inventory of actors involved. These strategic interventions include development projects that focus on specific areas or infrastructure networks, with dedicated actors, budgets, and defined timeframe, and/or policies that guide spatial development through rules and regulations for areas concerned.

While both are listed as design products, for the purposes of clarifying the course's deliverables for students, vision and strategy formulation are evaluated using a variety of criteria. For vision building, students must understand the complexity, uncertainty, and multiscalarity of regional spatial development, as well as the limitations of regional design, and the ethical issues involved. The formulation and argumentation for a spatial vision should be based on evidence of spatial development trends (see Figure 1), commonly shared values and norms, and appropriate planning principles. For strategy making, students need to understand the basic roles and instruments of strategic spatial



planning in delivering public good, spatial quality and equality. The development strategy is consistent with the spatial vision, which should be effective and feasible within the constraints of a given institutional context and resilient in the face of long-term spatial development uncertainties. It is important to emphasise spatial justice within the context of collaborative planning in order to arrive at a fair distribution of costs and benefits among the stakeholders. Besides, visualisation and story-telling are both important in communication in collaborative decision-making. Students should learn to visualise design proposals clearly, consistently, and persuasively, and be able to engage in critical debate. By working on vision and strategy making, students are expected to understand and critically reflect on the role of regional design in collaborative planning processes.

5. Conclusions

The chapter briefly introduced the approach of guiding vision and strategy making in planning schools with design education. It looked into the experience of the regional design course at TU Delft and positioned this approach within the landscape of planning education. Creating a situated learning environment and embedding the teaching in the discourse of collaborative planning are both crucial for such a domain of planning education. By no means this TU Delft approach should be seen as the model to follow, neither will it be relevant forever. On the contrary, this chapter seeks continuous interpretation and reflection on the tradition of 'learning by doing' in planning schools with design education to cultivate the future generation of planners and designers who could contribute to the solutions for complex spatial development challenges in transdisciplinary settings. The future challenges in spatial planning research and education lie in this transdisciplinarity, which necessitates a wider understanding and skill set in vision and strategy formation that extends beyond the scope of spatial planning and design itself. Nevertheless, in relation to spatial development at the regional level, both spatial vision and development strategy are components of regional design, which is a tool that is increasingly used for creating dialogues within the collaborative decision-making process. The design 'flavour' makes it unique compared to other planning education that focus more on science and/or policy, and it also sets the context for this chapter when discussing the relevance of the approach of guiding vision and strategy making.

In a nutshell, guiding vision and strategy making in university design studios has become an essential component in the teaching of spatial planning. Creating a situated learning environment is instrumental in getting students to understand the nature of collaborative planning. Such a learning environment can be enhanced by connecting teaching with research and practice in the design of assignments, organisation of teaching activities, and feedback moments, so that students have the opportunity to work on ‘real’ societal issues and keep connected to ‘real’ stakeholders in the planning context. Vision and strategy making in the university studio settings is a process of analysing, synthesising, envisioning, and strategising, which involves intense verbal and visual communication among students and teachers. It is an example of ‘research by design; design by research’, which is evidence-based and explorative at the same time. The essence is, through such a research and design process, to help students understand the multidisciplinarity and multiscalarity embedded in the current issues or future challenges, the complexity reflected in the conflicts of interests in the use of space among stakeholders, uncertainty related to long-term spatial development, and limitations of spatial planning. Besides, it is essential to let students debate on values and norms behind planning principles, roles, and instruments of strategic spatial planning in delivering public good, spatial quality and equality, within the given institutional context. Hopefully, knowledge and skills needed by the future generation of planners and designers will be cultivated with this approach.

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Street scene in Rotterdam. Photo by R. Rocco.

Street scene in Delft. Photo by M. Dabrowski.

Dimensions of Socio-Environmental Approaches as a Platform for Local Development Under Climate Change

Theoretical and practical considerations of transdisciplinarity*

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The governance of urban processes, in the face of the effects of variability and extremes of climate change, requires a complex approach, especially because of the inherent uncertainty and high infrastructure cost those solutions entails. The urgency of the responses and actions imposed by extreme weather events transfers additional complexity to less developed societies, given the drift towards sectoral responses and the structural lack of financing at the municipal level. This chapter proposes a two-pronged approach: 1) linking climate adaptation processes and 2) outlining strategies for local development. This double effect facilitates the process of climate change adaptation through the active integration of a wider range of actors in local development, integrates agendas and actions of greater complexity, and ensures a long-term perspective of evolutionary change. The chapter has a theoretical framework defined by its transdisciplinary perspective (Lang et al., 2012), i.e. a reflective, integrative, scientific principle articulated by co-participatory methods that aim to solve or transition social problems and at the same time relate to scientific problems by differentiating and integrating knowledge from various scientific and social disciplines to validate the link between climate change strategies and local development. This is presented through a case study establishing a framework for possible interventions with integrated objectives in order to determine policy recommendations and local development strategies within the characteristics and conditions recognised in the case study, paying special attention to the high number of informal settlements in abandoned areas, and the limited economic capacity of the municipality to cope with their needs.

COLLABORATIVE PLANNING, PLANNING EDUCATION, SITUATED LEARNING, SPATIAL VISION, DEVELOPMENT STRATEGY

1. Contextualising climate change variability and local development through adaptation

The literature on climate change adaptation has its basis in risk management and had been expanded to include a recognition of levels of vulnerability (social, economic, and environmental) present in each place and defined in specific conditions. The assessment of these conditions is the fundamental factor in implementing necessary socio-environmental change. This is more evident in locations that have asymmetric responses to the satisfying of basic needs, such as the main urban localities of the Reconquista river basin in the Greater Buenos Aires area, considered here as a case study.

Recognition of the causes and effects of climate change variability is defined in the complex interrelationships of diverse systems (ecological, social, and physical components under a common decision-making system), so the approach to understanding them is framed as that of a 'complex system'. This is based on the dynamic coexistence of natural and anthropogenic processes in a context of continuous change (Meyer, 2009). The locations of the selected cases are within the Reconquista river basin and could be conceptualised as part (a subsystem of) an urban delta system (the Paraná delta), which in turn is considered a complex adaptive system (Dammers et al., 2014) given its dynamic interrelationships between the water system, soil characteristics, its level of urbanisation, socio-economic conditions, and production systems, among others.

This chapter defines systemic interrelationship as 'a complex whole, a set of interconnected things or parts, an organised body of tangible or intangible things that interact to form a whole' (McLoughlin, 1969). The city is also understood as a complex system, composed of subsystems, encouraged by general systems theory (McLoughlin, 1969). From the point of view of complexity theory, cities can be understood as open systems because they exchange information with their environment (Portugali, 2006), as well as complex, because they are made up of numerous components or actors with interdependent behaviours, resulting in varied effects (Durlauf, 2005; Portugali, 2006; Zagare, 2018). In this chapter, the socio-ecological approach is proposed to reveal the interactions of the systems considered and, through it, to define the main challenges to be addressed.

Interrelationships between systems and sub-systems intersect within a non-static equilibrium (Pelling & High 2005; Johnson, 2012), i.e. one that is continuously changing and produces uncertain effects. Even a small change can trigger a qualitative impact on the whole system and thus require an adaptation process to reach a new equilibrium (Pelling & High 2005). Continuous interactions take place in a non-linear and unpredictable way, so it is necessary for the system to adjust to these changes to reach a non-static equilibrium.

Given that climate change variability has its most critical expressions at the local level, the main issues to counteract its effects lie in the capacity of territorial decision-making at the municipal level. In particular, those issues that make it possible to deal with adaptive dynamics, (necessary to manage the associated risks and embedded in a longer-term resilience strategy), are the development perspectives and challenges and actions to address the specific risks associated with the effects of flooding (also considering the lack of water during certain periods of the year).

This chapter argues that complex adaptive systems are defined by the resilience of the system, which implies its ability to absorb disturbances without being weakened or unable to adapt and learn. Some natural and social systems have the built-in capacity to recover from adverse circumstances, while others have to learn to be resilient. The chapter focuses on the role of networks as an interrelated support system and the role of institutions in building resilience in social and ecological systems under a framework of joint municipal territorial management, relying on their national actors and policies.

2. Resilience as adaptive capacity

The term resilience is based on three main perspectives: engineering, ecology, and evolution. Engineering resilience refers to the ability of a system to return to an equilibrium or steady state after a disturbance (Holling, 2001). Ecological resilience refers to the ability of these systems to 'absorb change [...] and still persist' (Holling, 1973). The main distinction between the two definitions is the maintained efficiency of the function versus its maintained existence (Schulze, 1996). In the proposed framework, which links territorial decisions with mandatory actions to cope with the effects of climate change, the concept of resilience needs to be broadened in order to apply it appropriately to local development conditions and thus target the necessary change-oriented adaptation. Evolutionary resilience (Davoudi et al., 2013) extends the description of resilience from the engineering and ecological viewpoints of restoring and enhancing, also considering the capacity of complex social-ecological systems to change, adapt, or transform in response to stresses and disturbances (Carpenter & Westley, 2005). The concept of resilience is thus established by thinking about local conditions and enabling the activation of an integrated process of change that integrates local development and adaptation to climate change. This study requires the consideration of local, biophysical, and social conditions, proposing to define as a basis the scalar level of vulnerability of the main system at stake, in this case the water structure, and from there to define the risks associated with other vulnerabilities (social, physical, and economic).

Wisner et al. (2004) define social vulnerability to climate change as 'the characteristics of an individual or group and their situation that influence their ability to anticipate, cope with, resist and recover from the impact of a natural hazard' (an extreme natural event or process). Anderson and Woodrow (1998) expand it to 'long-term factors that affect a community's ability to respond to events or make it susceptible to calamities'. They go on to distinguish between material, physical, social, organisational, motivational, and attitudinal vulnerabilities. According to the latter definition, the appropriate framework for integrating local development into climate change adaptation strategies requires the assessment of existing socio-environmental conditions including the need for forecasting and planning. Furthermore, the proposed theoretical framework seeks to clarify that territorial decision-making, as a vulnerable system, should also be considered within the requested action of change, considering Cutter and Finch's (2008) contribution on defining vulnerability as 'the potential damage incurred by a person, asset, activity or set of elements that are at risk. Risk is driven by natural, technological, social, intentional or complex hazards with the potential outcome being disaster. In our approach risk expands to social, economic, political and cultural conditions and factors in decision making, i.e. vulnerability is socially constructed'.

3. Returning to adaptive capacity

Under the theoretical re-conceptualisation of risk and vulnerability detailed in the previous paragraph, this paragraph seeks to define the next step: adaptation, defined as the actions people take in response to, or in anticipation of, anticipated or actual changes and risks, to reduce adverse impacts or take advantage of opportunities presented by climate change or other recognised risks.

Adaptation is not about returning to an earlier state, because all social and natural systems evolve and, in some respects, co-evolve with each other over time. This is the basis of evolutionary resilience (Davoudi et al., 2013). Evolutionary resilience extends the description of resilience from engineering and ecological views of restoration and enhancement to the capacity of complex social-ecological systems to change, adapt or transform in response to stresses and strains (Carpenter, 2005), and thus respond to our proposal to link local adaptation strategies with local development. Therefore, the social conditions within resilience can be framed to consider the following:

- Social resilience is often used to describe the capacity to adapt positively despite adversity (Luthar & Cicchetti, 2000)
- Social resilience is the ability of groups or communities to adapt in the face of external social, political, or environmental stresses and disturbances (Adger, 2000)

This defines the basic conditions to which a social group needs to respond in order to be resilient.

4. The components of the applied approach

The theoretical approach presented in this study of modelling adaptive resilience and strategically aligning the management of climate change effects and local development began by proposing the necessary assessment of the biophysical systems involved (local conditions within various interrelated systems), defining environmental resilience in its main line of argument, and revealing its own limitations. It can be agreed that it depends on the capacity of natural systems to absorb change and still persist, 'functioning, maintaining its existence and maintaining a certain level of efficiency of its recovery functions' (Holling, 1973; Schulze, 1996) as a result of which we conclude that the proposed system can be induced by design. To do so, engineering and social aspects must be aligned with biophysical conditions and recognise existing social conditions to trigger change through an institutional perspective. This is proposed by defining an iterative process of opportunities designed through co-evaluations and strategic alignments over time.

Adaptation to present and future risks is increasingly understood as an integrative process precipitated by the need to cope with extremes, within gradually changing average climatic parameters (Kelly & Adger, 2000; Jones, 2001).

Current adaptation strategies have recognised in the dynamics of biophysical systems, as well as in green spaces and urban water systems, potentials for enhancing biodiversity conservation and contributing to the solution of societal challenges (Goddard et al., 2010; Cohen-Shacham, 2016). Along these lines, the European Community has recognised the functioning of ecosystems as fundamental pillars for the mitigation of and adaptation to climate change (European Commission, 2015). While aligned to local development objectives and recognising their economic and operational constraints, these strategies can generate exponentially expanding environmental resources, economic benefits and social benefits (Kabish et al., 2015).

Within these strategies promoting the maintenance, enhancement, and systemic restoration of biodiversity by expanding urban eco-systemic capacity are nature-based solutions, as well as actions based on 'ecosystem-based adaptation', 'green infrastructure', 'ecosystem-based disaster risk reduction', and 'natural water retention measures'. All are defined around the search for answers to the various complexities that climate adaptation and local development demand today. These strategies and the concepts that validate them are mostly complementary, and can be and are used in both urban and non-urban contexts. It is important to consider that both nature-based strategies and potential associated strategies are highly complex to study and evaluate due to the multi-scalar nature of the dynamics of bio-physical systems, in both their spatial and temporal scales. As they are associated with territorial decision-making systems for applicability, they require the intervention of various levels of governance, from the purely local to the transnational territory. The local context and its particularities must always be distinguished for their possible implementation, hence the proposal described here is structured on a concrete experience that evaluates and correlates them.

This chapter argues that adaptive management processes informed by iterative learning about the ecosystem and through a systemic evaluation of the successes and failures of previous management, increases resilience, which in turn can increase the capacity to respond to climate change threats in the long term.

Thus, a second concept is proposed: the necessary activation of an adaptive management process, where the evaluation of past actions and the level of constraints considered in each time period needs to be assessed and revealed in order to define a cumulative knowledge to guide an evolutionary process of change in the various pathways taken under different levels of risk in order to improve their performance. Again, this is a request for external input. This type of adaptive management (Lee, 1999) can be used to pursue the objectives of:

- greater ecological stability
- more flexible institutions/structures for resource management
- recognising and activating the adaptive cycle (Holling, 2001)

As such, evolutionary resilience, understood as a process of cumulative/reflective knowledge, is proposed here precisely to emphasise that the system goes through different stages of change to become adaptive (Schulze, 1996) and that each decision and its context are important elements to consider in the more holistic decision-making processes proposed as a model of associated objectives.

To fulfil the integration of these objectives, from the environmental to the social sphere at the local level, it is necessary to implement a clear organisational structure under the recognised capacities of local government bodies, so that the process proposes including resources and skills of external bodies – in this case, academic support for systemic assessments which are already defined from a socio-environmental perspective.

This would result in a call for a transdisciplinary research approach, where possible changes can be jointly assessed by the various actors involved at each step of the process, from the main biophysical assessments to the social demands and the various capacities of the local government bodies involved.

The concept of adaptive capacity relates to the potential of a socio-ecological system to reduce its vulnerability (the level at which a system is unable to cope with adverse effects) and minimise the risks associated with a specific threat (Adger et al., 2003; Adger, 2006; Smit & Wandel, 2006). According to Folke (2005), adaptability is a prerequisite for the resilience of a system, which can be defined as 'the ability of a system to absorb disturbances' by reorganising itself to maintain its identity (Folke et al., 2010) before shifting to a radical state. The proposed path for change therefore requires a high level of flexibility and territorial action defined by a constant assessment of the various conditions considered in each system and through their interactions.

The complex interrelationship of the dynamics of the natural and built environment is constantly adapting, which means that the whole process must always be cyclical and evolutionary (depending on gradual changes). Adaptations depend on each system and its interactions (positive and negative) so proposed transdisciplinary approach needs to consider co-evaluation from the scientific perspective of local conditions (including the human and economic municipal resources to support this process).

Adaptations can be seen as opportunities to improve each system and its interrelationships so that an active transdisciplinary approach that proposes various possibilities for change co-defines its main objectives and scope and needs to align with local governance capacities to result in concrete and feasible strategies (in line with the municipality's development goals) as well as effectively integrate local stakeholders in their evaluation.

5. Transdisciplinary process for a new vision of local adaptability: The Arroyo Morón case

This study is based on joint research between different institutions that bring together various disciplines with the aim of improving local development, coordinating agendas and actors to respond to the effects of climate change and the environmental crisis at the local scale. This is in addition to the concepts of evolutionary adaptation activated by participatory processes, those that integrate local, public, and private actors, academia, and various disciplines to facilitate the processes of evaluation, implementation, and monitoring of alternatives for institutional, social, and environmental change. These are recognised as systems whose effects must be assessed in their interrelationships, interdependencies, and capacities in order to define a

Transdisciplinary approach for climate change and local development			
Municipalities involved	Moron (AR) Hurlingham (AR)	Municipal Goals: Flooding controls Slum upgrading in situ program Derelict industrial area regeneration Municipal Park Local airport Nodal transport point	
		Content + Approaches	Disciplines: Conversations to Speculations 10-week course: 3 weeks in situ
Disciplines/ Technical Universities	Landscape / SLU Malmo	Landscape Urbanism	A. Desk analysis: regional functional structures + densities + socio economics aspects + mobility + infrastructures + soil + water shed + flooding risk + planning operability. Synthesis: main Regional Challenges/ goals (per group)
	Urbanism	Integrated planning (actor relational approaches) Urban/regional functional structures Socio-economic development Socio-environmental approaches	B. Site visits + meeting Municipal experts, Main local plans and interest. Synthesis: New revised set of challenges/ Goals at Municipal Level
	UBA Urban design	Urban regeneration Urban design Slum upgrading strategies	C. Meeting local inhabitants (slums), interviews and mapping daily systems. Synthesis: New local D. main spatial proposal: Local+ Municipal scales E. Final regional vision, local strategies
Other partners	City of Amsterdam AMS Institute	Communicative planning	A. Site visits + meeting municipal experts B. Joint speculations and proposed new case studies and experiences C. Alignment of new set of goals within diverse student groups, each choose accents and directions
	AMS Water	Water System/ Public Private Models	
	AMS Energy	Water sensitive design/ local energy	

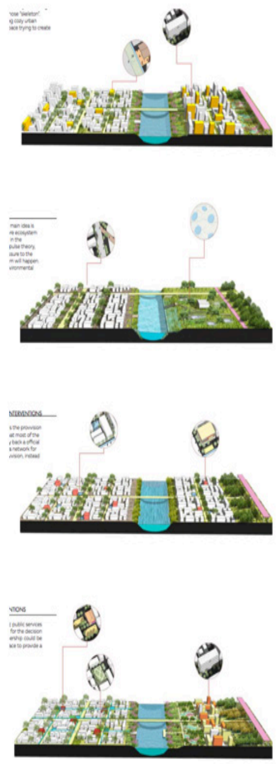

Image 1: Actors and roles in the transdisciplinary programme of the Arroyo Morón case. Authors: Diedrich, Janches and Sepulveda 2018.

plan of integrated actions in sustainable processes that increase their local impact.

From this perspective, during two three-month periods in 2018 and 2019, a research consortium called Transdisciplinarity for Climate Change in Complex Areas was formed, which offered the municipalities of Hurlingham and Morón on the periphery of Greater Buenos Aires to jointly define a possible framework of ideas for a strategic action plan for dealing with climate change. The full study forms a part of the research project 'Tactics and Strategies for the Integral Improvement of the Urban-Water Landscape in the Area of the Reconquista River Basin' by Flavio Janches and Juan Carlos Angelomé (Strategic Development Project 2018-2019, University of Buenos Aires). This exercise was carried out as part of the activities of the Master's Degree courses in urban and landscape architecture from three universities: Master of Landscape Architecture (SLU Malmo, Sweden), Master of Urban Design (University of Buenos Aires), and Master of Urban Planning (TU Delft).

The basic local conditioning factors of these two municipalities were evaluated from the disciplines of urban planning, ecology, landscape, anthropology, and governance, recognising that: 1) the natural features present in both territories are part of the Reconquista river basin, a tributary of the Paraná river and interrelated with its deltaic dynamics, and 2) that the quality of the local tributaries combined in the Arroyo Morón reveals high levels of pollution, and that flood control infrastructure is urgently needed. At the same time, the social conditions of the area were considered, which feature a large number of informal settlements in flood-prone and polluted areas where the poverty rate is high, and informal employment is the main source of income for most of the population located in irrigated areas.

In addition, the good level of connectivity and mobility at metropolitan level was recognised, allowing for the possibility of growth and densification, so that in a first meeting the guidelines for the development of the project were agreed. In this way, the operational framework of a support agreement was followed that sought to bring together strategies for local adaptation in response to climate change and local-inter-municipal development possibilities, enhancing the objectives of local development plans, while recognising the functional interrelationships at the scales of intervention (spatial and temporal).

The operational framework of this exercise was defined as transdisciplinary and structured according to the process defined by Diedrich et al. (2015) as 'beyond best practices' as a participatory dialogue, involving inhabitants, municipal specialists, and academic disciplines of landscape/ecology, urbanism/urban design/governance, anthropology, and urban design as a platform for co-evaluation and participatory design in order to facilitate, understand, and coordinate the complexities of climate change and spatial planning at the local level.

The design of this interdisciplinary activation framework was defined as a speculative process that coordinated a way of creating, of deliberating, and of possible decision-making, as a testing ground for the definition of critical responses and evolution of the knowledge framework, particularly adapted to the strategic guidelines of climate adaptation, environmental improvement, and socio-spatial integration.

Through the results obtained in each phase of the exercise, and from re-evaluation of the processes and projects developed, it is possible to redefine the framework of theoretical, technical, and methodological reflection in order to promote new integrative proposals and provide specific disciplinary responses to each systemic feature being considered. This is essential because of the complexity of the problems, which require new approaches to transform complex urban landscapes into more sustainable environments (Janches et al., 2019).

The exercise described here is structured within this design in a non-linear and interactive process of agreements, proposals, co-evaluations, measurements, and adjustments concluding with concrete possibilities to discuss possible development strategies with multiple actors and thereby define the specific strategies to follow. These improve and expand the objectives of existing strategic plans from a process that is not linear but iterative and incremental instead.

We now describe the phases of the exercise, its actions, and the actors involved in the transdisciplinary process. These defined the operational framework of the exercise, the systems considered, and the possible interrelationships between them.

Through their spatial definition, possible potentials were detected, which in turn revealed possible paths which were re-evaluated by the local actors involved from the economic and technical capacities of the municipalities to the possible spheres of participation of private actors, among other issues.

Phase 0: Systemic (prior) analysis and background review; strategic guidelines predefined by both municipalities

• Objectives: short-term: flood control, formalisation of marginal areas, industrial regeneration and activation programme, urban regeneration programme for the municipal park; medium-term: co-evaluation of strategic guidelines for the reconversion of a disused airport into a regional airport focused on the development of a multimodal metropolitan transport hub

• Actors: academics, municipal officials, inhabitants, and NGOs

• Actions: at the invitation of the municipalities, the strategic guidelines are jointly reviewed through discussions/interviews with the different stakeholders, the areas, the systems to be considered and their levels of risk and urgency are co-defined

• Output: the framework programme of the challenges to be considered, the map of actors and the urgent needs to be considered

Phase 1: Categorisation and prototypical proposal (integrating systems)

• Objectives: to define the systems at stake, and their possible interrelationships; to determine a prototypical synthesis of possible local solutions before approved and similar constraints

• Actors: academics and municipal officials

• Actions: re-evaluation of the system and its environmental impact, rainwater and sewerage management, socio-economic mapping, and integrated re-mapping; speculations from possible solutions based on the study of past actions and impact assessment

• Output: prototypical proposal of integrated local solutions

Phase 2: Presentation of prototype proposal (integrating systems) to local stakeholders; selection and review of technical feasibility, decision-making and management capacity

• Objectives: to evaluate the potentialities and limitations of the 'speculations' presented as tools or previous solutions from the economic and technical capacities of the municipalities and local actors involved

• Actors: academics, municipal officials, inhabitants, and NGOs

• Actions: implementation of three discussion tables, coordinated according to urgent problems where prototypes of possible solutions are presented and discussed by each group of actors to later define the possible frameworks and their limitations

• Output: definition of possible solutions from concrete strategies aligning the diverse interests of the stakeholders involved

Phase 3: Adjustment of the prototypical proposal recognising technical feasibility and decision and management capacity

• Objectives: detailed review of the technical feasibility required by the proposals and joint review of the institutional support system (financial and programmatic)

• Actors: academics and municipal officials

• Actions: presentation of detailed reports of the proposals, evaluation and discussion of their possible operability

• Output: assessment of possible actions, potentials, and constraints, both operational and in terms of decision-making and competence

Phase 4: Spatial contextualisation and co-selection of possible strategic actions

• Objectives: quantification of possible actions, spatial expression, special impact, and co-definition of strategic actions

• Actors: academics, municipal officials, inhabitants, and NGOs

• Actions: implementation of three discussion tables coordinated by actions where prototype strategies are presented and discussed by each stakeholder group and then hierarchies of interests are defined by possible agreements of their impacts

• Output: selection of local strategic plans in stages

Phase 5: Final selection according to technical feasibility, decision-making, and management capacity

• Objectives: definition of the local strategic plan for the specific framework of the transdisciplinary plan to be developed

• Actors: academics, municipal officials, and NGOs

• Actions: summary report of the actions to be developed, possible impacts, cost, and time

• Output: full report of the local strategic plan to be developed

Phase 6: Co-evaluation of socio-environmental impact

• Objectives: the implementation of a socio-environmental impact co-evaluation system

• Actors: academics, municipal officials, and NGOs

• Actions: implementation through participatory scenario system of the co-evaluations from the more technical framework to the social impact

• Output: socio-environmental co-evaluation report

Phase 7: Co-definition of strategic actions in critical areas and possible phases of evolutionary change

• Objectives: once a local strategic plan has been defined and agreed upon, its stages are defined and agreements are made for specific goals over time

• Actors: academics, municipal officials, and NGOs

• Actions: creation of two moderated discussion tables to jointly define the objectives by stages

• Output: local strategic plan, stages, goals, and possible funding

Phase 8: Detail of actions for cost definition

• Objectives: to define the estimated costs of each stage, recognising possible governmental and cooperation agency plans for potential implementation

• Actors: municipal officials

• Actions: municipal, inter-municipal assessments, and possible review at regional level

• Output: cost plan by stages

Phase 9: Local level visualisations of integrated systems and their possibilities. Second presentation to the community

• Objectives: to generate spatial visualisations of possible proposed changes and their spatial outcomes as a means of communication and dissemination for discussion among various actors and the strengthening of possible guidelines
• Actors: academics, municipal officials, and NGOs
• Actions: iterative process of visualisation, understanding, and detailing
• Output: visualisations and systemic-functional details of selected actions

Phase 10: Speculations; detailed strategic adaptive proposal

• Objectives: the definition and detail of possible local strategic plans presented as opportunities that determine the territorial changes linked to the socio-technical capacities of the actors and defined from the operative limitations of possible strategic adaptations
• Actors: academics, municipal officials, and NGOs
• Actions: two evaluation roundtables
• Output: final report of possibilities and adaptations of the decisions framed with possible financing

In each phase, the proposed processes were defined as 'conversations' where the framework consisted of proposals executed by the students, discussed/evaluated by the municipal experts, and enriched by discussions with the different parties, from inhabitants to different stakeholders within the river area between the two municipalities, culminating in a revised and delimited proposal of possible evolutionary plans for the implementation of an inter-municipal development framework.

6. Some final observations

The possibilities proposed in this study link local adaptation strategies with local development strategies. This responds to the strategic adaptation platform and its specific theoretical foundations. The implementation possibilities of the case study are reinforced by the values of empowering local capacities and co-assessing the main causes and effects of an aligned two-pronged strategy.

The role of a more academic environment in facilitating systems assessments has been established to validate the need for a transdisciplinary research approach while offering different development alternatives. This has a crucial enabling role in the local adaptation process that aims at a long-term perspective and meets the definitions of the above-mentioned socio-environmental theories and approaches. The demands of flexible regulatory systems and the inclusive perspective of stakeholders, aligned with their shared development objectives, are fundamental for visualising co-defined assessments and opportunities.

Active strategies of co-definition, co-evaluation, and co-design for facing complex and highly uncertain problems appear as significant milestones for water management and local development. The challenges are open and the possible activation for change from different concrete and evaluated development possibilities is clearly a new opportunity for municipalities in delta conditions aiming at development but constrained by lack of resources.

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Street scene in Amsterdam (2015). Photo by R. Rocco.


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